INTO THE BREACH

Historical Case Studies of Mobility Operations in Large-Scale Combat Operations

Edited by Florian L. Waitl

LARGE-SCALE COMBAT OPERATIONS SERIES

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Cover image: Combat engineers assigned to 82nd Engineer Battalion, 2nd Armored Brigade Combat Team, 1st Infantry Division, fire and detonate a mine-clearing line charge at Grafenwoehr, Germany, during a 2018 Combined Resolve X live-fire training event. US Army photo by Specialist Dustin D. Biven.

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Editor
Lynne M. Chandler Garcia

Foreword

Since the Soviet Union's fall in 1989, the specter of large-scale ground combat against a peer adversary was remote. During the years following, the US Army found itself increasingly called upon to lead multinational operations in the lower to middle tiers of the range of military operations and conflict continuum. The events of 11 September 2001 led to more than 15 years of intense focus on counterterrorism, counterinsurgency, and stability operations in Iraq and Afghanistan. An entire generation of Army leaders and Soldiers were culturally imprinted by this experience. We emerged as an Army more capable in limited contingency operations than at any time in our nation's history, but the geopolitical landscape continues to shift and the risk of great power conflict is no longer a remote possibility.

While our Army focused on limited contingency operations in the Middle East and Southwest Asia, other regional and peer adversaries scrutinized US military processes and methods and adapted their own accordingly. As technology has proliferated and become accessible in even the most remote corners of the world, the US military's competitive advantage is being challenged across all of the warfighting domains. In the last decade, we have witnessed an emergent China, a revanchist and aggressive Russia, a menacing North Korea, and a cavalier Iranian regime. Each of these adversaries seeks to change the world order in their favor and contest US strategic interests abroad. The chance for war against a peer or regional near-peer adversary has increased exponentially, and we must rapidly shift our focus to successfully compete in all domains and across the full range of military operations.

Over the last two years, the US Army has rapidly shifted the focus of its doctrine, training, education, and leader development to increase readiness and capabilities to prevail in large-scale ground combat operations against peer and near-peer threats. Our new doctrine, Field Manual (FM) 3-0, *Operations*, dictates that the Army provide the joint force four unique strategic roles: shaping the security environment, preventing conflict, prevailing in large-scale combat operations, and consolidating gains to make temporary success permanent.

To enable this shift of focus, the Army is now attempting to change its culture shaped by over 15 years of persistent limited-contingency operations. Leaders must recognize that the hard-won wisdom of the Iraq and Afghanistan wars is important to retain but does not fully square with the exponential lethality, hyperactive chaos, and accelerated tempo of the multi-domain battlefield when facing a peer or near-peer adversary.

To emphasize the importance of the Army's continued preparation for large-scale combat operations, the US Army Combined Arms Center has published these volumes of *The US Army Large-Scale Combat Operations Series book set*. The intent is to expand the knowledge and understanding of the contemporary issues the US Army faces by tapping our organizational memory to illuminate the future. The reader should reflect on these case studies to analyze each situation, identify the doctrines at play, evaluate leaders' actions, and determine what differentiated success from failure. Use them as a mechanism for discussion, debate, and intellectual examination of lessons of the past and their application to today's doctrine, organization, and training to best prepare the Army for large-scale combat. Relevant answers and tangible reminders of what makes us the world's greatest land power await in the stories of these volumes.

Prepared for War!

Michael D. Lundy
Lieutenant General, US Army
Commanding General
US Army Combined Arms Center

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Florian L. Waitl

Once more unto the breach, dear friends, once more;
Or close the wall up with our English dead.
In peace there's nothing so becomes a man
As modest stillness and humility:
But when the blast of war blows in our ears,
Then imitate the action of the tiger.[1]

—From William Shakespeare, "Henry V"

The current operational environment the US Army faces today has changed significantly in recent years. Emerging regional threats like Russia, China, North Korea, and Iran resulted in a need to shift the US Army's doctrine to address possible future large-scale combat operations (LSCO) against peer or near-peer competitors. While the US Army has been "bogged down" in counterinsurgency and stability operations in Iraq and Afghanistan for the last 17 years, our potential adversaries have studied our existing doctrine and capabilities with the intent to develop means to counter our once-guaranteed domain overmatch.[2] For the first time since the end of the Cold War, the US military and coalition forces face adversaries that have the ability to compete and in some instances even outmaneuver and overmatch our forces.

The newly published US Army Field Manual (FM) 3-0, *Operations*, provides a doctrinal approach for US Army theater armies, corps, divisions, and brigades to address the challenges associated with large-scale ground combat. The FM mentions that "historically, battlefields in large-scale combat operations have been more chaotic, intense, and highly destructive than those the Army has experienced in the past several decades."[3] Large-scale exercises, as were seen in the 1980s in Europe, haven't been conducted for decades. The skills to participate, lead, or fight in such large-scale combat operations as described in FM 3-0 have atrophied and as a consequence, the Army needs to rebuild itself; an institutional and cultural change is needed in order to successfully fight tomorrow's multi-domain operations.

The US Army is a learning organization that is proud of its history and heritage. We can gain valuable insights through the study of history which is the reason why Lieutenant General Michael D. Lundy, Commander of the Combined Arms Center at Fort Leavenworth, Kansas, specifically instructed the Army University Press to produce *The US Army Large-Scale*

Combat Operations Series book set. The purpose of this initiative is to introduce Army commanders and their staffs to some of the challenges one might encounter in large-scale combat operations (LSCO), to teach situational critical thinking, and to open the discussion of warfighting issues of mutual interest to the Army and Joint community.

Due to the simple reason that without mobility, maneuver forces will go nowhere, the LSCO book set wouldn't be complete without a volume specifically addressing mobility operations. As the Command Historian for the US Army Engineer School, I immediately volunteered to lead this endeavor and bring home this project to the Maneuver Support Center of Excellence (MSCoE) at Fort Leonard Wood, Missouri. MSCoE consists of the US Army Engineer School, the US Army Military Police School, and the US Army Chemical, Biological, Radiological, and Nuclear School which all have their place in mobility operations in large-scale combat operations.

This volume is a collection of historical case studies of mobility and countermobility operations drawn from the past 100 years with insights for modern large-scale combat operations (LSCO). It is organized chronologically to include World War I, World War II, Korean War, 1973 Arab-Israeli War, and Desert Storm.

Andrew B. Huebner starts the book with a closer look at the Gorlice-Tarnow Offensive on the Eastern Front during World War I. Even though the offensive is seen as one of Germany's greatest feats in the war, it is still one of many understudied topics by military historians of the west. He follows a dual perspective of both sides involved in the ensuing maneuvers of pursuit and retreat that characterized one of the largest front line shifts in the First World War. His insights about the stalled German advance after gaining major tactical victories time and time again is an eye opening experience which underlines once again the need to understand the culminating point of victory when planning and conducting mobility operations in large-scale combat operations. The next three chapters shift to the Western Front of World War I. Scott M. Znamenacek takes a closer look at how US Army engineer efforts ensured "freedom of movement" to operational and tactical forces during the Meuse-Argonne Offensive. In his conclusions, he connects the historical lessons to observations of contemporary operations and exercises that were collected by the Center for Army Lessons Learned (CALL). Even though a full century has passed since the Meuse-Argonne Offensive, many of the engineer roles, responsibilities, and capabilities are still needed today in order to fight and win on tomorrow's multi-domain battlefield. Christy L. Lindberg continues the examination of the Meuse-Argonne Offensive through the lens of

the newly established Chemical Warfare Service. Today's Chemical Corps traces its creation back to 28 June 1918 when the 30th Engineers (Gas and Flame) Regiment was transferred and redesignated as the 1st Gas Regiment. The Meuse- Argonne Offensive marked the "baptism by fire" of the 1st Gas Regiment after being created only 90 days prior. Lindberg points out the invaluable lessons and insights of how the chemical support enabled mobility operations during the campaign, which still influences the Chemical Corps today. Daniel K. Runyon finishes the examination of World War I by shifting the focus to Germany's need to develop new doctrine while at war. He highlights the strategic situation of Germany and examines the importance of being a learning organization similar to what the US Army is attempting today with the introduction of the new FM 3-0 and its shift to peer and near-peer threats in a multi-domain arena. He accomplishes this task by examining the history of the Hindenburg Line from its conception up to its breach in 1918.

Paul G. Munch keeps our focus on the Western Front and takes us through the interwar years to Germany's invasion of France. He chooses to concentrate on the importance of terrain and compares the actions that took place during the invasion of France through the Ardennes in 1940 to Germany's counteroffensive commonly known as the "Battle of the Bulge" in December 1944. Brett M. Boyle's account of the conquering of the Rhine by the US Army in 1945 discusses the roots of current doctrine and how specifically the lessons of the 1945 Rhine crossings influenced and shaped current wet-gap crossing doctrine. Mobility and countermobility operations in a mega-city are explored in Walker D. Mills' chapter when he discusses the block by block fighting that occurred in Berlin in the last days of World War II.

Ronney Z. Miller focuses on lessons from the Korean War when he examines Enemy Prisoner of War (EPW) and Refugee Control Operations essential to sustaining a high level of operational tempo and maintaining a successful battle rhythm while conducting large-scale combat operations.

George W. Gawrych shifts the focus to the Middle East and discusses the 1973 Arab-Israeli War in which Egyptian engineers crossed the Suez Canal and were able to breach the Bar Lev Line in record time. The last historical study examines the actions of Operation Desert Storm and how engineer support enabled maneuver units in the"100-Hour Ground War" against Iraq. The Commanding General of the Maneuver Support Center of Excellence, Major General Kent D. Savre, closes the book with a look at future mobility and countermobility developments that the US Army will face on the multi-domain battlefield of tomorrow.

This collection of essays seeks to shed some light on the last 100 years of mobility operations in large-scale combat operations. It also highlights several themes that current commanders and doctrine developers must be aware of when discussing or conducting mobility operations. This volume is by no means a comprehensive treatment of the subject, but we hope professionals and instructors alike will gain a better understanding of the historical context and appreciate the importance of history when looking at the future.

On a personal note, this initiative marks the culmination of my last 10 years supporting the US Army in a civilian capacity. After two successful deployments to Afghanistan during which I learned to appreciate the "human terrain" in military operations—followed by the chance to work as a historian at the Combat Studies Institute (CSI) Staff Ride Team conducting staff rides on a full-time basis and trailed by a period when I was employed as a military analyst at the Center for Army Lessons Learned (CALL) where I had the opportunity to travel Eastern Europe as part of the Russian New Generation Warfare (RNGW) study and later observed other major NATO and Coalition exercises—I finally attained my current position as the Command Historian at the US Army Engineer School. You might ask why I mention my last 10 years. Simple, I was able to move between the operational Army in the field and the "institutionalized" learning army in the classroom and had the chance to combine the lessons of history with contemporary operations and vice versa. This keeps history classroom discussions contemporary while at the same time you get the chance to bring history to the troops in the field. Lessons in history books are many times forgotten yet valid even in modern times. We love to speak about the lessons learned yet often make the same mistakes. While we can gain many insights from the battlefields of the past, the lessons are only truly learned if the behavior changes. This a point I always stress when conducting staff rides with my students. We don't learn history for history's sake but to improve and better today's warfighter to accept and overcome the challenges of tomorrow. I hope the reader will get a better appreciation for history after reading this volume and will remember that whatever challenge they might face in their professional career as a Soldier, there is probably a historical case study or staff ride to help overcome or see the problem from a different perspective. History matters.

This work would not have been possible without the voluntary time and work of the authors who have spent countless hours researching, writing, and taking my constructive criticism to make the volume what it is today; they are the experts in their individual fields of study. I would also

like to thank their families—and especially my own family—for supporting us in this endeavor, which is a work of love for many of us. Furthermore, the support received from the Maneuver Support Center of Excellence (MSCoE) and the US Army Engineer School (USAES) leadership has been exceptional.

I also owe thanks to the staff of Army University Press for putting this book into physical and electronic form as part of *The US Army Large-Scale Combat Operations Series* book set. Special thanks to Colonel Paul E. Berg, book set general editor; Donald P. Wright for production; Robin D. Kern for graphics; and Diane R. Walker and Lynne M. Chandler Garcia for layout and copy editing. As the general editor of this project, I alone am responsible for the errors, omissions, or limitations of this work.

Until then, into the breach once more my friends.

Notes

1. William Shakespeare, "Henry V," Act-III, Scene-I, lines 1–5.

2. Department of the Army, *Multi-Domain Battle: Evolution of Combined Arms for the 21st Century 2025–2040* (Fort Eustis, VA: Director, Army Capabilities Integration Center), October 2017, i.

3. Department of the Army, Field Manual (FM) 3-0, *Operations* (Washington, DC: 2017), 1-2.

Chapter 1

Titans on the Move: Mobility and Countermobility Operations during the 1915 Great Retreat

Andrew B. Huebner

> *History will record this campaign as one in which character fought against efficient machinery, and was not found wanting.*[1]
>
> –Stanley Washburn

The Great Retreat of 1915 marked one of the most significant shifts in the First World War. An overwhelming success to the Central Powers, the Great Retreat opened a huge wealth of exploitable land for Germany and threatened to push Russia out of the war. Almost daily the Germans captured thousands of Russian prisoners alongside huge caches of supplies. Throughout military history the Gorlice-Tarnow Offensive earned its mark as one of Germany's greatest feats in the war. However, the following months after the Gorlice-Tarnow Offensive marked one of the most strenuous periods of the German army in the First World War. Likewise, the Russian army underwent huge political and morale turnovers throughout 1915 but managed to prevent itself from falling into chaos. Strategically the summer retreat was rife with mistakes—forced engagements, an overreliance on strongholds, and a crippling lack of resources. However, tactically and operationally the conduct of the retreat was admirable and considered by one observer as "one of the greatest military maneuvers that has ever been made."[2] Clearly the Great Retreat was a mixed success for both sides.

How are we to explain the failures of not only the Russian army, but of the Central Powers in failing to end the Eastern Front in 1915? Over the years information has surfaced regarding the strategic decisions by both *Oberste Heeresleitung* (OHL, or German High Command) and *Stavka* (Russian High Command) during that fateful summer. Yet high command decisions cannot fully explain what made the Russian retreat so "brilliant" or the German pursuit so lacking. Ultimately the mobility operations conducted by the Germans, however sustainable they might have been, could not fully overtake the Russian defensive retreat or cope with the challenges of continuous open warfare in Eastern Europe.

Background

The Gorlice-Tarnow Offensive represented the culmination of a major shift in the Central Powers' strategic goals for Europe in 1915 rested on

uncertain ground. With the war in the West digging deeper into a stalemate, OHL increased its efforts in the East to knock Russia out of the war. Russia, of the three Entente combatants, appeared the weakest and most likely to consider a separate peace if pressured. Additionally, the Eastern Front by 1915 could not be handled by Austro-Hungary (KuK) who early in the war suffered a series of disastrous losses. By spring the inefficient military commanders of Kaiser Franz Joseph's army desperately tried replacing their losses with mass conscription and rushed training. Across Europe rumors spread that Italy, up until this point a neutral neighbor, was going to enter the war against the Austrians. Vastly unprepared, overall Austro-Hungarian commander General Conrad von Hötzendorf firmly appealed to the Germans for assistance for a new offensive. OHL responded by assigning Chief of the German General Staff Erich von Falkenhayn, later the mastermind behind the 1916 German offensive on Verdun, to assist the Austrians. By the end of April, the Austro-German coalition was poised to conduct a coordinated offensive, later named the Gorlice-Tarnow Offensive, at a weak point on Russia's Southwestern Front.

Russia—"The Clay-Footed Titan"

The Russian forces in 1915 were very different from the ones that marched off to war in 1914. Veteran frontline units, occasionally nicknamed "iron divisions," were far and few by 1915. Repeated offensives had drained Russia of its ready reserve units, particularly its first-rate territorial reservists. Much like the Austrians, the Russian army conscripted wherever possible and cut down on its training. Local conscript reservists (*Opolchenie*) were ill-trained and had to receive support from neighboring veteran units. Worse were the territorial units from the far reaches of the Tsar's empire who, although capable fighters, were prone to surrender—territorial unit commanders often received instructions to shoot any men attempting to flee.[3]

Furthermore, most units lacked capable low-level leadership. In the pre-war years the Russian army emphasized the role of officers over non-commissioned officers (NCOs) in making tactical decisions, believing NCOs were "made" through experience unlike officers who were "born" leaders.[4] However, losses reduced the lower-echelon officer corps to a hollow figurehead of lieutenants who "were hopelessly ignorant and could not even read a map."[5] Split up between a Northwestern and a Southwestern front, altogether 600 miles of frontline, reserves for each front were rarely bigger than a handful of corps—hardly enough to conduct proper counterattacks. These untrained men, led by incompetent junior officers, were essentially cannon fodder waiting to be steamrolled.

More critically, the Russian army lacked sufficient supplies. Pre-war munitions stockpiles were depleting fast and the wartime economy, caught off guard by the ever-lengthening war, fell embarrassingly behind military demands. At times entire regiments of incoming reinforcements lacked rifles or ammunition.[6] The deficiency in artillery shells epitomized the munitions crisis—on average each gun could expend only 5 to 10 rounds per day, in some sectors only 3.[7] Against German artillery, Russian counterbattery fire was almost nonexistent.

Gorlice-Tarnow Offensive

On the night of 1 May 1915, General August von Mackensen's Eleventh Army bombarded the entrenched positions of the Russian Third Army between the quiet transit towns of Gorlice and Tarnow. Sustained shelling persisted throughout the night until on the morning of 2 May combined Austro-German artillery surged into a 90-minute concentrated barrage. Although artillery shell reserves were slim, the devastation spared little, obliterating rows of trenches and dispersing the defenders. Infantry attacks charged and overran anyone left in the demolished trenches while artillery swept away counterattacking forces. In some sectors infantry advanced so far that friendly fire, not Russian shells, fell on German squads.[8]

Like lightning, chaos bolted throughout the Russian Third Army. With only roughly eight shell-deprived heavy guns, effective counterbattery fire was virtually impossible against the German artillery—"the mighty tail" to the German "beast."[9] Over the next few days General Nikolai Ivanov, commander of the Russian Southwestern Front, threw his reserves, the XXI and eventually the III Caucasian Corps, to plug the gap. However, the confusion among the withdrawing forces congested the roads and broke down communications. Counterattacking reserves, finding the roads backlogged or ill-suited for large unit maneuvers, sent in divisions piecemeal toward the front with little information. The muddled counterattacks barely phased the Germans as their artillery pulverized the inexperienced Russian divisions.[10]

After days of confusing and contradictory orders the bleeding Russian Third Army began pulling back, in turn leaving an exposed gap along the entire front. Further south of the Russian Third Army substantial Russian counterattacks by the weak Russian Ninth Army struck at the Austrians but failed to turn the tide of the offensive. Unable to reestablish new effective defensive lines, General Ivanov bitterly ordered the Russian Southwestern Front to withdraw northeast toward the San River, losing thousands of men and any hope for a summer offensive.[11] The breakthrough entirely

met Falkenhayn's expectations—the precision-driven might of the German beast pierced the side of the Russian giant.

Central Powers—"The German Beast"

Mackensen's army was well-equipped for the pursuit. Eleventh Army started the campaign with over 130,000 men composed of veteran units: the Prussian Guard Corps, the Forty-First Reserve Corps, Tenth Corps, the mixed Bavarian-Prussian "Corps Kneussl," and the Sixth Austrian Corps on loan from von Hötzendorf's army. In each corps were fresh reservists and Landwehr, so-called "home-guard" units, who had been practicing maneuver against fortifications and breakthrough tactics.[12]

Mackenson's forces also had at their disposal numerous resources for the offensive drive. From the Austrians the Germans received numerous carts, train cars, and transportation vehicles, each one tightly assigned to specific jobs. The Germans also committed the most resources toward artillery, massing together hefty munitions stocks and field pieces ranging from outdated 10-centimeter guns to heavy Austrian-made 305-centimeter siege guns. About four to six cavalry squadrons were placed at the disposal of each corps for reconnaissance, raiding, and breakthrough exploitation. Among the army groups were also a few battalions of bicycle troops, typically ill-used formations who during the summer campaign returned to their roots as rapid deployment troops.[13] Furthermore, each army group was supplemented by a limited number of reconnaissance aircraft and zeppelins. While the former would be used extensively in the summer of 1915, the latter appears to have had a limited role in bombing runs.[14]

However, logistics could do little to fully prepare for the Galician terrain. Prior to the offensive, the Germans worked hard to improve the railroads leading throughout Galicia, but the limited rail network restricted their ability for fast unit deployment. Furthermore, the gauges of the rail lines proved troublesome as the forces neared Poland where the Russians used wider gauges than what the Austro-German trains had.[15] Even with this issue German engineers worked around the clock to re-pin the rail lines with standard gauges or create new side tracks alongside preexisting lines.[16] The long, dusty roads of Galicia and Poland proved unsuitable for heavy traffic as the sand became a muddy mire after unpredictable rainstorms. Much of the territory the Germans advanced through were also wide-open plains, leaving advancing elements along the roads exposed to ambushes. Many tired troops noted how dizzyingly the plains stretched onwards, almost into infinity.[17] Indeed the Russians took a certain pride in their terrain advantages. Officers joked the retreat could continue as far as

the Ural Mountains until the enemy "dwindled to a single German and a single Austrian; the Austrian will, according to custom, give himself up as a prisoner, and we will kill the German."[18]

Yet Stavka had little doctrine regarding a defensive retreat which was reflected in the conduct of the Great Retreat. Like many wartime belligerents, Russian officers were followers of the age-old "cult of the offensive." Even with the development of fire and maneuver tactics, the infantryman still relied on the bayonet to ultimately defeat the enemy.[19] In addition, the manpower and munitions crisis denied the Russians the ability to properly conduct large counterattacks and encirclement maneuvers. Defensively little could be done to shore up fortifications and entrenchments as the German batteries pressed the front line deeper into the east. The few railroads left in stable condition often could not substantially deploy any reinforcements in critical areas. The rail system also was not under complete military control—more than two-thirds of the frontline railroad operations were still under civilian authorities. Constant debating between hostile local railyard administrators and army engineers occasionally left rows of rolling stock sitting idle.[20] Guiding the overall Great Retreat was the preservation of the Russian army while extracting as much blood from the enemy as possible.[21]

San River Battles

While Mackensen's forces slugged after the Russian Third Army, elsewhere the Russian Southwestern Front withdrew. Few conducted an exemplary retreat like General Alexei Brusilov, later famed for masterminding the famous 1916 Brusilov Offensive. During the disastrous summer of 1915, Brusilov commanded the Russian Eighth Army originally positioned along the far southern flank toward the Carpathian mountain passes against the Austro-Hungarian Second Army. A cavalryman by training, Brusilov instinctively reacted upon hearing of the successful German Gorlice-Tarnow breakthrough. Eighth Army baggage trains were already on the mountain roads well before Brusilov received official withdrawal orders. With the tight mountain roads clear, the iron commander marched his troops by night and by day had them dig positions to fend off attacks. As his forces withdrew Brusilov left small, temporary rearguards to harass Austro-Hungarian advances. Cavalry raids also disorganized the Austrians and, in one case, rounded up 5,000 prisoners and nearly two dozen machineguns. Not everyone under Brusilov's command fared as well; Colonel Lavr Kornilov's 48th Division, a veteran Third Army unit, held one of the farthest forward positions and was torn apart while withdrawing.[22] Along with the rest of the Russian Southwestern Army, Brusilov reached

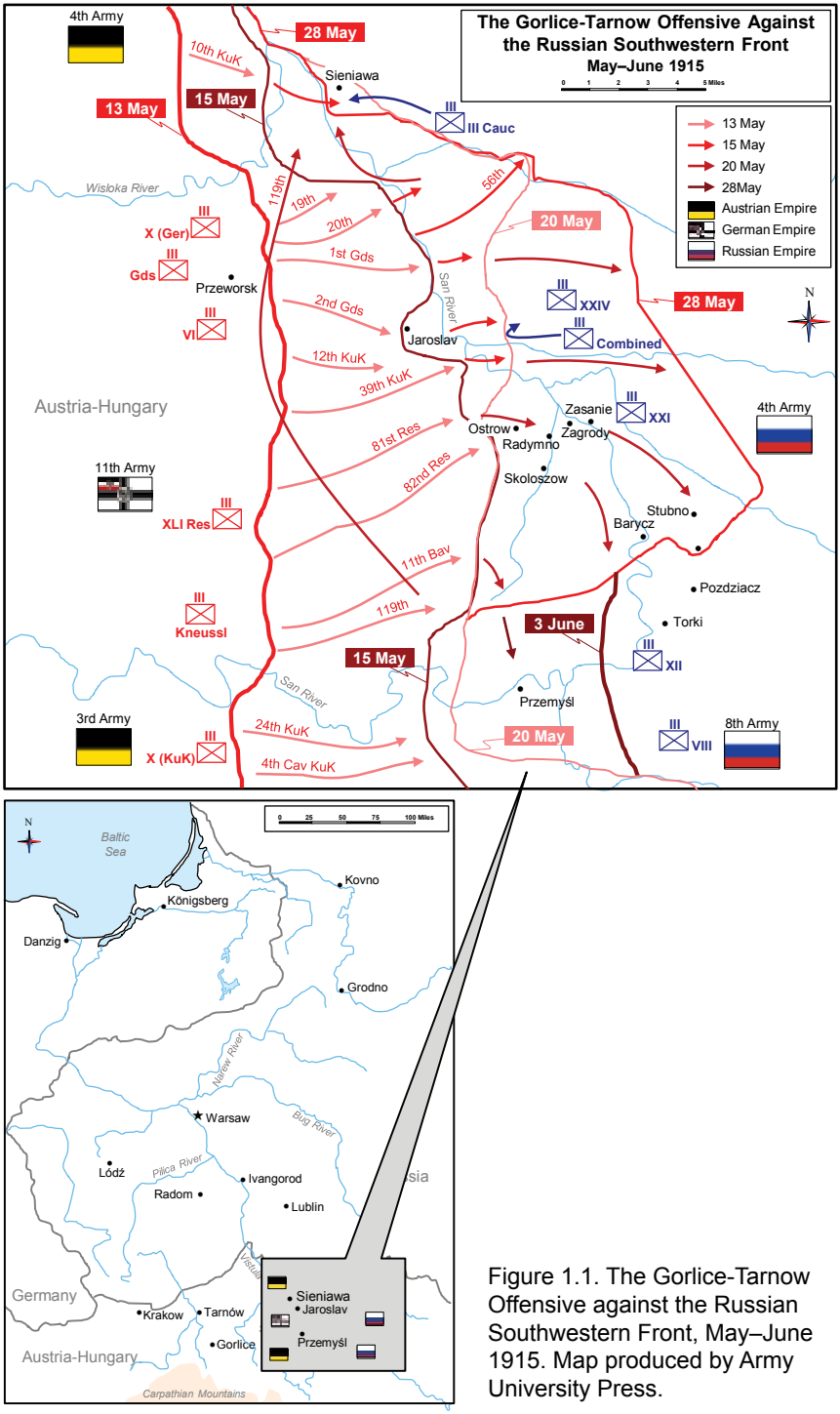

Figure 1.1. The Gorlice-Tarnow Offensive against the Russian Southwestern Front, May–June 1915. Map produced by Army University Press.

the San River where he received orders to hold Fort Przemyśl until no longer tenable.[23]

From the beginning General Brusilov had no intention of holding Przemyśl—earlier "the Verdun of the East" had been the site of a disastrous siege where the Austro-Hungarians suffered hundreds of thousands of casualties. Although the fortress was formidable, presently it had no real supplies and only three weak Opolchenie battalions.[24] However, his request to abandon the position was denied since the fortress had a significant value to the enemy and Grand Duke Nikolai, commander-in-chief of the Russian army, was under the Tsar's orders to hold whatever positions he could. Forced into an ugly position, the former-cavalry officer utilized fluid tactics to best defend the area. Brusilov deployed only a token force inside the fortress and tasked the rest with entrenching themselves around the city fortress. He also utilized the mostly dry Dniester marshes just west of Przemyśl to give his troops an extra buffer between them and the Austrians.[25] The poor marshy terrain also complicated the stretched Austrian supply routes.[26] Entrenched, Eighth Army made what they could around the desolate walls of Fort Przemyśl.

The crippled Ersatz line along the San-Dniester rivers proved a bloody endeavor for Mackensen's forces. The San-Dniester line ultimately stood between the Central Powers and Lemberg, one of the major Galician cities previously lost in the bloody battles of late 1914. However, aside from the river itself, the low-lying, open plains and lack of prepared positions made the San River difficult for even a well-equipped army to hold. German aerial intelligence also suggested that the badly mauled Russian Third Army was still retreating. Yet on 14 May, German cavalry reconnaissance near the San River met fierce small arms and sporadic artillery fire. Attempts to advance were contested not only from hastily built trenches but also from persistent Russian engineers detonating the remaining bridges that lay across the San. Particularly fierce fighting around the city of Jaroslav focused on the nearby hills and an aging castle.

Fortunately, resupply trains brought in severely needed artillery shells and the German forces reshuffled their deck for another breakthrough. On 16 May, the Germans attacked again in the same fashion as they had at Gorlice-Tarnow. In the river fording pontoon bridges were constructed while heavy artillery support suppressed the defenders. In addition, Mackensen's Eleventh Army split in a right hook toward the south to support Austro-Hungarian units assaulting Przemyśl.[27]

During this time, General Brusilov continued to maintain an offensive posture around Przemyśl. Brusilov conserved his forces dearly while continually sending out his best regiments to contest enemy breakthroughs. In one spectacular case a counterattack by a regiment captured 600 soldiers and 23 officers. The slow-advancing Austrians could barely push back the Russians as they constantly suffered from a lack of supplies. The culprit resided in poor rail lines that were so bad that some attack orders were turned down to concentrate on railroad repairs.[28] Ultimately by the beginning of June, Mackensen's southward hook forced Brusilov to withdraw Eighth Army from Przemyśl, leaving only a skeleton rearguard. The fortress along with 8,000 Tsarists fell into German hands on 4 June, but otherwise it was largely found empty except the four outdated cannons—all of them spiked.[29]

The rest of the Russian Southwestern Front fared far worse as the summer proceeded. After the San River line dissolved the Russian army continued its fighting withdrawal, evacuating Lemberg shortly before it fell on 22 June. The Russian Eighth Army continued creating new positions every day and destroying resources whenever they were pushed back. Cavalry especially proved their worth in a dual role of attacker and defender—acting as rearguards until the very last moment before fleeing on horseback or conducting raids against unsuspecting Austrian positions.[30] Often veteran units were used to reinforce gaps created by enemy breakthroughs. Colonel Anton Denikin, an Eighth Army division commander, recalled how bloody the job was as his "regiments were literally blown away by incredibly heavy German artillery fire."[31] His division particularly earned a reputation as Brusilov's "fire brigade," actively going from battle to battle with little rest. Although effective, Denikin's division lost many irreplaceable veterans.[32] Additionally nothing could be done to stop the lower quality units from surrendering en masse.

The sheer number of prisoners of war captured during the Great Retreat has no equal in the First World War. Already the Central Powers acquired more than 250,000 Russian prisoners; the number would rise to over one million Russian prisoners during the three-month period.[33] Many of the troops, their units smashed by overwhelming artillery and dogged by German cavalry, had no qualms about surrendering. Yet the Russians also succeeded in capturing more than a few prisoners. The majority of prisoners captured in Russian counteroffensives, numbering into the hundreds of thousands, were Austro-Hungarian.[34] While the small groups of exhausted and disheveled Germans "walked proudly, heads thrown back,

glaring defiantly at the curious crowds that watched them," the hordes of uniform and clean Austrians all "had the same expression of hopelessness and resignation."[35] In some cases so many would be captured at one time that trying to find their guards was "like trying to pick a queen bee out of a swarm of workers."[36] However much of a victory legions of prisoners represented for either side, they still added more to the traffic congestion and logistical issues of the summer of 1915 as they waited to be taken farther inland toward war factories or farmlands.

The roots of Austria-Hungary's slipshod and uneven performance laid not in the quality of men but the errors of an army that failed to properly fix itself. Adaptations by the Austro-Hungarians were slowly and unevenly processed. While the Russian giant could replenish itself with an almost endless sea of manpower, the Austrians were inefficiently expending green troops in a rigorous campaign. Artillery and rocket strikes often failed to tear apart or even impress the Russian defenders.[37] Attacking in tight formations and tattered blue-gray uniforms, charging Austrian troops made easy targets for the hidden Russians. Their morale was so broken that occasionally men refused to attack and even had to be cajoled by their officers to slowly advance against light resistance.[38] Regardless, the Austro-Hungarians did keep up with the Germans and rarely fell behind during the summer advance. Destitute and worn, the Austro-Hungarian troops shoved forward under the callous direction of General von Hötzendorf.

After Lemberg fell, operations stalled on 16 June once the Austro-German forces outran their supply lines. The breather was critical at this point in the war: Mackensen's forces had traversed approximately 250 kilometers of ground and exacted hundreds of thousands of losses on the Russian army.[39] By mid-June, the situation for the Central Powers had shifted toward the newly made Italian Front. The Italian Second and Third Armies, under General Luigi Cordona's initiative, attacked the Isonzo River striking toward the mountainous border between Italy and Austro-Hungary. Although by late June it was clear Cordona's offensive was failing, General Conrad von Hötzendorf began turning his one-track mind toward the Isonzo. Toward the Dardanelles, the British beat themselves bloody against the Turkish-defended rocks of Gallipoli and along the dusty roads toward Baghdad. On the Western Front, the Second Battle of Artois had ground down to a halt—ending Entente operations until late September. With no other immediate threats and the Russian titan on the move, German OHL reinforced its commitment to finishing the Eastern Front.

The Warsaw Salient

Debates resounded in the German general staff on how to proceed with the Eastern advance. Men like General Erich Ludendorff advocated for a continuation of the northern advance toward the east to threaten the Russian communications lines in Poland. He reasoned that the Baltic cities, Kovno and Vilna, would fall easily to an ambitious drive and another southern punch toward Brest-Litovsk would effectively encircle Warsaw while threatening the Russian capital Petrograd. Falkenhayn however viewed the situation in less ambitious terms. Instead of an encirclement, Falkenhayn wanted to converge on Warsaw and push the Russians out of the city. This required shifting Mackensen's forces northward to join a series of coordinated attacks with Army Group Gallwitz along the Narew River northeast of Warsaw, Army Group Woyrsch along the Vistula between Ivangorod and Warsaw, and Ninth Army directly west of Warsaw.[40]

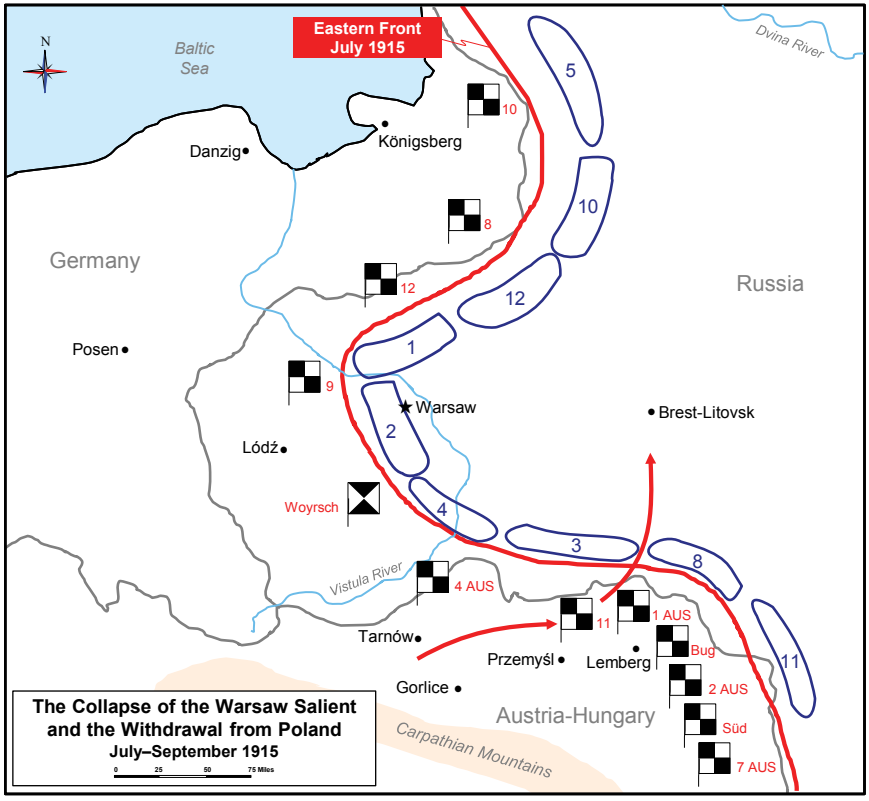

Figure 1.2. The collapse of the Warsaw Salient and the withdrawal from Poland, July–September 1915. Map produced by Army University Press.

Falkenhayn's seemingly unambitious plans offered the greatest sustainability. While Kovno and Vilna to the north were critical to the Baltic region, the capture of Warsaw's major railway and road networks were key to sustaining regional control. Additionally, Warsaw represented a historical bulwark for the Russian empire in Poland and forcing the Russians to withdraw would reap an additional morale blow. In the end Falkenhayn won the debate: the offensive was slated for 15 July.[41]

However, Falkenhayn's plan had to contest a major obstacle: the Polish fortress system. Alongside the juncture between the Vistula, Bug, and Narew rivers lay a series of fortresses built over the centuries by Polish lords, Russian commanders, and briefly Napoleon prior to his disastrous 1812 invasion of Russia. Stavka likewise fortified the positions as a defensive cornerstone, committing millions of rubles to modernize the forts with reinforced concrete, modern barracks, munitions depots, and underground communications. Unsurprisingly, forts were perceived as a critical part of the late 1914 campaigns.

Yet this was 1915, and the fortresses became a large strategic issue. In the pre-war years heated debates circled over whether the fortresses were still valuable bulwarks or were now a liability. On the surface the formidable fortresses appeared capable of stopping attacks with their long-range artillery and deep, massive entrenchments filled with barbed wire and clear firing lanes for miles. Additionally, many of the fortresses lay along the Vistula and Bug river systems circling around the western approach to Warsaw. However, the logistical and strategic reality stripped the antiquated fortresses of their value. Weary soldiers moving into positions complained about sunken trenches rotting from disuse and bulwarks barely suiting modern standards. One officer complained some fortifications were only partially made of concrete and mostly finished using brick.[42] Even the crown jewel of the fortresses, Novogeorgievsk—standing along the axis of the Narew and the Vistula—only had a fraction of its 90,000 troops armed. Yet the fortresses held a high percentage of the Russian army's artillery—routinely making them prime targets for munition-starved units.[43] Unlike the top-tier French forts at Verdun, the Russian fortress system at Warsaw was ill-suited for prolonged sieges.[44]

Few in Stavka who knew the reality of attrition warfare proposed withdrawing the fortress garrisons to new defensive lines. However, there was precedent to holding the fortress chain as it was a perfect salient for launching future attacks if Warsaw could be held. Additionally, the regional rail systems were not suited for a quick withdrawal, requiring upward of 200 trains just for Novogeorgievsk with far more for Warsaw.[45] Finally,

the fortresses symbolized the Tsar's commitment to defending Warsaw—withdrawal would further highlight the unfolding disaster. Although uneasy, Grand Duke Nikolai conceded to the Tsar's requests to hold Warsaw so long as General Mikhail Alekseev, chief of staff of the Russian Southwestern Front, believed possible. Effectively though this was a costly case of organizational paralysis: no one in Stavka wanted to make the hard decision of evacuation and contesting the Tsar's expectations.[46]

As the Russians prepared their aging fortresses, the Germans plotted to finally capitulate the Warsaw salient. The beating summer heat provided little relief to invader and defender alike as the pleasant Galician hills turned into flat Polish plains. Long, sandy roads became increasingly rutted and a brief period of rain in the southwest along Mackensen's front mired convoys in mud.[47] Stiff resistance by the Russian Third Army further exhausted Mackenson's troops as they moved into positions near the Vistula River. One artilleryman described how at night villages burned like bonfires while "shrapnel whistled unceasingly, and in the distance we heard faint 'hurrahs' . . . we had no time to admire the wild, stormy beauty of the night, as an attack in overwhelming numbers might be made at any moment."[48] Fortunately, trainloads of reinforcements and supplies were brought in to the bloodied divisions, but not nearly enough to bring them back to full strength. Most units, particularly Mackensen's forces, were well below half-strength.[49] To compensate for this weakness, each of the guns received more artillery shells.

Chlorine gas canisters also would make a rare appearance in the following weeks against Russian positions. Although devastating and reportedly far-reaching, gas attacks rarely brought expected results due to the rudimentary system and sporadic usage against heavily defended positions where artillery was not readily available. Gas masks were still scarce for both Russian and German troops alike and few methods existed to protect attacking troops. Additionally, only two cases of successful gas attacks were conducted: one south of Warsaw which in late-July cost the Russians 9,000 troops and another on 6 August at Fort Oscewis. In both cases, advancing troops were temporarily repulsed by coughing, bloody defenders who charged before succumbing to their injuries—the latter event famously dubbed by reporters as "The Attack of the Dead Men." Unsurprisingly, chlorine gas attacks also earned ire from the international community. Ultimately chemical weapons did little to turn the tide—only sheer firepower would root out the Russian bear.[50]

The renewed offensive began on 13 July with Army Group Gallwitz and Army Group Woyrsch pushing against heavily-fortified trench lines

along the northwest and northeast of the Warsaw. Days of makeshift offensive positions and aerial reconnaissance proved their worth as combined artillery and infantry attacks overwhelmed the Russian defenders and, despite the difficult, marshy terrain, proceeded along a smooth advance. Over the following days German troops chased after Cossack rearguards through burning districts, occasionally saving "many a village from the murderous torch."[51]

Further south the main assault from Mackensen's Eleventh Army began on 15 July with a thunderous three-hour bombardment followed by river crossings. Here the Russians fiercely contested the German river crossings, pouring incessant fire from behind the high river banks and barbed-wire laced trenches. Heavy anti-aircraft fire shot down any German aerial reconnaissance sent up. Limited Russian counterbattery fire, directed by aerial reconnaissance, poured onto the Germans. By nighttime only ragged elements of the Austro-Hungarian First Army achieved a tenuous foothold across the Vistula. Commanders were so surprised by the stalwart defense that some doubted whether a breakthrough was possible.[52] However, Mackensen persisted and in the following days his troops established more bridgeheads. By 29 July, Mackensen had only advanced 25 to 40 kilometers, but his position now threatened the entire Warsaw salient.[53]

Stavka sensed the German plan long before Mackensen reached his position. Reports from Warsaw hinted at the futility of holding the salient and recommended withdrawal. Grand Duke Nikolai did not hesitate to permit General Alekseev to "evacuate Warsaw, if you feel you must."[54] By 22 July, Alekseev sent out orders to the western flank—defended by the Russian Second Army—to withdraw toward Warsaw. The northern approach, defended by the Russian First Army and the fortress system, indefinitely remained on the defense.[55]

The Germans quickly took advantage of the Russian withdrawal, and on 29 July the offensive once more steamed to life. Army Group Gallwitz provided another diversionary attack to keep the fortresses busy as the other army groups circumvented the strongpoint. Mackensen's forces bombarded the Russian Third Army and pushed northward toward Brest-Litovsk, while Army Group Woyrsch and the Austro-Hungarian Fourth Army crossed the deep Vistula River to capture Ivanogorod and Lublin respectively. Days prior to the offensive, pontoon boats and bridges were discreetly moved at night. When the offensive began the troops forded the river on pontoon boats and, once bridgeheads were established, bridge construction began. Although the Russians put up a fierce fight, General Remus von Woyrsch's troops were able to advance on the retreating

Russians farther inland and by 31 July the Vistula was fully secured.[56] The conduct of the crossings was so noteworthy that strategist General Max Hoffmann, normally a scathing critic of his peers, praised the work of Woyrsch's engineers as "a very pretty piece of work."[57]

As the sun rose on 2 August, Warsaw was in full evacuation. Once more in Russian tradition, the retreating forces set ablaze any farmhouses and critical junctures it could, leaving behind trails of smoke. Cossack cavalry acted as a protective screen for the retreating infantry, making fast counterattacks and keeping the Austro-German forces off guard. Engineers worked fast rigging bridges with explosives and assembling temporary fieldworks just on the outskirts of Warsaw. Overcrowded trains whisked wounded and sick out deeper into Russia. Refugees surged ahead of the army, carting off all their possessions while almost daily, small groups of planes and zeppelins dropped bombs around the city. However exhaustive it might have been, the orderly evacuation was completed by 4 August; the next day the Kaiser's cavalry entered Warsaw's streets.[58]

While Warsaw mostly escaped devastation, the rest of the salient witnessed the terrors of scorched earth. Although the tactic harked back to the days of Napoleon's disastrous 1812 invasion, officially the Russian army never condoned scorched earth as a doctrine despite continually practicing it. Stavka Chief of Staff Lieutenant-General Nikolai Ianushkevich blatantly ordered the destruction of crops and any structures of military value in Galicia. The Grand Duke's policy toward occupied territories split government authority to front commanders who ideally were to coordinate with local governors. However, civilian governments often were long defunct by the time troops arrived. Hastily gendarmes stole from the peasantry all the livestock and crops they could muster. Early in the retreat, units regularly practiced scorched earth, torching almost entire transit cities.[59] Implementation of scorched earth was sporadic: occasionally telephone lines were cut behind neighboring units while facilities elsewhere remained unharmed, and gendarmes burned straw while leaving whole fields intact.[60] Ultimately more than four million cattle were lost in the chaos.[61] Some officers almost day and night destroyed residences, even alcohol, to deny their troops any incentive to delay their retreat.[62] Although Grand Duke Nikolai condemned these actions, commanders feigned ignorance and let the destruction continue.[63]

Scorched earth policies stretched not only to property but civilians as well. Naturally civilian refugees first swarmed the roads, hastily fleeing their towns before the fighting consumed them. Early in the summer,

destitute refugees nestled next to retreating units, receiving warm tea and meagre bread from Red Cross workers and soldiers alike. However, as the offensive continued more refugees swarmed the roads. The Tsar's army groaned as road traffic became intolerable and the movement "assumed the dimensions of a national migration."[64]

The further inland the Russian army went, the more hostile relations became. Abuse cases sprout up across the land, particularly from ethnic minorities haphazardly targeted as "untrustworthy" and potential enemy collaborators. Jews were a first-choice target, viciously descended upon by thieving soldiers who beat anyone that resisted. From the borders of Galicia and Lithuania, stretching to Poland, occasionally entire populations were deported or conscripted. Although by 1915 many of the Tsar's reservists had been mobilized, many more reservists still resided in local villages. Local military-aged men, between the ages of 18 and 45, were often forcefully conscripted by the retreating armies.[65] Although the exact effects of the policy remain cloudy, the few locals who remained to greet the Germans often looked at the invaders more favorably than the previous Russian occupiers.[66]

With Warsaw evacuated and the front line straightened, once more the German offensive stopped to rearm and assess a new strategic direction. General Ludendorff, along with several other general staff officers, believed that now the front line was beginning to straighten out and provide the Central Powers the ability to conduct enveloping breakthroughs. To the north demands were made for a northern offensive to push toward Kovno and Grodno, while in the south Austro-German forces were pushing closer toward the next Russian defensive line along the Bug River. General Conrad von Hötzendorf once more returned his attention to the southern sector, confident his forces could break through and encircle elements of the broken Russian Southwestern Front.

Falkenhayn protested such maneuvers in favor of stabilizing the line at Brest-Litovsk, but he ultimately compromised for once to his associates. Mackensen's battered Eleventh Army were to advance in a northerly turn toward Brest-Litovsk while the Austro-Hungarians prepared to conduct their "Black-Yellow Offensive" near the beginning of September. To the north, the heralded Feldmarshall Paul von Hindenburg would conduct the northern offensive to take Kovno.[67] By 11 August 1915, the Central Powers were utilizing the waning energy in their center of gravity to push the frontline again. The final roadblocks of the arduous campaign were the Warsaw fortresses.

Few situations typify the systematic destruction of the Polish fortress system like Novogeorgievsk. In the days leading up to the advance, the Germans carefully concocted their plan to take down the fortresses. Every bit of intelligence on hand was used, ranging from pre-war reports to reports from captured prisoners. Among them was one of the main Russian engineers who also had schematics of the entire fortress system stashed in his car. The Germans brought up 113 guns, including 21 150-mm guns, filed into 26 batteries. Additionally, a special armored siege train brought in a key passenger: General Hans von Beseler, devilishly known as "Battering Ram Beseler" from the Siege of Antwerp. Using the rail lines surrounding the fortresses, Beseler positioned his siege train and artillery to target the two weakest forts in the fortress system.[68]

Bombardment commenced on the morning of 13 August. Beseler advanced his troops using constant artillery fire to first force the Russians out of the trench systems and into the forts. Once near the forts, artillery was concentrated to stall the fort counterbattery until they were ready to begin the final assault and enter the forts. The artillery fire had an outstanding effect—one heavy shell lit up the munitions dump of one small fort, sending fire and bricks soaring through the smoke-choked air. Day by day, Beseler's forces repeated the maneuvers until on 22 August the guns at

Figure 1.3. Germans leading Russian prisoners over pontoon bridge over the Vistula River; fortress of Novogeorgievsk in background. Modlin, Poland. Photo courtesy of the Library of Congress.

Novogeorgievsk fell silent and the Russians poured out of the crumbling walls with raised arms. The entire command staff—30 generals, along with 90,000 men, 1,600 various artillery pieces, and one of the largest stockpiles of munitions in Poland—fell into German hands.[69]

Unfortunately for Stavka, no other fort proved an exception. Fortress Kovno, despite the effective use of its heavy batteries and combined cavalry and infantry counterattacks, eventually went under siege on 10 August. Lacking leadership, proper fortifications, and essentials such as underground communications, the Kovno fortress system began crumbling. Batteries incidentally fired on friendly forts and panic gripped the garrison, some attempting to flee on overcrowded trains. On 17 August the commanding general, Vladimir Grigoriev, disappeared into the night in his packed staff car. The next day Fortress Kovno completely surrendered.[70] Fortresses such as at Oscewis, Brest-Litovsk, and Kovel mostly escaped such devastating sieges, either mostly or completely abandoned before being overtaken by the Germans.[71] Imposing fortifications meant to last month-long sieges crumbled in mere days against modern technology and their own insufficient logistics.

