The German *Pionier*: Case Study of the Combat Engineer's Employment During Sustained Ground Combat

A Monograph

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14. ABSTRACT

The German Pionier: Case Study of the Combat Engineer's Employment During Sustained Ground Combat makes the assertion that the US Army and the US Army Engineer Regiment requires retraining and reeducation on the employment of combat engineers in sustained ground combat. The employment of the combat engineers in counterinsurgency operations during Operation Enduring Freedom and Operation Iraqi Freedom focused on an engineer centric approach to mobility operations in lieu of a combined arms approach practiced in sustained ground combat. This monograph conducted a comprehensive examination of the employment of German combat engineers in mobility operations during the Second World War, to demonstrate that the engineer centric approach to mobility operations is insufficient when conducting sustained ground combat. The monograph concludes that the combat engineer, when employed in a combined arms approach, are highly versatile formations that maintain friendly tempo while disrupting enemy tempo, prevent culmination while initiating enemy culmination, and extend the operational reach of friendly forces.

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Abstract

The German *Pionier*: Case Study of the Combat Engineer's Employment During Sustained Ground Combat, by MAJ Erich Schnee, P.E., US Army, 46 pages.

In February 2016, Chief of Staff of the Army General Mark Milley formally directed a shift of training focus of the US Army from counterinsurgency to sustained ground combat operations by directing "a focus on readiness levels to conduct sustained ground combat in a full spectrum environment against a highly lethal hybrid threat or near-peer adversary." For the US Army Engineer Regiment this means a return to mobility focused operations based on combined arms maneuver (such as the combined arms breach and river crossing operations) from the route clearance centric mobility operations that dominated the combat engineer's mission set during the Global War on Terrorism. To accomplish Milley's directed shift in readiness focus, the US Army Engineer Regiment must regain its proficiency in major ground combat operations. Beginning with individual soldier tasks and progressing up the echelons to collective combined arms training. Simultaneously, the Engineer Regiment and other supported or supporting branches of the US Army require retraining on the capabilities and proper employment of combat engineers.

This monograph seeks to explore historical case studies of German combat engineers (*Pioniere*) during the Second World War employed in major combat operations against a peer or near-peer adversary. To provide relative, meaningful, and actionable insights on the future employment of combat engineers, this monograph analyzes the experiences of the *Pioniere* through the lens of the modern American concept of operational art to align them with current concepts. By applying these concepts to the evidence supplied by the case studies shows that during sustained ground combat with a peer or near-peer adversary, combat engineers are highly versatile formations that when properly employed can maintain friendly forces tempo while disrupting enemy tempo, preventing the culmination of friendly forces while initiating enemy culmination, and extending the operational reach of friendly forces.

Published works, memoirs of participants, and historical studies of the selected case studies provide most of the evidence for this monograph. Additionally, current US Army doctrinal publications focused on operational art provide the evaluation criteria.

Contents

Acronyms

ADP	Army Doctrine Publication
A2AD	Anti-Area Access Denial
BEF	British Expeditionary Force
CARCO	Combined Arms Route Clearance Operation
CAS	Close air support
DoD	Department of Defense
FM	Field Manual
GD	*Großdeutschland* infantry regiment
IED	Improvised explosive devise
NCO	Noncommissioned Officer
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
OKH	*Oberkommando des Heeres*
OKW	*Oberkommando der Wehrmacht*
Pz	*Panzer Division*
RAF	Royal Air Force
RCP	Route Clearance Patrol
USFOR-A	United States Forces – Afghanistan
US	United States
zBV	*zur Besonderen Verwendung*

German Terms and Definitions

Armee	Army
Armee Gruppe	Army Group
Armeepionierführer	Army senior engineer officer
Barbarossa	German code name for the invasion of Russia (June 22, 1941)
Bautruppen	Construction troops
Bewegungskrieg	War of maneuver
Blitzkrieg	Lightning war
Brückengerät	Bridge material
Deutsche Pioniere	German combat engineers
Eisenbahntruppen	Railroad troops
Fall Blau	Case Blue – German code name for the summer campaign in Russia (June 28 to November 24, 1942)
Fall Gelb	Case Yellow – German code name for the invasion of France, Belgium, Luxembourg, and the Netherlands (May, 10 1940)
Fallschirmjäger Division	Paratrooper division
Gebirgsjäger Division	Mountain division
Generalleutnant	Lieutenant General
Generalmajor	Major General
Generaloberst	Colonel General or "uppermost General," equivalent to a US four-star general. Second in rank only to Field Marshal
Großdeutschland	'Greater Germany' infantry regiment; a separate combat formation comprised of pre-war ceremonial guards. Like the US Army's 3rd Infantry Regiment.
Gruppe	Group
Hohlladung	Hollow charge, a charge newly implemented during WWII; like today's shaped charge
Infanterie Division	Infantry division