In late August the Russians still retreated, but now the advantages were stacking in their favor as the summer fighting began slowing down. Although the Germans eventually took Vilna in the north, the tactical punches grew weaker. In addition, the front line had shortened from 1,700 to 1,000 kilometers, and terrain began to hinder the pursuers.[72] By the end of August, the terrain had opened to a series of rivers and swamps around the Privet Marshlands. The rail lines reached their limits, forcing exhausted columns to traverse uneven furrows and restrictive roads. The worn German army groups were slammed by strong counterattacks and eventually ground to a halt. Meanwhile the "Black and Yellow" offensive Conrad von Hötzendorf had boasted about fell into a quagmire. Tens of thousands of Austrian troops were lost in a struggle against flooded swamps, well-prepared positions, and skillful counterattacks by Brusilov's Eighth Army. Stretched beyond the reach of its rail lines, the costly Austrian offensive drug on for a month before finally conceding to a bloody halt at the end of September.[73]

Conclusion

There is no mistaking that the Central Powers approached the challenges of sustaining the offensive with considerable preparation. The conduct of the summer showcased General Erich von Falkenhayn's characteristic strategy of tactically forcing the enemy out but stopping short

of their annihilation. The reliance on reconnaissance elements and rapid troop deployment kept the commanders in constant contact with the enemy, but only at the speed of the main force. However, the trade-off came in a secure supply system for field armies and thus greater battlefield dominance. In heavily defended areas, supply lines made artillery the decisive factor in most engagements—uprooting shallow trenches, cracking aging fortresses, and shattering infantry morale. Tactically, the offensive breakthroughs were well-conducted and took full advantage of surprise and overwhelming firepower.

Yet no matter the major tactical victories Germany achieved, the campaign underachieved its strategic aims. At the pace the German offensive proceeded eastward, no amount of tactical victories could strategically force Russia to make peace and resolve the two-front war Germany found itself in. Ultimately, the Russian joke rang half-true: through the terrain and logistical exhaustion, the Austro-Germans inevitably ran out of steam before the Russian army did.

What stalled the German advance far more than enemy resistance was a myriad of environmental and human factors. Eastern European transportation networks at the beginning of the twentieth century were severely behind the standards in the West, underdeveloped roads became muddy quagmires, and the destruction of a single transit center meant costly disruptions in supply lines. Ultimately, the German advance proved unable to sustain and cope with inadequate transportation networks torn by scorched earth policies. The echoes of the Great Retreat would reappear in 1941 during Operation Barbarossa and continue into the 21st Century.

While it is tempting to solely admire and dissect the victors of this campaign, commanders can gain a great deal from the Russian Tsarist army. Their conduct of the retreat reflected a willingness to trade space for time with the enemy, giving up previous gains to preserve ground forces and material. Troops on the move harassed enemy advances by taking full advantage of the terrain. Russian troops utilized cunning tactics to delay the Austro-Germans even without pre-made obstacles or steady supply lines. In areas like the San River, the Vistula River around Warsaw, or the Privet Marshes, makeshift defensive positions effectively stalled German operations and forced them into breakthrough tactics.

However, much like the Austro-Germans, the Russian forces also had to handle traffic issues on poorly maintained routes and often without the

assistance of local authorities. Yet countermobility was a bigger matter for the Russians than mobility: utilizing available resources to successfully withdraw followed by stripping the areas of valuable assets and rendering useless unmovable assets to the enemy. Mobility and countermobility are two sides of the same coin—asset value, like modern warfare, is also fluid and constantly changing based on circumstances in multiple domains.

Additionally, the Russians suffered from a worst-case scenario that pushed many commanders to the breaking point. Like a ruptured tendon, insufficient munitions restricted Stavka's ability to take advantage of countermobility operations and regain the initiative. General Brusilov knew this fact and adapted his plans accordingly, even under orders to hold Fort Przemyśl, while the commanders of the Warsaw fortresses failed to come to this conclusion in time. Without effective supply systems the valiant efforts of troops, even in prepared fortresses, means nothing unless it could be followed through.

Although Grand Duke Nikolai, along with numerous Stavka officers, were relieved of their positions or outright sacked for the disastrous Great Retreat, few actions on their part can be considered absolute mistakes. Troop morale sagged, but the initiative seized in organizing a smooth retreat preserved order and in turn troop morale. In fact, Grand Duke Nikolai attained the height of his popularity among troops days before being replaced by Tsar Nicholas II as supreme commander.[74] Above all, preservation of order and control can preserve even the most beaten and ill-equipped army to fight for another day.

Today's large-scale operations require not just more resources but a different region-to-region approach in the face of far-reaching armaments and limited transportation networks. Mobility in such environments is vitally important where large, diverse climates and local support systems can restrict operations. For example, modern Eastern European rail lines are still not set to the same gauge, and many viable roadways are poorly maintained or unfit for large operations. As history attests, mobility systems are not guaranteed, often resting on tenuous logistical systems that can be easily threatened whether by a determined opponent or simply uncontrollable factors. Ultimately the summer of 1915 demonstrates how flexibility and preparation can prove decisive regardless of the situation one is in.

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Chapter 2
Enabling Maneuver: Engineer Operations in the Meuse-Argonne

Lieutenant Colonel (Retired) Scott M. Znamenacek

As we know, the engineers were never allowed to be idle. If they had nothing else to do, they could fight.[1]

—Fredrick Palmer

During the waning months of 1918, the forces of both the Allied and Central Powers attempted to break the trench warfare stalemate by integrating new maneuver doctrine and tactics into their operations. As the engineers of today enable maneuver in large-scale combat operations, so did their predecessors during the Meuse-Argonne campaign of 1918. The Meuse-Argonne campaign was the final offensive of the First World War, a culmination of years of conflict in Europe that stretched along the entire Western Front. The offensive began on 26 September 1918 and concluded on 11 November 1918 with the signing of an armistice agreement to end the conflict. Fielding more than 1.2 million US Soldiers for this operation, the offensive brought the war to an end at the cost of nearly 26,277 American lives.[2]

Background

As the First World War entered its fourth year, the American Expeditionary Forces (AEF) found themselves as a central element of a massive offensive operation to regain control of the rail lines in northern France and defeat the German forces holding key terrain in the vicinity of Verdun. During the previous three years, a system of complicated entrenchments and fortifications had enveloped the region. The use of large-scale infantry attacks supported by artillery and gas attacks had become the common tactic used by both sides in an attempt to overcome the opponent and gain a tactical advantage. The lessons experienced over years of combat reflected a growing ineffectiveness of the offense in the face of a robust defense comprised of well-built fortifications, machine gun positions, and artillery fires.[3]

During the years leading to the US entry into World War I, the National Defense Act of 1916 became an important document that would shape US military organization for the 20th Century. In addition to raising peacetime Regular Army strength to 175,000, it also increased wartime authorizations to 286,000 and included 65 infantry regiments, 25 cavalry regiments, 21 field artillery regiments, 7 engineer regiments, 2 mounted

engineer battalions, 263 coastal artillery batteries, and 8 aero squadrons.[4] These nine engineer units would play a vital role as the AEF became a larger asset in the European campaign.

In order to fight in a large-scale operation, the AEF organization needed to integrate both corps and armies in its structure. In prior force designs, corps and field armies were comprised of a small headquarters element to command their subordinate units. American planners led by Lieutenant Colonel Fox Conner and Major Hugh Drum (in consultation with Colonel Chauncey Baker who was studying Army tactical organizations) would form the General Organization Project.[5] The resulting design was field army headquarters commanding five corps. Each respective corps would command, control, and coordinate the actions of four combat divisions, in addition to organic support forces.

As the project progressed, both the corps and field army designs ensured that additional organic combat power would be retained by the headquarters to allow the commander greater flexibility to meet his tactical and operational objectives. For the field army, this meant retaining a diverse collection of capabilities to include engineers, supply, and military police. In addition, to fight this new style of war in Europe, large field artillery formations were included in the design. Somewhat similar in design, the corps's organic mix would include cavalry, antiaircraft batteries, signal, and support units. Under the final design, the General Organization Project's planners estimated that a full-strength field army and corps headquarters would number approximately 120,000 and 19,000 soldiers respectively.[6]

At the end of the war more than 17,400 engineer troops under direct command or technical supervision of the AEF's Chief Engineer, Major General William C. Langfitt, supported the theater by providing a variety of capabilities.[7] In addition to the core mobility and counter-mobility tasks, engineer troops "maintained lines of communication, built bridges, fought as Infantry, conducted camouflage, searchlight, flash and sound ranging, water supply activities, and many other special functions."[8] These wide-ranging efforts allowed US divisions to rapidly maneuver against and defeat the remaining German forces in the waning days of World War I.

Throughout the summer of 1917 and into 1918, the AEF's divisions began to gain valuable experience both in training and initial engagements against the Germans. It was during these operations that the various combat arms began to work together and identify many of the challenges of a combined arms fight. In one instance during the execution of a raid on

German positions, a failure to adequately plan and coordinate between the infantry and the engineers determined the fate of the mission:

> The infantry, through frequent patrols, knew the ground well, but no one thought to provide infantrymen as guides for the engineers and, consequently, the engineers were lost. That taught the American Army something about the necessity for "guides;" and a week later when the raid was tried again, everything went smoothly and it was a reassuring success.[9]

As a result, a close liaison relationship developed between the infantry and engineer forces. Prior to the first major operation of the First Division at Cantigny, engineers and infantry coordinated efforts to plan, coordinate, and strengthen their defensive positions.[10] The division engineer officer was often responsible for the siting of all positions, with the approval of the division commander. Once approved the engineers were often aided by infantry battalions to provide manpower to complete the construction of defensive trenches and other shelters.[11] Finally, combat engineers often provided valuable intelligence reports to their supported division headquarters as well as information to the commander and staff that were often more accurate and timely than those provided by the infantry.[12]

The Meuse-Argonne sector in the vicinity of Verdun had stabilized since September 1914 and basically remained unchanged until the campaign commenced in the fall of 1918. The only major operations that had been conducted since then were the German attacks on Verdun in 1916 and a French counteroffensive in August 1917. Over this time, a very complex battlefield developed. As the German forces constructed a defensive system in depth, they took advantage of the terrain to create a formidable obstacle for the Allied forces to overcome. In addition, planners realized the need for a robust logistical network, not only to re-supply forces, but also to rapidly move those forces for the next battle.[13] The needs for units living in the trenches meant that increased levels of supplies were required—not only food, but also the vast quantities of munitions and material that were needed to conduct combat operations. To meet these demands, the railroads and road networks of France became a critical backbone to ensure the heavy demands of the 1.25 million American combatants engaged in the campaign were met.[14]

Trench Warfare

The use of defensive fortifications existed long before the world entered the 20th Century. To enhance the defense tactics of the period, forces

on both sides of the lines employed the newest technologies in an attempt to halt overwhelming enemy attacks. The combination of machine guns and field artillery essentially ended the offensives of 1914 and drove both sides into the development of large defensive fortifications. Reaching 1,550 miles across Western Europe and built in depth, attacking forces found themselves facing an almost impassable obstacle.[15]

In the vicinity of Verdun, the Germans created a defense in depth by developing four trench lines manned with five divisions on line and another seven in immediate reserve.[16] Stretching for nearly 15 miles from the front lines to the rearmost trenches, this depth allowed for the repositioning of forces or the commitment of reserve forces if a line was breached. To further reinforce these fortified lines, the Germans used the battlefield's terrain to their advantage—using the hills and forests of the region, a number of "intermediate strong points."[17] Adding to the lethality of these fortifications, attackers would face an integrated defense comprised of "wire entanglements, machine gun positions with interlocking fields of fire, mortars, and concrete fighting positions."[18]

Wire Obstacles

One of the most common and rapidly emplaced obstacles was barbed wire, developed by an Illinois farmer in 1873 to control livestock.[19] Military leaders soon discovered the effectiveness of wire in the construction of defensive positions. Barbed-wire entanglements combined with the layers of mutually supporting trenches and machine guns made the Western Front a virtually impenetrable barrier to large infantry formations. In addition to barbed wire, a variant of barbed wire known as razor wire was also used to build obstacle belts. The development of this new capability introduced new requirements on both infantry patrols and combat engineers. This included the need to emplace, maintain, and eventually remove the fields of barbed wire.

Using existing capabilities to overcome this new obstacle, a new tactic was implemented to fire artillery on the emplaced barbed wire; the shrapnel would cut the wire in front of the attacking infantry. In addition, the introduction of tanks and Bangalore torpedoes reduced the effectiveness of wire obstacles against attacking forces.[20] To create gaps in wire obstacles, engineers implemented a recent invention from the British Royal Engineers, the Bangalore torpedo. Consisting of lengths of threaded pipe containing explosive charges, the pipes would be screwed together, pushed

into the wire obstacle and detonated, creating a hole approximately five feet wide. The use of this mine is described in *The History of the A.E.F.*:

> The plan called for the divisional engineers just before the attack to carry across No Man's Land, and push under the German barbed wire long pipes filled with high-explosive and then, at the appointed time, to explode these, thus opening the way for the infantry.[21]

Mine Warfare

During the First World War, military leaders looked for options to the mass offensive attacks and widespread trench construction that dominated the Western Front. As a part of the German Schlieffen plan, planners called for offensive assaults on both the French and Belgian fortifications on the frontiers between the countries. In a manner similar to siege operations from medieval history, engineers integrated underground mining techniques into the operational concept to attack the enemy from underground. This required soldiers proficient in both underground warfare and tunneling. Looking to peacetime occupations for the needed knowledge and skills, mining forces were formed around personnel recruited from those working in commercial mines, construction, or engineering trades. Seeing a benefit of implementing this tactic into their doctrine, the Germany Army began forming siege engineer units prior to the start of hostilities.

Subterranean operations on the Western Front allowed forces to advance without being observed by the enemy. One tactic that was widely used was the placement of explosive charges under key enemy positions in order to destroy the fortification, allowing friendly forces to conduct an attack on the surface. But it was soon discovered that the craters created by the explosions damaged the terrain to such an extent that infantry formations had difficulty moving forward during the attack. In addition, these explosions had multiple effects, from the casualties caused by the blast to psychological impacts (fear and demoralization) for surviving soldiers.[22]

One of the most notable sites for mine warfare in the Meuse-Argonne region was the village of Vauquois, located west of Verdun. The village stood on a hill and was of great military importance because of its dominating height and facilities for viewing the surrounding region. Before the United States entered the war, this place was the scene of large-scale military mining operations by both the French and the Germans. In these operations, deep tunnels were built under the opposing lines, and vast quantities of explosives were set off in them. After numerous detonations

were initiated by both sides, the town was literally blown off the top of the hill.[23] Other instances also included the Battle of the Somme in 1916 and Messines Ridge in 1917.

In addition to tunnel mining, land mines became more common. As military forces entered the 20th Century, new and more powerful military explosives significantly increased the lethality of mine warfare. A 1998 *Engineer* magazine article discusses the increased lethality over time: "Black powder shells of the Civil War period burst into only two to five fragments, while those of the Franco-Prussian War burst into 20 to 30 fragments. By World War I, a 3-inch high-explosive shell produced about 1,000 high-velocity fragments."[24]

Prior to the First World War, Germany introduced a pressure or "step-on" mine (in German, tretmine).[25] This type of mine (dispersed in large zones called minefields) was used throughout the 20th Century as a way to deter enemy assault forces from moving into a certain area or to channel them into defensive engagement areas. Lieutenant Ernst Jünger of the 73rd Hanoverian Fusilier Regiment described the German mines: "These hotheads are forever puzzling out the possible ways of . . . making the ground in front of the trench murderous with explosive machines. Perhaps they cut a narrow passage through the wire in front of their posts in order to entice an enemy patrol, by this bait of an easy way through, straight up to their rifles."[26]

Road and Railway Construction

At the strategic level, logistics planning determined the level of manpower and material support required for that campaign and deciding where to employ that manpower. Despite all the planning involved, it soon became clear that the war in the West had stalled; now both sides began to face the realities of the first truly modern industrial war. To strategic and operational planners, this meant massive numbers of men facing off and consuming munitions at a staggering rate prior to conflicts, leading to unpredicted requirements for both the AEF and the War Department.

Between the political strategic decision-making and the tactical resupply of units in combat operations lies the operational or theater level of logistics. This encompasses a variety of functions from base ports or major home nation depots, rail lines, and regulating stations to the railheads where supplies were delivered to armies, corps, and divisions. As the United States prepared to enter the war, an enormous effort went into building, maintaining, and expanding the infrastructure that supported this level of war. To support the American Expeditionary Forces (AEF), a

logistics network enabled the movement of supplies and personnel from ports to forward depots and railheads from 1917 until the end of the war. Logisticians utilized 28 ports and more than 5,000 miles of rail lines to move a projected 101,000 tons of supplies per day (for a projected a 4 million man force) through the logistics network.[27] In addition as US troops arrived in Europe, AEF engineers were called upon to build the required infrastructure. The effort to construct vast storage, light rail, and roads put the AEF in a position where they could ensure that their soldiers in contact with the enemy had what they needed to fight.[28]

For the tactical echelon, tactical logistics is a matter of daily resupply often in the most difficult circumstances. Food, water, and other consumables must be moved from army, corps, and divisional supply depots to soldiers in the front lines. This required a variety of transportation assets, including light rail for artillery ammunition, horse and wagon, motorized transport, and sometimes on the backs of soldiers to reach the trenches. [29]

One example of the transportation network was the Voie Sacrée (Sacred Way), which was a combined road and rail system that connected Bar-le-Duc and Verdun. Starting in March 1916, transport vehicles operated around the clock moving troops, armaments, and supplies to the Verdun battlefield. When the road was constructed, it was calculated that the road could handle the movement of 50,000 tons of freight and 90,000 men per week.[30] As Frederick Palmer commented in *Our Greatest Battle*, "And the engineers had taken precedence over everybody with the compelling argument that unless roads were built, no traffic could move forward."[31]

To maintain this capability required manpower, and 16 engineer labor battalions were tasked to the construction and maintenance mission. Beyond the manpower requirement, materials for both road and rail construction work came from the Engineer Corps and their forestry operations. AEF engineers produced "200,000,000 feet of lumber; 4,000,000 railroad ties; 300,000 cords of fuel wood; 35,000 pieces of piling; and large quantities of miscellaneous products" during the course of the war.[32]

Often, Army engineers were forced to build roads in a field-expedient manner with materials that were readily available. To cross the often-shell-pocked and muddy battlefields, engineers often used sandbags or planks to create a roadbed. The two following quotes from *The History of the A.E.F.* describe the scope and challenges that the engineers faced:

> It was not until the 4th Engineers finished building a complete artillery road with two bridges from Esnes to Malancourt across

No Man's Land that the artillery was brought forward. In building this road, 40,000 sandbags were used.[33]

Across No Man's Land, the engineers were working with mad haste to reconstruct the road, which had not been used for four years, and thus connect the roads behind the old front with those which the Germans had used. This was made doubly difficult in that the Germans had placed huge mines in the road which had blown holes hundreds of feet in diameter and 10 to 20 feet deep. Around the largest of these a temporary plank road was laid, wide enough for one way traffic.[34]

Bridging

Crossing water obstacles can be one of the most significant challenges to an Army conducting offensive operations. Throughout the history of the US Army, from Fredericksburg during the Civil War to the Sava River crossing in Bosnia, engineers have enabled maneuver forces to accomplish their missions.

During this era, construction bridging was the core mission for military engineers. But, in the ever-changing battlefield of the First World War, it was realized that some of methods that were used in the past were not

Figure 2.1. Renault FT tank and other military vehicles cross a stone bridge repaired by 203rd Engineer Regiment at Boureuilles, Meuse, 28 September 1918. Photo courtesy of the US Army Engineer School History Office.

suited for this environment. As a result, Allied engineers developed new methods to enable maneuver forces to cross obstacles. In addition, with the advent of tanks and other armored vehicles, engineers had to ensure bridges could handle the weight of the new vehicles. The primary methods used by combat engineers included "equipment bridging, stock spans, canal bridges, the Hopkins Bridge, and the Inglis Bridge (forerunner of the Bailey Bridge)."[35]

To further highlight the bridging challenges during the Great War, a 1933 account of military operations in France and Belgium in 1914 written by Brigadier-General Sir James E. Edmonds of the British Army described the efforts of the bridge builders:

> This bald enumeration, however, gives but a slight idea of the strain borne by the engineers during the weeks that the Army was on the Aisne. Nearly all of the bridges were within known range of the German guns; most of them were constructed, and at different times, all of them repaired under fire. At Vailly, where a permanent bridge was much needed, the German shells prevented even attempts to build one. The rise of the water necessitated frequent changes and modifications of level; and the incessant rain made the task of keeping the approaches in order most difficult and trying. Yet the engineers contrived not only to maintain the bridges, but to make bridgeheads and to entrench positions against the possibility of a retreat.[36]

Prelude to the Battle

Following the German retreat from the Marne River in July 1918, the Allied high command, led by Marshal Ferdinand Foch, designed a campaign centered on a series of convergent and practically simultaneous offensives against the German armies. As the AEF continued to improve defensive positions and conducted patrolling in the St. Mihiel sector following operations there from 12–15 September 1918, General John J. Pershing and the AEF would now shift their focus 40 miles to the northwest along the west bank of the Meuse. Over the next two weeks, the AEF planned and executed a series of complex and massive movements that moved troops, equipment, and supplies into the areas around Verdun. In an intricately planned operation that used three primary roads and was conducted primarily at night for secrecy, nearly 600,000 US Soldiers moved into the lines while 220,000 French and Italian troops moved into new positions.[37]

The US contingent for the upcoming campaign consisted of 15 divisions. Three of the divisions arrived from the AEF's attack into the Meuse-Argonne region, which was part of Marshal Foch's larger general offensive against the Germans while seven additional divisions recently fought in the battles at St. Mihiel. The concept of campaign focused on a series of joint attacks with the British attacking toward Mons on the left, the French in the center, and the American armies focused on Mézières. Foch's primary objective was to force the Germans to defend across the entire front, enabling the Allies to seize the rail lines that ran laterally across the Meuse region. Allied leaders hoped this effort would drive the German Army back within their borders by the end of 1918.

To execute this grand offensive, the Allies had a total of 220 divisions at their disposal. The plan called for the AEF's First Army and the French Fourth Army to move north in a simultaneous attack to capture the rail line between Carignan-Sedan-Mézières. This strategic rail system connected the population centers of Luxembourg, Thionville, and Metz and was located approximately 30 miles to the north Verdun. Of strategic importance to the German forces, "The enemy must hold fast to this part of his lines or the withdrawal of his forces with four years' accumulation of plants and material would be dangerously imperiled."[38] For the AEF's contribution to the operation, the First Army would attack in order to outflank the German forces along the Aisne River and support the French attacks in the west.[39]

Meuse-Argonne Offensive—Phase I (26 September–4 October 1918)

In the early morning hours of 26 September 1918, six hours of a continuous artillery bombardment fell upon the heavily fortified German positions. As the First Army crossed the line of departure at approximately 0530, they would soon encounter the German's first defensive line known as the Hindenburg line, later proving to be a formidable obstacle for US forces. As discussed earlier, the German Army had integrated a series of support lines (the Hagen Stellung) and organized trenches (the Volker Stellung) to support the Hindenburg line and to defend Montfaucon.[40]

During the battle, the V and III Corps met most of their objectives, but several US units struggled during the first day of operations. The 28th Division was halted by formidable German resistance, while the 37th Division from Ohio failed to capture Montfaucon d'Argonne. In addition, the 79th Division failed to capture their objectives at Montfaucon, and the 91st Division was forced to evacuate the village of Épinonville despite advancing nearly 5 miles. On the second day of operations, again, units con-

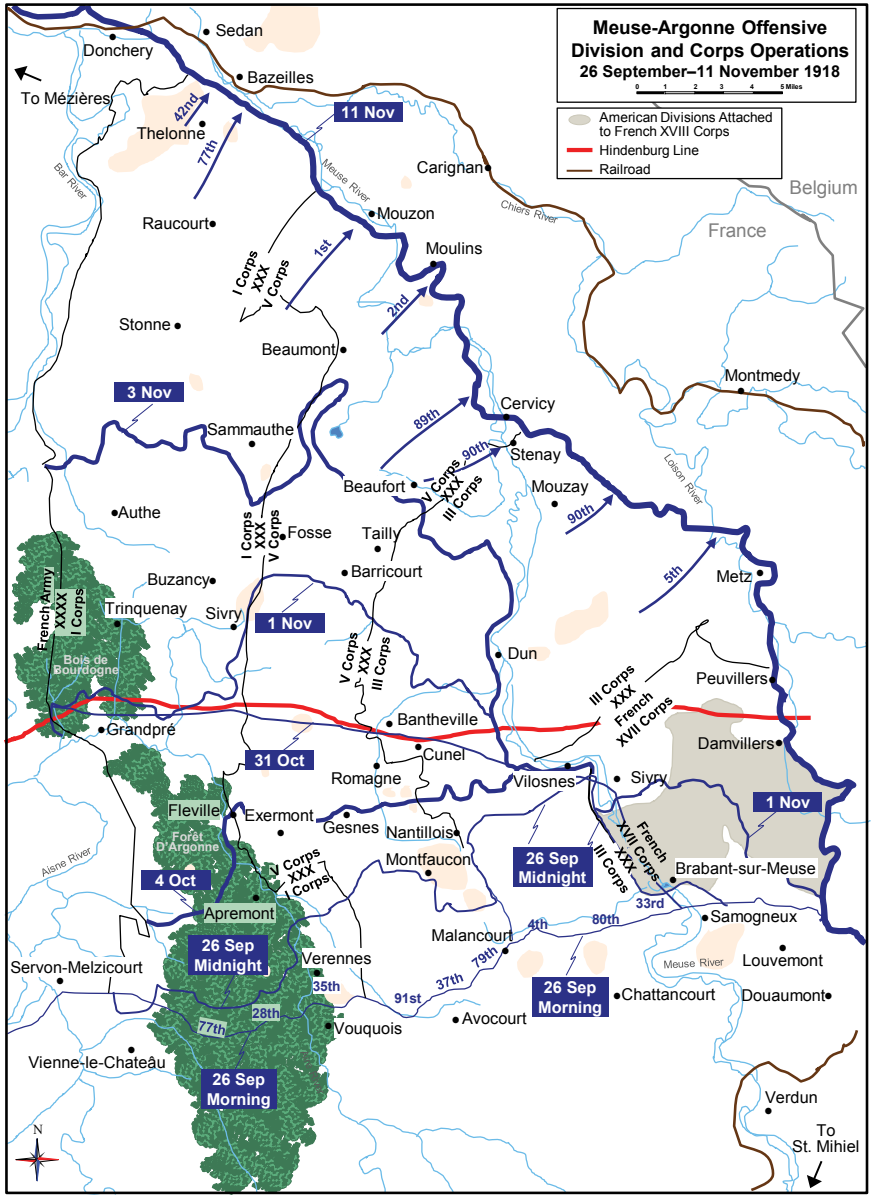

Figure 2.2. The Western Front-Meuse Argonne Offensive, Division and Corps Operations, 26 September–18 November 1918 (all phases). Map created by Army University Press.

tinued to struggle and most of First Army failed to make any significant progress. By the end of the day, the 79th Division had seized the heights of Montfaucon and the 35th Division, now forward of flanking units, captured the village of Baulny, Hill 218, and Charpentry.[41]

The French forces encountered problems as well. A portion of the adjacent French force became confused when one of its generals died; but the soldiers still advanced 9 miles, penetrating deeply into the German lines in the vicinity of Somme and Reims. Although French forces had made more progress into the German lines (approximately 2 to 5 miles) compared to gains by their adjacent American counterparts, the French units were fighting in open terrain, enabling them to conduct offensive operations.

For many divisions, the engineers were key to their ability to maneuver. In one instance, a report written by Captain Arthur E. Hartzell, a member of the American Expeditionary Forces headquarters staff, discussed some of the mobility challenges facing US forces. The operational plan for the First Corps was for the 4th Division (corps left flank) to attack to reach the Meuse north of Brieuilles with the 80th Division taking objectives south of the village. Simultaneously, the 33rd Division would swing around to the east after crossing the Forges, a stream which lay immedi-

Figure 2.3. Rock and mud road reconstruction in France by the 315th Engineers in September 1918. Photo courtesy of the US Army Engineer School History Office.

ately in front of the corps. Hartzell notes that although the "stream in itself was not a difficult obstacle but owing to the fact that it had marshy ground on both sides of it the problem of getting artillery and supplies across."[42]

In addition, engineers of the Fourth Division quickly came to the realization that no roads existed in their sector and their initial positions were under observation by the German forces which occupied the heights at Montfaucon. The Fifth Corps, located in the center of the AEF effort, also faced different challenges in their efforts to secure Montfaucon. Heavily wooded areas with hills and ravines dominated the center and areas to the west. Maneuver in the east was hindered by the Bois de Cuisy, a heavily forested area, and the River Aire on the corps flank with dominating terrain overlooking the river valley.[43]

The conditions under which the engineers struggled were difficult to say the least, but they persevered to ensure that the maneuver forces could achieve their objectives. Frederick Palmer's account of the battle in *Our Greatest Battle (The Meuse-Argonne)* highlights the environment in which the engineers worked:

> In broad daylight, in full view of the enemy's guns which forced them to wear their gas mask, they brought their boards and timbers to the river bank and did their building. Shells were falling on their labors at Consenvoye at the rate of 90 an hour; but that did not interrupt their labors. Men fell, but others kept on the job. Punctuality was a strong point with the Illinois men. The bridges must be up on time, and they were.[44]

General John J. Pershing, commanding general of the AEF, in his Final Report to the Secretary of War, also noted the role of the engineers during the first days of the offensive:

> The critical problem during the first few days of the battle was the restoration of communications over "No Man's Land." There were but four roads available across this deep zone and the violent artillery fire of the previous period of the war had virtually destroyed them. The spongy soil and the lack of material increased the difficulty. But the splendid work of our engineers and pioneers soon made possible the movement of the troops, artillery, and supplies most needed. By the afternoon of the 27th, all the divisional artillery except a few batteries of heavy guns had effected a passage and was supporting the infantry action.[45]

Meuse-Argonne Offensive—Phase 2 (4 October–1 November)

Beginning on 4 October, the First American Army began the second phase of its attack in the Meuse-Argonne offensive. It was at this time that all of the initial assault divisions (the 91st, 79th, 37th, and 35th) of the US V Corps were replaced by the 32nd, 3rd, and 1st divisions.

By the evening of 3 October, the First American Army, on the eastern side of the Argonne forest, was ready to continue its advance. But for four days there had been no forward movement by this army due to the necessity of building roads across No Man's Land for the transport of artillery and ammunition. The fighting would be some of the most difficult of the war due to the terrain the AEF faced. US forces stretched from Brieulles on the Meuse to Apremont on the Aire. To their front was the Kriemhilde Stellung, the last of the German lines of defense in this sector. On the flanks, the Aire flowed along the eastern side, and to the west was Exermont valley with the Gesnes creek. Beyond this were wooded hills and ravines, which continued to present a considerable obstacle to US offensive operations.

As the fight progressed, the 1st Division attack created a gap in the Allied lines after advancing 1½ miles against multiple German divisions, to include the 37th, 52nd, and 5th Guards divisions.[46] Even the engineers found themselves engaging the enemy. In one instance, on 9 October, the 1st Battalion of the 1st Engineers was sent up to assume defensive positions. Without automatic rifles or machine guns, the engineers dug in and engaged the enemy with their bolt-action rifles. Eventually relieved by two companies of the 181st Brigade brought up through the 26th Infantry's sector, it was noted in the *History of the AEF*, "If not for the actions of these engineers, the 181st Brigade would not have been able to attack through the dense woods."[47]

In his final report on the campaign, General Pershing commented on the growing capabilities of the AEF forces:

> We made steady headway in the almost impenetrable and strongly held Argonne Forest. For despite his reinforcements, it was our Army that was doing the driving. Our aircraft was increasing in skill and numbers and forcing the issue. And our infantry and artillery were improving rapidly with each new experience.[48]

To further enable the AEF's ability to conduct offensive operations, a monumental effort by the "engineers, labor battalions, pioneer infantry, and all available troops working at top speed allowed for the roads to be completed and widened in order to allow sufficient supplies and artillery ammunition to be sent forward to the guns."[49] In the waning days of October, the

American Expeditionary Forces had advanced 10 miles from their initial positions and had finally cleared the Argonne Forest of German forces. To the west on the left flank, the French had advanced 20 miles to the banks of the River Aisne. The second phase of the Meuse-Argonne offensive closed with the last line of German trenches of the Kriemhilde Stellung still to be taken. The attacks made in October had failed to accomplish all of the Allied objectives, and the last 10 days of the month were spent in reinforcing the artillery and putting new divisions into the line in preparation for the final phase of the campaign.

Meuse-Argonne Offensive—Phase 3 (1–11 November)

As the campaign moved into its final phase, the two field armies of the AEF would advance on their final objectives of the war. Led by General Hunter Liggett, the mission of the US First Army was to continue offensive operations to gain control of the Carignan-Sedan-Mezieres Railroad. The US Second Army, led by Lieutenant General Robert L. Bullard (former commander of the First Infantry Division), would advance east toward Metz. Countering the two US field armies was a force of 31 German divisions.

The final major operation of the war began on 1 November. In the face of American artillery, the German forces were easily overcome by the attacking infantry, a result of the battle's tempo and persistent fighting on the German forces. In subsequent fighting, the villages of Aincreville, Doulcon, and Andevanne were controlled by the US III Corps, while the V Corps captured Landres-et-St-Georges and advanced through successive German defensive lines. The US attacks culminated in the vicinity of Bayonville, Chennery, and to the north of the Bois de Barricourt. By 2 November, I Corps joined the fight, which then "became an impetuous onslaught that could not be stayed."[50]

On 3 November, the 5th Division was ordered to cross the Meuse and form a bridgehead at Dun-sur-Meuse to keep in touch with the retreating enemy. The 90th Division would follow as soon as the 5th Division established a bridgehead. Beyond the canal, the German forces continued to occupy a commanding position on the heights above the river. The Meuse at this point was at that time about "25 yards wide and about 5 feet deep" with steep banks and a swift current.[51] Passages in *The History of the AEF* describe the actions of the engineers during this period:

> During the night of the 4th–5th, the remaining two companies of the 2nd Battalion of the 6th Infantry were pushed across the footbridge at Brieulles. Then, just before dawn, the engineers complet-

ed two bridges across the canal and, despite heavy enemy fire, the battalion was rushed across and the bridgehead was made. This attracted so much of the Germans' attention that the 3rd Battalion of the 6th Infantry was able to cross practically without notice, a little further up the river, using bridges made of telegraph poles and duckboards.[52]

As morning arrived, US forces had secured Hill 262 overlooking the Meuse River below. Farther to the north, the 9th Brigade's attempted crossing with the 60th and 61st Infantry had failed and the brigade suffered heavy losses. After sundown, another crossing attempt was made near Clery-le-Petit, and by morning, the 3rd Battalion of the 60th and two companies of the 61st Infantry had successfully crossed.[53] The establishment of the bridgehead set the conditions for the 5th Division to attack and seize the heights east of the Meuse. This foothold enabled the division to establish artillery firing positions and conduct attacks to drive Germans from their positions.

In a subsequent action on the night of 7 November, four bridges spanning the Meuse River at Consevoye, Brabant, Regneville, and Samegneux were completed in a joint French and American engineering effort. In the early morning hours on the following day, the Seventeenth French Corps, consisting of four divisions—two American and two French—led an assault against the German forces. Despite no artillery preparation and only a dense rolling barrage, the corps advanced rapidly and faced little resistance crossing the river and capturing the adjacent heights.[54]

As the end of the war drew near, American forces captured the German defenses at Buzancy, which allowed French forces to cross the River Aisne and capture Le Chesne. The French forces subsequently captured their immediate objective—Sedan, and its critical railroad hub—and US forces seized the surrounding hills. On 11 November 1918, word of the German armistice reached forces in the field, and the fighting ended.

During the final phase of the campaign, engineer efforts were a critical enabler that allowed Allied forces to continue a sustained attack against the weary German forces. As discovered by the US forces, the need to maintain serviceable roads was essential to success. Due to the lack of roads and the speed of the US advance, the supply trains, artillery supplies, and reserve divisions found it difficult to keep up with the ever-advancing front. With seven divisions fighting in contact with the enemy, the road network was a critical capability that created the conditions for the AEF's successes in this campaign.[55]

Conclusion

As the AEF developed plans that included greater maneuver at multiple organizational levels, the US Army engineer efforts ensured "freedom of movement" to operational and tactical forces, thus allowing the maneuver forces to accomplish their mission. During the early months of the campaign, the role of the Engineer Corps was vague, but their importance emerged through combat, as noted by Frederick Palmer:

> Engineer troops for which our Allies had made an early request might be buried in obscure parts of the front, to come to light only in the shadow of an emergency which, as at Cambrai and in the German March offensive, turned engineer troops into combatants; or again, as our own demands grew, to return to our own fold.[56]

In today's multi-domain battle environment, maneuver support efforts still help combat arms units overcome countermobility challenges presented by both our potential enemies and the terrain on which we may fight.

In order to achieve multi-domain dominance, the combat division of today employs widely balanced capabilities in order to destroy concentrations of enemy forces, clear contested zones, and seize key terrain. Utilizing a mix of light, airborne, motorized, and mechanized infantry Brigade Combat Teams (BCTs), supported by both armor and engineer forces, windows of opportunity created by deep fires would allow US forces (along with Joint and Coalition partners) to achieve overmatch against any opponent. Forces assigned to penetrate into enemy territory "would rapidly bridge the efforts of both the land and air components while exploitation forces would facilitate joint commands to eliminate the adversary's warfighting capabilities through intensive fire and maneuver."[57] As stated by the former director of the Army Capabilities Integration Center, Lieutenant General H.R. McMaster, they can "fight their way through long-range weapons fire and gain physical contact with hard-to-find opponents" while striking "from unexpected directions with multiple forms of firepower."[58]

For engineers to be effective, integrated planning is required to fully leverage all of the capabilities available to the commander. In recent observations from the Army's combat training centers, commander and staff abilities to plan for and understand the roles, responsibilities, and capabilities of their supporting engineer assets often mean the difference between success and failure. To note, maneuver force commanders that integrated engineers early were able to reduce the friction and confusion that often occurs during offensive operations. In addition, when integrated planning with engineers is not conducted, infantry commanders may not fully un-

derstand all the complexities of a breaching operation. Failure to estimate the time it takes sappers to check for mines, clear the wire, and proof the lane leads to a desynchronized force.[59]

Combat training centers have also noted the value of engineer support to assist with countermobility operations when maneuver units conduct defensive operations. Countermobility operations use natural and man-made obstacles to deny the enemy freedom of maneuver and include constructing obstacle belts that can turn, fix, block, or disrupt an enemy force. In addition, engineers also enhance survivability by constructing fighting positions to protect vehicles and personnel from enemy threats. Finally, maneuver unit commander and staffs should leverage the expertise of their engineers to assist in the preparation of defenses and engagement areas. In the end, current observations have shown that maneuver units that augment and integrate an engineer element have a higher level of lethality and protection.[60]

Engineer bridging capabilities are still essential for ground combat operations in many regions in which the Army may be utilized. In order for combat formations to accomplish their mission, they must be able to maneuver in the operational environment. During recent operations in Operations Iraqi Freedom and Enduring Freedom, the need for engineers to conduct combat bridging was minimized due to the terrain in those areas of operation. Today as the Army looks to other regions and possible large-scale combat operations with near-peer adversaries, the need for combat bridging becomes essential for the maneuver commander. Whether in Europe or the Pacific, forces will need to move personnel, combat systems, and supplies across the streams and rivers that exist outside of arid desert environments.

As the forces in World War I attempted to use tunneling to gain a tactical advantage, it is believed that subterranean operations will proliferate as weaker combatants seek to evade detection and targeting by air assets. Most recently in Iraq, al Qaeda insurgents in their strongholds of both Anbar and the Dora and Ameriya neighborhoods of Baghdad were able to plant improvised explosive devices (IEDs) in sewers; the devices were large enough to flip Bradley fighting vehicles with deadly results.[61]

The large-scale combat operations of tomorrow may not reflect the conditions of central France a century ago, but many of the roles, responsibilities, and capabilities will be needed to fight and win on tomorrow's battlefield. As noted in the most recent version of Field Manual 3-34, *Engineer Operations*, engineer forces are able to provide this support by

mitigating the effects of terrain by combining the skills and organizations of the three interrelated engineer disciplines—combat, general, and geospatial engineering. This enables the ground force commander to assure mobility; enhance protection; enable force projection and logistics; and build partner capacity and develop infrastructure among populations and nations. Facing an ever-more-complex battlefield in which capable formations must be able to fight and win across multiple domains, today's Army engineers provide the freedom of action for land power.[62]

Notes

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2. Richard S. Faulkner, Center of Military History (CMH) Publication 77-8, "Meuse-Argonne 26 September–11 November 1918," Center of Military History, Washington, DC, 2018, 7.

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10. Department of the Army, "Monographs of the World War-The Battle of Cantigny by Captain Paul B. Parker," 338.

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22. Nicholas Murray, "Mine Warfare 1914–1918," *International Encyclopedia of the First World War*, eds. Ute Daniel, Peter Gatrell, Oliver Janz,

Heather Jones, Jennifer Keene, Alan Kramer, and Bill Nasson, issued by Freie Universität Berlin, Berlin 2016, accessed 14 May 2018, https://encyclopedia.1914-1918-online.net/article/mine_warfare.

23. Author's Note: Today the village of Vauquois still exists and has been rebuilt at the base of the hill on which the original village stood.

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31. Palmer, *Our Greatest Battle*, 93.

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33. Thomas, *The History of the A.E.F.,* 248.

34. Thomas, 259.

35. "WWI–Think Defence," *UK Military Bridging*, accessed 16 October 2018, https://thinkdefence.wordpress.com/tag/wwi/.

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37. Stewart, *American Military History*, 43

38. CMH 23-18, "United States Army in the World War," 9.

39. Stewart, *American Military History,* 43–44.

40. Arthur E. Hartzell, *Meuse-Argonne: Battle 26 September–11 November 1918* (Chaumont, France: AEF, Second Section, General Staff, 1919), 27–28.

41. Many of the divisions that fought in the AEF during World War I were Army National Guard or Reserve divisions. In this instance, three National Guard units (the 28th "Keystone" Division from Pennsylvania, the 37th "Buckeye" Division from Ohio and the 35th "Santa Fe" Division from Kansas and Missouri) played a significant role in the battle. Additionally, Reserve divisions such as the 79th and 91st Divisions also contributed to the AEF's operational design.

42. Hartzell, *Meuse-Argonne*, 25.

43. Hartzell, 27.

44. Palmer, *Our Greatest Battle*, 350.

45. CMH 23-18, "United States Army in the World War," 42.

46. Author's Note: It was during this phase that two significant actions occurred. The first was that of the "Lost Battalion" when the 1st Battalion-308th Infantry of the US 77th Division became isolated by German forces after attacks by units to their left and right had been stalled. Without this knowledge, the units attacked beyond Allied lines and found themselves surrounded by German forces. For the next six days, despite suffering heavy losses, the American units continued to fight. In addition, on 8 October, Corporal (later Sergeant) Alvin York made his famous capture of 132 German prisoners near Cornay.

47. Thomas, *The History of the A.E.F.,* 314.

48. CMH 23-18, "United States Army in the World War," 11.

49. Thomas, *The History of the A.E.F.,* 293.

50. CMH 23-18, "United States Army in the World War," 12.

51. Thomas, *The History of the A.E.F.,* 356.

52. Thomas, 356.

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54. Thomas, 308–10.

55. Thomas, 342.

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57. Major Nathan A. Jennings, "Realign the Army for Multi-Domain Battle," accessed 12 June 2018, https://www.ausa.org/articles/realign-army-multi-domain-battle.

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Chapter 3
Enabling Maneuver: Chemical Support in the Meuse-Argonne

Christy L. Lindberg

Over 47 days—from 26 September to the Armistice on 11 November 1918—the American Expeditionary Force was engaged in the largest battle yet fought in the history of the United States, the Meuse-Argonne Offensive. More than 1.2 million American servicemen were committed to the battle, in a combined Allied effort to finally break through German lines and once again combat the enemy on an open battleground. The objective was to cut the Mezieres-Metz railroad, which would sever the main lines of communication for the German forces along a front stretching from the Meuse River east of Verdun to a point midway into the Argonne Forest.

Throughout this campaign, toxic chemical agents, first introduced on the battlefield in April 1915, would be used effectively by German forces, inflicting a great number of casualties among American forces building up for the attack. Indeed, from 1915 to 1918, the Germans held the initiative in most areas of gas warfare. This they achieved through the introduction of new agents (the most recent, mustard gas in August 1917) that allowed them to direct more systematic thought to the question of how the employment of gas might alter a tactical situation. They were, for example, the first to use gas as an adjunct to maneuver in support of an infantry attack. The Allies struggled to keep up with such offensive doctrine, but they had to contend first with the development of effective defensive measures to counter German initiatives.[1]

Moreover, the use of toxic chemicals by the enemy was a hindrance to Allied forces and their ability to maneuver. Areas saturated by chemicals could be impenetrable for days and disrupt operations. Key to the success of the campaign was the newly-organized Chemical Warfare Service (CWS) which was tasked to provide offensive and defensive assistance to the American advance, in the form of gas training, providing smoke screens, and eliminating German machinegun positions with thermite. In addition, German chemical warfare material would be collected for investigation at the CWS laboratory near Paris.

Background

Upon American entry into the war in April of 1917, the formation of a gas service was far from a reality. While our British and French allies were forming gas services in theater, the beginnings of the American pro-

gram were much more disjointed. Stateside, research was being led by the Bureau of Mines and the eventual establishment of the American University Experiment Station in Washington, DC. Meanwhile in Europe, Brigadier General Amos A. Fries, chief of the fledgling American Gas Service, would seek the assistance of the British and French gas services to develop our capabilities. However, the race to combat this new form of warfare would see almost every branch of the Army having some connection to gas warfare:

> The Medical Corps directed the Gas Defense production. Offense production was in the hands of the Ordnance Department. Alarm devices, etc., were made by the Signal Corps. The Engineers contributed their 30th Regiment (Gas and Flame) and the Field Training Section. The Research Section was still in charge of the Bureau of Mines, in spite of repeated attempts to militarize it. And in addition, the Chemical Service Section had been formed primarily to deal with overseas work. While the Director of the Gas Service was expected to co-ordinate all these activities, he was given no authority to control policy, research, or production.[2]

In May 1918, Major General William L. Sibert, late in command of the 1st Infantry Division, was chosen to bring order to the chaos. An experienced Engineer officer, Sibert brought his organizational skills to the Chemical Warfare Service. Rather than working at cross purposes, Sibert brought not only his ability to organize, but his aptitude for getting different organizations to cooperate and work together.

The campaign to recruit volunteers for the Gas Service emphasized the technical nature of their work. Everything from chemists to explosives experts along with electrical experts and mechanics were needed for the varied needs of the new service. The "Hell Fire Battalion" was advertised as an opportunity to see active service on the front lines before other units were to be fielded. The chance to be the vanguard along with the combat arms was made even more enticing by the thought that we could "teach the Germans the war game in the use of their own hellish weapons."[3] The American forces also had a firm faith in the inventiveness of our scientists and the availability of resources to get the job done.