Infanterie Regiment	Infantry regiment
Kaiser	Emperor
Kompanie	Company
Luftflotte	An individual Air Force (i.e. *4th Luftflotte*)
Luftwaffe	German Air Force
Oberkommando des Heeres	German Department of the Army
Oberkommando der Wehrmacht	German Department of Defense
Oberst	Colonel
Panzer	Armor or tank
Panzerkorps	Armored or tank corps
Panzer Division	Armored or tank division
Panzergrenadier Division	Mechanized infantry division
Pionier(e)	Combat engineer(s)
Pionier-Bataillon(e)	Combat engineer battalion(s)
Pioniertruppen	Combat engineer troops
Schwerpunkt	Point of main emphasis
Seelöwe	Planned amphibious and airborne invasion of Great Britain
Stuka	Junkers JU-87 dive bomber and close air support aircraft
Sturmpionier(en)	Assault engineer(s)
Sturmtruppen	Storm troops
Technische Truppen	Technical troops
Wehrmacht	German armed forces from 1935 to 1946
zur Besonderen Verwendung	Special purpose battalion; predecessor of German special forces

Illustrations

Introduction

> *Pioniere* fight just like other units. However, their special and most important task is the execution of technical work in sight of the enemy, work that can be of the greatest importance to the other arms and the course of the engagement.
>
> —Helmuth von Moltke, Prussian Chief of General Staff *(1857-87)*

The nature and conduct of warfare is constantly changing. The adaptation of military forces in both strategy and tactics, coupled with technological advancements, drives a circular evolution in ways and means that nations fight wars. This evolution is evident when considering the US Army and its enemies in Afghanistan and Iraq since 2001. The United States executed rapid and largely conventional campaigns to topple the Taliban Government in Afghanistan (2001) and Saddam Hussein's regime in Iraq (2003). Following the end of major combat operations, the remnants of these organizations adapted to insurgency warfare. This transition offset the United States' advantages of firepower, troop levels, and technologically superior equipment.[1] These insurgencies utilized a largely unseen enemy that used small ambushes, improvised explosive devices (IEDs), and suicide bombers to intimidate local populations and destabilize the legitimacy of US-backed governments.[2] Despite being an army trained to conduct Full Spectrum Operations against an established and organized military force, the US Army adapted its strategy and tactics to meet the growing insurgencies in Iraq and Afghanistan.[3]

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[1] Beth Bailey and Richard Immerman, eds., *Understanding the U.S. Wars in Iraq and Afghanistan* (New York: University Press, 2015), 126-128, 131-132, RAND Corporation, "Conducting Counterinsurgency Operations: Lessons from Iraq (2003-2006)." Last modified 2008. Accessed January 25, 2018. https://www.rand.org/pubs/ research_briefs/RB9323/index1.html, US Department of the Army, Field Manual (FM) 3-24, *Insurgencies and Countering Insurgencies* (Washington, DC: Government Printing Office, 2014), 1-1 to 1-2.

[2] Dorian D'Aria and Tahnee L. Moore, "Adapting the Army: Institutionalizing Counter-IED Training Efforts," Fort Leonard Wood, US Army, accessed 27 January, 2018, https://www.wood.army.mil/engrmag/PDFs%20for%20Jan-Apr%2010/D'Aria-Moore.pdf; FM 3-24, *Insurgencies and Countering Insurgencies*, 1-1 to 1-2.

[3] US Department of the Army, FM 3-0, *Operations* (Washington, DC: Government Printing Office, 2001), 4-1, Part II discusses the concept of Full Spectrum Operations; RAND, "Conducting Counterinsurgency Operations: Lessons from Iraq (2003-2006)."

For the US Army's Engineer Regiment, this required a shift from major combat focused operations (such as the combined arms breach and obstacle emplacement) that support combined arms maneuver to stability and counterinsurgency operations (such as route clearance and train, advise, and assist).[4] Thus, engineer commanders at all levels tailored their pre-deployment training to prepare their soldiers for counterinsurgency operations.[5] This shift in training focus, while necessary, gradually produced an Engineer Regiment that is largely untrained in the conduct of sustained major ground combat operations. Of even greater concern, the US Army is largely unaware of the capabilities offered by a trained Engineer Regiment as well as how to efficiently employ them in major ground combat operations.[6] This unfamiliarity of combat engineer capabilities is evident to any veteran of Operation Enduring Freedom (OEF) or Operation Iraqi Freedom (OIF) who witnessed the practice of commonly referring to a combat engineer platoon as a route clearance patrol (RCP), implying a singular capability.

Correction of this discrepancy requires changes along two lines of effort. The Engineer Regiment must regain its proficiency in major ground combat operations. Beginning with individual soldier tasks and progressing up the echelons to collective combined arms training. Simultaneously, the Engineer Regiment and other supported or supporting branches of the US Army require retraining on the capabilities and proper employment of combat engineers.

Chief of Staff of the Army General Mark Milley formally initiated the first of these lines of effort when, in February 2016, he directed "a focus on readiness levels to conduct sustained ground combat in a full spectrum environment against a highly lethal hybrid threat or near-peer

[4] D'Aria and Moore, "Adapting the Army: Institutionalizing Counter-IED Training Efforts;" US Department of the Army, FM 3-34, *Engineer Operations* (Washington, DC: Government Printing Office, 2014), 1-1. The US Army Engineer Regiment encompasses all entities of engineers, both uniformed and civilian employees serving in the US Army in support of the US Government (USG).

[5] D'Aria and Moore, "Adapting the Army: Institutionalizing Counter-IED Training Efforts."

[6] US Department of the Army, "Decisive Action Training Environment at the National Training Center," Center for Army Lessons Learned, Volume III (September 2015): 109-113, 124-126.

adversary."[7] In a separate release, Milley further described his vision of a future war in which "the nation [will be required] to impose [its] political will on the enemy [by closing] with and [destroying] that enemy up close with ground forces."[8] Milley accomplished two important objectives by making these statements. He made the overarching mission of the US Army clear to its service members, while working to dispel common myths about warfare that have propagated throughout the American public since 2001. Within the US Army, this equates to a formal and directed shift from the counterinsurgency and stability operations practiced for the past seventeen years, to the major combat operations that resulted in the quick overthrow of the Taliban (2001) and Saddam Hussein's authoritative regime (2003).

The second line of effort, and the focus of this monograph, involves a general education of the Engineer Regiment, and other branches of the US Army, on the capabilities and employment of combat engineers in a future conflict as outlined by Milley. To accomplish this will require more than a mere 'dusting off' of pre-2001 doctrine. The current Engineer Regimental organization and equipment differ a great deal from those of 2001. Technological advancements have added new equipment and capabilities while making others obsolete. However, three core capabilities of the combat engineer have remained constant: mobility, countermobility, and survivability.[9] Additionally, due to their close interaction and training with maneuver forces, combat engineers train to fight independently as infantry if required. These core capabilities have remained common to all US Army combat engineers across time. They also appear constant across space, given the commonality of these capabilities in combat engineer

[7] Mark A. Milley, "2017 US Army Posture Statement," US Army, last modified February 24, 2016, accessed August 10, 2017, https://www.army.mil/article/163561.

[8] Meghann Myers, "Milley: Future wars will be long, they'll be fought on the ground, and spec ops won't save us," *Army Times*, last modified July 27, 2017, accessed on August 22, 2017, http://www.armytimes.com/news/your-army/2017/07/27/milley-future-wars-will-be-long-theyll-be-fought-on-the-ground-and-spec-ops-wont-save-us/.

[9] FM 3-34, *Engineer Operations*, 1-1.

employment by other nations' armies. This continuity allows for the study of historical employment of combat engineers to aid in the completion of the second line of effort.

Enabled by this continuity across time and space, this monograph analyzes two historical case studies of German combat engineers or *Pioniere* during the Second World War to demonstrate the capabilities and limitations of these formations. The insights gained through these case studies will serve as a source of valuable educational material for today's soldiers and leaders as they seek to refocus training efforts to prepare for future sustained ground combat with a peer or near-peer adversary.

Background

The Combat Engineer

Militaries have employed combat engineers to facilitate movement of friendly forces and to impede the movement of enemy forces for centuries. By the sixteenth century, field fortifications, strongpoints, and castles had become common features of warfare. States built these defensive works to reduce the mobility of enemy formations and provide enhanced survivability for friendly troops. The expense of replacing combat losses forced commanders to adopt principles of limited war and battle avoidance, making defensive operations the dominant form of warfare. This primacy of the defense resulted in prolonged and indecisive wars focused on siege operations.[10] To overcome these fortifications and restore mobility to the battlefield, European armies employed tactics to reduce the enemy's defenses by digging a series of zig-zag trenches up to the enemy's line of defense. These trenches, referred to by the French as "sap" trenches, enabled armies to bring forward assault troops, artillery batteries, or even dig mines underneath the fortifications.[11] This process for reducing fortifications is the basis for the term

[10] Michael Howard, *War in European History* (New York: Oxford University Press, 2009), 22, 33-34, 36-37.

[11] Geoffrey Parker, *The Cambridge History of Warfare* (New York: Cambridge University Press, 2005), 109.

"sapper," another name for combat engineers in most Western armies. Although tactics and equipment have and will continue to evolve, this example highlights the continuity through space and time of the mission of the combat engineer.

Combat Engineer Core Competencies

Mobility

Mobility refers to "combined arms operations and activities that mitigate the effects of natural and manmade obstacles to enable freedom of movement and maneuver."[12] Common types of mobility operations include reducing, bypassing, marking, or clearing obstacles such as minefields, roadblocks, IEDs and battlefield debris, establishing bridges, ferries, or ford sites across rivers and ravines (wet and dry gaps), and mobility-focused reconnaissance to identify enemy obstacles, mobility corridors and routes, and river crossing sites. Mobility operations are of such importance that the US Army Field Manual (FM) 3-34, Engineer Operations identifies them as "typically identified as essential tasks."[13] By enabling friendly forces freedom of movement and maneuver, the combat engineer provides the ground force commander a means of maintaining tempo, extending operational reach, and reducing risk of culmination.

Countermobility

The converse of mobility operations is countermobility operations. These are "combined arms operations and activities that use or enhance the effects of natural and manmade obstacles to deny an adversary freedom of movement and maneuver, disrupt the enemy tempo, increase time for target acquisition, and increase friendly weapon effectiveness."[14] In contrast to the examples provided for mobility operations, countermobility includes the installation of minefields, road blocks, cratering of roads, and destruction of bridges.[15] Both natural and manmade obstacles have

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[12] FM 3-34, *Engineer Operations*, 2-2.