On 15 August 1917, the War Department issued General Order No. 108, which authorized the creation of "Gas and Flame" regiments, one for each Army. In conformity with this order, Captain Earl J. Atkisson, Corps of Engineers, was assigned to the 30th Engineers and ordered on 30 August 1917 to report to the Commanding Officer of Camp American University,

Washington, DC to begin the organization of a "Gas and Flame" Regiment. On 16 October 1917, Company A and Battalion Headquarters were organized, and assignment of officers was made at once. On 3 November 1917, Company B was formed; two weeks later, non-commissioned officers were appointed for both companies; and by 20 November 1917 the battalion was at full strength and ready for overseas duty. Regimental Headquarters, 1st Battalion Headquarters, and Companies A and B sailed for France on the *USS President Grant* on 26 December 1917 and reached Brest on 10 January 1918.[4]

These "Gas and Flame" troops would earn the distinction of being among the first American gas warfare specialists to arrive in France. With less than three months training after their organization, they would be on the front line performing their primary missions. The training they received stateside was brief. Out of the 640 hours of total instruction, gas warfare and defense accounted for only 14 hours of the training plan.[5]

The tactical employment of the gas troops was to support the infantry before and during the battle. Smoke, thermite, high explosives, and gas were to be used to take out enemy defenses, to assist local attacks and neutralize local resistance. Finally, the tactical use of gas troops could reduce the enemy morale and effective strength by the discharge of lethal gas against his defensive garrisons and sensitive points from which opposition or counter-attacks were expected.[6]

The AEF tactical doctrine for the employment of special gas troops cited the advantages of using gas in terms of accuracy, the extended casualty producing area, and lasting results. The doctrine noted the effectiveness of gas for the elimination of well-entrenched targets that high explosive fires could not destroy. The amount and type of chemical agent employed depended on the tactical situation, as well as wind and terrain features.[7]

The creation of the Chemical Warfare Service on 28 June 1918, the 30th Engineers (Gas and Flame) was officially transferred to the CWS, and redesignated the 1st Gas Regiment. The CWS mission to provide gas support to the American efforts of the Meuse-Argonne Offensive fell to the 1st Gas Regiment. A regiment in name only, the 1st Gas was comprised of only six companies, with a total of about 1,500 officers and men, the remaining companies having not yet completed their stateside training. Rather than acting as a single organization, the 1st Gas was broken up by companies and platoons and attached to American units along the entire front- Company A with the 33rd Infantry Division, Company B to the 91st, Company C the 35th Division, D in support of the 79th Infantry Division,

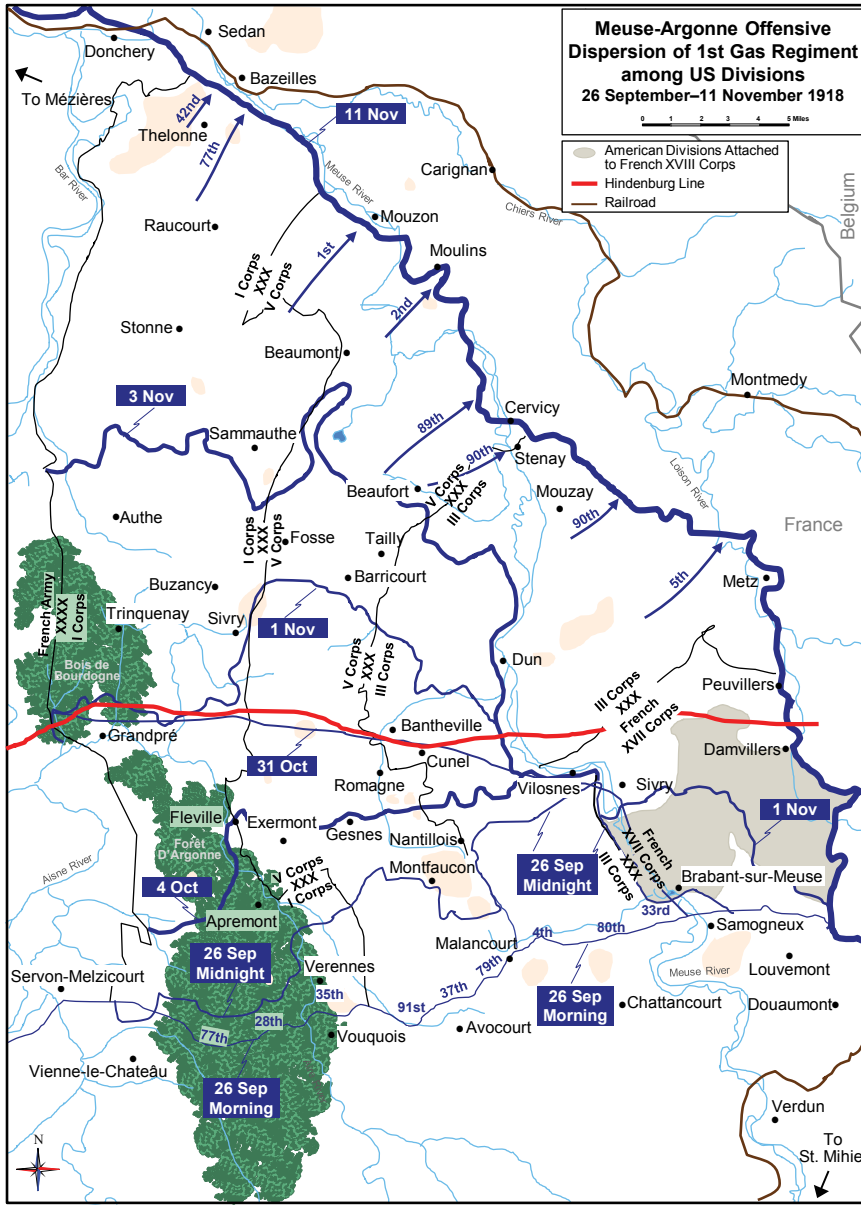

Figure 3.1. Overview of Meuse-Argonne campaign showing US units and the dispersion of the 1st Gas Regiment. Map created by Army University Press.

Figure 3.2. Firing a bank of livens projectors. Photo courtesy of the Chemical Corps Museum.

E Company split by platoons in support of the 28th and 77th Divisions, F attached to the 80th, and a platoon each from Companies B and D went to the 37th Infantry Division. Making command and control more difficult was the loss of 13 combat-experienced company officers, either to staff duty or from being sent back to the United States to train the remaining battalions of the regiment.[8]

The primary weapons fielded by the 1st Gas were the Livens Projector and the four-inch Stokes Mortar. Both systems were designed and produced by the British War Department, and provided to their American counterparts, who had no similar weapons of their own. The Livens Projector required a lengthy and labor-intensive process of emplacement, and with a range of about 1,800 yards, they were usually emplaced under cover of darkness, and just behind the front line positions. A "big shoot" might involve up to 5,000 projectors, making it necessary for the men of the 1st Gas to dig multiple emplacements nightly for a week before "zero hour." At "zero hour" the weapons were discharged, hurling the projectiles through the air toward their target. The singular advantage of the Livens was that, unlike mortars and artillery, the projectiles detonated on impact with the target, and all within a few seconds of each other, instantly blanketing the target, and without warning, often catching the enemy without cover and without their gas masks.

Figure 3.3. 1st Gas Regiment fires 4-inch Stokes, France 1918. Photo courtesy of the Chemical Corps Museum.

The Livens projector provided "the means for producing casualties and demoralization second to none." When used aggressively, they could keep enemy forces off balance; when employed on a quiet front, they could lessen considerably the likelihood of that front being used as a place to rest battle weary troops.[9]

The 4-inch Stokes mortar was designed specifically to fire chemical-filled shells; in fact, a conventional high-explosive round was never developed for it. Weighing 240 pounds, the mortar was light enough to be portable, and could be hand-carried forward by its crew as mobile fire support for advancing infantry. It fired a 25-pound projectile, or "bombs," containing approximately 7 pounds of fill—either chemical agent, white phosphorous (for producing smokescreens), or thermite- to a maximum range of about 1,000 yards. A well-trained crew, with a good supply of prepared rounds, could fire one round every three seconds for a prolonged length of time and could be fired even faster for shorter durations.

Preparation for Battle

The Meuse Argonne Offensive was the largest American engagement of World War I. Following the success of the St. Mihiel Offensive, the American Expeditionary Force led by General John J. Pershing bolstered the Allied forces along the entire Western Front. French and American troops, along with British and Australian units, fought in the Argonne Forest and Meuse River in the Alsace Lorraine region of France in the fall of 1918. Although the German forces had the advantage of key defensible terrain, the Allied forces had renewed momentum with the addition of fresh American troops.

Throughout the first weeks of September 1918, in addition to continuing their combat support of the St. Mihiel Offensive, the 1st Gas busied themselves cleaning and testing their weapons, checking the continuity of miles of electrical detonation wire, inspecting and repairing gas respirators, and moving tons of munitions up to forward area ammunition dumps, all in preparation for the upcoming Meuse-Argonne campaign.

In the days before the attack, the officers of the 1st Gas moved forward to reconnoiter their routes of advance and to identify likely targets. Plans focused on key targets such as gassing road networks and control points. As the area was still under French control, and not wanting to telegraph the impending arrival of American forces to the German forward observers, many of the Chemical officers carried out their reconnaissance in French uniforms. One observer in E Company described the ground over which the 1st Gas would soon fight:

> The forest itself is a stretch of wild country some 70 kilometers long and about 15 wide, consisting of thickly wooded steep hills and deep ravines, or gullies, the whole being wonderfully adapted to ambuscades and machine-gun work . . . artillery and machine guns had invested the underbrush and thickets. . . . Under these conditions it will not be hard to understand that here [would be] desperate fighting . . . and we were to start on a line of well-constructed and complete defenses.[10]

In preparation for the offensive, Captain Laurent Lowenberg, former commander of C Company and now in command of the 1st Battalion, issued the operational orders for the event. In addition to their Stokes mortars and Livens projectors, the men would carry their rifles, with each platoon also fielding Chauchat automatic rifles. "Be prepared to act quickly and intelligently," he wrote, "by throwing smoke, thermite and gas on such obstacles and targets which suddenly develop, and which give trouble to the advancing Infantry."[11]

After a week of moving Stokes mortars and ammunition by hand, truck, and train to the closest railhead to the front, on 24 September 1918 Company B began hand-carrying their supplies to their forward positions. By the evening of 25 September 1918, all the men were standing by at their forward positions, ready for "zero hour." Corporal Robert MacMullin, of E Company, later recorded:

> Our mission was to give support to regular army divisions by laying down massive doses of lethal gases by [Livens] projectors prior to attack; to lay smoke screens with Stokes mortars, and to silence enemy machinegun nests with such nasty things as white phosphorus, thermite, phosgene, skunk gas, etc. During an attack, the demand for our services grew rapidly and the regiment was spread pretty thinly, platoon by platoon, over a wide front reaching from Flanders to the Vosges.[12]

Early in the morning of 26 September 1918—with "zero hour" rapidly approaching—Captain Roscoe B. Dayton, commander of Company E, tasked Corporal MacMullin and another Soldier to move forward and establish a weather station, as the company was slated to fire both gas and smoke from their mortars at the start of the assault, it was important to ascertain wind speed and direction. Returning to Captain Dayton, MacMullin could report that unless the direction changed, the wind would not push the gas and smoke back on American positions.[13]

The Battle Begins

For the 1st Gas, "zero hour" was 0530 on 26 September 1918. Company A launched 1,000 Livens projectiles, including a recently-developed high-explosive version, where the liquid agent fill was replaced with 30 pounds of TNT. The plan was to use the new munition to cut through the aprons of barbed wire emplaced in front of German positions. The explosive effect was greater than that of the 8-inch howitzer, and the mass firing of Livens batteries meant the devastation wrought on German wire, trenches, and bunkers was instantaneous and complete. Other companies used their Livens to fire smoke projectiles, which not only obscured the American advance from the watchful eyes of German machine gunners, but forced the enemy to don their protective masks, out of fear the smoke was actually poison gas, or at the least was mixed with poison gas. In other locations the Livens projectors were set to fire blank charges only, and in sequence, rather than in a single volley, in an attempt to fool enemy "flash and sound" detectors. It was hoped the enemy would suspect the Livens positions were actually artillery batteries, and mark them for counter-battery fire, wasting their ammunition and efforts.

Due to the change and adaptation of the new German doctrine of elastic defense-in-depth in late 1916, the German defense consisted of three successive zones, the outpost zone, the battle zone, and the rearward zone. The outpost zone consisted of machine guns, mortars, and light artillery in order to contain enemy raids and patrols, to provide an early warning system, and to disrupt and slow down any enemy advance. Here the Stokes were called into service, to drop concentrations of smoke and thermite rounds on these positions as they were identified. "Our company used all of our different explosives, but largely smoke bombs," wrote Private Myron Edwards, of D Company. "Later reports advised us that the smoke added to the confusion of the Germans, making it very hard to . . . keep in contact with each other." Continuing in his description, Edwards recorded "Our 'D' Company, with . . . smoke and thermite bombs, were of great help to the infantry in cleaning out machine gun nests and other points of resistance [and] our men were called on many times in similar cases."[14] Thermite was especially effective against machine gun nests, as the bomb produced a shower of molten metal burning at a temperature of 4,000 degrees Fahrenheit, and was extremely difficult to extinguish. Molten thermite burned through the machine gun nest's overhead cover, dropping on the weapon and crew below, making the position untenable.

C Company, was ordered to support the 35th Infantry Division's attack in the well-fortified area of the Argonne Forest between Varennes

and Mountfaucon, and used Stokes and Livens to deliver gas and smoke shells on German positions. This forced the German troops there to remain in their bombproof shelters, and so blinded their observers that when the attack took place the 35th Division was able to make rapid progress.[15]

In a memorandum dated 14 October 1918, the Office of the Chief Gas Officer proposed the "Use of Gas Troops in Proposed Operations."[16] One of the first daily tasks would be to establish smoke screens in combination with lethal gas along the Meuse River between Bois de Chatillon and Sivry. Additional smoke screens not involving lethal gas will be used to neutralize and capture machine gun positions. Furthermore, Stokes mortars using thermite, smoke and small amounts of gas will also aid in taking out enemy machine guns.

Two days later, this was detailed in more depth in a memorandum on the "Study of Use of Gas and Smoke in Possible Operations." River crossings would be assisted with the use of smoke, gas and thermite from Stokes' Mortars, gas and H.E. from Liven's projectors, by the First Gas Regiment, to aid the crossing of the river at points between Erieulles and Vilosnes.

Also, surprise bombardments would be conducted with lethal gas shells upon selected sensitive points along the Route Nationale No. 64, between Liny-devant-Dun and Vilosnes. These bombardments were carried out with special shell No. 5 (Collongite). Besides inflicting casualties, such bombardments will aggravate the confusion and surprise occasioned by the advance, and will interfere with the bringing up of reserves.

In order to occupy the forests, such as Bois de Sartelle, Bois de Sivry, and Bois de Fontaines, a continuous and slow fire of special shell No. 7 (Aquinite) and No. 9 (Martonite) upon certain or probable battery positions, will at least decrease the rate and accuracy of their fire by compelling the enemy artillerymen to wear their masks. This slow fire should be preceded by a burst of fire of lethal gas on known positions to inflict casualties. As soon as the advance commences, a continuous and steady fire of special shell No. 20 (Yperite) upon the Bois de Mont and Cete de Chatel, one kilometer south of Sassey-sur-Meuse, and Cote de Saint Germaine (as soon as it is within range) will neutralize enemy activity from these positions.

From the beginning of the attack a steady fire of special shell No. 20 (Yperite) upon the enemy reserves in towns of Ecurey, Breheville and Reville would be of great assistance to the troops making the attack. These towns are admirable targets for Yperite, being in sheltered valleys and are

not positions which it will be necessary for us to occupy as soon as we reach our objective. Yperite in these positions will not only inflict casualties in the reserves, thereby seriously interfering with reinforcements, but will also cause casualties among retreating enemy troops.

A smoke barrage placed upon the heights northeast of Sivry-sur-Meuse and maintained until as long as necessary, would aid in the crossing of the river. Special shell No. 3 should be used for this purpose, and only limited and important targets should be selected for screening by smoke, owing to the meager supply of smoke ammunition on hand. These positions, which are screened, should also be submitted to a burst of fire of lethal shell, before the establishment of the smoke screen, for the purpose of inflicting casualties.

A supply of No. 5 lethal shells and No. 3 smoke shells should be carried forward by batteries (or selected batteries) advancing with the attack, in order to fire immediately upon new artillery or machine gun positions at the borders of the woods being flanked, north of Haraumont, in order to neutralize fire and obtain casualties.[17]

Two very hard lessons learned by the American Army came at a very high cost: "how to neutralize the greatly enhanced power conferred on the defensive by the machine gun and how to use gas in the offensive."[18] The reluctance to use gas to our fullest capability coupled with the determination to primarily use high explosives to counter enemy use of gas resulted in high casualties. The extensive use of gas shells by the enemy during this operation, together with the nature of the terrain, resulted in an appreciable number of gas casualties. More than 19,000 admissions were made to Gas Hospitals during this offensive, constituting about 19 percent of the total casualties incurred by the Allied Forces. Many of these casualties were caused by men not keeping their masks close by or not wearing them in the "ready" position; uncertainty of when masking was required (not recognizing the signs of gas attack, like the sight of a gas cloud, the smell of the agent, or the distinctive sound of a gas shell exploding as opposed to a HE shell); and unmasking too soon (for the same reasons, and because the mask limited vision, fogged up, and was uncomfortable).

Over the next month, the 1st Gas continued to support the American advance. Although under fire and taking casualties, their real struggle was with fatigue. Being the only chemical warfare specialists at the front, the 1st Gas had no relief, and could not be pulled off the line and replaced with another gas unit. Men struggled to move ammunition closer to the ever-changing front, and a three mile trip to the ammunition dump, carrying

mortar rounds by hand forward to gun positions, through mud and under fire, wore the men out. Additionally, constant fire missions were taking their toll on the mortars themselves, forcing the supply sections to repair parts, or scramble to find replacements.

Although the fire support provided by the 1st Gas Regiment was helpful in reducing enemy strong points, screening American advances, and creating confusion and misdirection among the enemy, the after action reports from the company commanders were less laudatory. While it was undoubtedly helpful, it could have been a greater success. Infantry commanders were often reluctant to request the assistance of the gas troops, either from ignorance of their actual function, lack of knowledge about what types of weapons they employed, or from fear any requested gas would blow back on friendly troops. One division gas officer reportedly recommended to a division operations officer (G-3) that gas be used during a particular phase of the engagement. The staff officer replied that he would employ the artillery firing gas shells only if the gas officer stated in writing that the gas would not cause a single American casualty. This request was unrealistic in that a thorough staff planner in World War I "usually included an allowance for casualties due to a friendly barrage."[19] Another objection raised to the use of gas was that commanders feared its employment would subject their men to unnecessary retaliatory gas attacks.

Unfortunately, many senior US Army officers remained oblivious to the potential use of chemicals by special gas troops in the offense. In preparing for the Meuse-Argonne campaign, for example, the US First Army Headquarters studied the spring offensives of 1918, where the Germans literally smothered the Allies with hundreds of thousands of gas shells in a relatively short space of time. To its credit, First Army Headquarters disseminated this information to its units and, in field orders during the campaign, urged subordinate corps and divisions to use gas. Gas was made available by the French to the Americans in a sufficient quantity to neutralize enemy batteries, strong points, and installations, and to produce casualties. The final decision to utilize gas, however, rested with the corps and division commanders. With little or no doctrine, training, or experience they were reluctant to employ gas. The offensive use of chemical weapons, according to one First Army general, "does not seem to be understood."[20] Army-level operational planning for the campaign included extensive use of gas, but its use by corps and divisions was halting. While the First Army's divisions did gain some confidence in the use of gas toward the end of the campaign, they never really mastered its employment. Had the 1st Gas Regiment more time prior to the assault to liaise with infantry com-

manders, or had infantry commanders received practical training or observed Stokes mortars and Livens projectors in use prior to "zero hour," perhaps the results would have been even more beneficial.[21]

In the wake of the American advance, CWS officers and NCOs scoured the battlefield for German gas munitions and defensive equipment. The German munitions were delivered to the CWS Gas laboratory at Puteaux, a suburb of western Paris. In addition to the research conducted on captured German gas warfare materiel, the CWS laboratory at Puteaux was developing products for gas defense. Finally, the Puteaux laboratory's Organic Division was developing a gas camouflage which, although too late for use in the Meuse-Argonne Campaign, was hoped to reap benefits in the planned American gas offensive of 1919. By developing and adding a secondary chemical to the agent, one that would produce a smell like freshly-dug earth, a common smell secondary to conventional shellfire, it was hoped the agent would be camouflaged from olfactory detection, leading to greater enemy casualties.[22] The benefits of establishing a site for gas training and experimentation was realized at the same time the creation of a gas laboratory was first requested, in December 1917.

This idea was realized with the AEF Experimental Field, later christened Hanlon Field, it had twin missions: to instruct unit and division gas officers and NCOs, and to conduct experimental work on new gas munitions and materiel.[23] The Gas Defense School combined classroom instruction with "hands on" training designed to provide practical experience and to build confidence in gas defense and decontamination operations. By "training the trainer," it was believed this knowledge would be passed down to personnel within the soldier's home unit. By the time of the Meuse-Argonne Campaign, the school had trained more than a thousand gas personnel. In August an offensive course was created, giving students the opportunity to plan and launch chemical agent attacks, using the gamut of weapons and agents available. To this effect, three ranges were created for the four-inch Stokes mortar, and for 75-mm and 155-mm guns. The target demographic for this training were officers destined for various staff positions at the division, corps, and army-level. Colonel Amos Fries, Chief of the Gas Service, knew that, by and large, division-, corps-, and army-commanders were unfamiliar with the strengths and limitations of poison gas, and were therefore unlikely to incorporate their use in the planning for upcoming offensives. With practical knowledge of gas weapons under their belts, these staff officers would be in a prime position to advise commanders on the benefits gas weapons provided. In addition to obtaining practical knowledge on gas delivery methods, these unit gas officers

were expected to become advisers whose technical knowledge would be solicited "in the preparations of all plans involving the extensive use of gas, whether by artillery or by other means."[24] Despite the order, staff officers too often told gas officers that their advice for offensive planning was not required and that they should concern themselves only with defensive duties. The success of division gas officers in integrating plans for the use of gas in offensive operations eventually depended on, in the words of the Gas Service's Chief, their ability to "go out and sell gas to the army."[25]

Additionally, Hanlon Field was used as the test facility for new gases and weapons, where the effects of weather and terrain on the behavior and persistence of gases could be ascertained. One new munition developed and tested here played a role in the support given by the 1st Gas Regiment in the Meuse-Argonne Campaign that of the high-explosive filled Livens projectile.[26]

The Medical Section of the Chemical Warfare Service, through its work in the physiological laboratory at Hanlon Field, had conducted extensive research in the effect mustard agent had on soldiers exposed during combat. Mustard agent, with its high boiling point, evaporates slowly, and soldiers exposed to it could unknowingly carry the agent on their clothing and skin for hours before the first signs of chemical burns appeared. Knowing that rapid decontamination was key to preventing injury, the CWS proposed the creation of mobile decontamination teams, known as "degassing units," attached to each American division, and capable of quickly moving into forward areas following an enemy mustard gas attack.

In training, the units performed well, moving quickly forward to assembly points, where "contaminated" Soldiers had congregated. The unit could roll onto site, erect a 50-foot hospital ward tent, assemble the shower unit, and begin bathing operations within 17 minutes. Each unit could then treat and clothe 1,000 men before their supply of towels and uniforms were expended and resupply required. Once the mission was complete, in nine minutes, the ward tent and shower unit could be broken down and repacked, and the units placed on the move.

In actual practice, the operation did not go as smoothly. During the Meuse-Argonne Campaign, these units had a difficult time traversing along the narrow, congested, muddy, shell-pocked roads of France, sometimes not arriving until several hours after the attack. Still, these units

did their job effectively, preventing injury and hospitalization of combat troops, and returning them to combat in an expedient manner.[27]

Conclusion

Today, the Army is preparing to conduct large-scale combat operations in a Chemical, Biological, Radiological and Nuclear (CBRN) environment. Through the process of assessing enemy capabilities, determining the appropriate protective posture and mitigating the threat of our adversaries, the Chemical Corps will continue to support the combat arms as it has done since its inception. The experience by the officers and men of the CWS during the Meuse-Argonne Offensive illustrates lessons learned that are still applicable in large-scale operations 100 years later.

Field Manual (FM) 3-0, *Operations*, provides doctrine on how Army forces, as part of a joint team, conduct sustained, large-scale combat operations with current force structure and capabilities against a regional peer. As it states, "Historically, battlefields in large-scale combat operations have been more chaotic, intense, and highly destructive than those the Army has experienced in the past several decades."[28] The Meuse-Argonne Offensive was the very definition of large-scale combat operations (LSCO), a battle "at the far right of the conflict continuum and associated with war."[29] Throughout the 47-day offensive, the US Army was simultaneously conducting offensive, and defensive operations; aimed at seizing, retaining and exploiting the initiative, in order to shape the operational environment, and win this war for our nation as part of Unified Action.

It is important to note that while the United States, and specifically the Chemical Warfare Service, the historic predecessor of today's Chemical Corps, used chemical munitions in World War I, this country is currently a signatory of the Chemical Weapons Convention, an agreement banning the use of chemical weapons that went into force 29 April 1997. However, as FM 3-0 states, "The likelihood of the enemy's use of Weapons of Mass Destruction (WMD) increases during large-scale combat operations—particularly against mission command nodes, massed formations, and critical infrastructure."[30] German use of chemical weapons was very effective against poorly prepared US forces in the Meuse-Argonne. It is an old saying amongst historians that history does not necessarily repeat itself but it rhymes. Our study of past adversaries, such as Germany in World War I—combined with our understanding of emerging Chemical, Biological, Radiological and Nuclear (CBRN) threats today—drives us to prepare to fight and win our nation's wars in a contaminated environment.

The tactical employment of the gas troops 100 years ago during the Meuse-Argonne Offensive was the same as the Chemical Corps's current mission, to support combat arms before and during the progress of the battle. Then and now, the importance of chemical defense specialists embedded at every level of command cannot be overstated. Again during World War I, Soldiers received 640 hours of instruction, with 14 of that being chemical-related. While today the brigade combat team (BCT) program of instruction consists of 568.1 academic hours with 9.5 hours of that covering CBRN specific training. The CBRN specific training covers 13 CBRN common Army tasks and the Mask Confidence Training (MCT) Exercise.

Combat commanders must be aware of what support is available to them in the arena of chemical defense and decontamination. The fledgling efforts of CWS "degassing" units of 1918 have grown to become more plentiful, more portable, and more effective than they could have imagined, and able to provide mass decontamination in support of large-scale combat operations.

One mission of the Chemical Corps, to take samples of enemy CBRN material and deliver it safely to a laboratory, remains relevant today. Understanding rapidly emerging threats can enable our success during large-scale combat operations. Our ability to assess CBRN threats, protect our service-members, and mitigate consequences of an attack, are the cornerstone of what the Chemical Corps provides our Army today. FM 3-0 identifies WMD as a threat on future battlefields. "The use of WMD and the constant pursuit of materials, expertise and technology to employ WMD will increase in the future. Both state and non-state actors will continue to develop WMD programs to gain advantage against the US and its allies."[31] This trend compels the United States Army Chemical Corps to not rest on our success supporting maneuver over the last 100 years. We must continue to prepare for the future. The Chemical Corps must seek tactically and technically competent recruits, which are capable of advising their commander in any situation. We must competently support movement and maneuver on tomorrow's battlefields; while remaining technically competent and tied to the science and technology community. In World War I this meant developing ways to increase our mobility of the gas troops by providing means for carrying forward more easily the ammunition needed for mortars. General William L. Sibert summarized it best: "It is my humble judgment, however, that the same rule will hold in the future as has held in the past, that is, the next war will begin ahead of where the last one left off, and that a nation that is not up-to-date in chemical warfare both offensive

and defensive will be so seriously handicapped as to be practically out of the fight in the very beginning."[32]

Innovative training and leader development, ensuring our units are organized for combat, continual force modernization, and working with our Allies are as essential to our success on the next battlefield as they were to US and Allied forces during the Meuse-Argonne Offensive. Preparedness for fighting in a contaminated environment decreases the potential lethality of future CBRN attacks. The US Army Chemical Corps continues to enhance the mobility of today's Army by fulfilling its mission of "Protecting the Force."

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Chapter 4
The Hindenburg Line: The Creation of Defense in Depth

Lieutenant Colonel Daniel K. Runyon

> *What is the object of defense? Preservation. It is easier to hold ground than to take it, defense is easier than attack. But defense has a passive purpose: preservation; and attack a positive one: conquest. . . . If defense is the stronger form of war, yet has a negative object, it follows that it should be used only so long as weakness compels, and be abandoned as soon as we are strong enough to pursue a positive object.*[1]
>
> —Carl von Clausewitz

The Western Front of World War I had become a stalemate between the most powerful armies the world had ever seen. The Allies and Germans had endured almost four years of fighting. Generals directed millions of soldiers and launched millions of artillery rounds with the intent to crush the opposition.[2] But the result was usually only a few meters of ground, and then the attackers would be driven back into the trenches where they started. This stalemate line had a space between the opposing armies called "no man's land." This line started in the Northwest of Europe, in the Netherlands and Belgium, and continued to the Southeast near the French-German border around Colmar, France. This chapter will focus on how the Germans tried to change the dynamics of this static line along the Western Front by creating a defense in depth. They did this along the central portion of this line that became known as the Hindenburg Line from the fall of 1916 until the Armistice on 11 November 1918.

Strategic Reason for the Hindenburg Line

The stalemate battle on the Western Front against the British and the French was only half of the Germans' war. They were also fighting on a much larger Eastern Front against the Russians.[3] The requirements to prosecute a two-front war were seriously draining on the entire German society and were stretching the capacity of the German Army. Their total losses of about four million men that were killed, wounded, or captured strained their ability to supply the necessary replacement forces on both of these fronts. This loss of men and expenditure of ammunition on both fronts was strategic in nature, as it was almost 20 percent of the German fighting age men. In addition, there was an Allied blockade of Germany that limited their access to raw materials needed for food and manufacturing of guns and ammunition. The food shortage was so serious that

the Germans were protesting on the streets.[4] Their ability to import the required goods to produce the millions of artillery rounds, have the men to produce these guns and shells, and still send capable men to the front to replace the losses was nearly impossible. These trends were painting an ominous picture for the German leaders trying to manage the war.

Old Way of Defense

The mentality for the German Army from 1914 until 1916 was "*Halten, was zu halten ist*" meaning "Hold on to whatever can be held." The way they executed this order was to put as many of their forces as possible in the most forward trenches. Then after the artillery prep, the shell-shocked troops tried to stave off the attacking infantry. But due to the decline of men and material, the German leadership realized that the way of war could not continue. The current army leader was not adjusting the strategy to compensate for the dwindling resources. This strategy was even more important when it was compared with the Allies. At the current rate, Germans would run out of men and material first. German General Ernst Jünger, a highly decorated front line officer, recognized that they were in "*die Materialschlacht*" or "the battle of material."[5]

The Chief of the German General Staff, Erich Von Falkenhayn, continued to insist on holding the strongest forward defensive line, and forced German leadership into a tough decision. With the shortage on both supplies and manpower, not to mention the food for the general population, it became clear they had to replace General Falkenhayn.[6] The new leader, Field Marshal Paul von Hindenburg and his new second in command, First Quartermaster General Erich Ludendorff, knew that with their recently assigned positions they would have to make some serious changes.[7]

The German military industrial complex was becoming weaker by the day.[8] They were not able to produce the required number of divisions or the supplies that they needed in the field. Von Hindenburg implemented a national manufacturing plan to increase the amount of ammunition and guns being produced over the winter of 1916–17. He understood this shortage during the battles of Verdun and the Somme, June–August of 1916. The German army had sustained 122,000 casualties and rotated 29 divisions in and out of the front line. But they were only able to replace 50–60 percent of the required men in the units. In addition, the munitions requirements during these battles were about 600 trains, but the German production lines were only able to supply 470 trains. His production plan should have boosted the output to the required levels but it was only able to produce around 60 percent of the expected material. Even the quality

and reliability of the artillery and small arms was observably reduced.[9] Due to this trend, Hindenburg and Ludendorff dismissed the increased manufacturing effort. The generals concluded that they would not be able to conduct any more offensive campaigns due to the lack of men and material and required ratio of offense versus defense. They knew they could not produce a strategic victory.

Germany's decision to change strategy was also influenced by the declaration of war by the United States. Germany calculated that it would take America about one year from the declaration of war for the Americans to place a significant number of trained forces into battle. Woodrow Wilson made this declaration on 2 April 1917, and so Germany had to prepare for a substantial uptick in the opposing force, on or about the spring/summer of 1918.

The new Chief of the General Staff, Von Hindenburg became convinced that Germany's expectation of a victory was impossible.[10] He was now faced with the choice of continuing to fight in the same way they had been over the last few years, or to change the strategy, all without revealing vulnerability to the Allies. He knew they must fight as strongly and efficiently as possible, in order to negotiate for peace from the strongest possible position. The Hindenburg Line would be a part of their strategy to accomplish just that.[11]

Von Hindenburg made an unpopular recommendation to his leadership.[12] Hindenburg wrote, "there no longer exists any prospect, according to human calculation, of forcing peace upon our enemies." In another note he wrote, "Before you take your last horse out of the stable, make an end."[13]

Process of Developing New Doctrine

The Germans did not take the task of developing new doctrine lightly. They had analyzed the successes and failures over the course of the last few years and came up with a new regulation titled "The Principles of Command in Defensive Battle in Position Warfare," published 1 December 1916. Von Hindenburg's principal assistant in executing this defense was Lieutenant General Ludendorff.[14] To Ludendorff, this new doctrine was *not* treated as "holy writ," but he did put his full authority behind it.[15] The "principals," as it will be called from here forward, did not specify to divisions the exact frontages or precise defense organizations of subordinate units.[16] It allowed commanders to analyze the terrain and use it to their advantage while placing the Allies at a disadvantage. This new doctrine mandated greater initiative for the commanders.

The Four Objectives

The new defensive method created tactical depth that would flex temporarily but not give significant ground. The "principles" involved four objectives.[17] First, the defender must not surrender the initiative to the attacker. Of course the attacker still gets to pick the time and place of the attack, but there were two keys to the new defensive line. The first key was the placement of defensive positions on the reverse slopes of the hills, and the second key was the placement of obstacles that channeled the attacking forces into vulnerable locations. Because the technology of the day did not allow reconnaissance assets to see as far as today, this reverse slope idea kept the Allies from knowing exactly where to shoot the artillery or what to expect when their infantry crested the hill. The terrain that was chosen for the construction of the line was well suited for a defensive campaign.

Second, the defense must rely on firepower, not large numbers of troops. Forcing the Allies to attack through barbed wire obstacle belts that channeled them into machine gun fire and artillery zones was key. After the surviving attacking forces had managed to make it through the initial defensive belt, they were subjected to an immediate attack from machine guns that were strategically placed in optimal locations to mow down the enemy. Then, if they made it past the machine guns, the exhausted Allies would be subject to artillery that was directed by forward observers who were placed on the best terrain. After these two brutal defensive measures, the Germans would launch a counter attack force that did not allow the attacking force to consolidate its gains. The tactical result was that the Allies were captured, destroyed, or forced to retreat back to the original line. Using this new doctrine, the Germans would lose only a fraction of the troops when compared with the old way.

Third, the defender must not hold ground at all costs (a controversial principle). Old doctrine built such a rigid defensive line that it cost more lives and ammunition than the Germans could afford and it made them vulnerable to a massing of Allied offensives that could catastrophically breach the German line and cause the complete collapse of the Army, therefore the controversial doctrine "do *not* hold ground at all cost" was implemented. The new doctrine allowed the defense in depth to flex, but not break.

And finally, the defender must consider depth for all construction and positions. The study of the terrain and strategic placement of these po-

sitions was a challenge. They found the best high terrain and ridgelines so they could observe the "troops in the open." This intelligence allowed them to launch their artillery and surprise the attackers from unseen counterattack positions on the reverse slopes and then push back the exhausted Allies before they were able to consolidate gains. The German reserves and long-range artillery were even farther back.

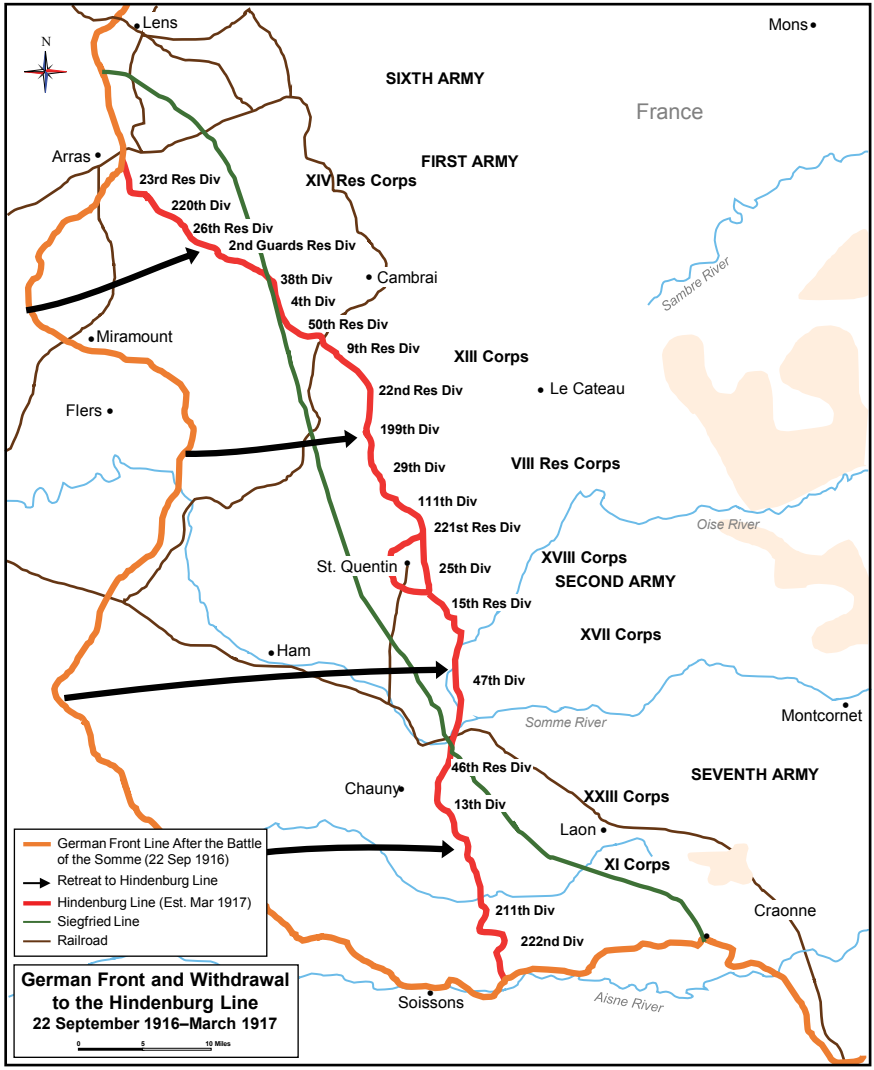

Figure 4.1. German front line before and after the withdrawal to the Hindenburg Line. Map created by Army University Press.

The key difference in the arrangement of troops on the battlefield was to place only enough soldiers on the front line to observe the attack of the Allies and to pass the information to the rear, while at the same time, putting up enough of a fight to delay and degrade the attackers' capability. This is key to any counter mobility plan. As the Allies progressed forward to the front line, their momentum was slowed due to the difficulty of the terrain, which was riddled with artillery holes and wire obstacles, had no usable roads, and finally was subject to machine gun fire from the Germans. Because the Germans used depth and reverse slope of the terrain to reduce the effectiveness of the initial artillery attack, they were able to counter attack with speed and capable units.

As this new doctrine was published, it named three zones.[18] The first zone was the "outpost zone" usually between 500–1,000 meters in depth. It contained the obstacles of barbed wire that were between 30–100 meters in depth and a series of trenches and machine gun bunkers. This arrangement of obstacles channeled the attacking units into the least favorable terrain and gave the defenders the best fields of fire for their machine guns. The front line German battalions occupied a few strong points and provided a few small counter attacks. The next zone is where the primary effect was placed on the Allies. It was called the "battle zone." It was from 1 to 3 kilometers behind the outpost zone. This second zone is where the Allies would typically get extended, lose cohesive unit structure, and the supply chain would be reduced in capacity. The Germans owned all of the terrain and chose the highest key terrain for artillery observation points. From these positions, the forward observers could direct the artillery directly on to the disorganized and exhausted attackers before launching the counter attack. The battle zone troops contained the German division support battalions who were in concrete bunkers up to 30 feet underground. They supported the "outpost zone" and provided local counterattacks after the attacking Allies had been hit with German artillery. The Hindenburg Line was built on "uncontested" ground behind the front lines. This allowed the Germans to study every possible Allied axis of advance and create obstacles to channel them into fields of fire and open fields that made them susceptible to artillery. This was one of the main factors of success. The final zone was called the "rearward zone." It was out of range of most Allied artillery, and is where the commanders placed the majority of the reserve forces and long-range artillery. These forces also utilized the reverse slope of the terrain and were able to quickly move through tunnels or trench lines into the battle zone and finish the expulsion of the Allied troops.

Engineers and Material to Build the Hindenburg Line

As shown in Figure 4.1, the front line between the armies had a significant curve or salient. So, as the Germans laid out their defensive plan, they needed to straighten it in order to shorten the distance. This shorter line would take 13 divisions less than the curved line. Another important fact was that the proposed line was so far behind the current one, that they were able to choose the best terrain available. This placement was critical to its success. The ground they chose was made up of a series of long, low ridges of chalky formation.[19] These ridges furnished excellent observation for artillery as well as reverse slope protection for the soldiers. It also contained a series of tunnels that would provide cover during the artillery attacks, as well as a means to move troops back and forth on the battlefield.

The order to begin designing and building the new line was issued in late September of 1916. The building of the Siegfried Line, as the Germans called it, would require an immense amount of resources to construct. This was mostly due to the size of the area behind the line. The area would cover about 500 square miles (88 miles long and 5–6 miles in depth).[20] The massive project was scheduled to be completed by March of 1917, just within six months' time. Success depended on the Allies not detecting that this construction project was happening.[21] Any sense of weakness or retreat may have given the Allies additional motivation to attack. The Germans needed to preserve the status quo until the line was complete. The overall construction supervisor for the Hindenburg Line was Colonel Paul Kraemer, an engineer from the Supreme Headquarters, and General Ludwig Lauter, the Inspector General of Artillery. These two men had the knowledge to understand how the two keys for the successful defense would work: engineering and artillery.

The management of this massive project was stereotypically German and followed a very orderly process. The special construction staff would survey and mark out the points along the entire defensive line. They marked the exact locations for each artillery observation point, the machine gun bunker, and the bigger shelters and tunnels for the soldiers.

After the positions were surveyed and marked, the facilities for all the workers had to be created. They would need housing, kitchens, hospitals, and all of the transportation to move tens of thousands of workers that were necessary to make these structures in just six months.

The Germans collected about 12,000 people from their reserve units as well as German and Belgium construction firms to be used as skilled workers. They would perform the more complicated tasks of building rail-

way lines, steel reinforced concrete emplacements, and tunnels. They also commandeered some French and Belgian concrete equipment and placed them at each of the building sites along the line. In order to facilitate speed, they standardized the bunker designs and forms as much as possible. This allowed most building material to be made off-site, and quickly assembled on-site. Once delivered, the workers could follow a repetitious pattern and move to the next bunker. When the construction was complete at that location, they would move the required equipment on the newly built railroad line to the new location. The construction process started with the forward most "outpost zone" and then worked farther away from the front line to complete the "battle zone" and finally the "rearward zone."

After the skilled workers had built major concrete shelters, the unskilled workers would "connect the dots" between each of the defensive structures with trenches and other earthworks. This massive effort required 65–70,000 laborers, of which about 50 thousand were Russian prisoners of war (POWs) who had been shipped from the Eastern Front. Another benefit of the ridgeline that they chose was the chalky soil maintained a steep slope without collapsing and was not susceptible to erosion during rainfall.

The material used in this effort was equally enormous. It consumed more than 50,000 rail cars of engineering gear, or more than 250 train loads per day, throughout the six months of construction. This mountain of material was mostly gravel, cement, lumber, and iron.

The Germans were successful (and lucky) to perform this massive construction effort without being detected. The weather followed the typical northern European pattern of windy, cloudy, and rainy most of the time. This weather limited use of the observation balloons and reconnaissance aircraft by the Allies. The first record of any knowledge of the new defensive line being built was late January 1917.[22]

The German order to withdraw forces from the front line to the newly created Hindenburg Line was issued on 9 February 1917 and was codenamed Operation Alberich. In order to delay the Allies from attacking unimpeded across the vacated ground, the Germans employed a scorched earth operation. They razed the roads, felled trees, and shot artillery rounds into their own evacuated bunkers and trenches to limit their use. They even evacuated 125,000 locals and destroyed their homes and wells so that the Allies could not obtain food or shelter.[23]

When the main German retreat of 35 divisions took place on 16 March, they left 10 divisions as a rear guard. The French and British armies were

not prepared for the withdrawal and did not (or could not) pursue the Germans during this very vulnerable moment. The move took about four days for the Germans to complete the withdrawal and take up residence in their new "home" of the Hindenburg Line.

Upon the discovery of the new defensive line, the Allies understood that the Germans believed the Hindenburg Line was capable of defying any assault made against it.[24] Allied observations reported wide swaths of barbed wire entanglements followed by large amounts of dugouts lined with heavy timbers and concrete lining the interior. Some bunkers were 30 feet deep or more. Each of the small dugouts could house between 4 to 12 men, and they were even wired for electricity and communication lines.[25] The second row of this outpost zone was at least 100 yards behind the first. There were hundreds more dugouts with observation points spread along the line, with satisfactory shelter. The third line was sufficiently manned with more shelters and observation posts. One commander from the 30th Division said that every phase possible had been considered in not only providing for defense, but also comfort of the occupants. He also reported that the Germans had used the terrain very well as they built the line behind a distinctive ridgeline that created a natural barrier to limit the view of the enemy positions. The ridge paralleled the defensive line about 1,500 yards behind the initial defensive line.

Conflict of Ideas

The doctrine of flexible defense in depth did not come without conflict. General Fritz von Lossberg, the chief of staff to the Third Army during the defensive victories in 1915 and 1916 said, "Categorically, every unit must fight in the section of the foremost position that it is assigned to defend. The voluntary surrendering of a position, or parts of a position can lead to the most disastrous results for neighboring units. Therefore, the voluntary surrendering of a position should only take place with the permission of a higher commander, who is in a position to determine its effects on neighboring units and on other arms (artillery)."[26] He went on to say that the reason for the victories, in his view, was due to the "determination to fight" because of the in-flexible lines, even though this inflexible defense caused massive loss of life that the German Army could scarcely afford.[27] In an interesting twist, the supporter of the new doctrine, General Ludendorff, had such openness to healthy debate that he not only allowed General Lossberg's view to be spoken, but General Ludendorff intentionally circulated his memorandum in order to have a discussion over the conflicting perspectives.[28]

Another significant change in the doctrine was the decrease of echelons required to make decisions. It was reduced from five echelons to two. Initially the decisions had to move through corps, division, brigade, regiment to battalion leadership. These echelons were all needed in the old doctrines' chain of communication. The "principles" went directly from the forward battalion to division. This did not sit well with the leaders that were now left out of that decision cycle. The first battalion that encountered the first offensive assault and would communicate directly with the division who was responsible for the artillery and counter attack in the battle zone.

This change in communication between echelons forced the other commanders to trust the decision makers, in much the same way that mission command philosophy is written. Army Doctrine Publication (ADP) 6-0 states, "Mission command is the exercise of authority and direction by the commander using mission orders to enable disciplined initiative within the commander's intent to empower agile and adaptive leaders in the conduct of unified land operations."[29] The doctrine goes on to state, "Shared understanding and purpose form the basis for unity of effort and trust."[30]

In addition to the doctrine change, the Germans modified the organization and units within their divisions. They increased the division commanders' span of control from five subordinate units (four combat & one non-combat) to nine subordinate units. The majority of the changes allowed the division commander to have organic transportation assets, sustainment troops, medical support, and a signal command.[31] Because the "principles" allowed the lead battalion in contact to bypass the regiment and brigade and speak directly with the division commander, this change of force structure gave the division direct access to his needed units for quicker counter battery and counter attack.

Testing and Training Countermobility

This doctrinal change needed to be tested. On 1 January 1917, a Testing and Instructional Division was set up, with a complete war-strength formation. Because of the speed that this doctrine was evolving, General Otto Moser, an experienced division level commander, did not receive a copy of the new doctrine until mid-January. The first unit arrived for their week of instruction on 8 February 1917.[32] This first training division, the 5th Bavarian Division, was redesigned with all of its new assets including the addition of some heavy artillery and increased infantry battalions. They had been removed directly from the front line, and General Moser trained its officers and non-commissioned officers (NCOs) on the

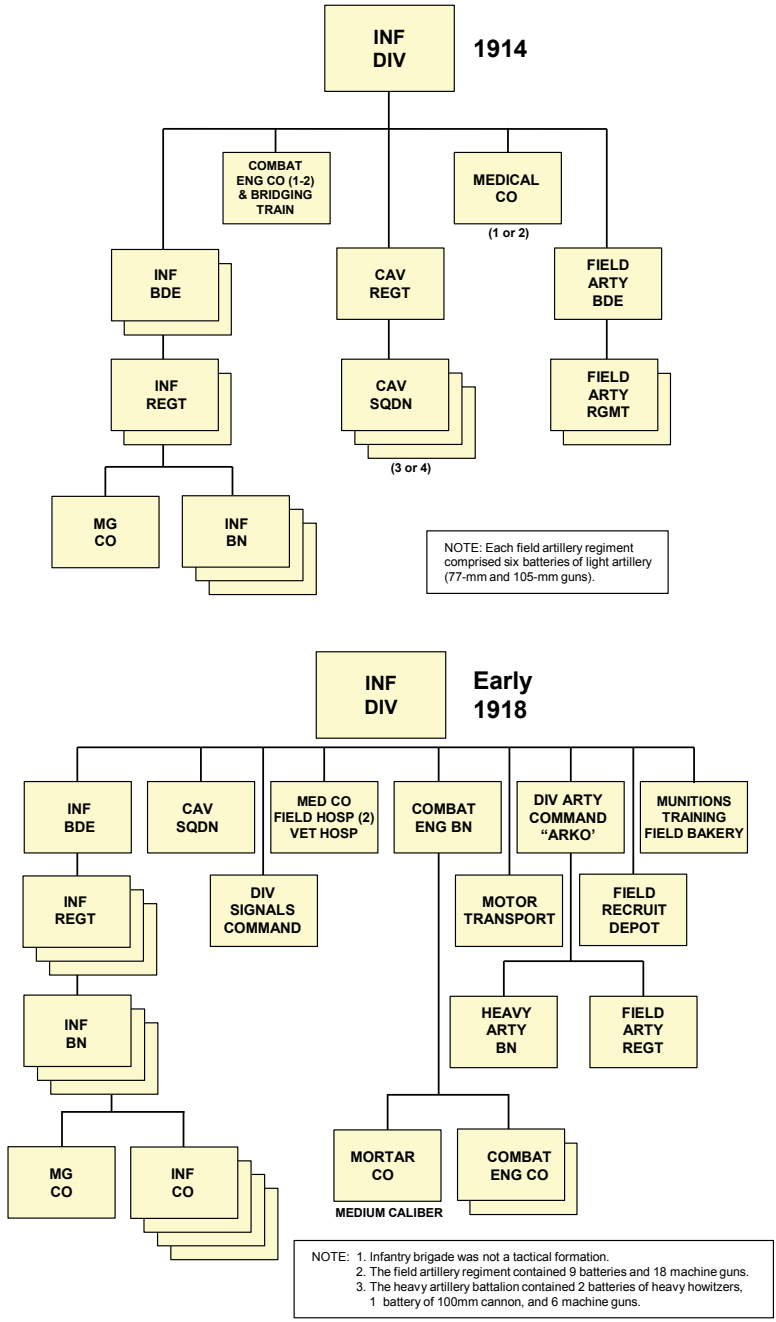

Figure 4.2. The additional forces given to the division commander reduced the echelons of communication and allowed the division to have direct access to the required forces. Graphic created by Army University Press.

new doctrine. The division constructed a full trench system and artillery firing positions, and they were trained on the execution of the "principles." The course was found to be a great success and was replicated across the German Army to share the experience with as many divisions as possible before the anticipated spring offensive.[33]

Training was given to high-ranking commanders and staff while the field armies established their own schools to train officers and NCOs. The training was so inclusive that even though it added to the strain on the ammunition production, they used "live fire" training with combined arms to ensure realism. Special emphasis was placed on training equipment that was especially useful in the execution of the defense: trench mortars, machine guns, and artillery. Even the units that were unable to be withdrawn from the front lines executed the training inside of their sectors. The "principles" doctrine was so different from the static defense that leaders had to understand the battlefield situation and be completely synchronized with the counter attack movements. The training was emphasized at the highest levels when Crown Prince Wilhelm said that this new doctrine "required well disciplined, well trained, and well led troops."[34]

Surprisingly in late January 1917, the decision as to when or if they should withdraw to the Hindenburg Line had not been finalized. Both the timing and messaging to the Army would be crucial. The leaders knew that the Soldiers would not easily retreat from more ground than they had won during two years of hard fighting, without crushing their morale. General Ludendorff had a meeting with a respected comrade, General Hermann von Kuhl, who stated:

> Enemy superiority is so great that we are not in a position either to fix their forces in position or to prevent them from launching an offensive elsewhere. We just do not have the troops. . . . Therefore we must direct all our efforts into building up Siegfried and devote no effort to our current positions. . . . [if not used] the positions produced will be worth nothing and we shall simply exhaust the men. We can save a lot of divisions, train them and deploy them elsewhere against the enemy with good prospects of success . . . if not we shall lose the campaign. A big decision must be made, not a half-hearted one. We must not shrink from [the decision to] withdraw into the *Siegfriedstellung*![35]

Allies Attack

After the training was completed, the Germans did not have to wait long to see if the new doctrine would work. On 9 April 1917, the British at-

tacked the German 6th Army, which marked the first Allied assault against the Hindenburg Line. The results were not good for the Germans. The German artillery was not active enough to disrupt the British during the attack, and the division assets were too far to the rear to be quickly accessible for a counter attack. The investigation following the event concluded that the commanders were responsible for the failure and not the doctrine. General Ludendorff knew that the new "principles" mindset would not be easily adopted, and he had to enforce negative consequences early. Therefore he was quick to relieve these officers of their command positions.[36]

Due to some German leadership reinforcement, the next attacks by the French and British told quite a different story. The French conducted a 10-day artillery prep with 5,000 artillery tubes followed by an attack by the 5th and 6th French armies on the 16th of April. Due to the success of the earlier British attack, the French anticipated a breakthrough of the line and a strategic collapse by the German forces. But to the contrary, the French attack was exactly what the Germans had built the Hindenburg Line for. The Germans were positioned on the reverse slopes of the hills and were therefore out of sight from the French forward observers, making their artillery ineffective. The French infantry attack that was followed the artillery preparation was broken up and disorganized by accurate German artillery, and when the infantry did come over the hills, the machine guns and counter attack forces had devastating effects. The French plan required that the offense succeed immediately, and because they lost momentum the French leadership knew that it would not achieve the decisive effort they had hoped for. The result, although costly to both sides, yielded approximately 134,000 French casualties, the highest number in any month since 1914.[37] These results validated the effectiveness of the new doctrine for the Germans. An after action review comment from German leadership concluded that the principles "insured uniform actions during the preparation and in the course of the defensive battle. At the same time, in no way did it hamstring initiative."[38]

Another early example of the success of the "principles" happened when the British continued to attack into the Hindenburg Line on 14 April 1917. The Brits attempted to "creep" an artillery barrage forward into the German lines, followed closely by an infantry force. But the Germans, who were on more advantageous terrain, were able to slow the trailing infantry with accurate artillery strikes of their own. This separation of the advancing British artillery from the men behind allowed the German defensive units to attack the confused and disorganized British infantry. During this well-executed defense, it only took two and a half hours to kill

or injure 66 percent of the British soldiers, and they were forced back to their side of the line.