[13] Ibid., 2-3.

[14] Ibid.

[15] As of January 1, 2011, US forces cannot employ persistent and undetectable land mines (land mines that are not self-destructing or self-deactivating); however, the United States will continue to employ

the inherent feature of acting against both friendly and adversary forces to impede their freedom of movement and maneuver. For this reason, military forces must integrate their countermobility plan with their concept of operations. In doing so, the combat engineer aids the ground force commander in disrupting the adversary's tempo, restricting his operational reach, and forcing early culmination, while protecting friendly forces during transitions between offensive and defensive operations.

Survivability

Survivability operations are "military activities that alter the physical environment to provide or improve cover, concealment, and camouflage, or used to enhance survivability when existing terrain features offer insufficient cover and concealment."[16] Combat engineers conduct survivability operations within the limits of their units' equipment and capabilities. These include building, repairing, or maintaining fighting and protective positions, and hardening, concealing, or camouflaging roads, bridges, airfields, and other structures. Survivability operations provide the ground force commander with improved basing, enhanced protection during transitions between the offense and defense, and reduced risk of culmination through the protection of available combat power.

The German *Pionier*

The German Army collectively refers to its combat engineers as *Pioniere*. They saw extensive combat during the Second World War on all fronts in the European and North African theaters of war. Their collective experience fighting against peer or near-peer adversaries—both the Western Allies and Soviet Union—represent an immense assortment of available case studies across the range of combat engineer capabilities. These case studies range from *Pionier* successes in facilitating freedom of maneuver for the *Wehrmacht* as it accomplished its early victories from

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self-destructing and self-deactivating mines (scatterable mines) to provide countermobility for the force. FM 3-34, *Engineer Operations*, 2-4.

[16] Ibid., 2-5.

1939 to 1941, to their attempts to prevent, and later forestall, the Allied and Red Army's advance into Germany during the defensive battles of 1943 to 1945. They provide an excellent example of the capabilities and limitations of combat engineers employed in sustained ground combat against a peer or near-peer adversary.

Mission

Mobility was the central theme of the German way of war from 1939 to 1945.[17] Their *Bewegungskrieg* (commonly mistaken as *Blitzkrieg*), was a war of maneuver on the operational level that used large-scale enveloping operations by armored and motorized forces around the flanks of the enemy to encircle and destroy them.[18] *Blitzkrieg*, an effective but less utilized theme of German warfare, utilized concentrated armored and motorized forces to shatter an enemy front by shock action and then plunge deep into the heart of the enemy's territory. Both used close air support (CAS) to provide fire support when mobile forces outpaced their artillery.[19] Although the German army made great progress in the mechanization and motorization of their *Panzer* and motorized infantry divisions, rivers and fortified positions remained formidable obstacles. The mission of reducing these obstacles and ensuring the mobility of these formations lay with the *Pionier*. Although the *Deutscher Pioniere* embraced their overall mission of mobility, countermobility, and survivability, their primary task of acting as assault troops took precedence resulting in an unofficial designation as *Sturm-Pioniere* (storm engineers).[20] This designation draws its lineage directly from the *Sturmtruppen* (stormtroopers) and tactics developed in 1917 to

[17] Robert M. Citino, *The German Way of War: From the Thirty Years' War to the Third Reich* (Lawrence, KS: University Press of Kansas, 2005), 253-256; Matthew Cooper, *The German Army: 1933-1945* (Chelsea, MI: First Scarborough House, 1990), 139.

[18] Robert M. Citino, *Quest for Decisive Victory: From Stalemate to Blitzkrieg in Europe 1899-1940* (Lawrence, KS: University Press of Kansas, 2002), 195; Citino, *The German Way of War*, xiv.

[19] Len Deighton, *Blitzkrieg: From the Rise of Hitler to the Fall of Dunkirk* (Great Britain: Jonathan Cape, 1979), 241.

[20] Gordon L. Rottman, *German Pionier 1939-45: Combat Engineers of the Wehrmacht* (Oxford, United Kingdom: Osprey Publications, 2010), 4.

1918 to restore mobility to Western Front in the First World War.[21] These assault tasks included reducing natural and manmade obstacles, breaching obstacles and fortified positions, and crossing water obstacles with bridging and assault boats. In the defense they constructed fortifications and shelters, erected obstacles, laid minefields, planted booby traps, cleared fields of fire, erected camouflage, and destroyed bridges.[22]

Organization

The *Wehrmacht* organized its engineers into *Pioniertruppen* (combat engineer troops), *Bautruppen* (construction troops), *Eisenbahntruppen* (railway troops – who both built and operated railroads), and *Technische Truppen* (technical troops). Each divisional combat formation of the *Wehrmacht* included an organic *Pionier-Bataillon*. The divisional *Pionier-Bataillon* was the basic *Pionier* unit encountered on the front lines and considered a key unit necessary to support combat operations.[23]

A typical infantry division contained an organic partly motorized *Pionier-Bataillon* and bore the same numerical designation as its parent division (*Pionier Bataillon 305. der 305. Infanterie Division*). Each battalion consisted of a headquarters company, three *Pionier* companies, and a bridging column. These three *Pionier* companies aligned with the three infantry regiments organic to the division and demonstrated the *Pioniere* primary means of employment to support maneuver formations.[24] The headquarters company included a 36-man staff section, 32-man signals platoon, and a mix of horse-drawn and motorized transport. The first and second *Pionier* companies relied on horse-drawn wagons and each included 191 soldiers organized into a headquarters platoon and three 52-man *Pionier* platoons. The third *Pionier* company (motorized)

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[21] Citino, *Quest for Decisive Victory*, 169.

[22] Rottman, *German Pionier*, 4-5.

[23] Ibid., 4.

[24] James Lucas, *Die Wehrmacht von 1939-1945: Zahlen, Daten, Fakten* (Stroud, Gloucestershire, Great Britain: Sutton Publishing, 1998), 27.

included 16 squad-carriers. Finally, the 102-man bridging column consisted of a headquarters section and 2 motorized bridge platoons.[25] The organization of *Pionier-Bataillone* organic to *Panzer* (armored), *Panzergrenadier* (mechanized infantry), *Gebirgsjäger* (mountain), and *Fallschirmjäger* (paratrooper) divisions were slightly different but maintained the overall concept of support to maneuver formations.[26]

Equipment

The equipment included in the *Pionier-Bataillon* represents an impressive concentration of capabilities that support the breadth of the mobility, countermobility, and survivability mission. The 15-man *Pionier* squad represented the basic fighting element of the battalion. While equipped with standard infantry weapons they also used demolitions, flamethrowers, three-man and seven-man inflatable assault boats, stocks of barbed wire, anti-tank and anti-personnel mines, and smoke candles and grenades.[27] For construction and earthwork the battalion relied on manual labor as it had no organic bulldozers or other large construction equipment. Power saws, pneumatic hammers, and hand tools served as the primary means of construction.[28] The motorized bridge column utilized the *Brückengerät B* (bridge material type B). This consisted of a mix of pontoons, trestles, planking, ramps, and motorized transport vehicles.[29] Together the two platoons of the bridge column could assemble a 130-meter floating bridge supporting 4-ton loads, an 80-meter bridge for 8-ton loads, or a 50-meter 20-ton capacity bridge. Additionally, the pontoons and planking material could assemble numerous permutations of ferries to transport troops, wagons, or armored vehicles across water obstacles.[30]

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[25] Rottman, *German Pionier*, 37-41.

[26] Lucas, *Die Wehrmacht*, 27-29, 92-93.

[27] Rottman, *German Pionier*, 40.

[28] Ibid.

[29] Horst Beiersdorf, *Bridgebuilding Equipment of the Wehrmacht: 1939-1945* (Atlgen, PA: Schiffer Publishing, 1998), 8.

[30] Rottman, *German Pionier*, 41.

Training

Initial *Pionier* training essentially paralleled that of a standard infantry unit. This foundation of skills provided the *Pionier* with the basic skills necessary to conduct his primary mission of assault troops as well as his secondary mission to fight as infantry. The training included extensive marksmanship training with rifles, machine guns, grenades, and the bayonet. Other tasks trained included individual movement and camouflage skills, map reading, range estimation, selection of movement routes, battlefield reporting, chemical warfare protection, aircraft defense with small arms, digging and camouflaging fighting positions, and field craft.[31] The primary method of instruction included a short lecture on the daily topic followed by extensive hands on practice in a field environment. This initial training lasted sixteen weeks, after which the *Pionier* reported to a *Pionier-Bataillon*.[32]

Once assigned to an operational unit, the organization's experienced noncommissioned officers (NCOs) and officers instructed them on a wide variety of *Pionier*-specific tasks.[33] These covered the breadth of the mobility, countermobility, and survivability mission of the *Pionier*. This unit-led instruction included erection of barbed wire entanglements, placing anti-tank and anti-personnel mines, constructing bunkers and machine gun emplacements, use of inflatable boats, assembling pontoon and float bridges, erecting small timber bridges for light vehicles and personnel, building corduroy roads, repairing roads and bridges, use of hand and power tools, road reconnaissance, and rigging electric and non-electric demolition charges.[34] The majority of their training focused on the assault aspect of their mission, reflecting the *Wehrmacht's* offensive spirit. These tasks included breaching barbed wire obstacles with demolition charges and wire

[31] Rottman, *German Pionier*, 10.

[32] Ibid., 10-11.

[33] Ibid., 11.