A key to the lasting success of this defensive line was the placement of counter mobility obstacles and artillery observation locations. They were the lynchpins for successful defense. Each attack by the allies forced them to slowly breach the barbed wire, fight through the initial trench system, and then move across the open terrain on the way to the second defensive belt. Because the Germans got to choose the defensive terrain that best suited them, the artillery fire and immediate counterattack against the disorganized and vulnerable infantry forces achieved favorable results. The Germans never allowed the Allies to consolidate gains. According to Lupfer, the British did not appear to understand that observation provided by key terrain greatly affected their operations. They tended to press on in a wide effort and did not seize fleeting opportunities to capture specific areas with favorable observation to press the advantage.

In contrast to the German methods of applying new doctrinal changes, it seemed the Allied leadership tried to repeat the exact method of the last success. This mentality to try the same formula instead of applying the concepts to a new situation can be seen with General Robert Neville, a French commander. He had achieved an earlier tactical victory with a rolling artillery barrage that was closely followed by an infantry advance at Verdun in 1916. His achievement recaptured territory that had previously been taken by the Germans and the French considered it a great tactical accomplishment. General Neville was now in charge of all Allied troops in France, and he "knew" that his technique would work on a strategic level.

The French commenced a large attack in April 1917, but his failure to understand the logistic and operational aspects of the situation resulted in disaster. The logistics trains were unable to supply the required amount of artillery munitions for the massive artillery wave that was supposed to precede the attacking infantry force. This caused some artillery units to run out of shells completely as they tried to fire the amount of rounds that were ordered. The infantry were unable to keep up with the "insane pace" of the artillery advance.[39] The Germans had machine gun strong points placed in a way so that they were protected from the artillery but were still able to shoot into the attacking French forces from multiple directions, including from the rear. Additionally and unknown to the Allies, the Germans had managed to capture an advance copy of the battle order, so they could prepare for every aspect of the Allied attack.

As the year of 1917 came to a close, even though the German army was in a grave situation with both men and material, they were learning significant offensive lessons from the counterattacks inside of these defensive battles. The Germans used these offensive maneuvers to put together their final offensive effort of WWI in the Somme during spring of 1918. They were able to conduct this last attempt because the Russians signed the Brest-Litovsk armistice in March of 1918, which ended the Russians participation in WWI. Therefore, Germany was able to transfer extra divisions from the Eastern Front between March and June.[40] Even though this final offensive effort was strategically unsuccessful, they were able to capture lessons learned from this attempt into the "interwar years" and build on them.

The Allied Breach

Throughout the spring and summer of 1918 the Allies continued to pour soldiers and ammunition at different sections of the line. The attrition on both sides was costly, but the Germans were nearing the end of their human supply chain and were calling up conscripts two years prior to the planned dates, requiring the men who had been scheduled for 1920 report dates had to be called into service in 1918.

The fall of 1918 was the beginning of the end for the Germans. The Allies kicked off the "Hundred Days Offensive" on 8 August 1918. As the offensive kicked off, one portion of the line had over 1,500 cannons along a 10,000-yard front to soften the line designated for attack. In the last 24 hours of preparation the British artillery fired almost one million shells. That averaged more than 10 explosions per second for the entire day! This offensive had a new toy for the Allies to use: a new weapon system they named "the Tank." One of the first battles that saw the tank was at Cambrai. It was a significant advancement in the offensive fight against this defense in depth. With the concept of mass, the artillery, infantry, and tanks could hit the line at once, without a significant artillery preparation, while at the same time using long-range artillery and air power to hold back the assault divisions from counter attacking. This was a useful tactic. The delay of the counter attack contributed significantly to the Allies being able to consolidate gains and achieve meaningful advancement of the line.[41]

Even though the "hundred days" offensive effort was viewed as a success, achieving victory was challenging. They had to secretly move the attacking force in order to surprise the Germans. The Allies moved 17 additional divisions to the Cambrai area between 20 November and 2 De-

cember, and because of the speed that was required, the Allied troops did not have appropriate time to study the ground or rehearse as they normally would. They transitioned immediately from assembly into the attack. The physical strains on horses and men had a significant effect during the attack. Many of the horses died of exhaustion and the men were so fatigued that they were unable to fight.

As the "hundred days" offensive continued into September of 1918, the Allies attacked into the Hindenburg Line in order to cut off the railroads that were supplying the German Army. During the attack the British advanced to the Canal du Nord and their engineers in charge of mobility were assigned to build enough bridges to cross the division. The engineers built foot bridges for the infantry, followed by more sturdy timber bridges for the artillery and larger supply vehicles. This offensive effort between 27–30 September yielded the British 48,500 prisoners and 630 captured artillery pieces.[42] Throughout October, other parts of the defensive line were breached and Allies began gaining ground beyond the Hindenburg Line. The advantage of this hardened defensive "line" that the Germans had had over the last year was lost and the end was in sight.

In the last days of the war on 7 November 1918, the Germans were conducting a scorched earth withdraw and destroyed all the bridges in the vicinity. The Allies continued the advance but needed bridges to make the final assaults. The weather in recent days had been very rainy, and the rivers were in flood stage making the engineering effort to enable these attacks nothing short of astonishing.[43] The division engineers had multiple tasks. They needed to repair the roads that were demolished to give commander mobility. These roads, especially through "no man's land," were in such poor shape from the thousands of artillery rounds they were not even recognizable as roads. They required huge amounts of rock that could not be brought forward in sufficient time or quantity. Therefore the engineers formulated a creative solution to use the stone from the buildings that the Germans had destroyed, as foundations for the new roads. This proved to be very effective.

Besides road building, the engineers had to bridge the gaps over the trenches and canals. The bridging techniques were most remarkable. Company A of the 1st Engineers, under the 4th Army Corps, built five footbridges across the Rupt de Mad after carrying the required timber for a distance of five miles. They reportedly were able to build these foot bridge in less than 15 minutes. Even more impressive was a 20-man detachment that constructed a timber bridge over the canal. They completed the task

in just three hours! This bridge was used to cross the entire 4th Divisions' artillery and all of their heavy equipment.[44]

Another creative idea was pre-constructed portable bridges. This was possible because most of the gap distances over the trenches and canals were of the same distance. These bridges were used to quickly cross the artillery over the gaps in a similar concept of todays' Armored Vehicle Launched Bridge (AVLB). These engineering efforts maintained the Allies' mobility and speed, and were a significant factor that helped hasten the German decision to sue for peace. The Armistice was signed on the 11th hour of the 11th day on the 11th month, 1918.

Lessons Learned

At the end, Germany was defeated in a war of *Ermattungsstrategie* (strategy of exhaustion or attrition), the very war German generals feared most due to Allied superiority in numbers of men and material which exhausted Germany on two fronts in a stalemate of trenches. Following the horrific experiences of World War I, the German High Command knew that a repeat of a prolonged stalemate of trench and positional warfare could not be the answer for any future war. The *Reichswehr* created a committee of 109 members who dealt with possible lessons learned from World War I. The results were published as the "Combined Arms Leadership and Battle" report, which became the new Doctrine and Training Manual for the *Reichswehr* in 1921.[45] General Hans von Seeckt, chief of the Army Command of the German *Reichswehr*, moved away from earlier doctrines of mass and encirclement and started to give new thought to speed and mobility. Seeckt, having experienced the highly mobile *Schlieffen* Plan Offensive in France in 1914 and the Gorlice-Tarnow Offensive on the Eastern Front in 1915, argued that speed would give more surprise and chance of exploitation if the enemy could not decide quickly. Seeckt believed that "attack alone dictates the law to the enemy" and that the most effective way is the *Umfassung* (envelopment) of one or both flanks and the attack in the enemy's rear.[46] In this way the enemy can be destroyed. Seeckt's conception of the attack itself revolved around the question of the *Schwerpunkt,* or the decisive point of the battle, requiring the concentration of all forces. This meant that the commander had to be constantly aware of the *Schwerpunkt* during the battle and at the same time had to remain flexible enough to recognize any change of the decisive point. Due to the risk of the *Schwerpunkt* being shifted at any time during the battle, Seeckt emphasized the importance of *Auftragstaktik* (mission-type tactics or directive control), which is similar to today's mission command phi-

losophy. He wanted to ensure that the new German army, the *Reichswehr*, would not suffer from the same adherence to out of date orders that had doomed the Kaiser's army at the Battle of the Marne in 1914.[47] He believed that "from the mission and the situation arises the decision."[48] These words would later be printed in the Combined Arms Leadership and Battle Manual of 1921. In fact, the same words would also guide the *Reichswehr* and eventually the *Wehrmacht* at the beginning of World War II, which demonstrates the importance of being a learning organization during times of war and peace.

Conclusion

In summary, as General David Perkins wrote in *Military Review* as Field Manual (FM) 3-0 was being rolled out:

> The Principles of Command in the Defensive Battle in Position Warfare established a benchmark when the German military took on the concept of 'operational depth' and applied it as a learning organization. . . . Throughout 1917, the Germans repeatedly frustrated the French and British forces, who fought with dogmatic and formulaic tactical doctrine to disastrous effect. Germany's response was the continued reexamination and evolution of its doctrine.[49]

The Hindenburg Line was a monumental countermobility effort. It created a defense in depth that challenged the Allies for many months. In addition to being a defensive "line," it still allowed the Germans to counter-punch against the Allied attacks with mobility. Eventually the Allies' technology evolved to include tanks and better aircraft, and they were able to breach this defensive line by causing simultaneous problems in depth, and reducing the Germans ability to mobilize the counter-attack behind the lines. As history demonstrates, battle and technology will cause the need for change of doctrine due to success and failure of tactical concepts. The German Army was very good at finding and implementing new concepts. Even though there is a tenuous relationship between the cautious development of tactical concepts and changing doctrine, it is necessary to be successful. The Germans did not advocate change just for the sake of change. They recommended changes, like the strategic defense in depth of the Hindenburg Line, only when the Army could not support the continued tactics of a strong defense being forward on an inflexible line. They also knew that they would have to quickly apply a wide range of the doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) before it could have the desired effect. This case

study reveals the doctrine, training, and division re-organization that were built around the concept of defense in depth.

Conversely, as Tim Lupfer said in his paper, "The Dynamics of Doctrine," the French possessed many of the pre-war regulations that were needed, but tended to ignore them in war. French tactical change during WWI was influenced more by one strong leader who tried to use a successful tactic from a past victory. Of course this was not as successful at the operational level because it did not consider all the DOTMLPF areas that shape the outcome. Even though the Allies did have innovative field army commanders that used different offensive and defensive organizations, the high command did not seek to find the best ones, study and test them, and finally, implement them as across the force.

The US Army must continue to focus on these concepts of mobility and countermobility. Even as the Multi-Domain battlefield evolves, there is one truth that will never change: it takes ground combat forces to occupy space and "own the ground." The mobility that is required to move land forces across the ground, or countermobility to try and stop them from moving, is the conflict that the Allies and Germans dealt with 100 years ago. Today, in any near-peer engagement, the same will hold true. Engineers must enable the maneuver commander to transport troops and equipment in their desired direction, and to channel the enemy into the least advantageous position. In the future, we must think about how obstacles can be placed on the ground for an indefinite time and from a distance. We must be able to breach the enemy obstacles without Sappers being exposed to enemy fire, and we must maintain momentum on our lines of communication. As we move forward, we should attempt to solve the problems that will arise on the battle field with a holistic method. In the spirit of Generals Ludendorff, Seeckt, as well as the Reichswehr, we should have a healthy, open, and intellectual debate, because our Soldiers deserve the best we can give them.

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Chapter 5
Defending the Ardennes: A Comparison of Two Battles

Colonel (Retired) Paul G. Munch

The French did not believe World War I was the "War to End All Wars." From their perspective, another war with Germany was inevitable. During the years leading up to World War II, demographic, geographic, social, political, military, and other factors led the French to adopt a strategically defensive outlook which fostered the construction of the Maginot line on their northeastern frontier and the imperative to protect their northern border by moving into Belgium to bolster the Belgian defenses. The "impregnable" Ardennes lay between these two sectors. Even Marshal Petain, the "Lion of Verdun," suggested the Ardennes "is impenetrable."[1] However, after a lightning swift victory over Poland, Hitler ordered the army to attack France through the Ardennes. In less than a month, the Germans defeated France, which was believed to have had the strongest army on the continent.

Four and a half years later, senior American commanders considered the Ardennes to be a quiet sector where they acclimated new units and refitted other units. Once again, the Germans attacked through the Ardennes. And, once again, they achieved complete surprise. Their initial gains were impressive. They created a huge "bulge" in the American line. However, this time the outcome was completely different. Isolated engineer squads and platoons, mainly acting on their own initiative, created and covered numerous small obstacles which blunted the spearhead of the German attack and gave American commanders time to react and to counterattack.

This is a case study of two battles which were generally fought over the same terrain, separated by less than five years. In one case, a daring and very mobile offensive thrust produced a decisive operational victory. In the other, small isolated units taking the initiative and using the terrain to their advantage stopped Germany's experienced battlefield commanders. This comparison offers several very important insights into achieving positions of advantage within future multi-domain operations against a peer or near peer adversary in large-scale combat operations.

France Prepares for the Next War

World War I was devastating for France. It claimed 1,315,000 soldiers from metropolitan France, or about 27 percent of all men between the ages of 18 and 27. Only the much smaller Serbia had a higher mortality rate.[2] In

addition, almost seven percent of French territory had been devastated by the war. But despite the euphoria at the end of the war, many leaders did not believe the Versailles Treaty which ended "The War to End All Wars" would result in a lasting peace. For instance, French Marshal Ferdinand Foch predicted, "This is not peace. It is an armistice for 20 years."[3] (Foch was off by several months.)

France historically pursued a defensive national military strategy over a more offensive strategy. Furthermore, France also understood Germany's demographic, industrials and other advantages. Consequently, almost immediately after World War I, France pursued a "continuous front" strategy to defend France against Germany in a war that they were sure was to come. This "continuous front" strategy grew out of their experiences from the last war where armies faced each other within long continuous fortified trenches and the advances in firepower had made offensive operations exceedingly costly. But unlike the last war, these fortifications would be constructed before the hostilities began and would be considerably more formidable. The Maginot Line was subsequently constructed to protect their border with Germany and the French-British armies were expected to move into Belgium to support the Belgian fortifications near the Belgian-German border. Thus, any German attack would initially face a "continuous" line of strong fortification backed by strong reserves.

After Adolf Hitler seized power in 1933, war seemed closer to reality. In 1935, he introduced compulsory conscription with the intent of increasing the army from the 100,000 men mandated by the Versailles Treaty to 480,000 men within 36 divisions. Then, he reoccupied the Rhineland in 1936. Both actions directly threatened France and violated the Versailles Treaty. France and its allies did not respond. Hitler was emboldened. He annexed Austria in 1938 and threatened the Sudetenland. The Allies sought appeasement. The Germans took control of the Sudetenland in September 1938 and the rest of Czechoslovakia in March 1939. Within a month of entering into a "non-aggression" pact with the Soviet Union, the Germans invaded Poland on 1 September 1939. The French and British honored their treaty with Poland, and they were now at war with Germany.

The Military Situation, 1940

Although the Germans had striped their western border to concentrate their strength in Poland and could only provide very weak resistance along the French border, the French made only a half-hearted incursion into Germany. They stopped well short of the Germany's overly-propagandized

West Wall and withdrew back into France within the month. The French were still hoping to avoid war with Germany.

Meanwhile, the French felt secure behind the Maginot Line which secured their border with Germany. In keeping with France's well-earned reputation for innovative defensive systems, the Maginot Line was a defensive masterpiece. The Germans realized it would be suicidal to attack through it. To the north and west, the Ardennes was considered inhospitable to mobile war. In March 1934, the War Minister and "Lion of Verdun," Marshal Pétain, stated, "It is impenetrable if one makes some special dispositions there. Consequently, we consider it a zone of destruction. Naturally, the edges on the enemy side will be protected. Some blockhouses will be installed. As this front would not have any depth the enemy would not commit himself there. If he does, we will pinch him off as he emerges

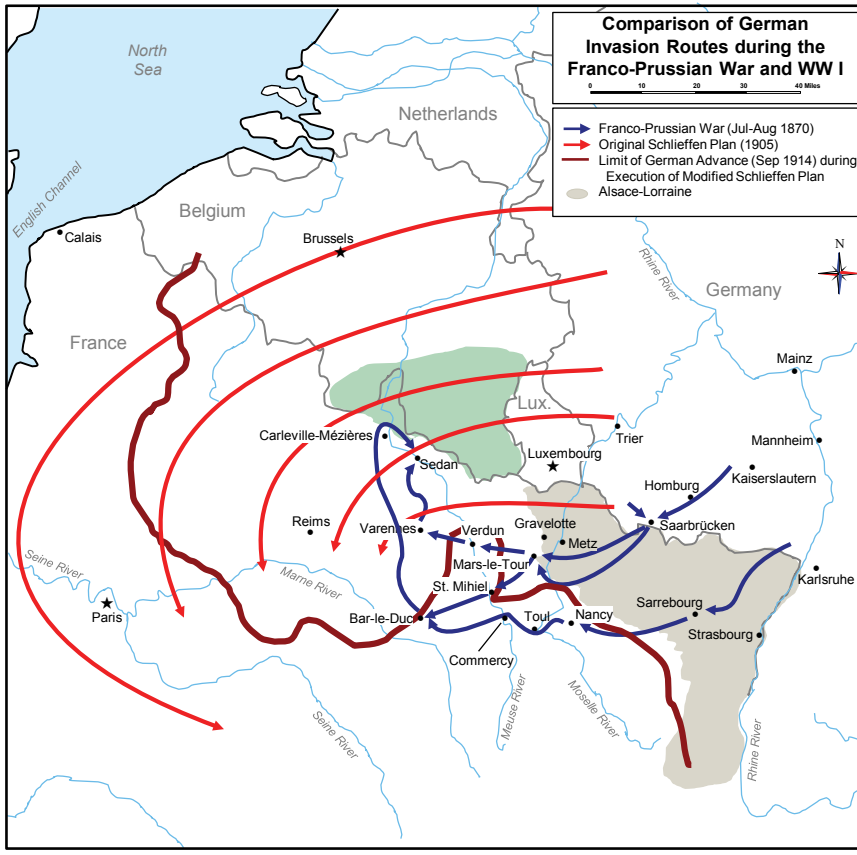

Figure 5.1. Comparison of previous German invasion routes into France. Map created by Army University Press.

from the forests. This sector is not dangerous."[4] Further west, the area between the Channel and the Ardennes posed the greatest threat to Paris and to France's industrial areas. It is also where the French expected the Germans to attack. Financial, technical, political and other factors had prevented the French from extending the Maginot Line into this area. But, in keeping with their overall strategic objectives, the French expected the Belgians to "invite" them into Belgium to assist in the defense of Belgium (and from a French perspective, keep the battle's destruction away from French territory).

Despite German propaganda, the Allies had a numerical advantage in men and material. France, Britain, Belgium, and Holland could field over 150 division compared to about 135 German division available for the attack on France. The Allies also had about twice as many artillery pieces, over 30 percent more tanks, and more aircraft.[5] In addition, many of the individual weapons, available tanks, and aircraft were also superior to their German counterparts. The Allies' military and industrial wartime mobilization was continuing to make them a more formidable adversary. The Germans were fully aware the Allies would pose a significantly stronger opponent than they faced in Poland. The Germans needed to act quickly.

Hitler originally directed the army to attack France on 12 November using "Plan Gelb," a variation of the plan used during World War I. They planned to rapidly move across Belgian's plains into France's most important areas. However, the plan was delayed by poor weather, lack of military readiness and other factors. In the meantime, an Allied initiative to block the import of Swedish steel to Germany changed Germany's immediate focus to occupying Denmark and Norway. During this respite, the French and Belgian armies faced the German army on their respective borders. Both sides strenuously avoided any belligerent acts against each other. It became known as the "Phony War."

During this Phony War, a few military officers convinced Hitler to move the main attack from Army Group B, scheduled to attack across the Belgian plains, to Army Group A, scheduled to attack through the Ardennes. Not all the generals thought this was a good idea. It was too risky.[6] But, Hitler ordered the change on 24 February. General Karl Rudolf Gerd von Rundstedt's Army Group A with 44 division, including seven Panzer and three motorized divisions, would attack through the Ardennes as the main effort. Army Group B with 30 divisions would be the main supporting attack with the objective of convincing the Allies that it was the main German effort (which the Allies thought was the case) and thereby draw

the bulk of their forces into Belgium and away from the German attack through the Ardennes. Army Group C had the objective of holding units supporting the Maginot Line in place and preventing them from reinforcing either the French left or center. The difficult job of reallocating and moving the troops began with little or no notice.

Despite the mounting indications that Germany would attack through the Ardennes (e.g., troop movements), the French continued to believe the main attack would come through Belgium. They positioned their most mobile forces in this area. While the Maginot Line could have been an effective economy of force effort to support other areas, the French continued to maintain a significant force behind the Maginot Line. Between these two areas, the Ardennes had only 40 pillboxes designed to withstand the impact of a 105mm shell. Each was armed with either two machine guns or a machine gun and a small antitank weapon. It was not until November that a program was initiated to construct another 100 bunkers. But, by that time the concrete arrived in January, it was too cold to pour it. Only 54 of the bunkers would be built by 10 May 1940, but even these lacked the metal fittings. Sandbags were used as a substitute. In addition, hastily emplaced obstacles were poorly sited and constructed, antitank ditches were too shallow, barbed wire was improperly anchored, and many of the mines were degraded by the dampness.[7] Even the minimal defenses envisioned by Pétain were questionable.

The German Attack through the Ardennes

On 9 May 1940, Hitler ordered the attack to commence on 10 May. The short alert was planned to maintain security and surprise. Army Group A's Panzer Group Kleist, spearheading the offensive, consisted of General Georg-Hans Reinhardt's XLI Pz Corps (6th & 8th Pz Div.) in the north, General Heinz Guderian's XIX Pz Corps (1st, 2nd & 10th Pz Div.) in the south, and General Gustav Anton von Wietersheim's XIV Motorized Infantry Corps (three divisions) in support. Guderian's XIX Corps was the main effort and his 1st Pz Division provided the main effort within the XIX Corps. The crossing points between Guderian's two flank divisions were a mere 20 kilometers apart. However, behind this spearhead waited a mass of troops which extended back beyond Frankfurt. The Fourth, Twelfth, Sixteenth and Second Armies were waiting on their turn to transit through the Ardennes's very limited road system.[8]

Prior to the main attack on 10 May, special troops in civilian clothes infiltrated across the border to seize key targets which would facilitate

movement through the Ardennes. Despite the powerful vanguard, the first day of the battle was more concerned with traffic control, neutralizing natural and manmade obstacles, repairing roads, and logistics matters than with combatting the enemy. Traffic backups were common. None of XIX Corps's divisions met their limited objectives set for the first day. In one instance, a Belgian company defending a favorable defensive position at Bodange delayed the 1st Pz Division by almost eight hours. The division's daily log suggested the delays were due less to the "energetic defense of the Belgians . . . but above all in the great difficulties which occurred when

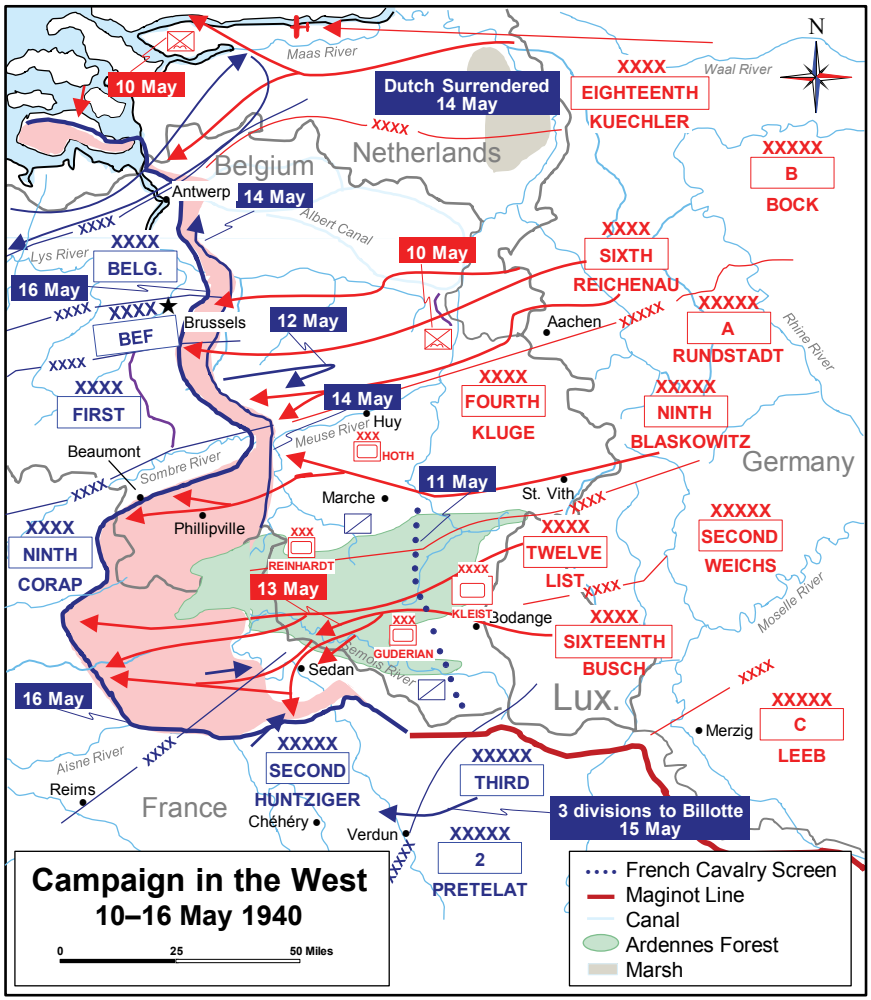

Figure 5.2. Campaign in the West, 10–16 May 1940. Guderian's advance past the Meuse River. Map created by Army University Press.

all usable crossing points and pathways were completely destroyed. Detours were usually not to be found."[9]

The Germans continued to face only light resistance during the second day; however, difficult terrain, destroyed bridges and snarled traffic continued to cause delays. Still, excellent progress was made. Light units rushed forward to secure key points and bridges; infantry units cleared towns and provided flank security; reconnaissance units located alternate routes; engineers repaired routes and replaced destroyed bridges; and panzer units moved forward to intercept and disrupt enemy movement in the area. But despite all the frictions of war, all three divisions made their daily objectives. The forward units had crossed the Semois River along a 20-kilometer front and were now entering the more open terrain north of the Meuse River. In addition, follow-on units were moving to secure and expand the recently taken areas.

The first German units reached the Meuse River at about 1400 on 12 May. It had taken about 57 hours of almost non-stop forward movement.[10] The French High Command and some German Generals assumed it would take nine days before the Germans would be ready to cross the Meuse River.[11] While the Ardennes had presented the Germans very difficult terrain, there had been little stiff resistance. Crossing the Meuse River would present a very different challenge.

Still relying on the element of surprise and fearing the ability of the French to strengthen their position behind the Meuse River, Kleist decided to immediately force a river crossing on 13 May with three corps abreast. Guderian's XIX Corps would lead the main effort against Sedan.

Guderian faced elements of Huntziger's French Second Army. Its overall mission was to secure the left flank of the Maginot Line, protect the Stevay Gap which threatened the envelopment of the Maginot Line, and have its leftmost elements serve as the hinge around which the remainder of the French army would pivot into Belgium. The French assumed the area's difficult terrain provided them economy of force efforts throughout the area. Consequently, the Second Army had a low priority in both units and equipment. Furthermore, Huntziger's analysis suggested the higher hills and Meuse River provided the Sedan area with one of the most defensible sectors in his sector. Consequently, he positioned his least effective units in this sector.

Despite the weak forces around Sedan, heavy concentrations of effective French artillery fire stymied German efforts near the Meuse. However, the Germans had anticipated this and had already planned air support.

About a thousand aircraft supported Kleist on 13 May and successfully neutralized the artillery and softened resistance throughout Group K's area. The impact of the screeching Stukas on the success of the battle cannot be underestimated. The sirens attached to the Stukas seem to make them even more threatening. Many demoralized French soldiers simply abandoned their positions. French antiaircraft support was almost non-existent and the little antiaircraft that was available, was ineffective. Only one German plane was lost to enemy fire. XIX Corps could now move forward. But since there was little time to provide detailed plans for the crossing, units were told to implement the plan which had been used for a map exercise on 21 March.[12]

Guderian's XIX Pz Corps commenced the attack at 1500 with its three Panzer divisions abreast even though the bulk of artillery and engineer equipment were still battling their way through the congestion to the rear of the Panzer Divisions. Facing heavy machine gun fire, but little artillery fire, Lieutenant Colonel (later General) Hermann Balck's 1st Infantry Regiment successfully led the attack by using organic rubber boats manned by the 37th Armored Engineer Battalion. In addition, engineers assembled the first rafts 38 minutes later and the 505th Engineer Battalion completed a 16-ton bridge by midnight.[13] The infantry, supported by Stuka attacks on enemy positions, aggressively pushed forward, and by about 1815 were beyond Bellevue, about 2½ kilometers beyond the crossing point. Not having orders, but understanding Guderian's intent, Balck pushed his infantry regiment forward to Chéhéry, about five miles south of Sedan.

By the end of the day, two other crossings had succeeded, but three had failed. Despite those failures, Guderian aggressively pushed elements of the corps to expand the tenuous bridgehead. The completed bridges allowed the first tanks crossed at dawn the next morning and the Panzer units helped defeat the French counter-attacks throughout the day. It was a great tactical victory, but it could only be an operational success if the Panzer units could continue to exploit the element of surprise and prevent the French from reacting in any effective manner. After overcoming the caution of his higher headquarters, Guderian linked up with the XLI Pz Corps at Montcornet on 16 May to form a powerful exploitive force which had the option to dislodge the Maginot Line, head to Paris, or split the main Allied army in Belgium. It was a decisive operational victory which caused the British to evacuate the continent from Dunkirk and would ultimately win the Battle of France.

Observations

How was Guderian's spearhead able to achieve such success? There are many factors which contributed to his success, but among the most important are the following:

• *Know the enemy*. The Germans achieved complete operational and tactical surprise by successfully playing on the French preconceived notion that the Germans would attack through the northern plains of Belgium and would not attempt attacking through the "impenetrable" Ardennes.

• *Maintain the offensive momentum*. Guderian maintained his momentum by relentlessly pushing forward and by keeping the surprised and unprepared French off balance. Guderian controlled the pace and direction of the battle.

• *Expert use of combined arms expertise*. Guderian's expert use of his combined arms team gave him a clear understanding of the terrain and enemy throughout the battle, enabled him to quickly neutralize protected and unprotected obstacles to his advance, protected his ever-expanding exposed flanks, relieved congestion of follow-on units, and provided the logistics needed to sustain the advance.

• *Pre-battle preparation*. Guderian was an acknowledged expert in mechanized battle. Fifteen years of study, experimentation, reflection, and preparation prepared him for this battle. He knew what he was doing. Pre-battle preparation (e.g., map exercise, mockups, etc.) also allowed Guderian's subordinates to fully understand and resolve problems prior to the battle, and to quickly execute his intent during the battle. Effective preparation and planning are force multipliers.

The Battle of the Bulge: The Situation, December 1944

Four and a half years later, the strategic situation had changed dramatically. The Allies were now attacking toward Germany. They had made excellent progress after the successful D-Day landings on 6 June 1944. But after logistic problems stalled the Allied short of the Rhine River, the Allies found themselves in an operationally defensive situation during December 1944.

Meanwhile, the noose was closing around the Third Reich. Hitler, clearly weakened by the 20 July assassination attempt, decided to attack toward the strategic port of Antwerp, split the American and British forces, and drive Britain from the war. When they were finally notified of

the plan, most generals thought it overly-ambitious and impractical. They were concerned about the insufficient available forces, ammunition, fuel, equipment, and other supplies; German units' readiness; Allied air superiority; the vulnerability of the extended flanks; and the continual flow of new American units onto the continent. With much difficulty, Rundstedt managed to get the scope reduced, but the concerns lingered.[14]

Hitler specified the prerequisites for success: (1) protect the forces being assembled without committing them to battle; (2) achieve complete tactical surprise; (3) have at least ten days of bad weather to restrict Allied air interdiction; (4) quickly exploit the breakthrough; and (5) have a relatively quiet period, especially in the East.[15] Twenty divisions and about 250,000 combatants were committed, but the battle-worthiness of the troops was questionable. Many were older men, recently drafted underage teenagers, transfers from the navy and air force, and foreign "volunteers."

General Bradley, 12th Army Group Commander, recognized that General Middleton's VIII Corps was stretched over three times the frontage considered doctrinally prudent. Furthermore, VIII Corps's units were not particularly combat ready. The 99th and 106th Division had recently arrived from the United States, the 4th and 28th Divisions were badly mauled from fighting in the Hürtgen Forest, and the 9th Armored Division was the reserve. But ignoring growing intelligence to the contrary, Bradley confidently predicted to Middleton during a tour of the area that there would be no German attack through the Ardennes. Like the French four years earlier, Bradley was guilty of mirror-imaging an enemy's intentions based on his own inclinations.[16]

The counteroffensive began at 0530 on 16 December 1944. It achieved tactical and operational surprise. Both Bradly and General Hodges, First US Army Commander, thought it a diversion or spoiling attack. It wasn't until later that evening they understood the extent of the attacks. The 6th SS Pz Army in the north was the main effort since it was the shortest route to Antwerp. But its thrust was delayed by elements of the battle-tested 2nd US Infantry Division, aided by extensive artillery support (e.g. eight artillery battalions fired almost 30,000 rounds during the defense of Krinkelt-Rocherath). The Germans expected to reach the Meuse River on the 18th, but they had only advanced about 10 kilometers by the 19th. Meanwhile, Lieutenant Colonel Joachim Peiper's battlegroup made a desperate attempt to reach the Meuse. While he advanced further than the units to the north and caused the First US Army Headquarters to evacuate, he too was continually delayed by destroyed bridges and numerous hastily improvised road-blocks protected by elements of the 254th, 51st and 291st

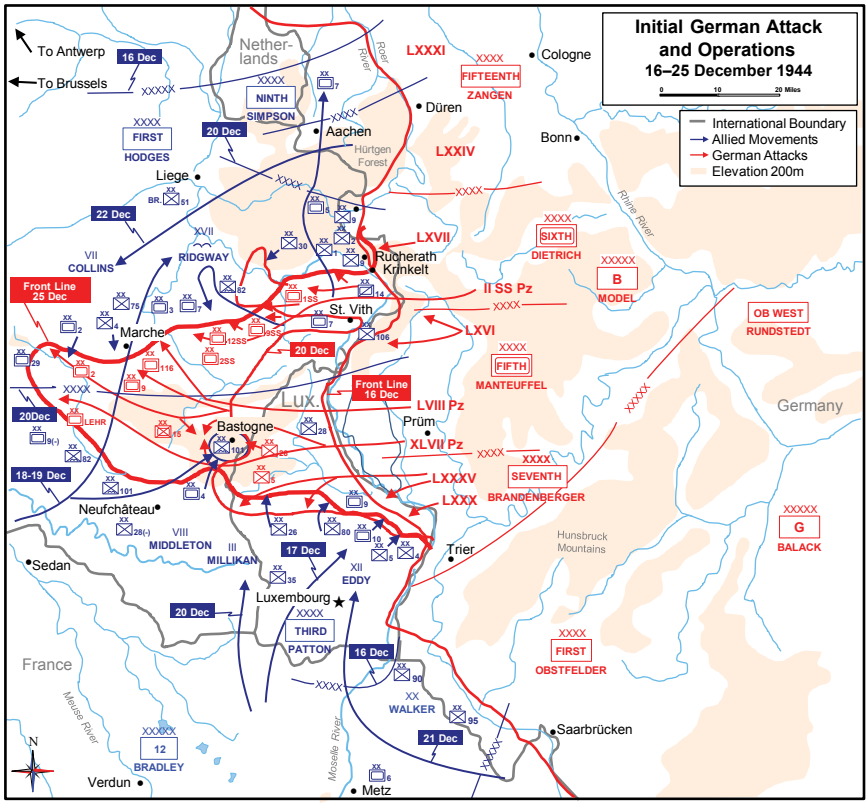

Figure 5.3. Initial German Attack and Operations, December 1944. German Ardennes Counter Offensive in December 1944. Map created by Army University Press.

Engineer Battalions. In his haste, Peiper left his scouts, engineers and most of his infantry support behind and thereby wasted more time finding essential detours around the engineers' obstacles. He was running out of time, fuel and tanks. As he reached his last hope, a bridge at Lienne Stream, the engineers blew it. All Peiper could say was, "The damned engineers! The damned engineers!"[17] It was the 6th SS Pz Army's furthest advance. But all the delays and a failure to hold his shoulder had given the US 30th Division and others the chance to get behind Peiper. Peiper retreated to defend La Gleize but faced overwhelming US strength. Finally, he ordered all able men to infiltrate back to German lines on the morning of the 24th. The wounded and equipment were left behind. The counteroffensive in the north was over.

The 5th Pz Army was the only one of the three armies to gain a significant breakthrough, primarily by better generalship and the 106th US

Infantry Division's disintegration on the Schnee Eifel. However, the effort was an operational failure. Its inability to quickly take St. Vith and Bastogne, key transportation hubs, hindered their forward movement and gave the Americans time to better respond to the crisis. It failed to gain its key objectives or to severely hurt the American army.[18]

The Battle of the Bulge continued through January, but ad hoc defensive and delaying actions by infantry, armor, engineer and artillery units; dwindling German reserves; a swift counter-attack by Patton's Third Army; and other factors had determined the outcome within the first few days of the offensive. It never came close to achieving Hitler's unrealistic objectives.

Observations

Like the 1940 battle, numerous lessons can be learned from this battle. Here are three observations:

• *Unrealistic objectives produce predictable results*. Except for Hitler, few believed the counteroffensive would reach Antwerp, let alone force Britain out of the war. There were simply not enough German resources to force such a decision against the ever-growing American resources which were flowing into Europe. In the end, the Germans didn't meet their objectives and spent a lot of valuable resources which may have been used for more important strategic objectives elsewhere.

• *Battlefield vision is essential*. Peiper rarely had a clear vision of what was going on around him. Consequently, he was constantly surprised at significant obstacles in his path and was unaware of opportunities which should have been clearly visible to him.

• *Countermobility buys time*. Although the Allies had no viable countermobility plan and were surprised by the attack, small teams of engineers took advantage of the terrain to build and protect roadblocks and destroyed bridges. While most of the obstacles were eventually overcome or bypassed, the Germans were continually delayed. The sum of these delays allowed the Americans time to react, counterattack, and defeat the Germans.

Each of these battles offers numerous insights into today's battlefield. Several specific lessons were briefly discussed above. But, a further comparison of the two battles provides additional insight into other broader lessons.

Mobility and Countermobility: A Yin-Yang of the Battlefield

Much attention is given to achieving and maintaining battlefield mobility. Considerably less attention is given to countering the enemy's movement and maneuver. Yet, mobility and countermobility are potentially of equal importance in deciding the outcome of a battle. They are opposite, but also complement each other in the same way that offensive and defensive activities are interdependent.

Offensive operations provide the initiative to a commander. He can choose the time, location, strength, and method of the attack. He should also be able to dominate the tempo and direction of the battle. However, "the defensive form of warfare is intrinsically stronger than the offense."[19] The French calculated that an attacking force required three times as much infantry, six times the artillery and 15 times the amount of ammunition to breach the deadly curtains of defensive fires experienced during the First World War.[20] However, defensive strength can be diluted by having to protect his entire sector. In contrast, the attacker can concentrate his strength in a relatively narrow sector to achieve an exploitable penetration, as Guderian did in 1940.

A defensive force can increase its strength by constructing, reinforcing, and defending impediments to the attacking force's movement and maneuver, as the Americans did in an ad hoc fashion during 1944. And while any obstacle can be breached if the attacker is willing to pay the price, well sited and defended obstacles can defeat an enemy attack, gain time, economize forces, and develop favorable conditions for future offensive operations.[21] In addition, commanders taking the offensive must counter the countermobility efforts taken by his enemy. In either case, each commander must clearly understand the terrain. In addition, commanders must fully understand their enemy's intent, operational procedures, and mobility capabilities to implement an effective countermobility system. Likewise, commanders taking the defense must also fully understand their enemy's intent, operational procedures and countermobility capabilities to implement an effective mobility plan.

Mobility, however, is not limited to the offense and countermobility is not limited to the defense. Once a penetration is likely or has been made, defensive commanders must have a freedom of movement to rapidly defeat the penetration by a combination of offensive and defensive operations. Conversely, the offensive commander must exploit the penetration by maintaining his forward momentum while protecting his growing flank

from a defensive counterattack. Clearly, mobility and countermobility operations greatly contribute to a commander's success. They ignore these force multipliers at their own peril and surprise.

Mobility and Countermobility Operations Are Combined-Arms Efforts

Nazi propaganda hailed the victory over France as proof of German superiority and the invincible air-tank tactics referred to as the Blitzkrieg. It would be politically and militarily useful for future adversaries to believe the Germans were invincible on any battlefield. But, a closer look at the 1940 attack through the Ardennes suggests an exceptional use of a combined arms team.

Guderian successfully used a combined arms team to maintain his forward momentum and thereby reach the Meuse River in three days. Improved communications and mobile reconnaissance units, often on motorcycles and bicycles to more easily bypass obstacles, gave him a clear picture of what was in front of him and provided viable options. His infantry-engineer team cleared his first significant resistance and delays in front of Bodange. The same infantry-engineer team, combined with airpower, gave him the initial bridgehead across the Meuse. Meanwhile, infantry units protected his ever-lengthening flanks while his engineers cleared natural and manmade obstacles, repaired and improved roads, and built bridges. Logistic units responsively moved supplies forward and military police helped relieve congestion. When given the opportunity, armored units moved rapidly to interdict Allied forces and prevent them regrouping or reinforcing positions, thereby helping the other members of the team perform their functions. Consequently, the French never significantly countered the German's mobility through the "impregnable" Ardennes. Guderian reached his first primary objective, the Meuse River, well before most believed possible.

In contrast, Peiper rushed tanks toward the Meuse River without much of his support. Without adequate reconnaissance, he wasted valuable time finding alternatives routes to the destroyed bridges which his engineers could have repaired. Nor did he realize he was just miles away from the First US Army Headquarters or a large American fuel dump which his tanks desperately needed. Without better infantry and artillery support, he lost tanks in towns which would have better neutralized by the infantry and his flanks were eventually breached by US forces. Peiper's failure to employ all his resources to ensure his mobility was a key element in his loss. He would have fared much worse if the Americans had executed a

coordinated sector countermobility plan as the Germans were doing in the Hürtgen Forest. These two offensives offer an interesting comparison on the use of the combined arms team.

Pre-Battle Planning and Preparation Are Essential

What is done before a battle can be as important as or even more important than what is done during the battle. The Germans had developed a doctrine which fit their strategic and historical inclination for short, offensive-minded wars and encouraging initiative at the lowest levels. They organized, equipped, trained, planned, collected intelligence, and conducted other pre-battle preparations in accordance with this doctrine. As discussed later, the German Army also invested a significant pre-war effort studying the lessons of recent battles and new techniques. Guderian's skillful handling of the XIX Corps was a product of this investment.

Guderian demanded detailed planning from his staff which was based on realistic assumptions, available resources, validated intelligence, acceptable risks, and other key factors. Plans were fully coordinated above, below, and all around. When possible, he wargamed plans at an appropriate level to identify weaknesses and flaws and to ensure his subordinates fully understood the plans and his intent. The effectiveness of his approach was demonstrated when XIX Corps reached the Meuse River and tactical situation prompted Guderian to direct the 1st Pz Division to execute an attack based on a map exercise conducted several months earlier, and when Balck took the initiative to extend the bridgehead based on knowing Guderian's intent. In contrast, the competency of Peiper's staff was suspect. In any event, the secrecy imposed by Hitler limited their preparation for the battle to less than several weeks. Peiper's advance was too often punctuated by a lack of coordination and confusion.

Terrain, Weather, and Time Are Constants in Land Warfare

There are factors which affect all land warfare. Among the most important are the terrain, weather, and time. All three played important roles in both battles. Terrain varies from locale to locale. It may be flat, mountainous, highly compartmented, etc. It may be covered with sand, snow, jungle, urban sprawl, etc. But, it is where land warfare is fought. Clausewitz suggests, "great commanders" possess "the faculty of quickly and accurately grasping the topography of any area." But, he also suggests it must be cultivated by training, experience, and imagination.[22]

British military theorist Liddell Hart suggested the Germans exploited the "possibilities for surprise" in 1940 with the "oft-taught lesson that

natural obstacles are inherently less formidable than human resistance in strong defenses."[23] Clearly, movement through difficult terrain was a predominant concern in both multi-corps efforts. In both cases, senior Allied military leaders neglected an area which presented a substantial vulnerability in their overall defense. Conversely, the Germans used this preconception to achieve tactical and operational surprise and then employed very mobile operations to exploit and maintain the surprise. However, the outcomes of the two battles were quite different. While there were many reasons for the different outcomes, the ability or inability to master the terrain during the battle was a critical factor in each battle.

Like the terrain, weather is a constant which can greatly affect the outcome of battles at all levels, including large-scale battles. For instance, weather delayed the Normandy landings several times before it was launched on 6 June 1944, and winter weather is generally blamed for failure of both the Napoleonic and German invasions of Russia. Hitler specifically specified ten days of poor weather for the 1944 counteroffensive to neutralize Allied air observation and interdiction. But he could not control the heavier than normal pre-attack rainfall which saturated the soil and made off-road movement for Peiper almost impossible. It also made the Allies' hastily prepared obstacles even more effective. Conversely, Guderian needed good weather to allow the Stukas to support his advance. Without them, he might have been seriously delayed in front of the Meuse River which in turn might have allowed the French to reinforce the area in front of the XIX Corps.

Both Guderian and Peiper raced to establish a bridgehead across the Meuse River. Guderian's very effective mobility efforts allowed him to cross the Meuse in less than three days. Most of his superiors thought it would take at least nine days. Conversely, Peiper's inability to quickly neutralize the American's ad hoc countermobility efforts continually delayed his advance and ultimately defeated his effort. As Clausewitz suggests, "time that passed is lost to the aggressor. Time lost is always a disadvantage that is bound in some way to weaken him who loses it."[24] Peiper lost the race and the battle.