[34] Ibid.

cutters, employing smoke, use of supporting weapons such as the machine gun and flamethrower, and the use of demolition charges to destroy enemy bunkers.[35]

Methodology

To provide relative, meaningful, and actionable insights on the future employment of combat engineers in sustained ground combat against a peer or near-peer adversary, this monograph analyzes two case studies that illustrate the mobility core capability of the *Pioniere* mission. The primary mission of the *Pioniere* as *Sturmtruppen* coupled with the *Wehrmacht's* reliance on *Bewegungskrieg* and *Blitzkrieg* allows for a focused study of the mobility aspect of the *Deutsche Pioniere* during the Second World War. Additionally, these case studies provide useful insights regarding the US Army's current focus on overcoming an adversaries' anti-area access denial (A2AD) efforts. This analysis assesses the chosen historical case studies through the lens of the modern American concept of operational art to align them with current concepts and draw relative, meaningful, and actionable insights.[36]

Two of the most notable campaigns of the *Wehrmacht* that illustrate the experience of the *Pionier* in providing battlefield mobility are *Fall Gelb* (Case Yellow - the invasion of France and the Low Countries in May 1940) and *Fall Blau* (Case Blue – the summer campaign in Russia, June 1942, which culminated at the battle of Stalingrad). Several sources provide valuable strategic context related to operations on these two fronts. Mathew Cooper's *The German Army: 1933-1945*, Len Deighton's *Blitzkrieg: From the Rise of Hitler to the Fall of Dunkirk*, Alistair Horne's *To Lose a Battle: France 1940* and Robert Citino's *Quest for Decisive Victory: From Stalemate to Blitzkrieg in Europe 1899-1940* serve as the foremost sources used for the Western Front in 1940. Likewise, Paul Carell's *Hitler Moves East: 1941-1943*, David Glantz and Jonathan

[35] Rottman, *German Pionier*, 11-12.

[36] US Department of the Army, Army Doctrinal Publication (ADP) 3-0, *Operations* (Washington, DC: Government Printing Office, 2016), 4, discusses the concept of operational art.

House's *When Titans Clashed: How the Red Army Stopped Hitler* and *The Stalingrad Trilogy Volumes One, Two and Three* provide the strategic context for the Eastern Front.

The campaigns selected to address the core capability of mobility of the *Pioniere* experience are the invasion of France (May 1940) and the battle of Stalingrad (August 1942 to February 1943). Within these two campaigns, two separate case studies for each address the question of the *Pioniere* effectiveness when employed as part of a combined arms formation versus their employment as a purely engineer formation. Alistair Horne's *To Lose a Battle: France 1940,* Heinz Guderian's *Panzer Leader*, Erich von Manstein's *Lost Victories*, and Tim Saunders's *Fort Eben Emael* collectively highlight the role of *Pioniere* in enabling the envelopment of the Allied forces in Belgium resulting in the victory over France in 1940. Additionally, Jason Mark's *Island of Fire: The Battle for the Barrikady Gun Factory in Stalingrad, November 1942 – February 1943* and *Into Oblivion – Kharkov to Stalingrad: The Story of Pionier-Bataillon* 305, and Heinz Schröter's *Stalingrad* provide critical information to support the analysis of combat engineers employed in an urban combat environment during the height of the struggle for control of Stalingrad in October to November 1942.

To transcend space and time between the *Wehrmacht Pioniere* and current US Army Engineers, the following analysis filters the insights these case studies reveal through a lens of operational art to align them with current US Army doctrinal concepts. As defined in Army Doctrinal Publication (ADP) 3-0: Operations, "Operational art is the pursuit of strategic objectives, in whole or in part, through the arrangement of tactical actions in time, space, and purpose."[37] Although operational art is comprised of ten elements, three directly apply to the mobility mission of the combat engineer; tempo, operational reach, and culmination.[38] ADP 3-0 defines tempo as the relative speed and rhythm of military operations over time with respect to

[37] ADP 3-0, *Operations*, 4.

[38] Ibid., 5.

the enemy; operational reach as the distance and duration across which a force can successfully employ military capabilities; and culmination as the limit of a force's operational reach.[39] Therefore the elements of tempo, operational reach, and culmination serve as evaluation criteria for the validity of the included case studies. Applying these criteria to the evidence supplied by the case studies analyzed below shows that during sustained ground combat with a peer or near-peer adversary, combat engineers are highly versatile formations that when properly employed can maintain friendly forces tempo while disrupting enemy tempo, preventing the culmination of friendly forces while initiating enemy culmination, and extending the operational reach of friendly forces.

Case Studies of Mobility

Mobility operations are ones in which a combined-arms formation mitigates the effects of natural and manmade obstacles to enable freedom of movement and maneuver.[40] It served as the primary mission of the *Pionier* and includes two distinct mission sets: assaulting fortified positions and gap crossing.[41] The case studies selected reflect each of these subsets with varying degrees of success. The analysis of mobility operations focuses on the invasion of France in May 1940 and the battle of Stalingrad, primarily during the period October to November 1942.

Gap Crossing – The Meuse: May 1940

On September 1, 1939, Germany invaded Poland—formally starting the Second World War in Europe. In just over three weeks, German forces surrounded and occupied the capital of Warsaw on September 27.[42] This campaign gave Europe its first glimpse of the new German way of war. This war of maneuver (*Bewegungskrieg*), commonly combined with and referred to as *Blitzkrieg*, relied on mobility, speed, and concentration of motorized and armored forces to

[39] ADP 3-0, *Operations*, 2-7, 2-9.

[40] FM 3-34, *Engineer Operations*, 2-2.

[41] Rottman, *German Pionier*, 4-5.

[42] Cooper, *The German Army*, 178.

achieve quick and decisive results. Although popularly thought of as a highly mechanized army, at the outbreak of war the *Wehrmacht* included only fourteen fully motorized divisions out of a total of 103. The other eighty-nine divisions still depended on horse-drawn wagons and marching infantry, reminiscent of the *Kaiser's* army during World War One.[43] The *Wehrmacht's* victories in Poland and later in France and the Low Countries depended on its ability to concentrate these mobile forces at the *Schwerpunkt* or decisive point of the battle and maneuver them across the battlefield as the situation evolved. Although the concept of operational art did not exist in the *Wehrmacht*, the operational elements of tempo, operational reach, and culmination formed the basis of *Bewegungskrieg* and *Blitzkrieg*. The responsibility of ensuring the mobility of these mechanized formations belonged to the *Pioniere*.[44]

On September 25, two days before the fall of Warsaw, Adolf Hitler gave senior army commanders the first indication that he planned next to take direct military action against France. Although war between Germany and the Western Allies had existed since September 3, *Oberkommando der Wehrmacht* (*OKW*-equivalent to the United States Department of Defense), had not considered the West to be a future battleground. Neither France nor Britain showed signs of an offensive spirit and Hitler gave no indication that he wished to invade the West.[45] Army senior commanders were in disbelief. With memories of World War One in mind, many believed that offensive action in the West would lead to certain defeat or, at best, stalemate.[46] This prevailing view within *Oberkommando des Heeres* (*OKH* – equivalent to the United States Department of the Army) stemmed from several factors including the time required to move the bulk of the army from Poland to Western Germany, weather, manpower and ammunition

[43] Cooper, *The German Army,* 166.

[44] Rottman, *German Pionier*, 4-5.

[45] Cooper, *The German Army*, 178-179.

[46] Ibid., 179.

shortages, geography, and lack of sufficient numbers of mobile formations.[47] Nevertheless, Hitler had decided to expand the war into Western Europe. The operational plan for *Fall Gelb* (Case Yellow – code name for invasion of Western Europe) underwent several modifications including multiple postponements from the original execution date of November 12, 1939. The final version of *Fall Gelb* directed two Army Groups (designated *Armee Gruppe A* and *Armee Gruppe B)* to cross the Dutch, Belgian, and French borders on May 10, 1940.[48]

Armee Gruppe B massed in northwest Germany along the Dutch and Belgian borders. Here *OKW* anticipated that the British Expeditionary Force (BEF) and French forces, concentrated along the French – Belgian border, would advance into neutral Belgium in the event of a German invasion of that country.[49] The main objective of *Armee Gruppe B* was to draw the BEF and French forces into Belgium and out of their defensive positions along the border. Concentrated along the German – Luxembourg border, *Armee Gruppe A*, which included seven *Panzer Divisions* and three motorized infantry divisions, were to maneuver through Luxembourg and the densely forested Ardennes to break through the French lines at Sedan and envelope the BEF and French forces advancing northeast into Belgium.[50] Both army groups would rely on movement and speed as the key to success. Geographically, the action at the Meuse River would settle the fate of the German attack.[51]

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[47] Cooper, *The German Army*, 179-180, discusses each of these factors in the pessimistic views held by *Wehrmacht* leaders.

[48] Deighton, *Blitzkrieg*, 243-255.

[49] Len Deighton, *Blood, Tears, and Folly* (New York: Castle Books, 1993) 170; William H. McRaven, *Spec Ops: Case Studies in Special Operations Warfare: Theory and Practice* (Novato, CA: Presidio Press, 1996), 30.

[50] Erich von Manstein, *Lost Victories* (Munich: Bernard & Gräfe Verlag, 1982), 103-105.

[51] Deighton, *Blitzkrieg*, 243.