Concluding Thoughts

Although these battles took place about 75 years ago, their lessons continue to resonate with the battlefields of today. They clearly demonstrate the need to understand the terrain; the value of surprise and security, the interplay of mobility and countermobility, the importance of integrating all the relevant components of multi-domain operations, and other

important functions. But, mastering these skills is not inherently easy. It takes curiosity and imagination, study and analysis, discussion and debate, reflection, experimentation in non-lethal environments, and the ability to turn ideas into realities.

Despite the complete emasculation of the German army by the terms Versailles Treaty after World War I, General Hans von Seeckt, Chief of the German Troop Office (1920–26), aggressively sought to prepare German army for the next war. One of his first efforts was to commission over 500 of his most experienced officers to mold their World War I experiences into a system of modern tactics and organization.[25] Many suggest Seeckt's foresight set the foundation for the German's early success during World War II.

At the individual level, Albert Einstein's suggestion that "genius is one percent talent and 99 percent hard work" applies to military leaders at all levels. For instance, Guderian's "genius" was the result of a 20-year effort. Seeckt encouraged young officers to think about the problems of the next war. Guderian took up the challenge. He closely studied and analyzed the British "experiments" on deep mechanized penetrations during the 1920s and personally paid a local tutor to translate the works of the British military theorists as soon as they were published. He later tested his theories by conducting well thought out exercises with his motorized battalion equipped with only dummy tanks and dummy antitank guns. He published his thoughts in "Achtung—Panzer!" in 1937.[26] He fully understood the potential and limitations of mechanized warfare. He was prepared for the challenges of the Ardennes.

The multi-domain battlefield poses many complex and difficult proble, but they are not insurmountable. They will take a lot of hard work. Following Seeckt's foresight, the study of past battles should be an important component of this effort.

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Chapter 6
Conquering the Rhine: Deliberate Wet-Gap Crossing, 1945

Major Brett M. Boyle

The Allied strategy to defeat Germany in Western Europe was straightforward: enter the European continent with a modern, industrial-age military force and advance on a broad front into the German heartland. After the Allies gained a lodgment in Normandy in June 1944, the only major natural barrier to the Allies advance was the Rhine River. Wide, fast, and prone to flooding, the Rhine had served the German states for centuries as a natural line of defense. As the summer of 1944 progressed, Allied senior leaders grew increasingly concerned about how to get their forces over this barrier. Crossing a river is resource intensive, but crossing a great river on a broad front required a massive effort of combined arms, engineering, and logistics. This type of operation can become part river crossing and part amphibious assault. The crossing of the Rhine tested the capacity and capabilities of the Allied force, requiring the direction of men and material--boats, bridges, barges, and landing craft of all varieties – toward specific spots along the great river barrier. If that could be done successfully, hundreds of thousands of troops could leap across that barrier to conclude their drive into Germany.

The initial Allied concept to liberate Western Europe from German occupation in 1944 planned for US, British, and Free French forces to cross the Seine six months following the landings in Normandy, or D+180 (180 days after the operation commenced). When D+180 arrived, Allied forces were advancing through France and the Low Countries and within striking distance of the German frontier.[1]

Allied Armies in the Western Europe combat zone were task-organized into three Army Groups. The 21st Army Group in the north consisted of the British Second Army, Canadian First Army, and by January 1945 also included the US Ninth Army. The 12th Army Group in the center included the US First, Third, and Fifteenth Armies. The 6th Army Group in the south included the US Seventh and French First Armies.[2] The arrangement of forces on the battlefield was rooted in doctrinal and organizational developments from the interwar period and was adapted by years of global conflict.

Doctrine and Organization

In 1944, US Army doctrine organized forces for conflicts between industrialized states on a linear battlefield. It divided the battlefield into two

zones: the combat zone (forward) and the communication zone (rear). The combat zone was a fixed size with boundaries that moved forward with the armies. As lines of communication extended, the communication zone grew, along with requirements to secure, administer, and rebuild the areas left behind the front lines. Rear echelon units inherited responsibility for security and administration of areas in the ever-expanding communication zone.[3]

The common assumptions about the nature of modern mechanized warfare also affected the structure of the US Army Infantry divisions. In the 1936 reorganization of those divisions, the overall troop strength was reduced from 22,068 to an experimental size of 13,552 to increase maneuverability. The Army also reduced maneuver regiments, the building blocks of the division, from four to three—eliminating two entire brigade headquarters, while supporting troops decreased commensurately. The division engineer regiment was reduced to a battalion, although some argued that only a company or less was needed.[4] Two competing views on the future of engineers on the battlefield developed. One view argued that thorough reconnaissance enabled by a mechanized force would allow maneuver forces to bypass obstacles prior to, and during combat. The increased benefits derived from motorized reconnaissance forces reduced the amount of demolitions required for mobility, as well as obstacles for countermobility. This change meant fewer engineers were needed.[5] The counter argument drew lessons from recent British and German experiences of an increased reliance on roads and bridges required to successfully maneuver highly motorized forces.[6] The 1939 division task organization settled at a strength of 520 personnel in the division engineer battalion, by proportion a larger engineer contingent that that found in earlier division strictures. Additional support could be provided by the non-divisional engineer combat regiment at 1,100 personnel, employed at the corps or army echelon. This overall increase in engineer capacity reflected the acknowledgement of the increased demands for both mobility and countermobility anticipated in mechanized warfare.[7]

In 1943, based on lessons gleaned from a variety of mechanized campaigns, US Army Ground Forces reorganized engineer combat regiments into engineer combat group headquarters to serve as scalable and tailorable headquarters elements for the myriad of non-divisional engineer units that were needed to shape the battlefield for commanders. First used to supervise training, the headquarters elements ultimately became tactical headquarters assigned at the army or corps echelon, with supporting relationships to divisional units.[8] This provided the ability to thoroughly plan

and control technical details required for more complex engineer problems facing mechanized armies.

Improved engineer equipment enabled substantial changes to river crossing doctrine of the previous decade. Surprise provided by paddle boats was sacrificed for the speed provided by storm boats to rapidly cross assault forces to the far shore.[9] Tactical Treadway bridging developed by 1941 was lighter for transport and also able to support greater loads with a faster assembly time. These capabilities were essential for mechanized forces to achieve breakout and exploitation.[10] These innovations proved critical for the successful crossing of western Europe's many rivers, most importantly the Rhine.

The Rhine River Problem

The Rhine River flows north from Lake Constance in Switzerland, growing as it is fed by melted Alpine snow. It winds through the western border area of Germany, enters the Netherlands, and splits into several rivers that continue on to the North Sea.[11] The river creates a physical barrier that is typically 700 to 1,200 feet wide, with a maximum width of approximately 2,000 feet. There are no fording sites along the length of the river. For much of its course, the valley its flows through is characterized by a flat floodplain on one shore, and a sharp rise on the opposite.

The Rhine River is liable to floods at any time of the year, creating a significant risk to any crossing attempt. Flooding in the southern stretches of the Rhine is most likely during summer months, as snow melts in the Alps and flows through Lake Constance. Flooding to the north is most likely during winter months that bring higher amounts of rain to the region. Water depth can vary as much as twenty-five feet during floods. When water levels rise, the floodplain significantly increases the width of the river.[12] Attempts to tame frequent flooding throughout history have led to a system of levees and dikes, particularly along sections of the river with wide, flat floodplains.[13] A deliberate levee breach in some areas can cause flooding up to five miles on each side of the river.[14] These seasonal challenges and surrounding terrain made it difficult for the Allies to select one ideal time to coordinate a river crossing along a 420-mile front.

Theater-level planning to assault across the Rhine River began as early as August 1944. A follow-up planning session at Third Army Headquarters was held in October 1944 and was attended by US, British, and Canadian representatives to discuss technical and logistical aspects of the crossing. The consolidated plan called for Twelfth Army Group to seize the entire

west bank of the Rhine and then cross on a broad three-army front (US First, Third, and Ninth Armies).[15] Ninth Army expected to cross near Wesel, heading for the open terrain of the North German Plain. To its south, First Army expected to cross near Cologne, while Third Army planned to

Figure 6.1. Army and Army Group borders at the Rhine River in March 1945. Task units show locations of US Naval support. Map created by Army University Press.

cross near Mainz, heading to Frankfurt and Darmstadt. Sixth Army Group was expecting to cross south of Third Army.[16]

The plan to cross multiple Armies across one of the most significant wet gaps in Western Europe required an ambitious amount of resources. The priority for resources went to the armies in the north, which were the main effort. Each army (First, Third, and Ninth) estimated one heavy pontoon bridge. First Army estimated four steel Treadway bridges, with three each for Third and Ninth Armies. Each estimated an extra steel Treadway bridge held in reserve. Each army also estimated three to four floating Bailey bridges.[17] Seventh Army, to the south, required additional resources due to constraints caused mainly by availability of steel Treadway bridges. For its southern crossing sites, it estimated one heavy pontoon reinforced, one heavy pontoon unreinforced, and only one to two steel Treadway bridges.[18] Even this significant amount of resources was not enough to project all Allied forces across the mighty Rhine.

The width, depth, and velocity of the Rhine River met or exceeded the capability of much of the armies' equipment. The river required larger power boats to handle the current, special pile driving equipment to construct bridging, heavier anchors for floating bridges, and specialized nets for force protection.[19] Much of this equipment belonged to the US Navy and was available in theater. Special equipment to include Landing Craft Mechanized (LCM), Landing Craft Vehicle and Personnel (LCVP), Navy Lighterage Pontoons (NLP) to assemble barges for bridge construction, and Army Transportation Corps sea mules (tugs) underwent extensive testing to confirm feasibility of overland transportation.[20] This equipment provided significant augmentation to the capabilities available to Army engineers.

The river's navigational importance also impacted the amount of material required and the length of time to emplace it. Semi-permanent bridges were required to have at least one seventy-five-foot span. The height of bridging north of Strasbourg was required to have a twenty-three-foot clearance above the maximum navigable water level, with only thirteen feet required south of Strasbourg.

The German counteroffensive in December 1944 made several impacts on the plan. Third Army changed its axis of advance and studied crossing sites in the vicinity of Coblenz and Cologne, although the locations finally settled in the area between Bingen and Worms. First and Ninth Army crossing locations remained largely the same, although the Ninth Army was shifted under the 21st Army Group for this part of the campaign.[21] Little bridging equipment was lost during the Battle of the

Bulge. However, stocks had to be rebuilt due to losses crossing the Roer River on the way to the Rhine.[22]

By January 1945, additional equipment was allocated to the armies in preparation for the Rhine crossing. Up to 600 additional storm boats were provided to Twelfth Army Group, as well as seventy-two Naval LCVPs organized into three task forces, one to support each Army. Once transportability of LCMs was proven feasible, forty-five were allocated to the First, Third, and Ninth Armies.[23]

Intelligence requirements based on terrain and weather became crucial for this operation. Flooding immediately prior to, or during, the operation could have disastrous impacts. Supreme Headquarters Allied Expeditionary Force (SHAEF) established a Flood Prediction Service within the 21st Weather Squadron, Ninth Air Force, to provide information to Army and Corps Engineers.[24] Army Engineers would disseminate information to tactical units, who reported technical measurements regularly back through the chain of command. The great challenge was to generate accurate estimates for the drainage basin that remained in enemy hands.[25] Technical experts from Office of the Chief of Engineers in Washington, DC, arrived in Europe to provide the best possible analysis to ground forces.[26] Geological data was also collected to study soil conditions at the crossing sites and the approaches in order to assess suitability by location.[27]

Training and rehearsals were another major part of the preparations. The Office of the Chief of Engineers, European Theater of Operations (ETOUSA), established a river crossing rehearsal site on the Loire River in France. The location offered a 900-foot gap with a river velocity up to six feet per second.[28] The site trained mainly technical aspects of the crossing, assessing feasibility of various pieces of equipment, and construction methods. Each army followed suit and established their own training sites which integrated combat troops with engineers to rehearse crossing operations.[29] Schools also rehearsed integration with naval units operating LCVPs and LCMs.[30] This training provided a cadre of trained operators, as well as the opportunity to rehearse a highly complicated operation.[31]

By March 1945, the Allies had closed on the Rhine with the British and Canadians from Wesel to the north. The Ninth US Army stretched from Wesel south to Dusseldorf. The First US Army reached from Dusseldorf to Coblenz. The Third US Army occupied from Koblenz to Oppenheim. The Seventh US Army from Oppenheim to the area of Mannheim and Speyer. The southern flank was the First French Army, which spanned south to Switzerland.[32]

Figure 6.2. US Army tanks are placed in position aboard LCMs for a ferry voyage across the Rhine River to the east bank. Photo courtesy of US Army Engineer School History Office.

The sequence for deliberately crossing the Rhine River followed a detailed timeline. The crossing forces, typically a division, would receive direct support from an Engineer Combat Group that would provide resources. Divisional engineers would cross and conduct mobility operations on the far shore in support of the advance. Engineers in storm boats would then transport infantry across the river. Once far side security was established, the bridgehead would be reinforced and expanded with follow on troops using motor-driven assault boats to rapidly transport personnel and equipment, with backup by raft, LCVP, and LCM as available. When the commander determined conditions appropriate, a cable would be emplaced across the gap to guide DUKWs, LCVPs, and duplex drive tanks. This would add an armored force to the far shore. At this time, tactical steel Treadway bridge construction would begin. The next goal was to replace tactical bridging as much as possible with floating Bailey or other available semi-permanent bridging to release assets for follow-on operations. The final phase was constructing two pile-driven highway bridges for each army. This was estimated to begin at D+14 and would take three

to four weeks.[33] At this stage, responsibility for improving the bridgehead transitioned to the Advance Section, Communications Zone (ADSEC, COMZ). Engineer troops assigned to the ADSEC would complete the highway bridges and begin three pile-driven railway bridges. The railway bridges were estimated to take forty-five days to complete.[34] The end state was the reestablishment of permanent lines of communication capable of supporting an army on the offense.

The Defenders

German forces opposing the Allies along the Rhine were organized into three army groups, each roughly opposite an Allied army group. Beginning in the north, Army Group H opposed the 21st Army Group. It included the Twenty-Fifth Army and the First Parachute Army. Army Group B was located in the center, opposite the 12th Army Group. It was made up of the Fifteenth Army and the Fifth Panzer Army. Army Group G, in the south, opposed the 6th Army Group with four armies on paper—the Seventh, First, Nineteenth, and Twenty-Fourth.[35] By this stage in the war, German forces were increasingly ad hoc. Most sources omit troop estimates, likely due to the inaccuracy of records from the period.

The centralization of decision-making authority by Adolf Hitler had disastrous impacts on defensive preparations. Time is everything in preparation, and Hitler did not authorize defenses to be prepared along the eastern bank of the Rhine until February 1945. Additionally, German forces west of the Rhine were directed to retake lost ground, rather than retreat east of the river to establish a defense.[36]

The fighting strength of German divisions had deteriorated from the previous June. Several divisions existed in battle group strength, with few supporting units, and, in some cases, were comprised of staffs only.[37] German forces east of the Rhine were equipped with small arms, artillery, and armored elements, and were fighting on their home territory. They integrated a growing number of rear echelon units and still proved lethal and capable of defense in small pockets.

The First Army Crossing

Conventional wisdom tells us that the plans don't survive first contact with the enemy. First US Army seized an opportunity on 7 March 1945, when Combat Command B, 9th Armored Division, learned of a railway bridge across the Rhine in Remagen that was not yet destroyed. Second Platoon, B Company, 9th Armored Engineer Battalion confirmed the in-

telligence and seized the bridge damaged but intact. It was one of only two bridges remaining across the Rhine. By midnight, the bridge was capable of passing tanks and support vehicles over the Rhine to establish a bridgehead for First US Army.[38] Military Police marked a route for the 47th Infantry Regimental Combat Team, the first unit to expand the bridgehead. The guides remained stoically in place like "statues" at each intersection through regular indirect fire to maintain the flow of traffic. The division history noted the significant inspiration the MPs were to troops rolling forward as they remained dangerously exposed to enemy fire. The Division Provost Marshal recruited nearby infantrymen and cross-trained them to perform traffic control as the MPs suffered casualties. Continuing the momentum was vital to survival on the east bank of the Rhine.[39] The bridge remained a magnet for enemy bombing and artillery fire and was reinforced with a Bailey Bridge—and later a timber trestle—to provide two-way traffic. Traffic was halted on 12 March for repairs, and the bridge collapsed on 17 March. By the time the bridge collapsed, First Army had established three alternate ferry sites across the Rhine to continue to expand the bridgehead, and had already crossed six divisions.[40]

The First Army situation on the east bank of the Rhine required rapid force generation to maintain momentum. A total of eight bridges were emplaced to reinforce the bridgehead and sustain momentum. Despite the initial success, these crossing sites were created in challenging circumstances. An additional steel Treadway bridge at Remagen was built under fire from snipers, observed artillery, and aerial bombing. A twenty-five-ton pontoon bridge at Kripp was also built under observed artillery fires. Force protection measures emplaced around the Bailey Bridges at Bad Godesberg contributed to the capture of five enemy swimmers attempting to damage the bridges.[41]

The crossing at Remagen was a tactical success and had second and third order effects across the First Army front. The sudden turn of events was certainly a psychological blow to German troops otherwise successful at destroying every other bridge along the Rhine. It also drew scarce resources from other locations as the Germans worked to sever the single crossing location. The greater success came from the months of planning, training, and the logistical movements that brought resources within supporting distance of the Rhine. The speedy recognition of opportunity allowed the First Army to capitalize in the tactical situation and bring forward resources to achieve a greater success.

The Third Army Crossing

Third US Army crossed on a three-corps front: VIII Corps made two assault crossings in the north, XX Corps made one in the center, and XII Corps made one in the south.[42]

Following the Ardennes breakthrough and the realignment of the axis of advance to the north, Third Army also had to shift bridging equipment and supplies from rear depots in Toul, Esch, and Arlon along a 300-mile round trip route to a forward depot at Alzey for XII Corps and Braunshorn for VIII Corps.[43]

The XII Corps crossing came first, starting at 2200 hours on 22 March in the vicinity of Oppenheim and Nierstein.[44] Terrain favored the offense, as rolling hills and urban centers to the west of the river masked advancing troops. East of the river, the floodplain provided excellent observation for several miles east of the river.[45]

The 5th Infantry Division was assigned to cross the Rhine first, supported by the 1135th Engineer Combat Group. The 204th Engineer Combat Battalion crossed the first wave of the 11th Infantry Regiment, in paddled assault boats. Two battalions crossed at Nierstein, and one at Oppenheim by 0130. By dawn on 23 March, the 10th and 11th Infantry Regiments were on the far shore. By 0730, the naval detachment had begun ferrying a significant number of troops and equipment. Four heavy pontoon rafts were established by 0930 and transferred sixty-five tanks and tank destroyers throughout the day.[46] Duplex drive tanks and DUKWs added to the crossing. Engineers prepared floats and conducted preassembly in rear areas to minimize assembly required on site with excellent results.[47]

The Third Army achieved tactical surprise and was building momentum. The M-2 steel Treadway Bridge at Oppenheim was the first tactical bridge to open in the Third Army area at 1800 on 23 March 1945, supporting armored vehicles.[48] Within twenty-four hours, a Class 40 heavy pontoon bridge was opened and another M-2 steel Treadway Bridge was started, all at Oppenheim.[49] Five divisions crossed the Rhine by the 27th, and an estimated 60,000 vehicles crossed over these three bridges during the first week.[50]

The 87th Infantry Division on 25 March, and the 89th Division on 26 March conducted crossings in the VIII Corps area. Each night, two crossing sites were chosen. Along this stretch of the Rhine, the river current was strong and surrounded by steep terrain on both sides.[51] Terrain favored the German defenders.

The first night, the 87th Infantry Division crossed at Boppard and Rhens with the support of the 1102nd Engineer Combat Group.[52] Enemy indirect and small arms fire from the opposing heights created casualties and forced the crossing at Rhens to be abandoned in favor of Boppard.[53] There, the first assault wave achieved surprise, and despite indirect fire on the crossing site, an M-2 Treadway Bridge was completed by 0930 on 26 March.[54]

On 26 March, the 89th Infantry Division crossed at Sankt Goar and Oberwesel with support from the 1107th Engineer Combat Group. The crossing at Sankt Goar was a challenge, as the defenders were well-prepared. The initial assault wave of five companies from the 354th Infantry Regiment, plus engineers from the 168th Engineer Battalion, crossed at 0200:

> A German 88-mm gun hit three of the thirty-one boats taken down to the riverbank at Sankt Goar before they could be launched. One shell killed three motorboat operators, injured six other men of the 168th Engineer Combat Battalion, and killed the 89th Division's chemical officer. The rest of the assault boats had gone about a third of the way across the river when heavy enemy fire came down, mostly from 20-mm antiaircraft guns. Then a shell ignited a gasoline barge anchored in midstream near Sankt Goar. By the light of the leaping flames the anxious watchers on the near bank saw boats exploding in a geyser of flying wood and sprawling bodies.[55]

By dawn, the assault force was clearing the town house by house. A small, well-equipped enemy force held up the advance in Sankt Goar until outflanked by a successful operation in Oberwesel.[56] Resources were shifted to Oberwesel, which offered less resistance, although Sankt Goar was not abandoned. Sankt Goar was also cleared of enemy forces by 27 March, when construction began on an M-2 bridge.[57]

The 80th Infantry Division crossed in the XX Corps area at Mainz in the early morning darkness of 28 March, supported by the 1139th Engineer Combat Group. The Rhine stretched up to 2,000 feet wide at Mainz, but the flat urban terrain masked much of the build up from enemy observation.[58] Enemy anti-aircraft fire from a nearby island caused early casualties but was quickly overcome. Paddle boats were followed by waves of motorized boats and ferries, and several hours later by naval craft. The naval craft reduced round trip times for the 2,000-foot crossing to 15 minutes, which was a significant improvement for the assaulting forces. From the opening of the assault until the completion of the Treadway Bridge, the Navy transported 7,000 troops and 600 vehicles. Naval craft continued to ferry back empty vehicles and wounded to allow the bridge to transport

traffic one-way in support of the advance. The first Treadway Bridge at Mainz was operational by 29 March. Built under enemy fire, it was among the longest tactical bridges ever built at 1,896 feet.[59]

By 30 March, Third Army occupied the entire west bank, and the majority of the east bank from Oppenheim to Coblenz.[60] Patton's command had built twelve tactical bridges for its share of the crossing operation.[61]

Ninth Army Crossing

The Ninth Army crossing carried significant weight. Once across the Rhine, the 21st Army Group would penetrate into the north German plain, and form the northern pincer to help isolate the industrial Ruhr valley.[62] The army group plan called for the British Second Army, with the US XVIII Airborne Corps, to capture Wesel in the north. The US Ninth Army would cross at Rheinberg.[63] Although well-resourced and deliberately planned the corps' effort suffered from adaptations "on the fly."

The original Ninth Army October plan to cross the Rhine called for a two corps operation to be launched on 15 December 1944. As the crossing dates for the Roer and Rhine rivers were postponed, the front also narrowed to allow only a one-corps operation. The Ninth Army designated XVI Corps to cross the Rhine at Rheinberg in February 1945 although the subordinate divisions did not receive formal orders to execute until 4 March 1945.[64] The corps staff immediately integrated its two engineer combat groups, directing the 1148th Engineer Combat Group to provide support to the 79th Infantry Division, and the 1153rd Engineer Combat Group to assist the 30th Infantry Division. [65]

Ninth Army units trained at two locations, Echt and Sittard, along the Meuse River in the Netherlands until 10 March 1945.[66] For the next ten days, the engineers conducted additional training along the Maas River.[67]

Each group also organized the battlefield in a different manner. The 1153rd Engineer Combat Group tasked its units to perform a specific function, resulting in eight "task forces." These task forces were separated to provide initial assault crossing, heavy ferry operations, road construction, boom construction, armored force transport, and several for remaining tactical bridging.[68] The 1153rd also designated three beaches as landing sites: Red, White, and Blue. Beaches were allocated at one per infantry regiment, all to be marked with colored lights to indicate locations for loading and unloading.[69]

The 1148th Engineer Combat Group organized support by unit. It task organized one battalion to support each of two assaulting regiments, and

tasked one battalion, the 1276th Engineer Combat Battalion, to launch Bailey Rafts, Sea Mules, and naval craft; install Treadway bridging; and install mine protection.[70]

The Ninth Army crossing began on 24 March with an artillery barrage at 0100. By 0200, the 30th Infantry Division assault wave crossed to the far shore and marked each beach. By 0600, a majority of the three assault regiments was on the east bank of the Rhine. Sherman tanks were crossing on ferries by 1200.[71]

The 79th Infantry Division crossed its assault wave beginning at 0300. The situation here became more difficult than the 30th Infantry Division to the north. Swampy terrain and steep banks on the far shore restricted the landing site, and some assault boats were ill-prepared to support heavy equipment and capsized in the Rhine.[72] Enemy artillery fire slowed progress on tactical bridging, which made the division rely on ferries for an extended period. The situation was exacerbated due to the overburdening of the 1276th Engineer Combat Battalion, which was tasked with not only launching heavy craft, but also building Treadway bridging.[73] The two assault regiments did not complete their crossings until 25 March after almost two full days.[74]

Several deviations from standard practice also had detrimental impacts to the crossing. Planners intended for bridge construction to begin after the far shore was seized to conserve limited bridging resources available. Seemingly light opposition on the ground combined with effective obscuration of the crossing site with smoke to influence commanders to speed up the timeline. Bridge construction began by 0630 for the 30th Division, and 0830 for the 79th Division, on the first date of crossing. When winds on the crossing sites shifted, enemy fire impacted bridges in both zones.[75]

The terrain also led the corps to situate several ferry locations upstream from bridging sites, a practice that posed risks to bridges under construction. These risks were to be mitigated with additional anchors, and five booms were planned for netting to protect all crossing locations from floating debris and explosive threats. The anchors either failed, or were not emplaced, and netting was not available. At White Beach, a floating Bailey raft with a Sherman tank collided with a completed Treadway bridge. At Red Beach, a Sea Mule drifted into a bridge recently reopened. Following repairs, it was opened for less than an hour before enemy fire made it unusable.[76]

Despite the challenges, enemy resistance was light and the Ninth Army crossings were successful. By nightfall on 24 March, engineers had crossed 13 infantry battalions, three tank battalions, two field artillery bat-

talions, and two tank destroyer battalions from the corps' two divisions to the east bank of the Rhine.[77] The bridgehead was secured, and conditions were set to encircle the Ruhr and penetrate deeper into Germany.

Seventh Army Crossing

Sixth Army Group planned to cross the Rhine using the Seventh Army on a two-division front. The French First Army would not make an assault crossing.[78] Each division led their crossing operation with two regimental combat teams. Seventh Army planned to retain only a twenty-five percent allocation of tactical bridging at Army level, and a number of twenty-five-ton pontoons for additional rafts. The location was set for a nine-mile front, centered on Worms.[79]

To the north of Worms, the 45th Infantry Division crossed with support from the 40th Engineer Combat Group on 25 March. Like Third Army, the plan relied on early morning darkness to obscure the crossing. To achieve surprise, the Seventh Army withheld artillery barrages. It prioritized speed provided by power boats over the stealth of paddle boats for the initial assault wave. The plan achieved uneven results and back-

Figure 6.3. Traffic crossing a Treadway bridge over the Rhine River south of Wesel. Photo courtesy of US Army Engineer School History Office.

fired for the 180th Infantry Regiment. The noise of power boats alerted the enemy on the far shore, who inflicted casualties from small arms and indirect fires as the assault wave landed. The assault wave lost sixty percent of the assault boats to enemy fire.[80] Slow currents, however, favored the attackers, who soon overran enemy positions with support from duplex drive tanks and artillery.[81]

To the south of Worms, the 3rd Infantry Division crossed with support from the 540th Engineer Combat Group. The division used artillery preparation and smoke to cross its assault battalions quickly to the far shore in just over an hour. Suppression and obscuration minimized early casualties, and equipment loss for assault boats remained low at ten percent.[82]

Engineers erected bridges at Worms, Rheinduerkheim, and Ludwisgshafen, with the first open for traffic by 1512 on the 25th. The initial bridge crossed more than 3,000 vehicles in a twenty-four-hour period to sustain the drive inland. By the 26th, Engineers had also constructed mine nets and began river patrols upstream from the bridges. The river patrols prevented several barges from floating down onto the bridge sites and causing disastrous damage.[83]

Figure 6.4. Traffic flows on the Alexander Patch Bridge, a heavy ponton bridge across the Rhine River in the vicinity of Worms. Photo courtesy of US Army Engineer School History Office.

Mobility on a Large Scale

Field Manual (FM) 3-0, *Operations*, defines Large-Scale Combat Operations as "major operations and campaigns aimed at defeating an enemy's armed forces and military capabilities in support of national objectives."[84] Frequently, these objectives require a military commander to advance through contested areas to compel the enemy to comply with friendly terms.

Mobility is key to this advance. It allows the military commander to gain a position of relative advantage over the enemy. As the joint force advances to its objective, it is impacted by the physical terrain over which it must travel. This terrain includes existing natural obstacles that may be used by the enemy to delay, or halt the advance, which manifest themselves in the form of gaps.[85] Army Techniques Publication (ATP) 3-90.4, *Combined Arms Mobility*, defines gap crossing as "the projection of combat power across a linear obstacle (wet or dry gap)."[86] The crossing of rivers, also known as "wet gaps," is further described as "among the most critical, complex, and vulnerable combined arms missions."[87]

The end state of a gap crossing is the break out on the far shore. A force must be able to transition into pursuit and accomplish the mission. To achieve this breakout, the commander must create a local superiority in force by generating combat power more rapidly than the enemy. This combat power must be able to safely cross from the near to the far shore faster than the enemy can generate a counterattack.

The task of crossing a gap, or reducing the obstacle, requires significant field engineering. The first two engineer tasks specified in FM 3-0 are to overcome obstacles, and to "create, maintain, and improve lines of communication."[88] It is not feasible for every division commander to maintain his or her own separate capability for such a resource-intensive mission set. Instead, corps and army commanders retain release authority for the additional assets required. Our current doctrine for how this can be synchronized and executed has its roots in the European Theater of Operations (ETO) during World War II. The deliberate crossing of the Rhine River, arguably the largest coordinated wet gap crossing in history, served as both the test bed for lessons learned up to that time, and also as an example of challenges that were yet to be solved.

Lessons Learned

Army Doctrine declares gap crossing fundamentals to be surprise, extensive preparation, flexible planning, traffic management, organization,

and speed.[89] The Rhine River crossing demonstrates both the wisdom that they impart and the perils that may come with complacency.

The speed with which First Army crossed at Remagen created a force that could withstand the inevitable counterattack. Speed provided by integration of naval equipment at all locations was a significant multiplier, transporting troops and equipment at speeds not seen in a gap crossing before. Speed remains essential to deliberate wet gap crossing and is inextricably linked to achieving tactical surprise.

Surprise relative to gap crossing is primarily described as a function of deception and operational security, although it should include tactical surprise.[90] Units all along the front integrated deception into their plans, notably the Ninth Army, through establishment of decoy bridge parks and crossing sites.[91] The application of tactics to achieve surprise echoed the prewar debate about whether speed could overcome silence. Artillery barrages were directed unevenly along the length of the front to prepare the battlefield for the assault wave. Among those locations that did not begin with artillery preparation, results were mixed. Within the Third Army area of operations, crossings for the XII Corps, with no preparation and a silent initial wave, achieved great success. However, the same could not be said for crossing sites of the VIII Corps, which experienced challenges at Sankt Goar and abandoned the site at Rhens. Those units that achieved surprise had greater success.

The preparation for the Rhine River crossing was a monumental effort. Beginning as far back as August 1944, it was a clear success as Allied forces overwhelmed defenders on the east bank. While luck may have played a role, preparation for the river itself and the unprecedented flood warning service was essential. The Allies understood the threat and, where it exceeded their capability, allocated resources from across the joint force to set the conditions for commanders.

Planning over an extended period must remain flexible and adaptable. Multiple iterations of planning and adjustments to the plan throughout the fall, and especially into the winter of 1944, were required as the enemy continued to "cast their vote." From sudden success at Remagen to the Third Army race at Mannheim, these adaptations were made largely because the Allies had done the planning and sequenced the advance of equipment to be within striking distance of the Rhine.

Traffic management remains a critical component when creating a crossing. Balancing the flow of engineer forces and combat units in the crossing area is a delicate task. Maintaining early crossing locations for

those still important sustainment functions to include resupply and casualty evacuation was employed all along the front. Additionally, sequencing the establishment of semi-permanent supporting bridges and removal of tactical bridges for follow on operations is a major decision point to maintain momentum.

The most successful units were the best-organized units. Within the Ninth Army crossings, organization of the crossing sites and subordinate tasks by the 1153rd mitigated technical mistakes and ensured a rapid, organized crossing for the 30th Infantry Division. Conversely, the uneven assignment of subordinate tasks and overburdening of the 1276th Engineer Combat Battalion contributed to major delays for the 79th Infantry Division. A well-organized plan can help mitigate other impacts to a gap crossing timeline.

The deliberate wet gap crossing of the Rhine River in 1945 was the largest synchronized assault crossing in World War II. Its extensive preparation, and rapid execution, provides for a substantial source of lessons in how to employ the joint force to cross a major wet-gap during Large-Scale Combat Operations.

Recommendations

The forced crossing of the Rhine yields strategic, operational, and tactical lessons for today's military professionals. But what can we do to set the conditions for success, to truly learn from the past and adapt those lessons to today's environment?

Training is essential to prepare for a complex mission such as a deliberate wet-gap crossing. This training should not be conducted in isolation but must include joint and combined elements. The allied field armies invested incredible amounts of training resources, even rotating units out of the front lines, in order to prepare at multiple echelons. Training sites across echelons from SHAEF on down created a crucial depth across the formation, in what was essentially a "mass production" of a capability that enabled major formations to succeed. Training for today's environment must be both rigorous and realistic.

In order to train realistically for the contemporary environment, we must build toward exercises that integrate all aspects of the environment into the scenario. Case studies from the past illustrate the importance of actions such as obscuration, air defense, and eliminating counter battery fires. But we must also bring those lessons into the current operating environment in areas such as the impact of satellite reconnaissance and drone proliferation.

Lastly, it cannot be understated how important material preparation will continue to be for a deliberate wet-gap crossing. As in 1945, success will hinge on materials being in the right place at the right time to provide the capability, and also the flexibility required to cross at a time and location most advantageous to the commander.

The next large-scale conflict will not look like the last one. Today's operational environment is tactically very different from the environment of 1945. However, it remains important to understand the roots of success and failure to continue to adapt and prepare for any future conflict.

Notes

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Chapter 7
To Take a City: Mobility and Countermobility in Berlin, 1945

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It was precisely 0600 in the morning of 16 April 1945 when the firing commenced. Lightning and thunder split the dark sky as *Katyusha* rockets and shells of all calibers streaked across the sky from Soviet positions across the River Oder. Thousands of guns were firing together, lined up almost wheel-to-wheel, with hundreds concentrating on just a single kilometer of front in key areas. The Soviet gunners howled with sinister glee, even as blood ran from their ears and many went temporarily deaf; the barrage was one of the heaviest in history.[1] Over the next 18 hours, they fired 1,250,000 rounds.[2]

As he watched from his command post, Marshal of the Soviet Union Georgi Zhukov could feel the earth tremble underfoot. Civilians in Berlin, 50 kilometers away, were woken by the sound. After the explosives and steel, came smoke to obscure Soviet forces during the assault. Acrid and thick, it mixed with the dust in the air and the smoke of burning homes and trees lit by the barrage. Finally, at precisely the arranged time, colored flares streaked skyward—the signal for Soviet infantry to rise from their positions and begin the assault. Directly in front of Zhukov was the main attack, launched from the Küstrin bridgehead where the Soviets had already secured a crossing. In the south the troops started to cross the cold river in Lend-Lease DUKWs and in small assault boats made of rubber and wood.[3] It was the beginning of the end. Two Soviet Fronts were charging toward their final objective: Berlin.[4]

The Soviet Fronts

After a rapid offensive that brought Soviet forces from the Vistula River to the Oder and Neisse Rivers in only 19 days, a distance of over 600 kilometers, they prepared themselves for the final push.[5] Soviet preparations were immense. Stalin was adamant that his armies be able to continue moving west after capturing Berlin. He wanted to be able to seize more German territory if necessary and maintain a strong posture facing the Western Allies. The Soviets massed a total of more than 2.5 million soldiers for the operation. They had also gathered 6,250 tanks and assault guns, most of which were the versatile T-34, and 41,600 pieces of artillery, large mortars, and *Katyusha* rocket batteries.[6] If Stalin had known the exact numbers, it would certainly have given him pleasure to know that the assembled force was considerably larger than the German force

that invaded the Soviet Union four years earlier for Operation Barbarossa. But the simple comparison of size does not do justice to the differences. The Red Army in 1945 was not the Red Army of 1941. Many of the soldiers crossing the Oder had defended the Volga in Stalingrad and then fought across the thousands of kilometers in between. They were hardened veterans of four years of brutal combat on the Eastern Front. The Soviet generals were now masters of armored maneuver, logistics, and deep armored penetrations. The tactics of massed armor spearheads and rapid maneuver that encircled and shattered the Red Army in June 1941 were now used against the retreating *Wehrmacht*. Their equipment was not the same either. The T-34, a highly effective tank that debuted in 1940 with a 76-mm main gun, had become the medium tank for the Soviets. Although still the mainstay of their formations, it was being replaced by the much heavier Stalin tanks, designed to fight toe-to-toe with the German Tiger tanks. Soviet forces had far more trucks, jeeps, and motorized vehicles thanks to the American Lend-Lease program. The programs supplied more than 480,000 motor vehicles of all types to the Red Army; nearly 100,000 of these were used to support Soviet forces in the battle for Berlin.[7] These Studebakers and Jeeps motorized the Soviet formations, allowing their infantry and logistics to keep pace with their armor and giving the Red Army a significant mobility advantage over the *Wehrmacht*. As one Army study of the battle put it, "The impact of the motorization of the Soviet Army cannot be underscored enough.[8] Despite this, there is a consistent effort in Soviet sources to downplay the effect of the Lend-Lease program.[9]

Gone were the material shortages of earlier in the war; the infamous rationing of rifle ammunition was a thing of the past. Many formations issued the PPSh-41 submachine gun with its magazines of 35 or 71 rounds to all of their members, completely forgoing the Mosin-Nagant Rifles that had served Russian infantrymen since 1891. In preparation for the drive from the Oder, just Zhukov's 1st Belorussian Front stockpiled over 7,000,000 artillery shells.

The Soviet force was divided into three Fronts, each equivalent to a Western Army Group and commanded by a Marshal of the Soviet Union, equivalent to a US five-star General of the Army. Zhukov's 1st Belorussian Front was in the middle, already across the Oder at the Küstrin bridgehead; Marshal of the Soviet Union Konstantin Rokossovsky's 2nd Belorussian Front was still preparing for the offensive in the marshy land to the north along the lower reaches of the Oder; and Marshal of the Soviet Union Ivan Konev's 1st Ukrainian Front to the south was crossing the Neisse River. Each Front was made up of armies—Zhukov's 1st Belo-

russian consisted of 11 armies built out of 77 divisions including General Vasily Chuikov's 8th Guards Army which shared the Küstrin bridgehead with Colonel-General Nikolai Berzarin's 5th Shock Army, and Lieutenant General Franz Perkhorovich's 47th Army. The 1st Polish Army crossed the Oder to the north of Küstrin with two Guards Tank armies and three more regular armies. Overall the force totaled nearly 1 million soldiers. Rokossovsky and Konev's Fronts to the north and south were organized similarly and of comparable size.

The Soviet air force was larger than ever before, and had recovered from repeated beatings earlier in the war. An air army also supported each Front. The Soviet air armies, comprised of more than 7,500 aircraft total, had a near total dominance of the skies, a complete reversal from earlier in the war.[10]

The most significant difference between this army crouched on the banks of the Oder and the one that retreated across thousands of kilometers of Poland, Ukraine, and Russia in 1941 is that these men were conquerors; they were avengers. This difference in identity and morale is hard to quantify but it was evident in the way the soldiers walked, the letters they wrote home, and the war booty they seized. The change was clear to men like Vasily Grossman, an embedded Soviet reporter who followed them to the gates of Berlin. He wrote, "The boys are smoking *makhorka* [coarse Russian tobacco], eating and drinking, and playing cards. . . . Soldiers no longer eat military rations. Rosy and well-fed faces are to be seen for the first time."[11]

The Germans

Opposing the Soviet advance was a German military increasingly on the brink of collapse, if not already in its midst. The *Wehrmacht* had become a ghost of its former self—many units were manned at fractions of their authorized strength and equipped with an eclectic mix of weaponry. The standard tables of organization for most units had been repeatedly reorganized to require fewer soldiers.[12] Signals and communication units were hit particularly hard as their soldiers were pulled for combat duties.[13] Hitler and the senior leadership in Berlin further added to the discord at the front by repeatedly changing and reorganizing the command structure and replacing commanders. By the end of the war, Hitler had developed a strong distrust of his *Wehrmacht* officers because some of them participated in the July Plot assassination attempt. He also blamed them for the mounting losses on the Eastern Front. He had begun frequently issuing direct orders to front line commanders himself, circumventing his high

command. One such order issued in April on the eve of the battle is nearly openly subversive toward the army command and exhibits his marked distrust of his commanders:

> Whoever does not do his duty at this moment is a traitor to our people. Any regiment or division which leaves its position acts so disgracefully that it must be ashamed by the women and children who are withstanding the bomb terror in our cities. . . . Anyone ordering you to retreat, unless you know him well, is to be taken prisoner at once and if necessary killed on the spot, no matter what his rank may be.[14]

War materials had all but ceased moving to the front, and shortages of fuel, spare parts, and ammunition were endemic. Over the course of the battle, more vehicles were abandoned or destroyed by the Germans themselves than were destroyed by the Soviets.

The *Luftwaffe* was down to double-digit numbers of serviceable combat aircraft, and their ground crews were being assigned to combat units. The bulk of the once elite 9th Parachute Division was manned by personnel who had never jumped out of an airplane, had fought in combat, or had been trained to do so. Nazi leadership had taken to conscripting Hitler Youth members, an organization akin to a politicized Boy Scouts, and elderly men too old for regular military service into the *Volkssturm*. Many of the *Volkssturm* went to the front without weapons and in their own uniforms, either left over from the First World War or borrowed from the Hitler Youth.[15] Those lucky enough were issued uniforms and helmets captured from the French in 1940.[16] Their combat record was mixed; they often resisted vehemently at first and quickly broke down under sustained Soviet onslaught. The author Antony Beevor, in his saga of the fall of Berlin wrote that "Many [soldiers] were appalled to hear in letters from home that their father, in some cases grandfather, or young brother was being drilled and given weapons training every Sunday."[17] Perhaps most indicative of their ability was the name some German officers used to refer to the *Volkssturm*—casserole: a mixture of old meat and green vegetables.[18]

Morale was also mixed. Many soldiers, particularly in SS (*Schutzstaffel*) units and soldiers whose homes were in territory already occupied by the Soviets were determined to fight to the death.[19] Similarly, many soldiers saw death as preferable to capture or subjugation by the Soviets—often they were one and the same. Members of the SS were shot on sight by the Soviets if they attempted to surrender.[20] But a rapidly growing portion of the military was simply trying to survive a war they felt was already

decided. Individual discipline, stronger in the German military than any other military of the war, started to break down.[21] Desertions were increasing, and the *Feldgendarmerie* were hanging any soldiers they suspected of fleeing the front from lampposts and trees. Estimates for extrajudicial executions by the *Feldgendarmerie* range from a few thousand to 25,000. Many of those executed were the very old or very young from *Volkssturm* units that had been called up only days before.[22] Trials were all but non-existent. Even officers found it increasingly difficult to control their men as the battle progressed. Relations between the SS and the *Wehrmacht*, never rosy, were abysmal. During the retreat, there were instances of regular soldiers shooting their SS comrades.[23] Based on their papers and interviews conducted after the war, it is apparent that many of the *Wehrmacht's* senior officer corps believed the war was lost and therefore resented the Nazi leadership for fighting on and extending a senseless slaughter. They also largely disagreed with the strategy of holding Berlin at all costs but their culture of complete loyalty and devotion to duty held even the most disaffected at their posts until the very end.[24] Senior commanders had several discussions about pulling the defenders out of Berlin so that it could be captured rapidly without sustained urban fighting. In effect, this was a move to shorten the war.[25] Even General Helmuth Wielding, the last commander of Berlin before the final surrender, shared his "dismay" at the senior Nazi leadership before the battle.[26]

Hitler had effectively split the German military into an East and West High Command, *Oberkommando des Heeres* (OKH) and *Oberkommando der Wehrmacht* (OKW) respectively. On 16 April, OKH was comprised of two major formations, Army Group Vistula under General Gotthard Heinrici and Army Group Center under General Ferdinand Schörner. Army Group Vistula was comprised of the 3rd Panzer Army, 9th Army, and Army Group Reserve. Army Group Center was comprised of the 4th Panzer Army and the 12th Army. It must be noted that all of these formations were well understrength and much of the strength they did have was made up of the *Volkssturm* and non-combat personnel hurriedly transferred from other areas.[27] In the West the Germans had the 12th Army under General Walther Wenck on the Elbe opposite the American 1st Army. Farther to the north, opposite the American 9th Army and the Anglo-Canadian 21st Army, was Army Group Northwest, a collection of small units that included units in Denmark on the Jutland Peninsula. But the German army in the West hadn't been a coherent fighting force since their disaster in the Ardennes Offensive in December of 1944 when they lost the equivalent of nearly 20 full divisions.[28] Towards the end of the battle, on 27 April, the

21st Army Group was formed out of the remains of the 4th Panzer Army but at this point was a formation in name only. In fact, there were a litany of newly created units being given orders in the last days of the war that either had ceased to exist, never existed, or were unaware that their orders or command structure had changed.

Metropolitan Berlin itself, renamed the "Berlin Defense Area," was divided into sectors, each with its own commander who was responsible for organizing a defense with available troops. Across the entire city, the civilian work force available for defense construction on any given day was around 30,000 laborers. However, without a clear plan or coordination from a unified command or weapons and men to man the defenses, most of their work served little purpose.[29] Supplementing this force were thousands of Allied prisoners of war (POWs) pressed into work from camps in an around the city, but they were even less motivated to build entrenchments.

Estimates of the total German forces arrayed against the Soviets at the end of the war differ because by then the *Wehrmacht*'s internal record keeping system had broken down, and because of post-war Soviet inflation of German strength.[30] Prior to 16 April, the most significant unit defending the "Berlin Defense Area" was a flak division. Alongside them were a handful of individual police and *Volkssturm* battalions reinforced with a few battered companies from the *Grossdeutschland* Division.[31] Around 100,000 soldiers supported by only 754 armored vehicles, of which less than half were tanks, defended the Oder-Neisse defense line. However, their strength rapidly disintegrated after the first day of fighting.[32]

The Western Allies

General of the Army Dwight Eisenhower's Western Allied armies first reached the Elbe at Schönebeck on 11 April and held there until the end of the war. Under his command was the American 12th Army Group commanded by General Omar Bradley. The 12th Army Group consisted of the 9th Army under General William Simpson, the 3rd Army under General George Patton, and the 1st Army under General Courtney Hodges. Eisenhower's northern-most formation was the Anglo-Canadian 21st Army Group commanded by Field Marshal Bernard Montgomery. Montgomery was the only Allied formation to cross the Elbe and kept advancing toward Hamburg and the Baltic Coast until the last days of the war. Eisenhower amassed more than 4.5 million Soldiers on the Western Front but he did little to exert pressure on the Germans after 16 April.

Civilians

Berlin was not evacuated during the war. Sustained bombing from 1941 onward and the demand for men in the factories of the Ruhr Valley and at the front lines drained the city, but most estimates put the civilian population during the battle at around 2.7 million. That figure includes nearly 300,000 foreign workers, tens of thousands of Allied POWs and other political prisoners.[33] During and immediately before the battle, the population was actually rising, as German refugees from Pomerania and the Eastern Reich fled the Red Army advance. By mid-February almost 8.5 million German refugees were moving westward. On some days in early 1945, 50,000 refugees were arriving in Berlin daily. Nazi authorities did their best to keep them moving because Berlin no longer had the infrastructure or resources to support the burgeoning refugee population.[34] Demographically the city was also unique—nearly 2 million of the 2.7 million people remaining in the city during the battle were women.[35]

The civilians did their best to stay underground or stay hidden; most of the casualties were suffered by women standing in lines on the street for food or water in spite of the obvious dangers of such behavior. Of this phenomenon, Beevor wrote, "Like Napoleonic infantry, the women standing in line for food simply closed ranks after a shell burst decimated their queue. Nobody dared lose their place."[36]

Most of Berlin's subway network had been converted into makeshift bomb shelters, but these were crowded, dimly lit, and dirty—most held double or triple their intended capacity.[37] These spaces had become the communal centers of daily life where were Berliners spent most of their time, carefully rationing their meager food, and joking in a dark, fatalistic humor.

An often-ignored part of the battle was the use of rape as a weapon by the advancing Soviet forces. Many German women were raped repeatedly by groups of soldier over many days, including the old and the young. Some female Soviet soldiers, especially liberated POWs were also raped. The practice was so widespread that even Soviet sources noted it in their letters and diaries, often with a mixture of disgust and indifference. Beevor detailed an incident recorded by the Soviet reporter Grossman about a young woman: "She was being raped repeatedly in a farm shed. Her relatives came to the shed and asked the soldier to allow her a break to breastfeed her baby because it would not stop crying. All this was taking place next to a headquarters and in the full sight of officer supposedly respon-

sible for discipline."[38] Statistics for rape are difficult because the subject has long been taboo for both German and Russian sources, but reasonable estimates easily number in the hundreds of thousands.

The Plan

The Soviet operational plan was relatively simple. Zhukov was to penetrate the German defenses on the high ground of the Seelow Heights and then drive west along *Reichsstrasse* 1 to Berlin, the most direct route. Soviet forces during the war preferred to seize a city "on the bounce" moving rapidly into the central area to seize key terrain while bypassing strongpoints.[39] Rokossovsky's 2nd Belorussian Front was to attack northwest towards Stettin on the Baltic Coast and then turn south to help encircle Berlin. As the right flank, his Front was also responsible for preventing the German forces of Army Group Vistula in Pomerania and along the Baltic Coast from turning south and interfering with Zhukov's drive west. Konev's 1st Ukrainian Front was to attack along the southern axis and encircle Berlin from the south. Their role was particularly important because they would cut off the American 1st Army from their route to Berlin. As one US Army study put it, "The plan was a three-way compromise: it centered the main weight of the attack on Berlin but provided for simultaneous maximum breadth and depth of penetration."[40]

The fear of American forces reaching Berlin before the Soviets remained a primary concern of Stalin until Berlin was encircled on 23 April.[41] Unbeknownst to Stalin, General Eisenhower had already decided that the Western Allies were stopping on the Elbe River only 90 kilometers to the south-west of Berlin. On 14 April he stated that "Berlin is no longer a military objective" merely a "prestige objective."[42]

The Battle

After a thunderous start to the offensive on 16 April, Zhukov's Front stalled at the Seelow Heights because of stiffer than expected German resistance. Heavy casualties in the assault units, especially armored units, slowed the assault. The defenders had also escaped the preparatory bombardment with only light casualties because of their withdrawal to a second defense line in the night, a tactic they had developed and employed previously against the Soviets.[43] Stalin personally called Zhukov and suggested that he was considering designating Konev's Front as his main effort in the race to Berlin. This would be a huge affront to Zhukov, tantamount to an accusation of failure. As one veteran of the battle put it, "Whoever raised the victory flag over the *Reichstag* would go down in history as the winner of the war."[44]

Konev in the South faced a more difficult river crossing operation because he did not have the advantage of the already captured Küstrin bridgehead, but made much more progress in the first day—crossing the Neisse in depth. By the second day, his armored spearheads had broken the German defensive line and were moving in open country.[45]

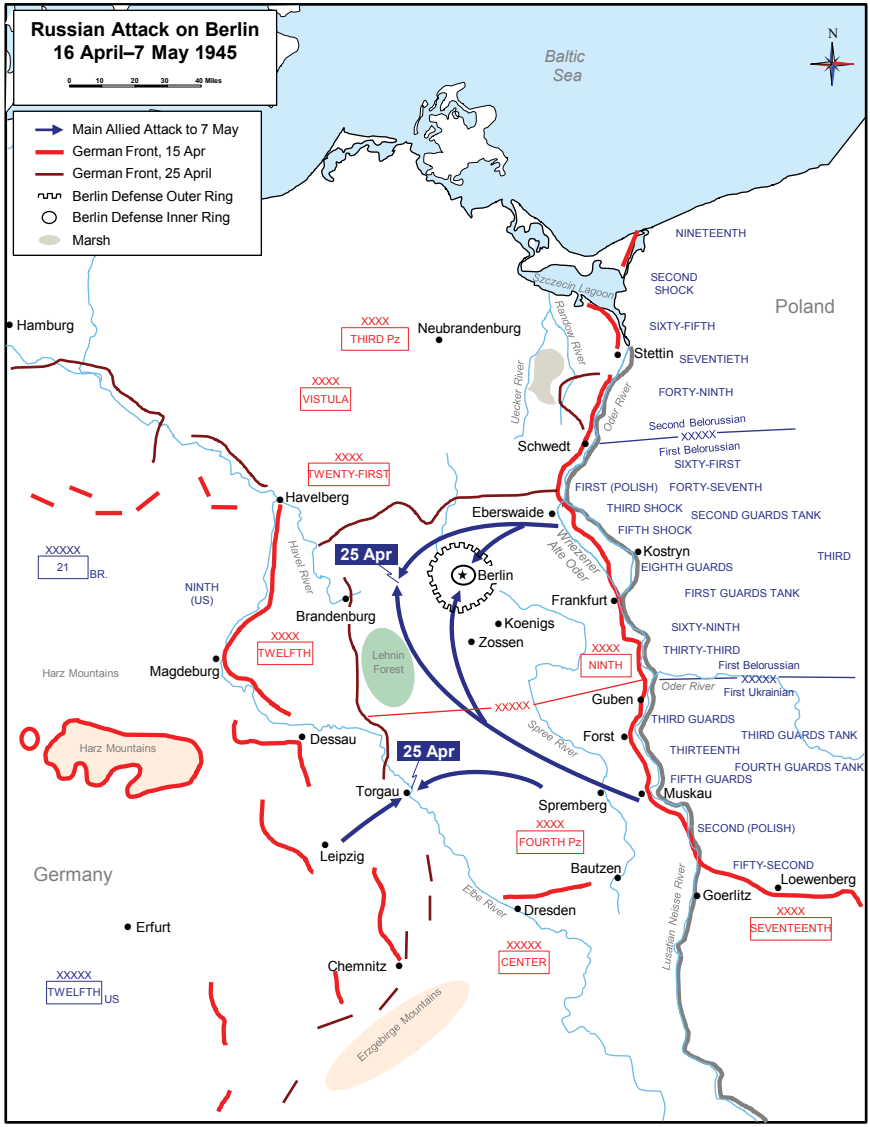

Figure 7.1. Detail of the Soviet attack. Note the turn north of the 1st Ukrainian Front across the sector boundary with the 1st Belorussian Front. Map recreated by Army University Press, courtesy of US Center of Military History.

The *Luftwaffe* began running suicide missions on 17 April, both as a new policy and on the individual initiative of some pilots. They created a suicide squadron to fly missions against Soviet controlled bridges but pilots were also using outdated aircraft to ram and dive into larger Soviet bombers.[46]

By the mid-morning of 18 April, Zhukov had broken the defensive line at the Seelow Heights but sustained greater than anticipated casualties. One German newspaper claimed the Soviets had suffered 33,000 casualties and the Germans suffered only 12,000.[47] Though certainly not an impartial source, this estimate is probably not far off for the initial fighting in that sector. The Soviets had also lost over 700 tanks and self-propelled guns, the majority of which were lost by Zhukov's Front and were evidence of stiff resistance at the Seelow Heights. The losses together represent the armored strength of an entire Soviet tank army.[48] However, the rapid movement of the Soviet lead elements and mass encirclements and surrenders of German troops would soon rebalance the casualty ratios.

Konev continued to move rapidly toward his objectives along the southern axis, already reorienting himself so he could better race toward Berlin. German defenders were still thrown off by his attack to the northwest, having expected Konev to attack towards Prague farther south.[49] In a phone conversation, Stalin had given him permission to make Berlin his primary objective. During the early morning of 18 April, his leading columns forded the River Spree when no intact bridges could be found. A German counter-attack against his flank was unsuccessful and did little to slow the advance of his tanks.

By 19 April the German 9th Army had begun to disintegrate under Soviet pressure from multiple directions, and many commanders were realizing that Soviet spearheads were already many kilometers behind them. They were also aware of the preparations by Marshal Rokossovsky's Front farther north. He had finished redeploying his troops from Pomerania and would start his assault across the Oder the next morning.

Hitler's birthday was 20 April. It is unclear if this was significant or even known to most of the Soviet soldiers, but certainly the Germans attached significance to the date. The Western Allies, well aware of the occasion, dropped particularly heavy loads of bombs on Berlin. Their last raids on Berlin were the following day on 21 April. Far from ineffective, these last raids were particularly heavy and are estimated to have caused over 50,000 casualties, mostly among the civilian population.[50] On the same day, Zhukov noted that his artillery was now firing directly into metropol-

itan Berlin, but more likely this was for morale because there were few, if any, worthy targets identified.[51]

Konev issued orders for his commanders to "categorically break into Berlin" by the night of 20 April. Little remained in their way except the Germans retreating from the Oder line. During the day on 21 April, his tanks captured Zossen, about 20 kilometers south of Berlin, where the German High Command was located. Their requests to evacuate the headquarters had been repeatedly rejected by Hitler until the Russians were less than 15 kilometers away. The result was such a hasty exodus that the gates were left open and even the phones that connected the headquarters to German units around the world had been left on.[52] Upon arriving, the Soviet troops even took the time to answer one or two of the still ringing telephones. German commanders had not yet realized the headquarters had moved.[53]

By 22 April, Soviet artillery was now shelling the center of Berlin. Over the next ten days, millions of Soviet shells would fall on the city. Unfortunately most of the casualties were civilians who moved around the city in the open. The intensive shelling had little effect on the well-entrenched defenders.[54]

Along the *Reichsstrasse,* Zhukov's advance was still slower than expected, and he issued the order for a policy of "24-hour-a-day-advance". Zhukov was ready to use whatever exhortations necessary to get his troops into Berlin ahead of Konev's.

The same day, 22 April, Konev's tanks had finally reached Teltow Canal, at the southern edge of the Berlin defensive line, but few German commanders knew of this development because of the complete breakdown in communications.[55] The following day, on 23 April, Berlin was completely encircled by Russian forces, and they began to assault towards the center of the city from the north, east, and south simultaneously. The prize was now the capture of the *Reichstag* building in central Berlin.

From 23 April to the final surrender on 2 May, the fighting in central Berlin was bloody and chaotic. It was no longer an organized defense, but a series of independent small unit actions. Larger formations simply ceased to exist and what remained in the capital were small, uncoordinated, company and battalion sized groups. Hitler repeatedly changed the chain of command in the last few days, and the communications between the senior officers and the small combat groups that remained became non-existent. Many of the last defenders were from primarily non-German

SS units who knew they would not survive capture and had stronger ideological motivation than most.

The 12th Army, 21st Army, and 9th Army made three attempts to relieve the besieged city from the west, north, and southeast respectively. The relief effort from the north was made by Army Group Steiner, a military formation in name only. Even if there was manpower available to create the formation, the commander, General Felix Steiner, had no way of communicating with them. He was also nowhere to be found. Steadily degraded well before the battle began, the German communication system by this point had completely broken down.[56] However, an important post-battle study by German participants does credit the relief efforts with providing a morale boost to the defenders and to Hitler himself. After the final relief attempt failed on 30 April, Hitler committed suicide.[57]

On 28 and 29 April, Soviet forces fought for the key Moltke Bridge in central Berlin, which survived repeated German attempts at demolition. The bridge was within sight of the *Reichstag* only a few hundred meters away, and the last obstacle before the final objective. The fighting raged for hours in a cold rain as Soviet tanks and infantry struggled against lashing machinegun fire and flak rounds. Eventually, Soviet heavy tanks supported by artillery firing over open sights to suppress the defenders

Figure 7.2. A photo of the Reichstag taken after the battle. Note the burned out vehicles in the foreground. Photo courtesy of the US Center of Military History.

in the *Reichstag* were able to force a crossing.[58] On 1 May Soviet soldiers stormed the symbolic *Reichstag*. However, because of the size of the building and ferocity of the defenders, it was not fully cleared until late on 2 May. The exact timing of the historic flag raising on the *Reichstag* is in dispute. Zhukov was adamant that the building be captured in time for the annual May Day Parade on Moscow held on the 1st but it is probable that he recorded capturing the building prematurely.

The battle for the *Reichstag* in many ways mimicked the character of the battle for the city as a whole. While inevitable that Soviet soldiers would eventually storm the building, in their haste to do so rapidly, they suffered many more casualties than would have otherwise been necessary. The best estimates are that the Soviets suffered at least 2,000 casualties for just the capture of the *Reichstag.*[59]

By 1 May, Wielding had been appointed the senior German commander in Berlin. He knew that Hitler had committed suicide the day prior and that he had authorized the remaining forces to attempt a breakout. Acknowledging his lack of control, Wielding authorized units to attempt breakouts on their own or to surrender. On 2 May at 0215, Wielding broadcast a call for a ceasefire to Chuikov's 8th Guards Army and shortly after sent emissaries to negotiate the surrender of the city to Chuikov, ending the battle for Berlin.[60] The remains of the German 9th and 12th Armies retreated toward the Elbe in the hope of surrendering to the Western Allies, and some small groups of soldiers trapped in the city were able to escape through Konev's lines to link up with the retreating 12th Army. With little resemblance to a professional army, most soldiers retreated westward singly or in small groups.

A few small pockets of die-hard Nazis continued to resist in the capital but were cleaned up in the following few days. The battle was over. Six days later on 7 May, General Alfred Jodl, would surrender Germany to the Allies and all her remaining forces in the field.

Conclusions

The Battle of Berlin is one of the best case studies for large-scale urban warfare in history. Millions of troops fought over a city that was larger than Paris, Rome, Moscow, or Washington DC. An excellent example of operational mobility, the battle was not only fought in the confines of the city but was a larger operation starting with bridging operations and mechanized maneuver and encirclement in a battle space cluttered with millions of civilians, competing national organizations, and military units from different branches and nations. It was two weeks of maneuver and

assault in a mixture of terrain. Our current military operations on urban terrain (MOUT doctrine), codified in Army Techniques Publication (ATP) 3-06, *Marine Corps Techniques*, was established in the Second World War based on experiences from battles like Berlin and Aachen.[61]

The battle is also a window into Soviet operational doctrine—when provided with nearly inexhaustible reserves and resources how did they choose to fight? The battle is therefore a window into contemporary Russian doctrine, an adversary specifically identified in the current Army Operating Concept, *Win in a Complex World*, as a competing power and part of the "4+1."[62] We see how they practiced the tenets of "Unified Land Operations*"* laid out in Army Field Manual (FM) 3-0, *Operations*. They manipulated the depth of the battlefield to their advantage, using tempo and concentration to create their own depth relative to the defenders. They used a three-pronged attack that allowed them to rapidly shift the main effort and disorient the defenders. They overwhelmed them with decisions, and caught them in combined arms dilemmas. A close study of the battle yields innumerable conclusions and evidence that advance our understanding of large-scale maneuver and mobility through the lens of FM 3-0. At its simplest, the case study is an example of how to overcome a denied-mobility environment by applying flexibility, simultaneity and depth, but it also offers tactical and operational lessons on urban warfare.

Terrain

The terrain around Berlin dictated character of the fight. German commanders were able to leverage and reinforce available terrain and existing obstacles. The upper reaches of the Oder River, which become the Neisse River, is where Konev's Front crossed. While not a massive river, it was an obstacle that required intact bridges, amphibious vehicles, bridging equipment, and enough reconnaissance to identify fordable points. The German defenders were generally able to tie their fields of fire into the river, forcing the Soviets in some cases to bridge and cross the river under fire. But limits on ammunition and available weapons usually limited this to small arms fire rather than artillery or tank rounds. Above the river lies the Seelow Heights, which either overlook the river itself or commanded the plain inland from the river. The heights are nearly 50 meters high and offer a fairly significant obstacle, especially when entrenched and defended. Zhukov dangerously underestimated the strength of the German defensive line across from his Küstrin bridgehead, which cost him casualties and time in the race for Berlin.

Once over the heights, the path to Berlin is largely flat. Several small lakes lie immediately to the East of Berlin but no effective defense was tied into these features. Germans defended lightly along *Reichsstrasse 1*, the main east-west highway in Germany, running from Königsberg to Berlin. The area south of the capital, particularly around Zossen, where the German High Command was located is thickly forested with pines. This impeded the movement of Konev's tanks more than open country would have and forced him to limit his movement to roads; however because of the German collapse this was not as much of an issue as it could have been if a more effective defense was mounted.

Within Berlin the Spree River and a canal system made up of the Teltow, Hagel, Tegel and Landwehr canals provided significant barriers to mobility for the Soviets. A few bridges were captured intact but they also made sure they had a surplus of engineer forces and equipment at the front of the formations so they could quickly bridge obstacles, as well as artillery that could provide suppression for bridging operations. Chuikov, the commander of the 8th Guards Army observed in his account of the battle: "There [in central Berlin] every building was a fortress. And where the walls of Old Berlin rose up, there was the Nazis' most powerful defense line of all. The Landwehr Canal and the sharp bend in the River Spree, its high banks clad in concrete."[63] Chuikov was identifying key terrain in the last phase of the battle, the buildings in the central sector of Berlin and the remaining bridges. Joint Publication 2-01.3 defines key terrain as "Any locality, or area, the seizure or retention of which affords a marked advantage to either combatant."[64]

The urban core of the city itself was also a significant obstacle. The ruined buildings had become a warren ideal for defensive operations and were improved for this purpose by soldiers and civilian laborers. Allied bombing had wrecked over 70 percent of the city producing extensive rubble. Soldiers and labor organizations had dug miles of trenches, laid miles of wire, and built upwards of 400 reinforced concrete bunkers at key locations in the city as well as repurposing the massive flak towers. The towers were castles of reinforced concrete over 70 meters high originally built to house air defense batteries on the roof.[65]

Berlin, an urban metropolis with a maze of streets and alleyways above ground, also had a significant number of subterranean structures like cellars, basements, bomb shelters and a full metropolitan subway system under the city. The defenders capitalized on these for shelter, storage, communications, and even maneuver space. Often connected under-

ground, these subterranean networks allowed the defenders to maneuver and counterattack in small groups across the city. The Germans doctrinally favored a strongpoint defense. Their strongpoint defense doctrine, developed in 1918, facilitated more maneuver than a traditional linear defense and allowed for mutual support between strongpoints. Strongpoints were also much easier to hide in the urban environment than linear defenses. This allowed the defenders to adopt an ambush-like approach to the defense, which played to their strengths.[66] Their lack of coordination also forced units to operate independently, which again, made strongpoints an obvious choice over a linear defense line.[67]

The Germans found that the urban environment was an excellent place for the short-range *Panzerfaust* anti-armor weapon and refined the art of stalking Soviet tanks. This required sneaking up behind the tanks and firing on them from behind at a range of less than 25 meters to hit the weaker rear armor. Employed this way, the weapon was more than sufficient to knock out a T-34. Dozens of German soldiers became "*Panzerfaust* aces" by the end of the battle, and the weapon was so effective that it was often employed in a breaching or assault role by the Soviets if captured. One German officer remembered of the final days: "They were too tired even to speak. Their faces were empty. No man would wake up unless shaken vigorously. Tank hunting, one of them wrote later, had become a 'descent into hell.'"[68]

The Soviet force was more mixed in its urban performance. Some of the soldiers were proud veterans of the "Stalingrad School of Street Fighting" but many were green and inexperienced. Novices quickly learned that infantry-armor cooperation was absolutely essential, that infantry should move from building to building by any means other than the street, and that large amounts of explosive was the best way to enter buildings. Tank rounds or artillery firing over open sights was the best way to prepare buildings for entry. They also quickly organized into effective six to eight man assault groups armed primarily with grenades and submachine guns but also weapons for hand-to-hand combat.

Depth

The Battle for Berlin was fought on a relatively small front less than 100 kilometers deep. This was both a problem and a solution for the Soviet doctrine of "deep battle."[69] Soviet doctrine called for deep penetrations by mobile groups that bypassed even the enemy reserve in order to completely rout his forces. The shallow front prevented deep penetrations in

real terms. There simply was not enough space on the battlefield, however, which meant that the Germans had to deploy their forces without the depth they would have liked and that their defense was therefore weaker. There was also a clear decline in the quality of the German defensive doctrine and sophistication from 1944 onward for reasons beyond just lack of personnel.[70] They knew from the outset that the battlespace would not allow them to trade space for time, and they would have to use First World War type defensive tactics to hold back the Soviets. Soviet forces could more easily penetrate a shallower defense and rapidly penetrate all the way to Berlin because of the compressed battle space.[71] This is a clear example of using depth to their advantage, defined in FM 3-0 as "the extension of operations in time, space, or purpose to achieve definitive results."[72]

Flexibility

The Soviets built flexibility into their plans from the very top to the very bottom. FM 3-0 defines flexibility as "The employment of a versatile mix of capabilities, formations and equipment for conducting operations.[73] Perhaps the best example of operational flexibility in the war was Stalin's use of competing Fronts to race to Berlin. His commanders understood the importance of capturing Berlin and the consequences of failure or sluggishness, perceived or real. Stalin designed an operation where any of the three Fronts could have reasonably captured Berlin. There was not a clear supporting effort except by his designation. He was able to leverage this in the first days when Zhukov's 1st Belorussian Front was not able to breach the defenses of the Seelow Heights, and Stalin shifted the main effort to Konev's 1st Ukrainian Front with a simple phone call. This was masterful flexibility at the operational level.

In all the Fronts, units with obstacle reduction and bridging capability like the engineer and pioneer battalions were kept with the vanguard to increase mobility. Having them far forward gave their commanders the flexibility to choose their routes, which saved time when obstacles were inevitably encountered. Even in Berlin itself, the Soviet commanders were building combined arms teams out of armor, artillery, infantry, and engineers to spearhead their assaults. These teams gave commanders the flexibility at the point of advance to move rapidly and clear obstacles. One commander said in a Red Army magazine, "The well-organized mutual support guaranteed the success of the attack." And noted that these assault groups had to be concentrated on a narrow front. This was not a broad front advance, indicating that Soviet commanders understood the effective application of mass and concentration.[74]

This combined arms approach was forgotten by later Russian commanders in Afghanistan and Chechnya who studied the massed armored tactics employed in more lightly defended German cities. The Russian assault on Grozny in 1994 was reflective of this organizational amnesia but the lessons from Berlin have been revisited in recent years.[75]

Small unit tactics developed by infantrymen emphasized communication and combined arms at the squad level for urban combat.[76] Recent studies have emphasized the initiative and flexibility of the Soviet urban assault groups, rebutting the prevailing opinion that Soviet infantrymen were unskilled or lacked tactical proficiency. One analysis that used recently declassified Soviet documents claimed, "The specific conditions of urban combat demand initiative, audacity and improvisation by small-unit commanders and individual soldiers, just the areas where the Soviet military and, more broadly, Russians, are held to be lacking."[77] Chuikov, a veteran of the urban fighting in Stalingrad and Berlin made it clear in his memoir that the Soviets understood what was required in urban combat:

> These groups need to be flexible in tactics, because, after entering a fortified building and the labyrinth of rooms occupied by the enemy, they are faced with a welter of unexpected situations. . . The soldier in a storm group must have initiative and boldness, must rely on himself alone and believe in his own powers. No one else can carry out his job for him; his comrades have got enough of their own to do . . . in an assault, he is very often left to his own devices, acts alone, on his own responsibility.[78]

Simultaneity

The Soviets attacked Berlin from the east, north, and south. They used three Fronts to attack a single objective from multiple directions. The Germans did not have the forces to respond to all three directions at once, and even if they had them, they did not know which direction should have taken priority. Senior commanders after the war recalled phone calls to OKH asking for guidance on which axis they should prioritize their defense as the battle was unfolding, to which their command essentially replied. "We don't know."[79] The tri-pronged Soviet assault caught them in an operational dilemma that they were unable to solve. The German commanders could have more easily responded to a single thrust, but were overmatched when faced with two simultaneous thrusts and a third thrust two days later. Even without the massive concentrations of Soviet combat power, this approach would have paralyzed the German command and forced them either into inaction or a decision that left them vulnerable. Also at the

tactical level, Soviet urban doctrine called for decentralization, partly in order to facilitate simultaneous action against an enemy to overwhelm his defenses.[80] This operation was an excellent example of the simultaneity, defined in FM 3-0 as "The execution of related and mutually supporting tasks at the same time across multiple locations and domains."[81]

Final Thoughts

The Army believes that urban warfare and particularly megacity warfare is in our future, and that we will again face large-scale combat operations at the brigade level and above. "*Operations among populations, in cities, and in complex terrain*" are specifically called out as part of the future operating environment.[82] Tactical and operational mobility in the urban environment is essential to success. That we may not have overmatch capability in all of our weapons systems and capabilities is anticipated as well.[83] "Multi-Domain Battle: Combined Armed for the 21st Century," an Army-Marine Corps White Paper, outlines that we may not have uncontested control of the skies.[84] We need to revisit battles and wars of earlier eras in order to adequately address future threats. Major General Robert Scales put it succinctly in *Armed Forces Journal International,* "Urban warfare, a subject that many military professionals would prefer to avoid, is still with us. Moreover, it may be the preferred approach of future opponents."[85] So we must devote ourselves to study, but we cannot simply read the history for history's sake; we need to examine the history through the lenses of contemporary doctrine and operating concepts like FM 3-0 and Training and Doctrine Command (TRADOC) Pamphlet 525-3-1, *Win in a Complex World*.[86] Current conflicts are showing us that while the nature of warfare may remain immutable, the nature of the threats we face is changing rapidly.[87]

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Chapter 8

Enhancing Operational Mobility: Refugee Control and Enemy Prisoner of War (EPW) Operations during the Korean War

Ronney Z. Miller

The Korean War (25 June 1950–27 July 1953) qualifies as one of the most significant events of the twentieth century. It marked the first time in history that a multinational force, united under the auspices of the United Nations, employed military forces to combat wrongful aggression and at the time it was fought, the war in Korea represented an experience that contrasted with what became known as the "American Way of War." Unlike both World Wars, which were violently prosecuted on the battlefield with massive resources, extraordinary lethal force, and superior technology until complete and decisive victory was secured, the Korean War was limited in scope and scale and ended in stalemate—a conscious effort to avoid "Armageddon." It was also the first time that the US Army confronted a well-trained, well-equipped, well-led, and well-organized Communist army which embraced an alien ideology and practiced new concepts of warfare.[1] Although it was not a global conflict, the Korean War did feature two opposing armies engaged in sustained ground combat that was as intense as any war America has ever fought. Military police units actively participated in port security and harbor patrol duties; conducted route reconnaissance missions; escorted hospital trains and convoys; provided security for command posts, forward aid stations, supply dumps and fuel farms; rounded-up stragglers; investigated crimes; and conducted guerrilla and bandit suppression operations. Without question, Refugee Control, Enemy Prisoner of War (EPW), Traffic Control, and Rear Area Security operations qualified as the most critical missions performed by military police units during the course of the war, and all of these directly or indirectly supported the ability to move men and material to the decisive point of battle.

Encompassing ten campaigns, the Korean War can be categorized into two phases. The first year of conflict was characterized by maneuver and a fluid battlefield punctuated by large-scale advances and withdrawals up and down the length of the peninsula; the last two years of the war devolved into a war of position—a holding action that featured bitter struggles to defend, capture and oftentimes, recapture key outposts. The abrupt breach of peace in the "Land of the Morning Calm" also exposed a hollow US military force. Maneuver divisions serving on occupation

duty in Japan (the first to "march to the sound of the guns") had recently completed a reorganization that included significant reductions in manning and equipment levels. The 1st Cavalry Division and the 7th, 24th, and 25th Infantry Divisions all lacked reconnaissance, tank, military police and replacement companies, and medical detachments. Furthermore, infantry and artillery battalions were operating at two-thirds strength. (The last organizational changes that occurred within Eighth Army prior to the outbreak of hostilities in Korea was the inactivation of I and IX Corps on 28 March 1950).[2] Subsequently, Eighth Army was forced to adopt emergency expedients during the first months of the war. Fortunately, a mobilization apparatus was in-place that enabled the United States to respond to the "Korean Crisis" more effectively than in previous wars.

The military police units that initially deployed to the Korean Theater of Operations were hard-pressed to accomplish their wartime mission. In addition to a poverty of equipment and personnel; an acute shortage of maps; and a conspicuous absence of established Tactical Standard Operating Procedures (TSOPs), individual military policemen (MPs) and military police units as a whole were simply not trained for their combat role. Nevertheless, MPs from the start provided field commanders with a wide-range of support that would directly contribute to battlefield success. The Military Police Corps performed all those functions as in previous wars with one notable addition. Black market activities, which are often associated with an army fighting in a developing nation, had escalated to a crisis level by early 1951. No doubt, the vast number of refugees forced from their homes with few material possessions also contributed to the severity of this problem, which soon engaged the resources and expertise of the Military Police. Previously, the control and prevention of black market activities was assigned to Civil Affairs units. For the remainder of the war, the Military Police Corps would take sole responsibility for the control and eradication of black market activities and have maintained ownership ever since.[3]

However, in the early days of the Korean campaign, everybody was a combat soldier. The MPs of the 24th Infantry Division, the first military policemen to deploy, soon found themselves holding the line with the 21st Infantry Regiment at Chochiwon; only a week later, the 24th Military Police Company was fighting a rear guard action at Taejon. One of its platoons, with other rear guard elements, remained there for 36 hours after the main body had withdrawn and then battled its way through enemy roadblocks to escort the last convoy to safety.[4] As Colonel William M. Campbell, Provost Marshal of X Corps, observed, "It took this strange

Korean War to make Military Policemen realize they were just as much as part of the fighting team as the infantry soldier. Those who did not realize it right away damn soon learned."[5] Most notably, MPs ensured operational mobility—a vital component to full-spectrum combat operations. This study will specifically examine the role of the Military Police Corps in conducting Refugee Control and EPW operations and how it enabled operational mobility.

Refugee Control Operations

With the war confined to the peninsula, both opposing forces waged large-scale combat operations in what can best be described as an "abbreviated maneuver box." Enhancing operational mobility and sustaining a successful battle rhythm required that the modest transportation arteries and limited mobility corridors remain unobstructed for the exclusive use of military traffic. Few habitable areas of the world at that time were more unsuited for large-scale conventional combat operations than Korea. A rugged, mountainous peninsula, Korea lacked adequate road and rail networks, as well as modern airfields and seaports, and at best, could only boast primitive lines of communications. It was also a region of climatic extremes that intensified the normal hardships of combat.[6] Narrow roads with soft shoulders and hairpin turns; bridges with limited weight capacities; and road networks densely-populated with choke points posed a significant challenge to vehicular traffic. (Thus, each tank company serving in Korea included a tank-dozer to undertake the numerous earth-moving and route-improvement tasks essential to mobility). The tyranny of terrain and weather common to the Korean peninsula also represented an obstacle to operational mobility. The spring thaw and torrential monsoon rains in the summer would transform the valley floors into quagmires. Visibility was significantly reduced, and movement by wheeled or tracked vehicles was greatly impaired. Heavy snowfall and ice in the winter also adversely impacted trafficability and visibility.[7] It required herculean efforts to overcome the challenges of terrain and weather; however, engineer units did just that. A small tribute paid to one of these units is representative of many: Lieutenant General John W. O'Daniel, Commanding General, I Corps, consistently referred to the 84th Engineer Construction Battalion as the "Conquerors of the Imjin."[8]

Refugees (who congested these limited road networks and mobility corridors) had the real potential to dangerously disrupt ground combat operations and for periods of short duration, did adversely impact military operations. The Korean War witnessed a "refugee problem" that was as troublesome as any experienced in other wars fought by the United States,

and it manifested itself in two immense waves of noncombatants—following the initial North Korean People's Army (NKPA) invasion of the South in June 1950 and following the full-scale intervention of the Chinese People's Volunteer Army (CPVA) in late November 1950. In the first instance, amidst the clamor and confusion of an unexpected war, the Republic of Korea (ROK) government appeared on the verge of collapse and reacted to this cataclysmic event with terror and alarm almost to the point of paralysis. Concerted efforts to cope with refugees did not materialize for several weeks *after* the initial North Korean attack. The basic responsibility for housing, feeding, clothing, and segregating civilian refugees belonged to the host nation; whereas, military police units attempted to minimize refugee interference with military operations. (Ultimately, MPs were engaged in processing, feeding, providing shelter and medical care, and safeguarding refugees during the entirety of hostilities). By mid-July 1950, the ROK government had miraculously recovered and by the end of July, it had established 58 refugee camps, most of them in the Taegu-Pusan area, to care for displaced local nationals.[9] The timing could not have been more fortuitous. The final days of July witnessed some of the hardest-fought battles of the Korean War; nevertheless, the NKPA had managed to overrun almost all of South Korea by then and the tactical situation had reached a critical point—for both opposing forces.

On 1 August 1950, Lieutenant General Walton H. Walker, Commanding General, Eighth Army, ordered his command to begin a phased withdrawal behind the Naktong River (the last natural obstacle between Taegu and Pusan) and to organize a defensive posture oriented on terrain retention. Subsequently, a defensive perimeter (called the Naktong River Defense Line) was established; barely more than a beachhead, it was labeled by journalists as the "Pusan Perimeter." The front was now clearly defined and more or less static. Consequently, combat multipliers such as close air support, artillery, and naval gunfire could be employed more effectively, while interior lines of communications increased the reliability and responsiveness of logistical support. Characterized by a series of intense battles fought simultaneously, the Defense of the Pusan Perimeter encompassed two distinct phases. The first phase (5–22 August 1950) became known as the "First Battle of the Naktong Bulge." The second phase (31 August–15 September 1950) became known as the "North Korean Great Naktong Offensive."[10] During these protracted engagements, the NKPA failed to designate a main effort; therefore, the enemy never concentrated sufficient strength in a given sector to achieve a decisive breakthrough. As a result, the NKPA sustained prohibitive casualties and were compelled to

forcibly conscript untrained South Koreans of dubious loyalty into their ranks to replenish their manpower losses. The ability of Eighth Army to employ a mobile reserve and rapidly shift forces to meet these piecemeal attacks and defeat them in detail was enabled by secure road and rail networks.[11] Additionally, the main effort of combat engineer units at this time was oriented on countermobility operations which delayed and restricted enemy maneuver; channelized enemy threats into engagement areas; and allowed friendly forces to engage targets at maximum effective range with superior weapons systems.

A recurring tactic employed by the enemy during the battles of the Pusan Perimeter was to herd large numbers of refugees ahead of its assault forces, and the volume of refugees moving through friendly lines in July and August 1950 was greater than any other time in the Korean War. During the Defense of the Pusan Perimeter, the movement of noncombatants was restricted by route, area, and time and it was not uncommon for a team of four MPs to have to deal with hundreds of refugees at a time—and almost on a daily basis. Loudspeakers, operated by Korean interpreters, were used to direct the flow of refugees and warn them of the danger of traveling at night. As a necessity, refugees were generally re-routed toward the southwest and away from Taegu. This kept them moving; prevented them from congesting the battlefield; and it kept the main supply routes open.[12] In many instances, trucks returning to the rear were commandeered to transport refugees and on a certain level, Refugee Control operations were approached in the same manner as obstacle reduction, with refugees viewed as "nuisance" obstacles.

Because it was common practice for enemy personnel in native dress to mingle with civilians so that they could move inconspicuously to infiltrate behind friendly lines (in concert with a very real guerrilla threat), it was essential as a force protection measure to methodically screen and search refugees for contraband material and weapons. "One method of searching was to screen each person with a mine detector which would indicate the presence of metal under the clothing of innocent appearing civilians. One "pregnant" woman was found to be carrying a radio under her clothing, which accounted for her "condition." It was later determined that she had been relaying the locations of friendly forces to North Korean units."[13] Fueled by ethnic and religious intolerance and/or political and economic instability, it is not unusual for these irregular/hybrid threats to emerge during major combat operations.

To identify guerrillas, saboteurs and Communist sympathizers was no easy task—especially when one is completely unfamiliar with Korean

culture and unable to speak the language. Fortunately, a defining moment and enduring legacy of the ROK-US Military Alliance was realized on 12 August 1950—the Korean Augmentation to the US Army (KATUSA) program was introduced. As a result of this initiative, South Korean soldiers were integrated into US units and served side-by-side with American Soldiers. The use of indigenous personnel as an augmentation was a necessity and proved enormously successful:

> Most South Korean personnel assigned to MP units were former indigenous policemen and in some cases, entire companies were attached. They received a 'crash course' in American methods and equipment, and despite the language barrier, became masters of US equipment and a distinct asset in dealing with straggler control, guerrilla suppression, refugee control, sign posting, pilferage and black-marketing, and sabotage.[14]

Most notably, KATUSAs spoke the language, knew the culture, and were familiar with the terrain. Paired with a "warrior buddy," unit combat effectiveness was greatly enhanced by the special "skill set" that KATUSAs brought to the table.

Another force enabler worthy of mention includes the (South) Korean National Police (KNP) and the ROK Army Military Police. Liaison among the KNP, ROK and US military police units was firmly established in the early weeks of the war. Interoperability was not an issue since the KNP and ROK MPs had been organized, trained, and equipped by the US Military Advisory Group to the Republic of Korea (routinely referred to as the Korean Military Advisory Group and abbreviated as KMAG). And both of these formations had enough English-speaking personnel in their ranks to effectively bridge the language barrier. With two words emblazoned on their helmets and armbands, "*Heon Byeong*" which translates to "Law Soldier," ROK Army MPs and local KNPs performed a critical task that *only* a native Korean was qualified to perform with consistency. They were extremely adept at differentiating between North and South Koreans, stealthy guerrillas and panicked refugees, and disguised North Korean soldiers and South Korean peasant farmers.[15] To illustrate the latter, while en route from Masan to Yongsan on 11 August 1950, the 2nd Battalion, 27th Infantry Regiment ran headlong into a wave of refugees. While negotiating the heavily-congested road, an ox-drawn cart overturned—exposing a weapons and ammunition cache. Disguised as refugees, the North Korean soldiers that were accompanying it bolted across an open field; most of them were shot dead.[16] The reliance on local nationals to perform functions normally expected of our own MPs was not a reflection on training,

but illustrated a method of refugee handling that was necessary due to the character of the theater of operations.

During the latter stages of the Pusan Perimeter battles, the flow of refugees diminished; however, many South Koreans living in close proximity to the main line of resistance (MLR) were forced to relocate. Tied to their land by ancestral heritage, many farmers and their families resisted. Equipped with inadequate communications systems, MPs had to exercise diplomatic skills and on occasions, make on-the-spot command decisions independent of higher authority. Entire rural villages were impacted and one extraordinary example proved unique. Masan was infested with Communist sympathizers and agents, and guerrilla attacks in the area occurred with disturbing regularity. At the peak of the "North Korean Great Naktong Offensive," Han Gum-jo, manager of the Masan branch of the Korean Press Association, confessed that he was the chief of the South Korean Labor Party and had funneled information to the enemy through a Pusan affiliate. It was also determined that the chief of the Masan prison was the head of a Communist cell that included seven of his guards.[17] In an effort to facilitate force protection of the 25th Infantry Division's rear area, Major General William Kean applied an innovative solution and ordered the local population evacuated except for emergency essential personnel. As part of a five-day operation known as Operation Exodus (10–14 September 1950), the 25th Military Police Company participated in the evacuation of more than 12,000 South Koreans from Masan to Changseung-po (a refugee camp located in the vicinity of Taegu). The entire evacuation was accomplished by amphibious landing craft.[18]

In concert with a brilliantly executed amphibious assault at Inchon, Eighth Army began its breakout from the Pusan Perimeter on 16 September 1950 and advanced steadily northward on a broad front, aggressively pursuing the disorganized NKPA. Shuttling back and forth along the MSRs, MP units played a vital role in eliminating enemy road blocks and proved invaluable in mapping roads and reporting road conditions. Concurrently, combat engineers shifted their main effort to mobility operations. On 28 September, Seoul was liberated; on 30 September, friendly forces reached the 38th parallel and crossed this artificial boundary on 9 October; and on 19 October 1950, the North Korean capital of Pyongyang was captured by elements of the ROK 1st Division and the US 1st Cavalry Division.[19] During the pursuit and exploitation phase of the breakout from the Pusan Perimeter, displaced local nationals sought to return to their homes. Military police units were once again decisively engaged in controlling the movement of refugees and military traffic. The reemergence of

a robust ROK government played an instrumental role in keeping this episode confined to a "controlled crisis." Amid a growing sense of pessimism and despair, refugees on or near MSRs were desperate for food and other supplies; thus, MPs had to be extra vigilant to prevent pilferage. A greater danger to operational mobility was that posed by enemy stay-behind-forces and guerrillas. Eventually, these irregular forces would concentrate in three geographic areas: The Chiri-san Mountains; northeast of Seoul (between the Pukhan River and the area that would become known as the Iron Triangle); and the Taebaek mountain region.[20] This asymmetrical threat was not effectively neutralized until 31 January 1952.

In less than six weeks, the battle front had moved northward more than 300 miles and on 24 November 1950, Eighth Army began its "final" push to the Yalu, River, which had as its objective the destruction of the North Korean regime and the unification of the peninsula. The full-scale intervention of the Chinese Communists Forces (CCF) in late November 1950 completely derailed the United Nations Command's "end-of-the-war" offensive and forced Eighth Army and X Corps (operating independently of one another) to transition to the defense. Through a series of synchronized attacks, the CCF would unceremoniously expel friendly forces from North Korea. Eighth Army (operating in northwest Korea) would withdraw overland; whereas, X Corps (operating in northeast Korea) would be evacuated by sea. As Eighth Army prepared to vacate Pyongyang, no less than 100,000 refugees fled southward from South Pyongyang Province and with numerous divisions using the same MSR, traffic on southbound routes became imperiled. Every available MP (ROK and US) and KNP were employed to untangle this "human knot."[21] To facilitate the movement of friendly troops and the control of refugees, military police units also participated in multiple rear guard actions. During the epic engagement at Kunu-ri, the 2nd Military Police Company would distinguish itself. One of its members, Sergeant First Class Robert F. Keiser was twice recommended for the Medal of Honor. Due to an administrative oversight, his heroism would go unrecognized for 64 years. During an awards ceremony held on 25 March 2014, he was retroactively awarded the Distinguished Service Cross.[22]

Because of the lack of timely intelligence, Walker was reluctant to establish a static defensive line. Instead, he selected a series of phase lines and intended to leap-frog in reverse from one to the next before friendly forces could be fixed, flanked, or enveloped. As soon as Eighth Army could occupy an effective line of defense, it would seek to return to the offensive. The imperative to this course of action relied upon the mobility of friendly

forces to gain separation from the enemy and in turn, this was dependent upon keeping the MSRs clear. Ultimately, Eighth Army would withdraw a total of 275 miles (which qualifies as the longest retreat in US military history). Eighth Army was unable to organize tenable defensive positions until it reached Line D (which ran through Pyongtaek-Wonju-Samchok). Also called the Pyongtaek Line, it lay 50 miles below the 38th parallel.[23] Few armies of the 20th Century have suffered such a dramatic reversal of fortune as the United Nations Command when the Chinese intervened in the Korean War. And to this day, the debate continues over Eighth Army's withdrawal from northwest Korea—was it a prudent retreat or a shameful "How-Able"—"Haul Ass"—operation?

On 4 January 1951, Seoul changed hands for the third time within a six-month period. The orderly evacuation of the South Korean capital exceeded expectations. As the last tank crossed over the Han River, it was followed by weary MPs. No doubt, the CPVA intervention had precipitated another mass exodus of refugees (both North and South Korean). Refugees that had only recently returned to their homes were now fleeing south again through the worst winter the peninsula had experienced in decades. The ROK government quickly established additional refugee

Figure 8.1. In the wake of the full-scale Chinese Communist intervention, refugees flee south with whatever possessions they can carry and through the worst winter the Korean peninsula experienced in decades. Photo courtesy of the National Archives.

camps (mainly in the Taejon area). With more than a million refugees stampeding south, the volume of displaced Koreans that soon flooded into Taejon was enormous, and in an effort to alleviate overcrowding, 200,000 refugees were re-routed by ROK and US military police units to nearby camps during the first two weeks of January alone.[24] In a desperate effort to escape the raging battles that were in progress, civilians crowded into every available train and thousands fled on foot. Ox carts, Mongolian ponies, and primitive "A" frames were employed to haul their few belongings. Many of those that rode on the tops of freight trains were killed when the train would pass through a tunnel and several of those that rode on top (or clung to the sides) succumbed to exposure. Subsequently, military police units were given orders to inspect all southbound trains in their area of responsibility and without exception, remove all refugees. Thereafter, trains arriving in Taejon were relatively free of refugees as a result of this initiative.[25] During this time period, numerous children were separated from their families and/or simply abandoned; these children would have perished if they had not been recovered by MPs and other service members and transported to safety.

The evacuation of X Corps from northeast Korea was conducted from three ports (Songjin, Wonsan, and Hungnam) and from Yonpo Airfield. The evacuation of X Corps from Hungnam proved most spectacular as a logistical exercise, and it represented the main effort of X Corps's evacuation from northeast Korea. During the evacuation of Hungnam, 193 shiploads of men and material were successfully transported to the port city of Pusan. Approximately 105,000 military personnel; 91,000 civilian refugees; 17,500 vehicles; and 350,000 tons of supplies were evacuated by sea. This qualified as the largest amphibious operation of the Korean War and was frequently referred to as an "amphibious assault in reverse."[26] The evacuation of civilian refugees was not a military necessity, rather it was a purely humanitarian endeavor. In support of this operation, the 772nd Military Police Battalion established around-the-clock port security to prevent any possible sabotage to ships and harbor facilities by enemy infiltrators and to prevent pilferage by local nationals. MP units also counted the houses in Hungnam to help tally the possible number of refugees and as a tide of other refugees flooded into the area, collecting points were established on the beach where these individuals were fed, properly clothed, and provided with basic medical care. Because many of these displaced civilians were determined to take along their most valued possessions, even "honey" buckets and "honey" carts—Port-A-Johns—had to be searched for contraband. For five days and nights, MPs collected and loaded refu-

gees and 300 enemy prisoners of war.[27] The evacuation of X Corps from Hungnam was completed on Christmas Eve of 1950 as the 3rd Infantry Division, acting as the rearguard, embarked for Pusan.

In the midst of all of this, Walker was killed in a jeep accident on 23 December 1950 and was replaced on 26 December by Lieutenant General Matthew B. Ridgway. Ridgway's assumption of command also marked a defining moment in the Korean War. Anxious to regain contact with the enemy, he ordered a series of limited objective attacks that began in mid-January 1951. Inspired by these successes, Ridgway issued orders for a major counterattack that commenced on 25 January. Operation Thunderbolt began as a reconnaissance in force and differed from previous offensives in that the advance was cautious and deliberate until gradually "snow-balling" into a full-scale attack. This operation was force-oriented rather than terrain-oriented; any ground that was taken was immaterial to closing with and destroying the enemy. This was a concept that the rank and file soldier could grasp and it became known as the "Ridgway mission." Subsequently, Operations Roundup, Killer, and Ripper followed this pattern and on 15 March 1951, Seoul was recaptured—the fourth and last time that the South Korean capital would change hands during the course of the war. By the end of the month, Eighth Army had fought its way back to the 38th parallel and three weeks later, established a strong defensive position 20 miles beyond (in most places along the main line of resistance). By the spring of 1951, both opposing armies had concluded that the issue of achieving a decisive military victory was no longer a viable option.[28]

However, the Chinese were determined to launch one last major effort to capture Seoul. Once this was achieved, the Communists would advocate for a cease-fire. The Chinese Fifth Phase Offensive (also known as the CCF Spring Offensive) employed an unprecedented amount of artillery support; however, it still relied upon massive numbers of infantrymen for battlefield success and as such, 30 Chinese divisions were committed to this two-phased campaign—which qualified as the largest ground action of the Korean War. The CPVA failed miserably in its attempt to capture Seoul and sustained catastrophic losses in the process. By the summer of 1951, the Korean War had definitely entered a new phase. The military situation on the ground had developed into a positional and stalemated conflict. Thus, it seemed mutually advantageous for the belligerents to initiate negotiations and to transfer a stalemated military situation to the conference table.[29] The history of the Korean truce talks began on 10 July 1951 and after two years of intricate, verbose and exasperating dialogue, an armistice was finally consummated on 27 July 1953. During this phase

of the Korean War—the "active defense"—combat engineer units shifted their priority to survivability tasks with an emphasis on the construction of field fortifications. Throughout the Korean War, general engineering missions such as road repair and maintenance helped to improve and maintain the infrastructure essential for sustaining military operations.

In the summer-fall of 1951 when the main line of resistance solidified, 80,000 farmers from South Korea were moved to points north, east, and west of Seoul to plant and harvest rice. This project was supervised by ROK and US military police units and screening teams from the United Nations Civil Assistance Command Korea (UNCACK) and heralded the final stage of the "refugee problem."[30] More determined than ever to return to their ancestral homes, displaced civilians ignored the limit of advance that had been imposed upon them for their own safety by Eighth Army (a boundary known as the "Farmer's Line.") During the stalemate phase of the war, it was Eighth Army's policy to keep civilians 20 miles south of the main line of resistance. Fortunately, military police units were no longer suffering from critical personnel shortages; additional MP units had been activated in-country; veterans had learned valuable lessons based upon first-hand experience; and replacements arriving from the United States were well-trained. Additionally, MPs took advantage of some force modernization assets that had previously been unavailable for their use.

The helicopter, boasting both vertical lift and hover capability, became a coveted asset. These rotary wing aircraft were employed to locate groups of refugees and by using the "herding" technique, refugees could be turned around or diverted to collecting points. If necessary, helicopters could be used to rapidly transport military policemen to critical points on the ground. Loudspeakers mounted on helicopters were also used to disseminate instructions and printed leaflets were dropped to reinforce these directives. Refugees soon determined that their best chance of success was to stay off the highways and to take the trails over the mountains. This tactic was largely mitigated by continuous patrolling by light aircraft and wheeled vehicles. MP aerial observers could easily detect indicators of habitation—clothes on the lines, smoke from chimneys, and footprints in the snow.[31] Concurrently, the M20 Armored Utility Car was introduced into the fleet of MP vehicles. These armored cars provided greater firepower and survivability than the M38 and M38A1 jeeps and equal on-road mobility.[32] For all practical purposes, the "refugee problem" had been conquered by the end of 1951.

EPW Operations

EPW operations began in July 1950 when 224 North Korean soldiers were captured. The first prisoners taken by non-ROK units was recorded on 2 July 1950. The USS *Juneau*, the HMS *Jamaica* and the HMS *Black Swan* engaged four North Korean Navy torpedo boats and two motor gun boats near the coastal village of Chumunjin. Five of the six enemy boats were destroyed and five (some accounts indicate six) survivors were rescued/captured.[33] With the initial commitment of US ground troops, the 24th Military Police Company established forward collecting points at Kongju and Chochiwon to facilitate the transfer of EPWs to a POW enclosure that had been established at Taejon.[34] As the war progressed, transit camps would also be utilized. The overall objective was to expedite the evacuation of EPWs so that frontline units could be promptly relieved of the responsibility for guarding, housing and feeding prisoners. The Korean War witnessed two great surges in the numbers of EPWs captured—during the pursuit and exploitation phase associated with the breakout from the Pusan Perimeter and as a result of the CCF Spring Offensive. Due to the lack of transportation assets in the first weeks of the war, it became standard practice to use supply trucks to transport EPWs to the rear. Since trucks returning to supply dumps were carrying no cargo and added no additional traffic to the roads, this method proved quite satisfactory and was adopted for the entirety of the Korean War.[35] Evacuation procedures vastly improved with the increase in the number and types of MP units and later on, EPWs were transported to rail centers by truck (short-haul) and then evacuated to camp enclosures by rail (long-haul). This method optimized the existing infrastructure to the fullest.

The processing/handling of EPWs began immediately upon capture and the five "S's" were rigorously applied: Search, Silence, Segregate, Speed-to-the-Rear, and Safeguard. Victims of their own propaganda, North Korean soldiers were initially reluctant to surrender for fear that they would be shot by their captors. The risk of being shot by their own leaders was another deterrent.[36] Many that were captured during the early weeks of the Korean War had been seriously wounded and were evacuated through medical channels. Others attempted to conceal weapons with the intent of using them. To combat this menace, "Marines routinely had each prisoner of war strip buck naked. However, on a single occasion, they were shocked to find two women among the captured North Koreans. Someone helpfully provided two pairs of long johns, but the American press had a field day when the women got to the rear and complained."[37] Thus, this

practice was abruptly abandoned. Nevertheless, EPWs were quickly segregated by rank, gender, nationality, political/ideological views, and combatant status. The latter two became problematic.

Thousands of refugees were picked up and absorbed in the prisoner of war stream in the early stages of hostilities. Subsequently, most of these individuals were reclassified as civilian internees (CIs) and those that were reclassified from EPW to CI status were released under two operations. During Operation Homecoming (July–August 1952), 27,048 individuals were released to ROK government custody and after additional processing, they were returned to their home provinces. During Operation Thanksgiving (October 1952), another 11,407 civilian internees were reclassified and released to their home provinces in the same manner as Operation Homecoming.[38] Guerrillas and Communist sympathizers were also subjected to reclassification if extenuating circumstances warranted such action. It was also discovered that many South Korean males of military age had been pressed into service against their will by the Communists and some ROK Army soldiers that had been captured by the North Koreans found themselves in the same predicament. In these cases, the individual appeared before a board to determine his loyalty and the ROK authorities exercised a prominent role in these procedures. As a result, 37,625 individuals were cleared for release.[39] Another level of concern involved the number of Chinese Nationalists that filled the ranks of the CPVA. At the end of the Chinese Civil War in October 1949, many of these veterans were given the unappealing choice of being summarily executed or enlisting in Mao's army. To provide an example, 70 percent of the soldiers that comprised the CPVA 124th Division had served in Chiang Kai-shek's Nationalist Army.[40]

By 15 September 1950, friendly forces had captured and interned at the Eighth Army camp enclosure 3,380 North Koreans.[41] On 28 September, the day it reentered Taejon, the 19th Infantry Regiment had captured so many North Korean stragglers, that it was unable to keep an accurate count of them. By the end of September and unlike the previous weeks of brutal combat, prisoners were being taken in such large numbers that existing facilities were inadequate to accommodate them. Thus, additional enclosures and a hospital were hastily constructed in the Pusan area. Located on the outskirts of Inchon, an abandoned prison compound with a large courtyard, formerly used by the Japanese to intern Allied prisoners during World War II, was conveniently converted to a camp enclosure and soon after, camp enclosures would be erected at Pyongyang.[42] During this period, many North Korean soldiers expressed relief upon capture; exhibited a docile attitude; and displayed a belief in an early cessation of

hostilities. "The latter seemed fully justified to the MPs that were escorting hundreds of EPWs with only a token number of personnel and without incident. For example, seven MPs escorted 520 prisoners to a camp enclosure at Inchon on 24 September and on 27 September, two MPs brought in an additional 115 prisoners."[43] Because the ROK government was unlikely to assure humanitarian treatment, Eighth Army took sole responsibility for the custody of EPWs on 26 September 1950. The intent was to place EPWs under US control as soon as possible after capture to ensure compliance with the Geneva Convention.[44] Another motivating factor in support of this unilateral decision concerned the various units which comprised the United Nations Command. Differences in interpreting the articles of the Geneva Convention might have been a cause for friction. By assuming singular custody of EPWs, this potential 'minefield' was avoided.

On 25 October 1950, the ROK 1st Division clashed with an enemy force near Unsan, North Korea, and captured three enemy soldiers—the first Chinese Communist EPWs of the Korean War. By the end of October, the EPW population would increase to 38,250 and to 81,765 by the end of November. By the end of December 1950, this figure expanded to 113,873.[45] With the full-scale CCF intervention in late November 1950, friendly forces were compelled to conduct a series of large-scale withdrawals. Concurrently, several EPW facilities were closed and prisoners were transferred to the Pusan area; EPWs held at Chinnampo, Inchon and Hungnam were evacuated by sea. As the principal port of entry for troops and supplies, it was soon deemed prudent to relocate the preponderance of EPWs elsewhere. This initiative also acknowledged that in the event friendly forces had to vacate the peninsula, Pusan would experience a role reversal: It would serve as the principal port of embarkation and evacuation. Cheju-do was initially considered, but was discounted because it was overcrowded with refugees; potable water on the island was scarce; it had a history of weak government control and periodic civil unrest; and a ROK government in exile might opt to establish a seat of government there. The possibility of finding a site "within the continental United States, one of its territories, or in some area under its control" was also briefly entertained.[46] Ultimately, Koje-do (an isolated and sparsely populated island located 40 miles off the southeast coast of the Korean peninsula) was selected. Construction of camp facilities began on 1 February 1951 and by the end of the month, 53,588 EPWs had been re-located from Pusan to Koje-do as part of Operation Albany. By 31 March, the total camp population on that island would number 98,799.[47]

By this date, Seoul was in friendly hands (for good) and Eighth Army had reestablished itself at the 38th parallel and was continuing to fight its way north. In its push to Line Kansas, Eighth Army had captured 4,800 Chinese and North Korean soldiers. This elevated the total number of EPWs to 143,952: 103,635 North Koreans; 37,625 South Koreans that the NKPA had impressed into service; and 2,702 Chinese.[48] On 22 April 1951, the CPVA launched its Spring Offensive which resulted in the worst defeat imposed upon the Chinese Communists during the Korean War. The defeat of the Chinese 5th Phase Offensive led directly to truce talks; moreover, soldiers of the CPVA which had rarely surrendered up to this point were now more inclined to embrace that option; 95 percent of EPWs were captured during the first year of the war. Thus, the establishment of additional transit camps was required to facilitate the expeditious evacuation of EPWs from division collecting points. Transit camps were established at Suwon, Chechon, Taejon, Hayang, Yongdong-po and Parhan-ni; the camp at Chechon was soon moved to Wonju and between 26–31 May 1951, 4,750 EPWs were processed through Wonju alone.[49] By the end of May, the number of Chinese EPWs approached 38,000 and the prisoner population on Koje-do was increasing at such a staggering rate that it exceeded the capability for friendly forces to effectively manage.[50] Because Koje-do was an island, it was erroneously presumed, at the time, that the EPW population did not represent a threat to military operations. The UNC would belatedly realize that the monumental challenge posed by EPWs during the Korean War did not occur on the battlefield, but behind barbed-wire.

With the visibility of hindsight, the sense of urgency in removing prisoners from Pusan was understandable; however, the speed of execution would prove costly. The rate of EPW shipments far outpaced the construction of facilities and compounds designed for a capacity of 4,500 were overcrowded by as much as 100 percent.[51] With the failure of the CCF Spring Offensive, large numbers of additional EPWs were sent to Koje-do. Initially, internment operations were based on the experiences of both World Wars; prisoners were fed, housed, clothed, provided medical care and guarded—nothing more. The Geneva Convention of 1949 established the concept of EPW rights and obligations while in captivity; however, the Chinese and North Koreans viewed POW camps as an extension of the battlefield. The first collective violence against camp personnel occurred on 18 June 1951 and resulted in the deaths of three prisoners; eight other EPWs were seriously wounded.[52] EPW intransigence would steadily escalate and it was later learned that specially trained

agents would engineer their own capture/surrender in order to gain access to the POW Camp at Koje-do. These agents would organize mass-scale violence against camp authorities and had been trained to incite riots and mutiny in the prison camps.

The armistice negotiations that began at Kaesong on 10 July 1951 (and transferred to Panmunjom on 25 October 1951) also instilled a false sense of security and complacency among the detaining force. Passive resistance, mass defiance, and occasional violence was not initially considered a cause for undue alarm. Camp authorities viewed these incidents as isolated occurrences, and it wasn't until much later that officials realized otherwise. Initiatives designed to reorganize EPW compounds and disperse EPWs into enclosures of more manageable size galvanized pro-Communist EPWs to drastic action—which culminated in the capture of the camp commandant, Brigadier General Francis T. Dodd, on 7 May 1952. He was "kidnapped" for the express purpose of disrupting the on-going Armistice negotiations; to damage the prestige of the United States; to wreck the UNC screening process; and to extract concessions. That same day at the Panmunjom conference table, delegates reached agreement on Item 3 (concrete arrangements for a ceasefire and armistice in Korea to include oversight mechanisms to enforce both). This left only Item 4 (prisoner repatriation) as the only issue to be resolved before an armistice could be realized.[53] Meanwhile, Brigadier General Charles F. Colson was rushed to the island to take command. In a misguided attempt to secure Dodd's release and to localize the incident, he signed a statement admitting to mistreatment of prisoners and that the screening process would be suspended. Seventy-eight hours after his abduction, Dodd was released unharmed.

On 14 May 1952, Brigadier General Haydon L. Boatner assumed the duties as commandant of the Koje-do POW Camp—the 14th commandant within a 16-month time period. An "old China-hand" and a Chinese linguist, he forcefully and effectively conveyed a message to the enemy POWs: "Prisoners don't negotiate."[54] He quickly drove a wedge between the Chinese and North Korean EPW leadership; readily identified the Chinese and North Korean "honchos" and had these ringleaders separated from the general prison population; and introduced non-lethal chemical incapacitating agents and riot control tactics to subdue rebellious compounds—reducing the number of EPW fatalities engaged in violent protests. By the end of June 1952, EPWs had abandoned their enthusiasm for conducting large-scale violence against their captors and as a testimony to Boatner's leadership, one magazine soon described Koje-do as the "Alcatraz of Korea."[55] Although exaggerated, under his capable leadership,

decisive action was taken and order and discipline were restored. However, incidents on a smaller scale would continue and the "Swan Song" of this chapter would appropriately conclude with the formal exchanges of prisoners of war.

Operation Little Switch, the exchange of sick and wounded POWs, was conducted between 20 April and 3 May 1953. The United Nations Command returned over 6,670 EPWs and civilian internees.[56] While en

Figure 8.2. Sergeant Chang Myong-oh, a Republic of Korea military policeman, displays weapons found in Prisoner Compound No. 72, Koje-do. EPWs made the knives and spear heads from the steel supports of their shoes, the sharp daggers from oil drum metal, and spears from tent poles. Photo courtesy of the US Army.

route to the exchange areas, EPWs refused DDT dusting, demonstrated, and staged hunger strikes to create the impression that they had been mistreated. In contrast, the Communists released 684 UNC/ROK POWs.[57] During Operation Big Switch, the full-scale exchange of prisoners of war was conducted between 5 August and 6 September 1953. The UNC returned 75,823 EPWs to Communist control. The Communists returned 12,773 UNC/ROK POWs (including 3,597 Americans); 2,634 US service members died while in captivity. Currently, more than 7,800 US service members remain unaccounted for from the Korean War.[58] Operation Big Switch went relatively smoothly, marred for a while only by the unruly behavior of some diehard Communist EPWs. They shouted slogans, defiantly waved Communist flags, hurled insults at UNC personnel, and spat in the faces of supervising officials. With the conclusion of Operation Big Switch on 6 September 1953, the "EPW problem" died a "natural death."

Conclusion

The Military Police Corps accrued valuable and costly lessons associated with its participation in the Korean War. Foremost among these, training—a cornerstone of "Military Americana"—is non-negotiable. Training must be realistic and hands-on; conducted to standard; properly supervised and evaluated; and corrective actions must be applied soonest when deficiencies are noted. The absence of training in peacetime has dire consequences in wartime and like many of its sister branches, military police units that initially entered the Korean War were poorly-trained and poorly-equipped. For those MPs that deployed to the peninsula at the outset of hostilities, experience proved to be the best teacher, and those individuals that didn't learn fast enough were "carried from the battlefield on their shields." MPs on the battlefield routinely operate as flexible, tactical elements and oftentimes during the Korean War, military police companies functioned as three separate platoons and platoons operated in three and four-man teams. Most notably, MP units participated in combat, combat support, and combat service support missions during the Korean War. Today's military must be globally responsive and individual soldiers and units must be highly trained to operate decisively across the full spectrum of operations in a multi-domain environment.

Mission, Enemy, Terrain, Troops and Support Available, Time and Civilian Considerations (METT-TC) remain as applicable today as it did during the Korean War. In the case of the latter, vibrant, cosmopolitan urban centers span the globe. When the Korean War began, Seoul had a population of 900,000. Today, the South Korean capital has a population of 10.5 million and the Seoul metropolitan area boasts a population of

25.5 million. As of May 2018, the world population numbers 7.6 billion; in 1970, there was half as many people in the world as there are now.[59] In future large-scale combat operations, the expectation that the US Army would encounter a "refugee problem" is a supremely valid assumption and no doubt, large-scale combat operations would result in the displacement of tens of thousands of noncombatants. The "refugee problem" experienced in the Korean War would pale to insignificance in comparison, and most of these refugees would be comprised of women and children and the elderly. Host nations may not have the resources and capacity to cope with a refugee crisis and/or friendly forces could be operating in an environment with a hostile government. Thus, refugees could be sympathetic to the enemy or could actively engage in guerrilla warfare. Thievery and black marketing represents another asymmetrical threat associated with refugees and these criminal activities could inadvertently or purposely promote acts of terrorism. Fresh water, rations, fuel, and clothing will all qualify as high-demand items and the theft of these items could potentially threaten the ability of maneuver forces to refuel, rearm and resupply. To protect the force, the US Army must be prepared to work with host nations, coalition partners, and to use its own resources to cope with noncombatants and reduce the likelihood of collateral damage, civil unrest, guerrilla warfare, irregular/hybrid threats, starvation and disease.

During the Korean War, friendly forces encountered an unprecedented, highly-orchestrated asymmetrical threat. Chinese and North Korean EPWs enthusiastically embraced the role of combatants even in captivity and were determined to fight in whatever way their Communist leaders dictated. The lessons of Koje-do are extremely relevant to today's Global War on Terror. Waging combat against radicalized jihadists that disregard the international rules of warfare reflect the same attitude displayed by the Communist Chinese and North Koreans during the Korean War. Expectations that these extremists will convert to a docile demeanor upon capture is a concept without merit. EPW resistance at Koje-do produced ample lessons in handling militant captives who still considered themselves as active combatants (which were very applicable to large-scale detainee operations in Iraq) and would undoubtedly apply to any large-scale combat operations in the future. Most importantly, one does not "negotiate" with EPWs; undisputed authority must be established at the outset and firm control must be maintained; adequate facilities must be secured and sufficient personnel must be available to perform the EPW mission; and individuals and units must be thoroughly trained in detainee operations. Specially trained agents that "infiltrated" the EPW camp at Koje-do were

cleverly aided and supported by "local hires" and even ROK Army prison guards. Due to globalization, national boundaries have become more blurred (especially in Europe) and it is important to realize that the United States is no longer an "isolated fortress. Clandestine adversaries could easily be present within our formations or in the formations of our allies.

Maintaining technological overmatch capabilities is largely dependent upon force modernization initiatives. Advances in technology that enhance the ability to shoot, move, communicate and sustain must be exploited to full advantage, and tactics must keep pace with technology! Another consideration at the user-level is that combat multipliers all have this in common: "If not employed, they're not effective." Soldiers must be proficient in the employment of weapons, vehicles, and survivability-enhancing equipment. However, force modernization is not just restricted to hardware (weapons systems, aircraft, vehicles, communications systems, etc.). Force modernization encompasses Doctrine, Organization, Training, Materials, Leadership and Education, Personnel, and Facilities (DOTMLPF) and operational concepts and organizational constructs must shape the way we use technology. The potential for adversaries to achieve overmatch capabilities in selected areas is a serious concern and a real possibility; thus, the US Army must endeavor to gain maximum synergistic effect from future technological investments to maintain overmatch in cross-domain operations, and if necessary, force structure must be reorganized to sustain overmatch capabilities. Equally important, basic soldier skills must be maintained in the event of technological failures/shutdowns.

During its 474th meeting on 28 June 1950, the United Nations Security Council passed UNSC Resolution 83, calling upon member nations to assist the Republic of Korea in repelling North Korean aggression and to restore international peace and security in the area. This resolution (in concert with UNSC Resolution 82 passed on 25 June 1950) provided the legal basis for collective intervention in the Korean War. Ultimately, 16 member nations responded (United States, United Kingdom, Australia, Belgium, Canada, Colombia, Ethiopia, France, Greece, Luxembourg, Netherlands, New Zealand, Philippines, South Africa, Thailand, and Turkey). Five other member nations provided medical units (India, Italy, Sweden, Denmark, and Norway). Coalitions represent both the history and the future of US warfare and for the foreseeable future, US military commanders will most often be the leaders of multinational coalitions. Without question, major combat operations with multinational forces are inherently more difficult to organize and execute than those with national forces; likewise, joint operations represent significantly greater complexity than single-service op-

erations. However, joint and combined operations provide increased warfighting capabilities and coalition partnerships can add a large measure of "legitimacy" to a military operation. During the Korean War, military police units routinely exchanged liaison officers with the KNP and ROK MP units. This initiative was not unique to the Military Police Corps; it was a universal practice. Liaison officers were also exchanged/embedded with other UN member states that committed combat troops/medical detachments in support of South Korea. Leveraging coalition partners to meet a common threat vastly increases the odds of success on today's modern battlefield, and future large-scale combat operations have the potential to qualify as the most violent armed conflict in the history of mankind.

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Chapter 9

Egyptian Engineers: Linchpin in the Suez Canal Crossing Operation of 6 October 1973

George W. Gawrych

After the Israeli triumph in the Six Day War, no Arab army or coalition of armies seemed a match for the Israel Defense Forces (IDF) in a conventional war. Israel's victory in 1967 rested on the three pillars of intelligence, the air force, and armored forces; together they allowed the Israelis, though outnumbered, to win dramatically against three Arab armies of Egypt, Jordan, and Syria.[1] It seemed unlikely that any army would wage a conventional war against an adversary superior in these three critical areas of maneuver warfare. But the Egyptians, in conjunction with the Syrians, would find ways to exploit Israeli vulnerabilities in each area, and the cumulative effect of these exploitations would produce tremors within Israel both during and after the 1973 war.

All indicators suggested that Egypt, Syria, and Jordan would require a generation before they could face Israel in another major war. The IDF had clearly demonstrated its military prowess on the battlefield, while the three Arab states had shown considerable military ineptitude. For the Arabs to attack from their position of military weakness with the goal of achieving political gains seemed to make little sense. But Egypt surprised everyone by doing just that.

For Egypt to gain any military or political success against Israel in the 1973 Middle East War depended on the Egyptian Armed Forces first crossing the Suez Canal, then assaulting the Bar Lev Line, and finally establishing secure bridgeheads on the eastern bank. These challenges were, first and foremost, an engineering problem, and therefore, the achievement of crossing the Suez Canal depended upon, in many respects, the competence of the Egyptian Corps of Engineers.

The Bar Lev Line and Israeli Defenses

The 1967 Arab-Israeli War had suddenly changed Israel's strategic situation in the Middle East. In addition to gaining the West Bank, the Golan Heights, and the Gaza Strip, Israel occupied the entire Sinai Peninsula, gaining for the first time a defensible frontier with Egypt along the Suez Canal. Despite the decisive defeat of its army, however, the Egyptian regime refused to adopt the posture of a defeated nation. Consequently, less than a month after the war, hostilities between the two countries broke out with an artillery duel ushering in a long war of attrition (1967–70).

The Suez Canal now emerged as the new battleground of the Arab-Israeli conflict, and Israel eventually found itself suffering an unacceptable level of casualties defending the canal.

Toward the end of 1968, the Israeli General Staff decided to take advantage of the natural barrier presented by the Suez Canal and built fortified positions all along its 160-kilometer length. These concrete fortifications would help the IDF limit its casualties caused by the massive Egyptian artillery fire directed against Israeli troops on the east bank. In 1969, Israel completed what became known as the Bar Lev Line, named after then chief of the General Staff, Lieutenant General Haim Bar Lev.

Designed as early-warning observation posts along the Suez Canal, the Bar Lev Line matured into a defense system with a depth of 30 to 40 kilometers designed to deter the Egyptians from launching a major amphibious operation. To Egyptian planners, the first major obstacle in the Israeli defenses was the Suez Canal which Moshe Dayan, Israeli Defense Minister in 1967 and former Israeli Chief of the General Staff during the Sinai Campaign, referred to as "one of the best anti-tank ditches in the world."[2] Constructed in the desert, the canal is an artificial waterway 180 to 220 meters wide and 16 to 18 meters deep. To prevent sand erosion, the canal's banks are lined with concrete that rises above the water line. At high tide, the water flows a meter below the top of the concrete wall; at low tide, the water runs three meters below the top (four meters below in the southern part of the canal).

The Israeli General Staff incorporated the Suez Canal into its defensive plan for the Sinai called *Dovecoat*. At the water's edge of the canal, the Israelis constructed vertical sand ramparts that rose at an angle of 45 to 65 degrees and to a height of 20 to 25 meters to prevent the Egyptians from landing tanks and heavy equipment without prior engineering preparations on the east bank. Israeli military planners expected that the Egyptians would need at least 24 to 48 hours to break through this barrier and establish viable bridgeheads.

As a final touch to take advantage of the water obstacle, the Israelis installed an underwater pipe system designed to pump flammable crude oil into the Suez Canal to create a sheet of flame. This burning furnace would scorch any Egyptians attempting a crossing. Some Israeli sources claim the system was unreliable. Nevertheless, the Egyptians took this threat very seriously, and, on the eve of the war, during the late evening of 5 October, teams of frogmen blocked the underwater openings with concrete.[3]

At the top of the sand ramparts that ran the length of the canal, Israeli engineers constructed 30 strongpoints at 7 to 10-kilometer intervals. Built several stories high into the sand, these concrete forts were designed to provide troops with shelter from 1,000-pound bombs as well as offer creature comforts such as air conditioning. Above ground, the strongpoints' perimeters averaged 200 by 350 meters, surrounded by barbed wire and minefields to a depth of 200 meters. The entire length of the canal contained emplacements for tanks, artillery pieces, mortars, and machine guns so that Israeli soldiers could foil an Egyptian crossing at the water line.

To support the rapid movement of Israeli troops to the possible Egyptian crossing zones, the IDF constructed an elaborate road system. Three main roads facilitated movement north and south. Lexicon Road ran along the canal and allowed the Israelis to conduct patrols between the strongpoints. Ten to 12 kilometers east of Lexicon stood Artillery Road, with some 20 artillery and air defense positions and tank and logistic bases. Thirty kilometers from the waterway, Lateral Road allowed the Israelis to concentrate operational reserves for a major counterattack. A number of other roads running east and west were designed to facilitate Israeli counterattacks against the Egyptian crossing sites.

The defense of the Sinai depended upon two plans, *Dovecoat* (*Shovach Yonim*) and *Rock* (*Sela*).[4] In both plans, the Israeli General Staff came to expect the Bar Lev Line to serve as a "stop line" or *kavatzira*—a defensive line that had to be held at all cost.[5] As noted by an Israeli colonel shortly after the War of Attrition, "The line was created to provide military answers to two basic needs: first, to prevent the possibility of a major Egyptian assault on Sinai with the consequent creation of a bridgehead which could lead to all-out war; and, second, to reduce as much as possible the casualties among the defending troops."[6]

To prevent a limited Egyptian crossing operation, *Dovecoat* called for the employment of only regular forces. Responsibility for defending the Sinai fell mainly upon the regular armored division, supported by an additional tank battalion, a dozen infantry companies, and 17 artillery batteries for a total of over 300 tanks, 70 artillery guns, and 18,000 troops. The mission of these regular forces was to defeat an Egyptian crossing at or near the water line. The armored division deployed one armored brigade forward near the Bar Lev Line with two armored brigades in reserve, one to reinforce the forward armored brigade and the other to counterattack against the Egyptians' main effort. One was located at Bir Gifgafa, the other at Bir Tamada, east of the Giddi and Mitla Passes. Should the regular armored division face a major offensive, the Israeli military would activate

Rock, a plan mobilizing two reserve armored divisions with support elements. Their employment would signify a major war.

On the eve of the October War, the IDF possessed three vulnerabilities in its Sinai defense system. First, because of the religious holiday of Yom Kippur, only some 800 infantry troops, mainly reservists instead of regular units, manned the 20 or so strongpoints along the Bar Lev Line. Second, the Bar Lev Line had experienced some degradation after the War of Attrition, which had ended in August 1970. The IDF gradually closed some fortifications, cutting the number of strongpoints from around 30 to approximately 22. Third, all Israeli planning was thus predicated on the assumption of a 48-hour warning to be provided by Israeli Military Intelligence. During these two days, the Israeli Air Force (IAF) would assault the Egyptian air defense systems while the army mobilized its reserves and deployed them in the Sinai according to plan. On land, the Israelis expected to defeat the Egyptians with tank-heavy brigades, with Israeli pilots providing reliable "artillery" support to counter the Egyptians' firepower. The forward armored brigade was deployed in three tactical areas running from north of Qantara to Port Tawfiq in the south. Each forward tactical area contained a tank battalion of 36 tanks whose primary mission, in case of an Egyptian attack, was to move to the water line and occupy the firing positions along the ramparts and between the fortifications.

Despite its imperfections, the Bar Lev Line, while not constructed as a Maginot Line, still presented a formidable barrier. The Israeli senior command expected it to function as a graveyard for Egyptian troops, helping to foil a major Egyptian effort to establish bridgeheads on the east bank. Consequently, the Egyptian General Staff had to devote a great deal of time, effort, and resources in developing a plan for overcoming the line, and the Egyptian Corps of Engineers played a key role.

Egyptian Military Aims and Plan

To achieve any success against the IDF, the Egyptians had to penetrate the sand embankments of the Bar Lev Line while simultaneously exploiting cracks in the three Israeli pillars of intelligence, air force, and armor. The responsibility for breaching the earthen embankments before the IDF could react with sufficient repelling force fell to the Engineer Corps, under the command of Major General Gamal Ali. Upon this engineering problem rested much of the crossing operation's tempo. To clear a path 7 meters wide for the passage of tanks and other heavy vehicles involved removing 1,500 cubic meters of sand. Meanwhile, in the Egyptians'

worst-case scenario, Israeli tank companies and battalions might launch counterattacks within 15 to 30 minutes, with the two armored brigades in reserve arriving in two hours. Breaching operations, therefore, had to achieve success quickly.

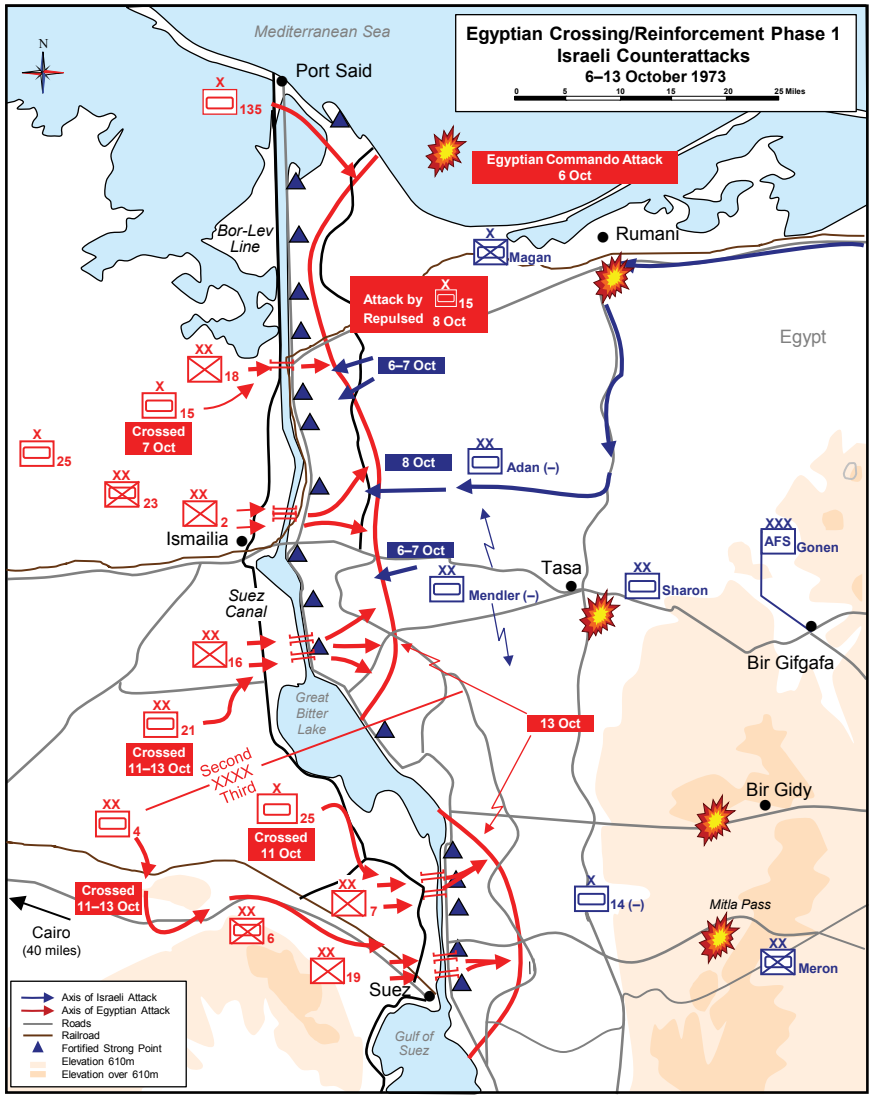

Figure 9.1. Egyptian Crossing/Reinforcement Phase 1 of Israeli Counterattacks. Map of Sinai front showing the Bar Lev Line with its extensive road network and initial disposition of troops on 6 October 1973. Map created by Army University Press.

To facilitate these operations, the Egyptian General Command assigned six missions to the Engineer Corps:

1. Open 70 passages through the sand barrier.
2. Build 10 heavy bridges for tanks and other heavy equipment.
3. Construct five light bridges, each with a capacity of 4 tons.
4. Erect 10 pontoon bridges for infantry.
5. Build and operate 35 ferries.
6. Employ 750 rubber boats for the initial assaults.[7]

Of the six tasks, the first proved the most critical.

To expedite the breaching operation, the Egyptians discovered a simple yet ingenious solution: a water pump. Other methods involving explosives, artillery, and bulldozers were too costly in time and required nearly ideal working conditions. For example, 60 engineers with 600 pounds of explosives and one bulldozer required five to six hours, uninterrupted by enemy fire, to clear 1,500 cubic meters of sand. Construction of the much-needed bridges would consequently begin much too late.

At the end of 1971, a young Egyptian officer, or perhaps an NCO, suggested a small, light, gasoline-fueled pump as the answer to the crossing dilemma. So, the Egyptian military eventually purchased 300 British-made pumps and found that five such pumps could blast 1,500 cubic meters of sand in three hours. Then, in 1972, the Corps of Engineers acquired 150 more-powerful German pumps. Now a combination of two German to every three British pumps would cut the breaching time down to only two hours. This timetable fell far below that predicted by the Israelis, who apparently failed to appreciate the significance of the water cannons used by the Egyptians during their training exercises.

The Egyptian Corps of Engineers also participated in the deception plan to surprise the Israel Defense Forces. The corps, for example, failed to complete certain projects to give the appearance of unpreparedness for offensive operations. Meanwhile, the engineers worked to ensure secrecy in approach areas to the canal and hid troop dispositions. A sand rampart was constructed on the western side of the canal to conceal final Egyptian troop movements. To prevent the compromise of the date and time of the offensive, the Egyptian General Command informed its lowest level troops the night before the impending attack. The Corps of Engineers thus strengthened defensive positions and passage routes near the Suez Canal largely in the spirit of a training exercise.

When the war broke out at 1405 on 6 October 1973, the engineers were poised to perform their numerous assignments. The first infantry

wave began at 1420 and involved approximately 1,000 Egyptian rubber boats and 8,000 men. Two engineers piloted these boats back and forth across the Suez Canal while the infantry scaled the ramparts. At 1430, an Egyptian soldier raised his national flag on the east bank.

After scaling the ramparts, the Egyptian infantry bypassed strong points to establish ambush positions for the anticipated Israeli counterattacks. Meanwhile, combat engineers followed the infantry screen and began clearing the minefields that the Israelis had placed around and between the strongpoints. The immediate goal was to establish bridgeheads to a depth of 3 to 5 kilometers.

The second assault wave focused on tackling the sand barrier. The Corps of Engineers had formed some 70 engineer groups specially tailored for this task. Each group had to breach a single passage. Working from wooden boats, these engineers attached their hoses to the water pumps and began attacking the sand obstacle. Many breaches occurred within two to three hours—according to schedule.

In some areas, however, the engineers experienced unexpected friction. In particular, the Egyptian Third Army encountered difficulty in its sector in the south. Here, the clay proved resistant to high-water pressure and thus imposed delays in the breaching operations. Engineers in the Second Army erected their bridges and ferries within nine hours, whereas the Third Army's engineers generally needed 16. Moreover, breaching the sand barrier created mud one meter deep in some areas. Thus, the engineers had to fix floors for the passage of heavy vehicles. Among the materials used were wood, rails, stone, sandbags, steel plates, and metal nets.

Two hours after the initial landings on the east bank, 10 bridging battalions on the west bank descended to the water's edge to place bridge sections into the water. The Egyptians used the PMP heavy folding pontoon bridge. This Soviet-made bridge allowed the Egyptians to shorten the erection time of bridges by a few hours and to repair damaged bridges more rapidly by simple unit replacement. It could take only 90 minutes or so to construct a PMP bridge. Its rapid construction also caught the Israelis and even Western armies by surprise.

Within an hour of their descent, bridging engineers began their work, while a dummy bridge battalion constructed light bridges to serve as decoys. The dummies effectively diverted Israeli pilots from the real bridges. Israeli pilots, for their part, reported strikes on several bridges, raising

Figure 9.2. Egyptian Army crossing the Suez Canal on 7 October 1973. Photo courtesy of the Central Intelligence Agency.

expectations in rear headquarters of tactical successes. In fact, either a dummy bridge had been destroyed or the PMP bridge could be quickly repaired. Meanwhile, the other Egyptian engineers worked frantically to build the landing sites for 50 or so ferries.

By 0800 on the second day of the war, the Egyptian Corps of Engineers had made a successful crossing operation. Ten heavy bridges, two for each of the five infantry divisions involved in the crossing, were operational, and some 80,000 troops, 500 tanks, and 11,000 vehicles had crossed the canal—all at a loss of only 170 men. It took some 15,000 engineers organized into 35 battalions to make the crossing possible.

Each engineer battalion had a specialized mission, such as manning the boats or building bridges. Initially, most engineers focused on the actual crossing, working to erect or repair bridges, for example. Other engineers, however, supported the assaulting commandos and infantrymen who penetrated to a depth of 5 kilometers east of the canal to establish ambushes for counterattacking Israeli armor.

Combat engineers were essential for the establishment and consolidation of the bridgeheads. Each Egyptian division possessed an engineer battalion, and they cleared antitank and antipersonnel mines, relying mainly on either Soviet-made mine probers or mine rollers.

The success of the crossing operation also depended on the detailed planning and timely transportation of five infantry divisions, each reinforced with an armored brigade. To get across the canal as fast as possible,

each piece of equipment, bridge, unit, and headquarters moved according to a fixed timetable and specified destination. To facilitate efficient movement of these units, the Corps of Engineers constructed an elaborate road system—some 2,000 kilometers of roads and tracks—to move troops rapidly to the canal with the maximum of protection and minimum of congestion. Extensive field exercises and rehearsals removed glitches and limited friction. Military police, in cooperation with engineers, worked to keep timetables on schedule.

The Egyptian General Staff needed competent leaders to follow such timetables. Egypt had suffered defeat in the 1967 war in large measure because of poor military leadership. An undisclosed number of officers had abandoned their troops in battles. These officers gained the designation of "chocolate soldiers," that is, ones who had melted away in battle. To address the leadership problem, the Egyptian General Staff devoted much time and effort in developing leaders who, by example, gained the confidence and trust of their men. Officers were expected to command at the front, in similar fashion to their Israeli counterparts.

The Egyptian Corps of Engineers, like the rest of the armed forces, needed exemplary commanders at the senior level to lead them in battle. When the Third Army experienced delays in breaching the earthen embankments, Major General Gamal Ali, the director of the corps, personally visited the sector. Brigadier General Ahmad Hamdi, commander of engineers in the Third Army, lost his life on 7 October while personally directing bridge construction. He represented the type of military leaders Egypt needed, not just in the engineer corps but in the entire armed forces.

At the small unit level, the Egyptian Armed Forces instituted reforms after their decisive defeat in the Six Day War that in 1973 led to the fielding a of much improved military. After the 1967 rout, the Egyptians changed their conscription policy and enlisted large numbers of graduates of universities and technical institutes into the armed forces. Before many had avoided military service. Now, the armed forces had a better trained, technically competent, and educated personnel, including the Engineer Corps. Moreover, once inducted into the army, the recruits remained in service until the October War. Most engineers thus had been in the army for several years or more, which raised their level of experience and competence by sheer longevity of service. They were well versed in what was expected of them for the crossing operation and the establishment of shallow bridgeheads on the east bank. The same could be said for air defense, which constituted the fourth service in the armed forces. The IDF, in its general arrogance, underestimated the fighting capabilities of their opponent. Is-

raeli officers and soldiers learned in battle that they were not refighting the Egyptian army of 1967.

Most importantly, President Anwar Sadat directed the senior command to develop a cautious, risk-adverse campaign plan based on military capabilities. Initial operational objectives called for the armed forces to:

- Cross the Suez Canal and destroy the Bar Lev Line.
- Establish bridgeheads 10 to 15 kilometers on the east bank.
- Inflict as much damage as possible in men, weapons, and equipment.
- Repeal and destroy Israeli counterattacks.
- Be prepared for further missions depending on the situation.[8]

This plan called for ground troops to stay with their air defense umbrella. Rather than defeat the IDF, Sadat sought to inflict as many casualties and as much destruction of material as possible so that Israel would experience the humiliation and pain of war without a clear military victory. He hoped thus to spark diplomacy after the war with the serious involvement of the United States in a peace process.

The Israeli public, completely surprised by the war and palpably angered by the heavy losses sustained in the first few days, demanded an accounting. Left with little choice, the governing coalition formed the Agranat Commission with the mandate to investigate the failure to anticipate the Arab offensives on two fronts, to evaluate the army's preparedness, and to assess the IDF performance in the first few days of the war. The commission's findings proved brutal. They ended the military careers of the chief of staff (a lieutenant general and highest-ranking officer in the IDF), the chief of military intelligence and two of his senior subordinates, and the Sinai front commander.

As revealed by the Agranat Commission, Egypt was fortunate that political and military decisions made in Israel on the eve of war enhanced Egyptian chances for the crossing operation's success. Israeli military intelligence had failed to provide a 48-hour warning but only informed the prime minister at 0430 the morning of. After discussions with her war cabinet, Prime Minister Golda Meir decided against the IAF launching a preemptive strike against Syria or Egypt. Moreover, once warned of approaching war that day, senior commanders failed to ensure that the regular armored division in the Sinai deployed according to plan. The forward armored brigade, for example, should have had its tanks positioned along the east bank. But it appears that there was confusion whether to regard the Bar Lev Line as a warning or defensive line. Among other criticisms, the Agranat commission highlighted a general arrogance in the IDF as a

major problem in assessing Arab armies and in preparing the armed forces for a surprise attack.

Conclusion and Significance

With their successful crossing operation and establishment of bridgeheads to a depth of 12 to 15 kilometers in the Sinai, the Egyptian Armed Forces rightfully etched a place in the annals of modern military history. Analysts of this feat have tended to focus on how Egypt achieved strategic deception and surprise, or they have concentrated on the Egyptian employment of the surface-to-air missile (SAM) defense system and antitank weapons to neutralize the Israeli Air Force and Armor Corps respectively.

Despite the significance of the above accomplishments, the Egyptian Armed Forces still faced the obstacles of the Suez Canal and the Bar Lev Line, and surmounting this challenge was essentially an engineering problem. The Egyptian Corps of Engineers accomplished its mission in part because of meticulous planning, elaborate preparations, vigorous training, and commendable execution according to a set-piece battle plan. The use of water cannons and the PMP bridges meant that the Egyptians could establish their bridgeheads before the Israelis could organize a large-scale counterattack.

Egyptian competence and Soviet weapons thus combined to undermine Israeli military strategy. The accomplishments by the Egyptian Corps of Engineers stand as a lesson of what a Third World army can achieve if its political and military leaders devise a war strategy that cleverly balances their military's capabilities with those of their adversary. On its front, Egypt certainly attained strategic, operational and tactical surprise, stunning virtually everyone in Israel. This initial success allowed the Egyptians to dictate the tempo of the battlefield during the first phase of the war, as the crossing operation generally went according to plan with minimum Egyptian casualties.

The 1973 war had an immediate and profound impact on the US Army after Vietnam. Drawing upon several studies of that conflict, General William E. DePuy, the first commander of the US Army Training and Doctrine Command, published a new military doctrine in 1976 called "Active Defense." This field manual drew upon the example of the 1973 War to emphasize the new lethality of the battlefield, the importance of combined arms, and the mutual interdependence of air and ground forces.[9] These tactical "lessons" provided clear direction for modernizing and professionalizing the US Armed Forces after the Vietnam War. Then, in the 1980s, the US Army transitioned to offensive doctrine and the operational art,

culminating in an impressive performance in Desert Storm. The decisive military victory, however, brought with it the potential for a self-inflicted trap of an unrealistic standard.

A repeat of this exemplary performance turned into an imperative, as proclaimed in September 1992 by General Gordon Sullivan, the Army Chief of Staff: "The standard for America's Army must be 'decisive victory.'"[10] Field Manual (FM) 100-5, *Operations*, the capstone manual of the US Army published in June 1993, reiterated Sullivan's litmus test for military excellence, defining decisive victory as "to win quickly with minimum casualties."[11] Nothing less appeared acceptable. Operation Iraqi Freedom in 2003 brought a relatively easy military victory in the conventional phase of the conflict but the drawn-out Phase IV (stabilize) and Phase V (enable civil authority) operations would challenge the aspects of "decisiveness" and "minimum casualties" which the US Army defined as the standard of excellence.

Yet the 1973 war precisely demonstrates the limits of superior military power in the face of a skillful and lucky adversary who can find effective countermeasures to transform war into a bloody affair filled with uncertainty, confusion, and human frailty. Moreover, political and military decisions in Israel placed the IDF in a defensive posture with the initiative in enemy hands. The IDF created too high expectations and thus failed to walk the fine line between confidence and arrogance. A much-improved Egyptian Army led by a better prepared and professional engineer corps with non-lethal water pumps helped in the long run for Sadat to gain the return of the Sinai to Egypt from a peace treaty with Israel.

Notes

1. For a detailed analysis comparing the 1956 and 1967 Sinai campaigns, see George W. Gawrych, *Key to the Sinai: The Battles for Abu Ageila in the 1956 and 1967 Arab-Israeli Wars* (Fort Leavenworth, KS: US Army Command and General Staff College, 1990). For a strategic and operational analysis of the 1973 War see his *The 1973 Arab-Israeli War: The Albatross of Decisive Victory* (Fort Leavenworth, KS: US Army Command and General Staff College, 1996).

2. Discussions wıth Israeli officers attending the US Army Command and General Staff College, 1986–90.

3. Trevor N. Dupuy, *Elusive Victory: The Arab-Israeli Wars, 1947–1974* (Fairfax, VA: Hero Books, 1984), 395–96.

4. For a general discussion of Israeli war plans, see Avraham Adan, *On the Banks of the Suez* (Novato, CA: Presidio Press, 1980), 57–58; Hanoch Bartov, *Dado: 48 Years and 20 Days* (Tel Aviv, Israel: Ma'ariv, 1981), 283–84.

5. The concept of "stop line" comes from Amnon Reshef, interview with author, 30 June 1994, Tel Aviv, Israel; Aryeh Keren, interview with author, 4 July 1994, Armor Museum, Israel. Both men commanded armored brigades in the Sinai during the 1973 war with the rank of colonel.

6. Arnold Sherman, *In the Bunkers of the Sinai* (New York: Sabra Books, 1971), 23.

7. Sa'ad al-Shazli, *The Crossing of the Suez* (San Francisco, CA: American Mideast Research, 1980), 52–53. Shazli was chief of staff for the Egyptian Armed Forces.

8. Gawrych, *The 1973 Arab-Israeli War*, 20–21.

9. Paul H. Herbert, *Deciding What Has to Be Done: General William E. DePuy and the 1976 Edition of FM 100-5, Operations* (Fort Leavenworth, KS: Combat Studies Institute, 1988), 25–36, 68–72.

10. Gordon R. Sullivan, "Delivering Victory: Improving Synchronization," *Military Review* (September 1992), 3.

11. Department of the Army, Field Manual (FM) 100-5, *Operations* (Washington, DC: June 1993), 1-5.

Chapter 10

Crossing the Berm: Maneuver Support during Desert Shield and Desert Storm

Florian L. Waitl

Breaching a complex obstacle covered by enemy fire is the toughest attack mission a unit can get.[1]

—General (Retired) Frederick Franks Jr.
Commander, VII Corps, Operation Desert Storm

In the early morning hours of 2 August 1990, Iraqi troops under the dictatorship of Saddam Hussein launched an overwhelming attack across the international border of Kuwait in an unprovoked act of aggression with the purpose to annex and proclaim the tiny but oil-rich Kuwait as Iraq's 19th province. The Iraqi Army was able to take over Kuwait within 36 hours by employing one elite armored division of the Republican Guard from the west and one armored and one mechanized infantry division from the east totaling about 140,000 Iraqi soldiers. Airmobile assaults of Iraqi Special Forces Commandos created mayhem and took several key objectives in the capital in support of the operation. The emir and the royal family barely escaped Kuwait. Of the little more than 20,000-strong Kuwaiti Armed Forces, only about 3,000 to 7,000 troops escaped to Saudi Arabia while the rest were either killed or captured. Iraqi follow-on forces rooted out any resistance and continued to secure the oil fields and commercial wealth of Kuwait. Iraqi engineers constructed roads running north to south which were utilized by the rest of the Republican Guard as well as three more divisions from the regular Iraqi army to move south to the border of Saudi Arabia. These units were accompanied by their complete logistics tail which prompted Allied intelligence analysts to conclude that Saddam Hussein was preparing for a subsequent move to seize the Saudi Arabian oil fields and the Persian Gulf ports.[2] While the Emir of Kuwait, Sheik Jaber al-Ahmed al-Sabah, and members of his government-in-exile urged the General Assembly and the Security Council of the United Nations for support, the actions by Iraq met worldwide condemnation, and the United States mobilized its diplomatic and military power at a surprising speed, which resulted in an international response of unprecedented size and strength. The stakes were high and if the imminent invasion of Saudi Arabia couldn't be deterred, the United States and its Coalition forces would find themselves at a major disadvantage. If the Saudi port cities of Jubail, Damman, and Dhahran were denied access due to Iraqi occupation or through other available means, the Coalition army would have had to use Red Sea ports which would have extended

the buildup of troops for months before any kind of military decision could have been forced upon Saddam Hussein.[3]

On 7 August 1990, President George H. W. Bush approved the deployment of combat forces to defend the Kingdom of Saudi Arabia, and the first units of the XVIII Airborne Corps began deploying to Saudi Arabia the very next day.[4] Operation Desert Shield was composed of an international coalition of 32 countries that sent soldiers to the region. The combined force not only halted any attempts of an Iraqi advance into Saudi Arabia but forced Iraq into a static defensive posture along their "new" border with Saudi Arabia. By 16 January 1991, the military buildup in support of Operation Desert Shield of US and Coalition forces was of historic proportions, and with the passing of the 16 January 1991 deadline at midnight, the defensive Operation Desert Shield transitioned to the offensive operation known as Operation Desert Storm.[5] During both the defensive and offensive operations in the Saudi-Iraqi desert, mobility was of the outmost importance. Without mobility, the maneuver units wouldn't have been able to successfully deter Saddam Hussein's push into Saudi Arabia nor would the might of the Coalition forces been able to expel Iraqi troops from Kuwait in a mere 100-hour ground war.

Background

In 1990, Iraq had the fourth-largest army in the world with one of the most powerful air forces in the region, an extensive air-defense network fashioned after the Soviet model, and a modified organizational structure supported by a wide array of modern Soviet and Western weapon systems.[6] When fully mobilized, the Iraqi army was over a million soldiers strong and due to the eight year war (1980–1988) with Iran, many troops were combat experienced. Even though the equipment used by the Iraqi army was a generation behind its American counterparts, the sheer numbers of available soldiers, tanks, fighting vehicles, and artillery pieces made the Iraqi army an intimidating force to be reckoned. But the long Iran-Iraq War left the Iraqi economy in shambles with nothing to show for. The war of attrition cost Saddam Hussein not only hundreds of thousands of deaths but he also accrued more than $600 billion in debt. Kuwait's wealth would be the solution to his debt problem.[7]

During the Iran-Iraq War, the Iraqi army developed some offensive skills at the end of the war but remained essentially a defensive force that thought in linear terms. Static deliberate defense with reinforced positions in triangular configurations to maximize firepower would become the Iraqi modus operandi. The influence of Soviet doctrine with its emphasis on ob-

stacles, mutual fire support, and preplanned kill zones was apparent. Defenses were prepared in depth, positioning two units to the front and one to the back to create a triangular kill zone in which artillery and armor could effectively hit any unit that broke through the front lines. The danger of artillery delivering chemicals weapons such as mustard and nerve agents was a real threat that Coalition forces wouldn't take lightly.[8] The complex obstacles were designed to inflict both personnel and equipment losses on the enemy, delay his movement, and impede his maneuver. Obstacle belts consisted of a combination of minefields, berms, ditches, trenches, road craters, and wire. The Iraqi army wasn't able to construct in-depth defensive fortifications as was seen during the eight-year period of the Iran-Iraq War but the existing defensive fortifications became stronger with every day.[9]

Within the first two weeks following the invasion of Kuwait, the Iraqis reinforced their hold on their "new province" by developing a comprehensive defensive obstacle plan by adding to their troops in Kuwait with additional armored, mechanized and infantry divisions. The first obstacle complex paralleled the Saudi Arabian border in southeastern Kuwait. With time, this defensive system was extended west until it was well into Iraq proper.[10] The Iraqis utilized classic examples of Soviet-inspired defensive positions which gave an infantry brigade consisting 2,000 to 3,000 soldiers a stretch of the front between 5 to 8 miles in which they would develop their defense in depth of up to 3 miles deep. Iraqi engineers would deploy mines to the front of these defensive positions and furthermore included "fire trenches" (trenches filled with flammable liquids) and other obstructions that would reinforce the minefields.[11] The abundance of mines owned and employed by the Iraqis was due to their experience in the eight-year-long Iran-Iraq War in which the Iraqis developed considerable experience in obstacle preparation and accumulated a large inventory of antitank as well as antipersonnel mines. According to some estimates, the Iraqis may have emplaced in excess of 2.4 million mines, of which 600,000 were antitank and 1.8 million antipersonnel, in the primary obstacle belt alone. This doesn't include the minefields discussed earlier as part of the defensive strongpoints or protective minefields.[12]

The Iraqi army consisted of 4,500 main battle tanks of which about 500 were Soviet T-72s. Its artillery had about 3,200 guns, some of which outranged any comparable weapon in the US inventory. The flexible yet centralized command structure and its ability to coordinate large-unit operations over far distances impressed observers during the Iran-Iraq War. The Iraqi General Headquarters was able to supervise up to 10 corps headquarters not only in administrative or logistical tasks but also during large-scale

combat operations. Each corps directed as many as 10 armored, mechanized, or infantry divisions and the brigade was usually the smallest unit to operate independently.[13] The *Saddam Line* was described as a formidable if not impregnable barrier by the Western media and a great deal of publicity was placed on the prior success and lethality of Iraqi defense tactics during the previous Iran-Iraq War.[14] By late September 1990, Saddam Hussein recalled 14 reserve divisions and the Iraqi 3rd Corps began to relieve units of the Republican Guard along the border with Saudi Arabia. The Republican Guard units would return to pre-invasion locations in southeastern Iraq while the regular infantry divisions began to build the Saddam defensive line along the Saudi border. The Kuwaiti Theatre of Operations (KTO) was occupied by 13 light and 9 heavy Iraqi divisions; 14 of them were in the forward defenses of the echeloned defense of Kuwait. The Saudi border and coastline was defended by 10 infantry divisions which were supported by the corps reserve of four heavy divisions. The theater reserve consisted of six Republican Guard and two regular army divisions which were placed further into Iraq proper. Even though an Iraqi offensive become more and more unlikely daily, it became also clear that Saddam Hussein would not evacuate Kuwait unless his forces were to be forcefully removed.[15]

Setting the Stage

The first US troops arrived in Saudi Arabia within 36 hours after President George H. W. Bush's 7 August 1990 approval to send combat forces to the Kingdom of Saudi Arabia. In the coming months, the American military projected a large force so far and so fast as never before. During the first six weeks of Operation Desert Shield alone, the United States moved by air the equivalent of the entire Berlin airlift which had taken 65 weeks back in the late 1940s. During the first six months of Operation Desert Shield, the US Army deployed 295,800 personnel. The commander of Forces Command, General Edwin H. Burba Jr., stated that this is "the greatest mobilization and the greatest deployment, given the time constraints we were under, that ever occurred in the history of the world."[16] The challenges of deploying and supporting these troops would be massive. There were no longstanding coalition or host-nation agreements with Saudi Arabia as had been the case with the South Korean and German government. A massive logistics structure that stretched more than 8,700 miles supported the troops in Saudi Arabia. [17]

The Arabian Peninsula is as large as the size of the United States east of the Mississippi, and the existing infrastructure was lacking modern roads and a rail network. The relatively underdeveloped region was transformed within six months into a combat theater capable of sustaining two

Army corps. The countryside consists of a variety of desert terrains while Saudi Arabia's urban areas possess a modern commercial infrastructure from which the US drew most of its support. The modern seaports, airports, and few existing roadways in these urban areas were able to receive the immense number of US troops in a small amount of time but the logistical infrastructure to feed, shelter, and supply this force wasn't available. While the other services had pre-positioned equipment and supplies in theater, the US Army had no similar pre-positioned stockpiles which forced them to bring along everything they needed. In order to deter Saddam Hussein's possible drive into Saudi Arabia and to create the impression that Saudi Arabia was well defended, General H. Norman Schwarzkopf, Commander of US Central Command (CENTCOM), ordered that combat forces had to be on the ground before being able to deploy and develop an adequate support base. The immense increase of US and Coalition combat forces meant that logistics bases needed to be built in remote areas in order to accommodate and stage these forces for future operations. Major General William Pagonis, deputy chief of staff for logistics at US Army Forces Command, prepared the logistics plan and together with his small handpicked team became the nucleus of all logistics support for Army troops arriving in Saudi Arabia. Pagonis deployed without a staff engineer, and the need for engineers to support the logistical effort was apparent. A US Army Corps of Engineers (USACE) officer, Lieutenant Colonel James Walter, was added to Pagonis's staff to take on the much-needed engineer planning. Since USACE was the designated Department of Defense's contract construction agent for the KTO, USACE started the support of the logistics effort by providing critical design, constructions, contracting, and real estate support for the US forces.[18] USACE deployed more than 160 Army Civilian Corps members in support of Operation Desert Shield and Desert Storm. These Army Civilians made up 90 percent of the construction management and real estate capability during the war.[19]

In October 1990, the strategy of only committing one Army corps to defend Saudi Arabia shifted to the offensive plan utilizing an overwhelming force. President Bush and his national security team opted to follow the advice of General Colin Luther Powell and the Joint Chiefs of Staff which called for a two-corps attack deep inside the Iraqi desert.[20] The armor-heavy VII Corps from Europe was chosen to support this mission due to its capabilities as well as due to the fact that US Army Europe (USAREUR) was at the beginning of a massive restructure effort to reduce its footprint in Europe altogether.[21] On 8 November 1990, the President publicly announced the deployment of VII Corps. By 20 December 1990, VII Corps had moved

its equipment to the seaports from where 19,800 wheeled vehicles; 5,200 tracked vehicles; almost 3,000 containers of equipment; and over 23,000 tons of ammunition was shipped to Saudi Arabia by sea. The deployment of USAREUR personnel by air was staged at several aerial ports all over Germany and by the time the ground offensive into Iraq would take place, more than 78,000 USAREUR Soldiers deployed to Saudi Arabia.[22]

Due to the planned rapid influx of incoming forces, theater priorities shifted. Some additional reserve units were activated to augment VII Corps's combat support and combat service support forces in order to prepare VII Corps's arrival and sustainment. The most significant lack was identified in engineering, heavy maintenance, supply, and transportation. Significant changes especially in the structure at Echelons Above Corps (EAC) were needed to support the change from the original defend and deter operations to the imminent offensive operations. The engineer focus shifted from survivability and general engineering to mobility support. The construction of areas to house and support the incoming VII Corps; build forward heliports, airfields, and ammunition supply points; and to develop main supply routes would be the reason for the engineer units to become even more important. The force placement is of the utmost importance in large unit operations, and the locations of the incoming units had to correspond with the scheme of maneuver for the upcoming attack without giving away the plan of attack to Saddam Hussein. The Soldiers of VII Corps concentrated in the desert, east and south of King Khalid Military City, which would become the logistics center for VII Corps, and west of XVIII Airborne Corps. The XVIII Airborne Corps continued its defensive mission until the Coalition forces would move into offensive operations. Engineers continued to improve the road network from the ports of entry to the King Khalid Military City which not only improved the mobility of the Coalition interior lines but it was also part of the deception plan. CENTCOM prohibited the construction of any bases or the pre-positioning of any equipment and supplies west of Wadi Al Batin so that Saddam Hussein believed that the main attack would come through Kuwait's southern border area when in fact the Coalition forces would swing west and north through Iraqi territory to circumvent the Iraqi defenses for the most part.[23]

Maneuver commanders needed to have their assigned engineers forward in order to prepare for the necessary breaches, which is why many units that were originally envisioned for the Echelons Above Corps missions were reallocated to support the corps and the maneuver units. This left only a few engineer units available to support operations at Echelons Above Corps. The 416th Engineer Command would only consist of the

411th Engineer Brigade, the 30th Topographic Engineer Battalion, the 43rd and 864th combat heavy engineer battalions, and some engineer companies and detachments, which is why the 416th Engineer Command didn't receive theater wide construction management responsibilities. It would be responsible for engineer tasks in the communication zone (COMMZ) which consisted of the triangular area stretching from Dharan to King Khalid Military City to Riyadh and then back to Dharan. The engineer command liaison officers coordinated the review of project proposals, helped validate and approve projects, facilitated the execution of approved projects, and supported USACE with design, real estate inspection, construction inspections, and programming. By the time the war ended, the 416th Engineer Command and its subordinate units successfully built, upgraded, and maintained 2,000 miles of roads; installed approximately 290 miles of pipeline to move bulk petroleum; developed seven major logistics support bases, provided large-scale electrical power to critical facilities and constructed four Enemy Prisoner of War (EPW) camps which could house as many as 100,000 EPWs.[24] By the time the major air offensive against Iraq began on 17 January 1991, about 93 percent of the XVIII Airborne Corps's engineer force; 54 percent of the VII Corps's engineer force; but only 19 percent of the Echelons Above Corps engineer force had arrived in theater. The deployment or lack of sufficient amounts of combat engineers became a great concern. With the air offensive in full swing, the engineer priorities were to build and repair roads, move troops forward, and develop logistics bases in the northwest in preparation of the ground offensive. A total of 1,000 miles of main supply routes and two major Logistic Bases (Echo and Charlie) were constructed to support the VII and XVIII Corps. Heavy reliance on some host nation assets continued and delayed construction projects were the results of missing resources such as heavy equipment to produce asphalt, concrete, or crushed rock. CENTCOM was concerned that US forces would become overly dependent on contractors. Once the ground war began, the engineers assigned to echelon above corps continued their efforts in support of troop operations, while the combat engineers at the corps level focused on breaching minefields and other obstacles which would hinder maneuver units to quickly move past the Iraqi defense belt and into the hinterland of Iraq to cut off Saddam Hussein's forces.[25]

Engineers also supported the preparation of troops being activated and sent over to Saudi Arabia to be part of Operation Desert Storm. The 14th Combat Engineer Battalion at Fort Ord was ordered to the National Training Center (NTC) at Fort Irwin, California, in late November 1990 in order to familiarize mobilized reserve component forces with the Iraqi-style

obstacles they might encounter. The battalion built the obstacles as part of the 177th Armor Brigade Opposing Force (OPFOR) and mimicked Iraqi fighting forces, which were of tremendous training value for the maneuver units about to deploy to Saudi Arabia in support of Desert Storm.[26]

Crossing the Berm

During the early morning hours of 17 January 1991, Task Force Normandy consisting of eight AH-64 "Apache" attack helicopters from the 101st Airborne Division (Air Assault) and four MH-53J "Pave Low" helicopters destroyed two ground air-defense command and control sites deep inside Iraq, which blew a 40-kilometer-wide hole in the Iraqi antiaircraft defense network. The air phase of Desert Storm began and the gap in the defense network allowed the Coalition air forces to fly thousands of air sorties in the next 38 days before the start of the ground campaign. Iraqi targets were pounded relentlessly and by the end of the third week, General Schwarzkopf declared air superiority. The Iraqi Air Force had been rendered ineffective, and the air campaign shifted toward Iraqi ground troops and their lines of communication, command and control centers, logistics centers, and armored vehicles. The air strikes concentrated especially on Republican Guard divisions and any Iraqi units along the Kuwaiti-Saudi Arabian border.[27]

The air campaign blinded the Iraqi Army. Coalition ground forces used the time to move into their pre-attack positions and prepare for the upcoming ground offensive. The creation of "ghost" formations broadcasting radio recordings of divisional field exercises in the areas vacated by the departing forces as well as demonstrations by the US 1st Armored Cavalry Division, the CENTCOM theatre reserve, in the area of Wadi Al Batin left Saddam Hussein guessing from where the ground offensive would take place. Naval and amphibious forces added to Saddam's confusion by clearing approaches to the coast, battleships shelling coastal defenses and US Marines conducting training exercises as if the Coalition offensive would originate from the south, accompanied by an amphibious landing from the Persian Gulf.[28]

The actual offensive plan envisioned a double envelopment in a three phase ground offensive designed to trap and annihilate the Iraqi forces inside the KTO. The first phase would consist of the XVIII Airborne Corps to move into the Euphrates River Valley to cut off the Iraqi Army from escape and to provide protection for the Coalition's western flank. At the same time, two divisions (1st and 2nd) of US Marines from Marine Central Command (MARCENT) supported by the 1st (Tiger) Brigade of the US

2nd Armored Division and Joint Forces Command (JFC) East, consisting of forces from Saudi Arabia, Kuwait, Oman and the United Arab Emirate (UAE), were to attack straight north toward Kuwait City in order to confirm Iraqi expectations. The second phase would consist of VII Corps drive north, then north-east and finally turning east in order to attack the Iraqi theatre reserve on the Iraqis right flank while JFC North, made up of formations from Syria, Egypt, Saudi Arabia and Kuwait, moved northwards into Kuwait. During the final phase, JFC East, JFC North and MARCENT would liberate Kuwait City while VII Corps would annihilate Iraq's theatre reserve. The idea of rapid maneuver and therefore limiting casualties due to Iraqi forces not being able to react fast enough reflected the then contemporary AirLand Battle concepts of initiative, depth, synchronization, and agility. General Schwarzkopf's "Hail Mary" play was only possible after the Iraqi Air Force was devastated and Iraq could no longer impede or even see the major logistical preparation and the movement of Coalition forces west of the Wadi Al Batin.[29] In 14 days, more than 64,000 wheeled and tracked vehicles and 255,000 Soldiers from the two Corps would be moved from their Tactical Assembly Areas (TAAs) to their Attack Positions (APs) which for some of the units would be as far as 300 miles.[30]

The Coalition ground forces organized into four groupings along a 430-kilometer (270-mile) front. From the west, the XVIII Airborne Corps would mark the far left while the VII Corps would be to its immediate right. Combined, these two Army Corps made up Army Central Command (ARCENT) which was later known as American Third Army. The XVIII Airborne Corps had the French 6th Light Armored Division attached while the British 1st Armoured Division supported VII Corps. To the right of VII Corps, east of the Wadi Al Batin, JFC North, followed by MARCOM, and JFC East would complete the line all the way to the coast. Two additional US Marine Expeditionary Brigades (MEBs), also under MARCENT, were to remain offshore to be part of the earlier discussed deception plan. Special Forces Soldiers conducted long-range reconnaissance operations deep into Iraq's open desert to monitor Iraqi movements and to make certain that Iraq's right flank has not been left open as a trap for the coalition.[31]

On 16 February 1991, the Coalition forces began artillery fire raids on the forward Iraqi positions from behind their own front lines. Helicopter raids across the border also began with great success. The bulldozing of sand berms, clearing of minefields, and other preparatory actions to prepare for the ground war were being conducted while the US Air Force continued to pound Iraqi positions. At 0400 on Sunday, 24 February 1991, the Coalition ground offensive began.

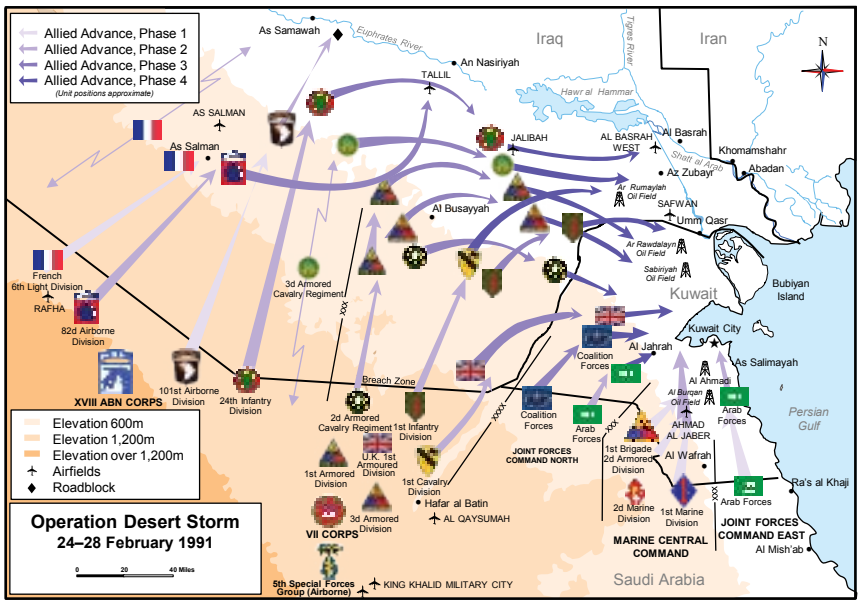

Figure 10.1. Operation Desert Storm Allied Advance from 24–28 February 1991. Map created by Army University Press.

All-out attacks against Iraqi forces at three points along the Coalition line would take place almost simultaneously which marked the beginning of the storm that would last 100 hours. The French armored division reinforced by the 2nd Brigade of the 82nd Airborne Division started their massive western envelopment with a ground assault that would secure the Coalition's left flank while elements of the 101st Airborne Division air assaulted deep into Iraq and established forward support bases in one of the largest helicopter-borne operations in military history. The French armored division's objective was As Salman and just before reaching As Salman, they came across the Iraqi 45th Infantry Division. After a brief battle in which the French forces lost 2 dead and 25 wounded, the French took 2,500 EPWs and controlled the enemy division area without further incidents. The French forces pushed further to As Salam which they took without opposition. The much expected Iraqi counterattack never materialized, and the Coalition's left flank was secured. The 1st and 3rd brigade of the 82nd Airborne Division followed the advance and cleared a two-lane highway into southern Iraq which would become the main supply route (MSR) for follow on forces and equipment. After securing Forward Operating Base (FOB) Cobra and expanding it into a major refueling point, CH-47 Chinook helicopters airlifted artillery pieces and other equipment into Cobra while the

101st continued its air assault north and by evening had severed Highway 8 about 170 miles inside of Iraq. The 24th Infantry Division had the role of blocking the Euphrates River Valley and therefore preventing the escape of any Iraqi forces from Kuwait and then attacking east in coordination with VII Corps to defeat the armored-heavy divisions of the Republican Guard. The rapid progress north due to light opposition made the establishment of positions deep inside of Iraq possible by the end of the day.[32]

VII Corps had the mission of destroying the armor-heavy Republican Guard by advancing north parallel to the XVIII Corps, followed by a massive turn to the right in order to assault to the east into Kuwait. The VII Corps consisted of the 2nd Armored Cavalry Regiment, the 1st and 3rd Armored Division, the 1st Infantry Division, the 1st Cavalry Division and the British 1st Armoured Division. Since the XVIII Airborne Corps advanced as quickly as they did to the west of VII Corps, and VII Corps had less distance to cover but faced a denser concentration of enemy forces, General Schwarzkopf moved up the VII Corps attack by 14 hours. The 1st Cavalry Division, located in the center of the 300-mile Coalition line, made a strong but limited attack north along the Wadi Al Batin to confirm Iraqi expectations of the major Coalition assault utilizing the wadis as the main avenue of attack. Iraqi units reinforced against the 1st Cavalry Division feint while the main VII Corps attack came farther to the west. The 1st Infantry Division spearheaded the armored attack by creating a massive breach into the Iraqi defenses. The Iraqi forces were surprised once the 1st Infantry Division's tanks with plow blades and combat earthmovers breached the Iraqi defensive zone and used the plows to neutralize about 10 miles of Iraqi lines by filling in the enemy lines and burying many enemy soldiers alive. The major problem the 1st Infantry Division encountered was the number of EPWs that were hindering and slowing down follow on missions. The 1st Infantry Division successfully cut 24 safe lanes through the Iraqi minefields for passage of the British 1st Armoured Division without losing a single Soldier. At the same time, the 2nd ACR to the west, followed by the 1st and 3rd Armored Divisions, swept around Iraqi obstacles and moved into enemy territory. Concerned that the 1st and 3rd Armored Divisions were too dispersed from the 1st Infantry Division for mutual reinforcement, the VII Corps Commander, Lieutenant General Frederick M. Franks, halted the advance that day only 20 miles into Iraq.[33]

JFC East forces moved up the coastal highway on the extreme right while further inland, the US 1st and 2nd Marine Divisions supported by the 1st (Tiger) Brigade of the US Army's 2nd Armored Division began their push straight toward Kuwait City. The most elaborate defense lines and

even tighter enemy concentration than what was seen by VII Corps would have to be breached by the Marines. The 1st Marine Division, equipped with M60A3 Patton tanks and TOW equipped high mobility multipurpose wheeled vehicles and supported by heavy artillery, started the movement at 0400 and breached berms and rows of antitank and antipersonnel mines. After destroying two enemy tanks, 3,000 Iraqis surrendered. The 2nd Marine Division with the Army's Tiger Brigade on its west flank, attacked in the western part of the MARCENT sector and had similar successes as the 1st Marine Division. By day's end, the 2nd Marine Division captured 35 T-55 tanks and more than 5,000 men of the Iraqi 9th Tank Battalion. The 1st Marine Division secured Al Jaber airfield by nightfall, and both Marine divisions were about 20 miles into Kuwait and took almost ten thousand EPWs on the first day alone.[34]

On Monday, 25 February 1991, the Iraqi command in the KTO was disoriented and due to the speed of the Coalition forces, they had no chance to organize and respond adequately. The XVIII Airborne Corps continued its aggressive push deeper into Iraq and by day's end, they had advanced in all division sectors and captured and cleared Objectives Brown, Grey, and Red. During the advance and the establishment of a functioning forward operating base, the XVIII Airborne Corps experienced only weak resistance from isolated Iraqi soldiers while thousands of EPWs were captured. The 3rd Brigade of the 101st Airborne Division continued its air-assault jumps further to the north and occupied a blocking position on the south bank of the Euphrates River, just west of the town of An Nasiriyah. In the VII Corps's sector, the British 1st Armoured Division's passage of the mine breach cut by the 1st Infantry Division the previous day progressed slow and would not be completed for hours to come. The 1st and 3rd Armored Divisions on the western edge of the corps's sector, the British still bogged down in the passage and not in Iraq yet, made the 1st Infantry Division and 1st Cavalry Division vulnerable to a possible Iraqi armored counterattack. To further complicate VII Corps situation, the Syrian and Egyptian forces to the east had not moved forward the previous day and a huge gap was created in the Coalition line. CENTCOM informed the 2nd ACR to prepare to assist the 1st Cavalry Division in taking over the advance east of Wadi al Batin if the Syrian and Egyptian forces would not advance north. Unable to freeze the entire advance of VII Corps indefinitely, the 1st Armored Division and 3rd Armored Division continued their advance north shortly after daybreak. A few hours later, JFC North moved north enough to close the gap and VII Corps to its west and the MARCENT to its east could resume their advance north. In the afternoon,

Figure 10.2. A Marine Corps M1A1 Abrams main battle tank equipped with a mine-clearing plow passes a truck in an abandoned Iraqi position. Photo courtesy of US Army Engineer School History Office.

the 1st Armored Division directed air assets against an Iraqi brigade position and took almost 300 EPWs while the British 1st Armoured Division turned east to take on the Iraqi 52nd Armored Division. That night, the 2nd ACR and 3rd Armored Division turned east and encountered isolated enemy units. The first Iraqi counterattack since the beginning of the offensive ground operations commenced in the early morning hours of 25 February when the 2nd Marine Division was attacked on the right and center. The Tiger Brigade raced north to support the 2nd Marine Division's effort to hold the line and by the end of the day, the Tiger Brigade cleared several bunker complexes and captured about 1100 EPWs, among them the Iraqi 116th Brigade commander.[35]

On 26 February, the XVIII Airborne Corps units began to turn their attack northeast into the Euphrates River Valley. While the west and north flanks were protected by the French and the 101st and 82nd Airborne Divisions, the 24th Infantry Division encountered its heaviest resistance of the war when its three brigades moved toward the Iraqi airfields at Jabbah and Tallil. The Iraqi 47th and 49th Infantry Divisions, the Nebuchadnezzar Division of the Republican Guard, and the 26th Commando Brigade used the terrain to their advantage and stood and fought. During a dust storm which limited visibility tremendously, the American technological advan-

tages became apparent. Thermal-imaging systems in tanks, Bradleys, and attack helicopters enabled crews to spot and hit Iraqi tanks at up to 4,000 meters before the Iraqis were even able to spot any of the US vehicles. The combination of superior weaponry and technique were responsible for the enormous success and all objectives were taken by dawn. The 1st and 3rd Armored Divisions had similar successes that day and defeated several divisions of the Republican Guard. Once VII Corps reached the wheeling point in its advance, the formation began to turn east to begin the main assault on Republican Guard strongholds to their front. The 1st Infantry Division advanced from the breach site of the previous day to the north and together with the 1st Armored Division on the far left, the 3rd Armored Division to its rights, the 2nd ACR to the front of this formation, the 1st Infantry Division would take the southern part of advance heading east. At the same time, the British 1st Armoured Division advanced east on a separate axis and at around 0930, the 1st Cavalry Division was released from its theater reserve role and supported VII Corps on their push east. The 2nd ACR encountered the T-72 tanks of the 12th Armored Division and the Tawakalna Division in the afternoon of 26 February, and these two divisions were well emplaced and were ready to fight. During the Battle of 73 Easting as it would become to be known later on, the 2nd ACR destroyed at least 29 tanks, 24 armored personnel carriers along numerous other vehicles and bunkers. Once again, the advantage of being able to utilize the superior thermal-imaging equipment during the sandstorm proved to be the game changer in this battle. To the south, the British 1st Armoured Division started its attack to the east as well and encountered the 48th Infantry and 52nd Armored Divisions along with the remnants of other Iraqi units attempting to withdraw north. The British would be engaged for almost two days of continuous heavy fighting. The 2nd Marine Division along with the Army's Tiger Brigade and the 1st Brigade of the 2nd Armored Division resumed their push northwards while the 1st Marine Division turned northeast toward the Kuwait City International Airport. By the end of the day on 26 February, the Coalition forces defeated 24 Iraqi divisions and the biggest problem CENTCOM encountered were the massive amounts of Iraqi soldiers surrendering and therefore clogging up the roads and logistical areas.[36]

On the morning of 27 February, the XVIII Airborne Corps prepared to continue its advance east toward Al Basrah and the 24th Infantry Division secured the Jalibah and Tallil Airfields on the advance east. The VII Corps move to the east also continued and the 1st Cavalry Division moved through the 1st Infantry Division's breach and up the left side of

VII Corps's sector. Once the 1st Cavalry Division was on line, the VII Corps deployed five full divisions and a separate regiment against the Republican Guard. VII Corps conducted a giant envelopment and trapped disorganized bands of Iraqis attempting to flee north. The 2nd Marine Division along with the Tiger Brigade, held their positions on Mutla Ridge and maintained close contact with JFC North. The liberation of Kuwait City by Saudi commanded units would signify the next and last phase before the cease-fire went into effect at 0800 on 28 February 1991. By the time the cease-fire went into effect, only five to seven of their once 43 Iraqi combat divisions remained capable of offensive operations. The Iraqi Army lost 3,847 of their 4,280 tanks; more than half of their 2,880 armored personnel carriers; and nearly all of their 3,100 artillery pieces.[37]

Following the ground war against Iraq, the US Army mounted the largest civil-military reconstruction operation since the end of World War II in an effort to restore the shattered country of Kuwait. The Kuwaiti government was unable to provide for all of its own recovery needs, and therefore the US Army played a critical role in rebuilding Kuwait. US Army Soldiers and USACE army civilians conducted damage assess-

Figure 10.3. Members of the 72nd Engineering Company, 24th Infantry Division, test a mine-clearing rake attached to an M-728 Combat Engineer Vehicle. Photo courtesy of US Army Engineer School History Office.

ments, cleared tons of debris off the streets of Kuwait, restored essential services such as electrical power and water supplies, and provided much needed emergency medical care.[38]

Conclusion and Significance

The ground phase of Desert Storm might have only lasted 100 hours but the success had been in the making since 1982. The AirLand battle doctrine was introduced in 1982 and was designed to tackle the problem of how to defend Europe against the Soviet Union. AirLand battle doctrine stressed the need of close coordination between the Army and the Air Force in order to successfully fight against the Soviet Union. The war against the Soviet Union and the Warsaw Pact never materialized but it prepared the US military for the fight against Saddam Hussein's forces in the desert of Iraq. The Desert Storm victory depended heavily on the ability to outmaneuver and overmatch Iraqi forces. Several insights can be gained by taking a closer look at Desert Shield and Desert Storm when preparing for future battle. It is no secret that future warfare against a peer or near-peer competitor will include the air, land, sea, space, and cyberspace domains. The idea of having to fight an enemy that will use disruptive technologies and therefore will change the character of warfare is scary and uncertain. Desert Storm was one of the last large-scale division and corps level combat operations the US Army experienced, and the insights are manifold.

During the massive staging phase of Desert Shield, CENTCOM and ARCENT planners were forced to deploy combat forces first due to the Iraqi threat to Saudi Arabia. The concern of support units, especially engineer units, arriving too late to construct and operate much needed facilities that the XVIII Airborne Corps and the VII Corps needed was a constant fear. Due to the late arrival of engineer units and the lack of engineer planners, the Army engineer force did not reach the appropriate strength until late in Operation Desert Shield. A greater reliance on contractors would be the answer to the engineer shortage, which is a solution the US Armed Forces have utilized extensively during Operation Enduring Freedom in Afghanistan and Operation Iraqi Freedom in Iraq. Even back in 1990, the CENTCOM engineer expressed concern that US forces risked becoming overly dependent on contractors. Contractor support comes at high costs and is not always available, especially if the US Army finds itself engaged in Multi-Domain Operations in the near future against a peer or near-peer competitor. Either these operations might be too kinetic to get qualified civilian contractors to support the Army mission or the competitor might even find ways to influence the available host nation contractor base so that

the contractor opts to not get involved. In Desert Storm, every aspect of engineer operations suffered because engineers were not deeply involved in logistics or strategic planning from the beginning. Ultimately, 141 Army engineer units deployed to the Gulf including an engineer command, 3 engineer brigades, 6 engineer groups, 32 engineer battalions, and 99 separate companies and teams. There were 19,453 engineers from the active component, 2,275 from the Army National Guard, and 1,953 from the Army Reserve, for a total of 23,681 engineers.[39] The engineer capabilities at Echelons Above Corps suffered the most due to the much needed engineer force at the corps level that had the breach and mobility support mission.

Other maneuver support elements such as the Military Police (MP) units would also be critical in the tactical and operational success. The two areas that posed the most significant challenge to MP units included EPW Operations and Refugee Control. EPWs were captured and surrendered during all phases of operations in Southwest Asia. Of the 70,000 EPWs processed by US forces, 50,000 were captured during the ground combat phase of Desert Storm. The large numbers of EPWs that were captured or surrendered greatly exceeded Army Forces Planning Data and Assumptions (AFPDA) estimates and in many instances, surrendering enemy units delayed and disrupted the battle rhythm of maneuver units. US Army MP units operated four EPW facilities: one in each Corps geographical area and two at Echelons Above Corps (EAC) in the KTO. Recent automation upgrades facilitated rapid accountability of EPWs and proved especially valuable in accounting for the large numbers that were captured or surrendered in such a short period of time. Various forms of "backhaul" were utilized to evacuate EPWs from the battle zone; however, this process was a serious impediment due to the volume of EPWs and the physical characteristics of numerous newly fielded logistics vehicles. Additionally, the brisk pace of combat operations out-distanced semi-stationary Corps EPW holding facilities; thus, the forward placement of corps-size holding areas was essential to reducing the distance traveled by Division MPs. During and immediately after the cessation of hostilities, MP units provided humanitarian assistance to displaced Kuwaitis returning to their homes and Iraqi refugees fleeing the civil war in Iraq. Feeding, guarding, housing and controlling large numbers of unexpected EPWs and refugees required significant combat support and combat service support assets and refugee control, normally a host nation responsibility, adversely impacted the management of a massive EPW population. The additional burden of providing humanitarian support to refugees could not be ignored; had not been anticipated; and detracted from the EPW mission. Sorting large num-

bers of EPWs and refugees became manpower and structure intensive. There were even instances of moving refugees to EPW holding and internment areas for subsistence. Thus, EPW facilities were confronted with demands that exceeded design capabilities. The deployment to Southwest Asia demonstrated a need for increased planning and awareness in regards to EPW Operations and Refugee Control. EPW evacuation procedures must be reevaluated in light of the increased tempo of maneuver warfare. Inter-service EPW training should be undertaken to properly develop and embed the requisite skills and international treaty obligations associated with EPW operations, and this initiative should not be limited to the Department of Defense. Anticipated Coalition partners can share and support this collective effort; an example of this was the USAMPS training team that deployed to Fort Dix, New Jersey, to provide instruction to Kuwaiti soldiers in EPW Operations in support of Operation Desert Storm. Future doctrine must incorporate an increased awareness of EPW Operations and Refugee Control as an operational and tactical concern of maneuver commanders.[40] The disruption in operational mobility caused by mass numbers of EPWs and refugees must be anticipated in future large-scale combat operations. Another key consideration is that host nation support may be nonexistent, as was demonstrated during Operation Desert Storm.

An uncomfortable fact is that the Iraqi army was by no means a peer or near-peer enemy like the United States faces today. US forces enjoyed air superiority, if not even air supremacy, had a combination of superior weaponry and techniques, overwhelming artillery, and attacked Iraq after successful deception operations kept Saddam Hussein guessing when and from where the fast moving offensive would take place. All these advantages have deteriorated in the last two decades. The United States has not conducted a large-scale combat operation since the invasion of Iraq in 2003. Several US capabilities across the Doctrine, Organization, Training, Material, Leadership Education, Personnel, and Facilities (DOTMLPF) spectrum are being outmatched by peer or near-peer competitors. In order to duplicate the success as has been seen during Desert Storm, the US Army and the Joint Force needs to change and adopt the Multi-Domain Operations concept in order to keep the pace with its competitors. Today's battle lines are even more blurred than ever before and the enemy will use the help of non-traditional organizations or other substantial influencers in the geo-political arena, which denies or degrades the support the United States might receive from other coalition partners or host nations. The future battle will rage in all domains, and we will need to find a way to breach each one.

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Chapter 11
Large-Scale Combat Operations: Mobility Operations in the Future

Major General Kent D. Savre

War against peer or near-peer adversaries in the future will require US Army formations to fight for access to decisive physical spaces from which campaign objectives will be achieved in pursuit of conflict termination and negotiated settlements. History has proven in this pursuit that a clash between land forces for relative position of advantage is a dynamic exchange of constructive, destructive, and informational activities that enable friendly force freedom of maneuver while denying that of the enemy. This dynamic exchange of activity in future large-scale combat calls for a reimagined appreciation for integrating and synchronizing all elements of combat power at the tactical and operational levels in time and space and across the five domains to assure mobility.

Future Formations

Future formations must maneuver through highly contested and obstructed operational distances with sufficient combat power in time to penetrate denied areas and defeat enemy forces.

Figure 11.1. Future Formations Description. Created by Army University Press.

This chapter intends to provoke deeper thought and discussion about the future nature of assuring mobility and enabling maneuver against adversaries capable of employing effects at greater ranges, with greater lethality, and with new means and methods to deny friendly freedom of movement and maneuver (see Figure 11.2). Emerging trends and proliferation of advanced technology will challenge current mobility capabilities. However, the fundamentals of assuring mobility (predict, detect, prevent, neutralize, and protect) and combined arms breaching suppress, obscure, secure, reduce, and assault (SOSRA) will remain critically relevant now and into the future. This work offers discussion of future challenges to mobility capabilities associated with these fundamentals and provides potential ideas to promote new ways of thinking about assuring mobility in future multi-domain operations.

The Complex Environment: Challenges to Future Mobility

Joint Publication (JP) 3-17, *Terms and Military Symbols*, defines mobility as, "the quality or capability of military forces which permits them to move from place to place while retaining the ability to fulfill their primary mission."[1] Future adversaries will employ new means and methods to obstruct freedom to move with a countermobility campaign tied to the geo-political, natural, and man-made features of operational areas across greater depths. Future US forces must therefore employ renewed means and methods to plan, prepare, and conduct mobility operations to understand, shape, and mitigate the effects of a broad range of challenges and obstacles.

An emerging trend that will challenge movement is how future adversaries intend to exploit advancements in information technologies and lethality to deny future ground formations access to decisive land spaces. "Joint Operating Environment (JOE) 2035" describes "potential adversaries will likely develop and deploy advanced C3/ISR capabilities that can be coupled to precision and area weaponry . . . enabling them to identify, track, target, and attack at range."[2] This improved reconnaissance-strike capability tied to adversaries' countermobility plans, obstacle belts with engagement areas, and ability to target mobility infrastructure at greater range will challenge US forces. Future threats may further combine redundant intelligence, surveillance, reconnaissance (ISR) and sensing from multiple domains to target from a broader menu, such as electronic warfare, armed drones and robotics, hypersonics, directed energy, lasers, and other long-range or remote targeting capabilities.

How adversaries might employ effects from the space, cyberspace, electromagnetic spectrum, air, or maritime domains to create physical, virtual, or cognitive obstacles to movement in the land domain is unclear. The proliferation of creative means and methods, however, requires analysis of implications. These means and methods will challenge the air, space, and cyberspace superiority US forces currently enjoy and rely upon to assure mobility and freedom of action.

Future threats will attack in the space and cyber space domains to disrupt intelligence, surveillance, reconnaissance, communications, and precision navigation and timing. The effects of these attacks will, "complicate friendly forward-deployed forces' operations and delay reinforcing forces by restricting friendly space-based reconnaissance, preventing the joint force from conducting movement, and making distributed mission command difficult in all areas."[3] Threats will employ a broad and creative array

of obstacles to disrupt, turn, fix, or block US forces in the physical, cognitive and virtual dimensions; therefore, new ways of thinking about breaching and assuring mobility to achieve positional advantage are demanded.

Proliferation of robotics and autonomous systems (RAS) present both opportunities and challenges for mobility in the future. As noted by "Joint Operating Environment 2035":

> The next two decades will see significant advances in autonomy and machine learning, to include the emergence of robots working together in groups and as swarms, used to perform complex actions, make autonomous decisions, deliver lethal force, provide ISR coverage, and speed response times over wider areas of the globe.[4]

These systems may provide adversaries novel ability to conduct spoiling attacks, to over-watch obstacles and key terrain, or to become obstacles themselves. RAS may further enjoy natural camouflage and concealment of increasingly urban operational environments, adding to the complexities of sensing and discerning threats and obstacles from other features.

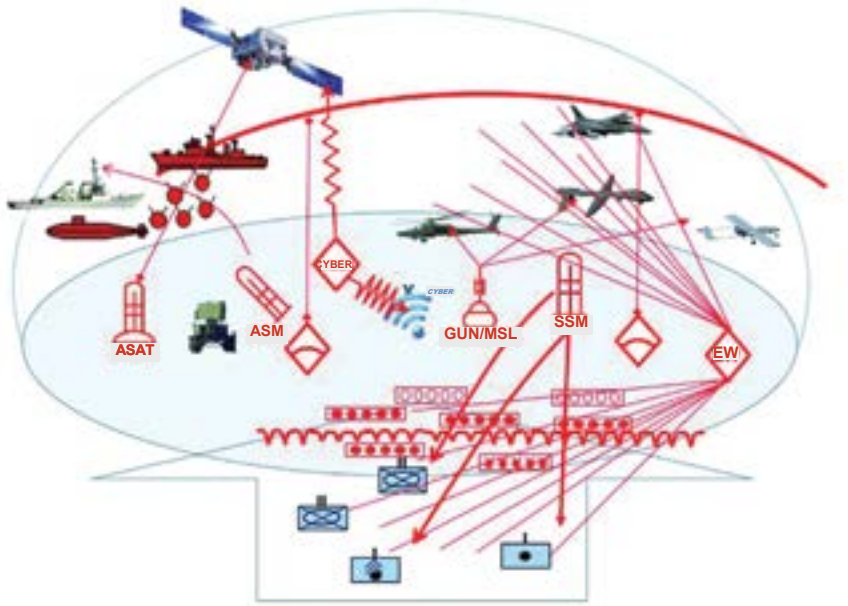


Figure 11.2. Sketch speculates how an adversary might use cross-domain capabilities to deny US freedom of maneuver. Graphic courtesy of US Training and Doctrine Command (TRADOC) G2.

"Urbanization will likely continue to increase into the foreseeable future, with some 60 percent of the global population living in cities, usually near oceans, by 2035."[5] Dense urban environments will remain complex and restrictive terrain, densely congested by multiple skyscrapers, miles of city blocks, and subterranean facilities with interconnecting industrial and suburban outer corridors. Adversaries will use these features to exploit or shape to deny mobility. Enemies will force civilian populations to disperse onto mobility routes, direct criminal threats to slow US forces, and conduct operations within urban areas to counter US military weapons and capabilities.[6] Both traditional and nontraditional means and methods of threat countermobility operations in dense urban areas could severely challenge friendly formations.

Meeting the Challenge

Future US forces must understand mobility at the tactical through strategic and geo-political levels. Adversaries will employ a broad range of anti-access and area-denial (A2/AD) activities to prevent movement. US forces must consider how adversaries may influence regions through diplomatic, information, or economic efforts to deny potential use of terrain or mobility and logistics sectors during competition periods.

First and foremost is the time-honored premise that operations and tactics are subordinated to policy and strategy. Mobility must be considered at the highest levels and through the lens of carefully calibrated posturing of all elements of national and combat power, policy, and agreements. Forward and rotational forces, allies, and partner capabilities with trusting interoperable relationships, along with prepositioned materiel, further enable broad conditions for access to potentially decisive spaces. This calibrated posture and preparation during competition periods seeks to influence favorable conditions for optimal mobility toward cooperative and assuring ends. This further deters adversaries by demonstrating credible and reliable ability to rapidly transition to conflict if necessary with assured access to decisive space, despite A2/AD efforts, if deterrence fails.

Establishing mobility over greater time and distance to decisive spaces requires future formations to obtain near complete and real-time understanding of the operating environment. Terrain, weather, and the adversary's use of domains along with information to influence populations and lethality to create obstacles will deny US forces access to decisive spaces. However, leveraging future capabilities that generate near complete and real-time data will provide US forces the distinct advantage to fight from where and when desirable.

Figure 11.3. This graphic shows how multi-domain operations in large-scale combat operations might look in the near future when integration and synchronization of all elements of combat power at the tactical and operational levels in time and space and across the five domains assure mobility to our forces. Courtesy of *Military Review*.

US forces should strive for high fidelity, three-dimensional mapping of physical and human layers of operational environments from which multiple domain and dimensional obstacle overlays can be visualized. A fused interface should include relevant activities and obstacles in or originating from unique dense urban and subterranean layers, space, cyberspace and electromagnetic spectrums, and air space layers that disrupt movement. Predictive decision support technology should dynamically consider environmental and other human patterns as obstacles to mobility. A real time tool available to formations at echelon will optimize understanding, provide early warning, and ultimately allow forces to see obstacles and challenges that must be reduced or mitigated. This will enable movement and maneuver to positions of advantage in the land and other domains historically not considered.

Highly lethal and layered obstacles and engagement areas will be over-watched and targeted by redundant threat reconnaissance-strike ca-

pabilities at greater depth. Breaching fundamentals will remain valid at the tactical level; however, consideration must be given to multi-domain activities and the need for operational level shaping efforts to support breaching operations in depth and on the move. Technology advancements nested with the ability of US forces to integrate and synchronize cross-domain effects should be explored to employ the breaching fundamentals. Adding the term "multi-domain" to the fundamentals of combined arms breaching should inform the sequencing and convergence or combination of effects to successfully reduce defended obstacles.

US forces will operate in all domains to identify threat countermobility and reconnaissance-strike systems at greater range to suppress and obscure enemy capabilities. Information denial, manipulation, and attack operations combined with emerging technologies will be required to ensure multi-domain camouflage, concealment, obscuration, and deception to achieve near invisibility. Positions of advantage in each domain will be secured, even if temporarily or locally at a minimum, to enable land forces to secure breach sites, contested gaps, or challenging corridors.

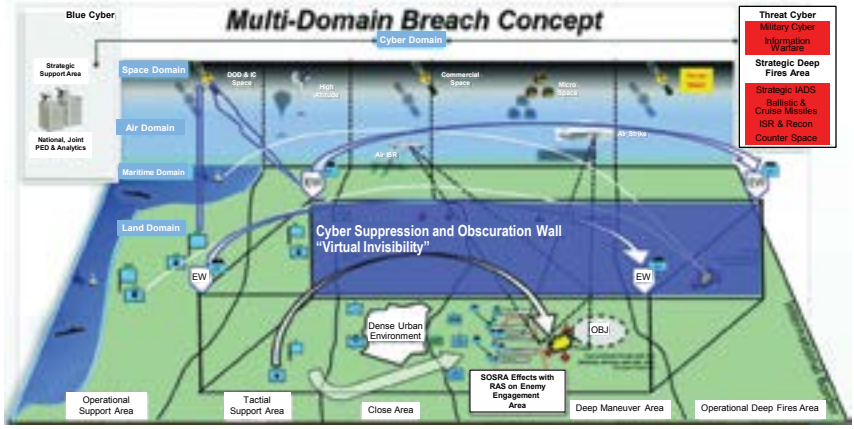
Sequential or simultaneous reduction and mitigation of physical, cognitive, or virtual obstacles will set favorable conditions for main efforts to maneuver toward next position of advantage. Robotic and autonomous detection, breaching, bridging, and route creation should be pursued.

The tactical level will continue to seek remote and stand-off omni-directional detection of threat sensors and obstacles on the move. Technologies capable of penetrating and identifying the seen and unseen at greater depth in any environment and at speed will enable mobility. Enhanced units and platforms with all-hazards sensors tethered to robotic and autonomous obstacle defeat and mitigation capability should be explored for both physical and virtual dimensions through which obstacles may be emplaced.

Conclusion

The pursuit of persistent overmatch and access to decisive spaces requires continued critical and creating thinking about how to assure mobility with careful consideration to the dynamic evolution of action and counteraction in a technology-rich future environment where machine learning and artificial intelligence could become a real thing. Deputy Secretary of Defense Bob Work stated in his 2014 speech to the National Defense University:

> Our forces face the very real possibility of arriving in a future combat theater and finding themselves facing an arsenal of advanced, disruptive technologies that could turn our previous



Persistent Access to Positional Advantage in a Future Operational Environment (OE)

In 2035, REDLAND crosses the international border and invades the country of GREENLAND to seize territory and gain access to seaports for the purposes of freely exporting oils and expanding economic trade. REDLAND swiftly gains control of key terrain and is setting conditions to continue advance on GREENLAND'S capital and seaports. US forces continue posturing, and Allied nations' demand for REDLAND to remove forces is ignored. Article V is invoked, and Allied forces begin land operations to defeat REDLAND forces and restore preconflict territorial sovereignty.

X Corps (US) with three divisions converge and combine multi-domain effects to maneuver and defeat REDLAND forces. Shaping operations begin with X Corps employing joint-level assets in the operational support area to converge space, cyber, air, maritime, and land domain capabilities into the close, deep maneuver, and fires area. X Corps fixes enemy forces and disrupts coordination efforts between adjacent enemy units. X Corp suppresses and obscures REDLAND's long-range, multi-domain ISR-fires systems, integrated air defense systems, and obscures cyber and space threats. Multi-domain effects allocated to 52nd Division Mechanized (ME) enable cross-domain maneuver to close with and destroy REDLAND's 10th Division Tactical Group (DTG) in the deep maneuver area massed with physical, virtual and cognitive obstacles in vicinity of GREENLAND's massive capital.

52nd Division (ME), with evolutionary decision support technologies, attacks to destroy REDLAND'S 10th DTG by employing and integrating all domain effects with X Corp and supporting enablers. 52nd Division (ME) continues employment of fires and cross-domain effects to suppress and disrupt enemy threat in depth, enabling assigned combat teams to penetrate, breach, and gain dynamic positions of advantage in all domains. Multi-domain enabled combat teams supported by Robotic Autonomous Systems (RAS) formations successfully conduct combined arms breaching and bypass at speed and on the move by identifying and reducing all virtual, cognitive and physical obstacles. Well-coordinated suppression, and obscuration of enemy ISR/strike capabilities continue, with speed, protection, reach, and endurance achieved through employment of RAS formations to assure breach and assault forces protected mobility to continue attack with persistent access to positional advantage.

Figure 11.4. Persistent access to positional advantage in a future operations environment. Courtesy of US Training and Doctrine Command (TRADOC).

> technological advantage on its head—where our armed forces no longer have uncontested theater access or unfettered operational freedom of maneuver.[7]

The nature of future challenges and assuring mobility will evolve, yet remain unknown and unknowable. The rapid and adaptive exchange of activity in future large-scale combat operations should be imagined and shape how US forces integrate and synchronize all elements of combat power at the tactical and operational levels in time and space and across the five domains to achieve assured mobility. Future forces should continue to explore new means and methods to employ integrated elements of combat power across domains with emerging technologies to understand, shape, and mitigate or reduce a broader range of obstacles on the move to continuously assure mobility and enable maneuver to positions of advantage as has been done by successful commanders throughout history.

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