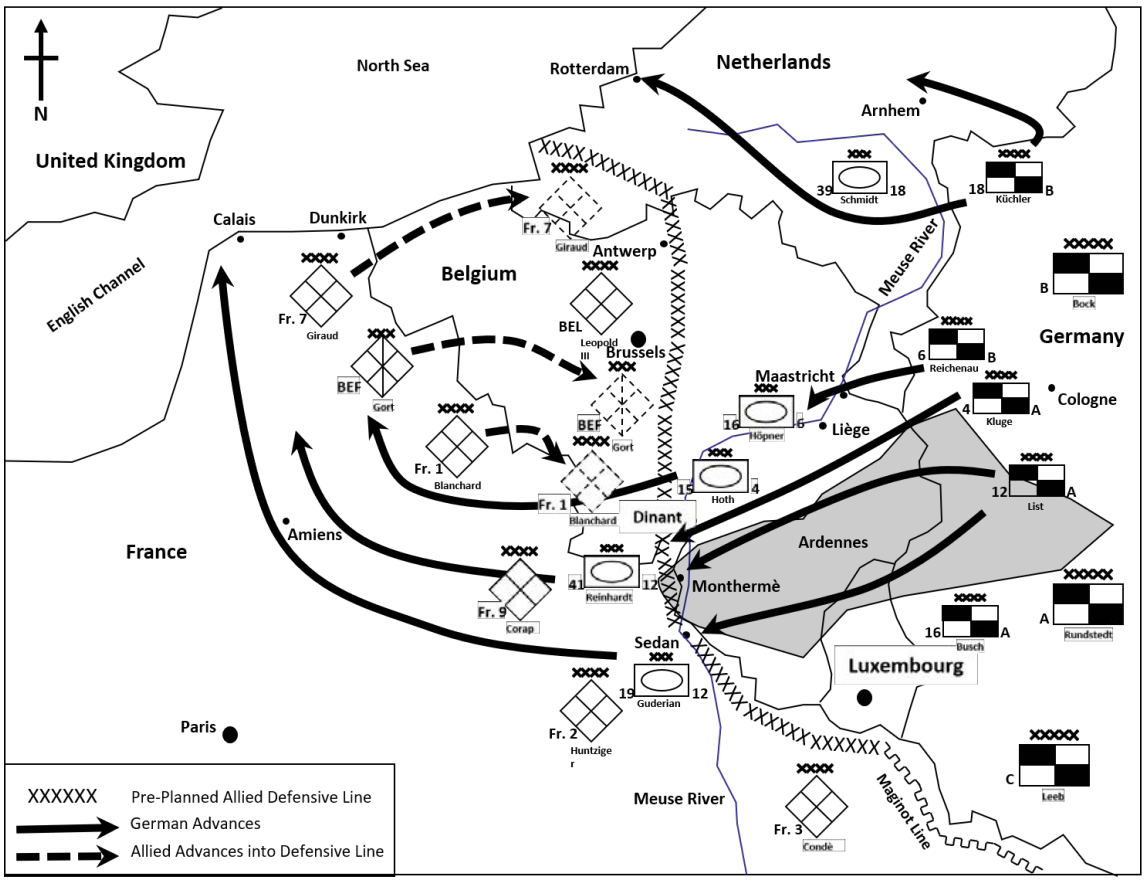

Figure 1. *Fall Gelb*, the German invasion of France and the Allied response. Author's rendition of map in Len Deighton, *Blitzkrieg: From the Rise of Hitler to the Fall of Dunkirk* (Great Britain: Jonathan Cape, 1979), 302-303.

Armee Gruppe B – Maastricht & Fort Eben Emael

Belgians have always been very aware that their country contains the only logical avenue of advance for the Germans into France. Between the two World Wars, Belgium sought to strengthen their defensive framework that was based on a system of fortifications and natural barriers.[52] The overall strategy was to disrupt and delay a potential invader to allow the Belgian military time to mobilize and establish defensive positions in the center of the country.[53] Along Belgium's eastern border with Germany, the junction of the Meuse River and Albert Canal

[52] McRaven, *Spec Ops,* 29.

[53] Tim Saunders, *Fort Eben Emael* (South Yorkshire, Great Britain: Pen & Sword Books, 2005), 15.

provided a significant obstacle to *Armee Gruppe B*. The newly constructed Fort Eben Emael provided a valuable strong point defending this critical junction. Constructed to compliment the French Maginot Line, it represented the linchpin of their defense. Between Fort Eben Emael and the Maginot line stood the Ardennes Forest, a seemingly impregnable obstacle for an advancing Army.[54] This modern fort provided "long-range fires to cover the three defended bridges over the Albert Canal, which if captured intact would give the Germans access to the routes into central Belgium."[55] After the collapse of Poland, a German invasion of neutral Belgium to circumvent the Maginot Line seemed very likely. The Belgians believed a defensive position centered on the fort would delay the Germans for five days, long enough to ensure that the BEF and French Army had enough time to advance into pre-planned defensive positions within central Belgium. This calculation formed the entire basis for the Allied defense of Belgium.[56]

The Germans also understood the importance of Fort Eben Emael and the bridges it protected. To seize the vital bridges over the Albert Canal and Meuse River, they devised a truly combined arms operation. The assault began with an airborne landing of 420 *Fallschirmjäger* (both parachute and glider-borne) to land on top of Fort Eben Emael and three of the bridges across the Albert Canal. The task to neutralize the heavy guns within the fort that provided fire support to the bridges belonged to a specially trained all-volunteer force comprised predominantly of *Pioniere* and armed with the revolutionary *Hohlladung* (hollow charge or shaped charge) .[57] Simultaneously, a detachment from *zur Besonderen Verwendung 100* (special purpose battalion) disguised as Dutch military police were to seize the three bridges across the Meuse River located just across the Dutch border in Maastricht. Advancing from Germany, the *4.*

[54] McRaven, *Spec Ops,* 30.

[55] Saunders, *Fort Eben Emael*, 17.

[56] Saunders, *Fort Eben Emael*, 17-18; Alistair Horne, *To Lose a Battle: France 1940* (1969; repr., London: Penguin Books, 2007), 255.

[57] Saunders, *Fort Eben Emael*, 74; Horne, *To Lose a Battle*, 257.

Panzer Division, reinforced with the *51. Pionier Bataillon* would then cross the German-held bridges and establish a bridgehead on the west bank of the Albert Canal, allowing the remainder of *6. Armee* to advance into central Belgium.[58] Seizure of these bridges across both the Meuse River and Albert canal was vital to maintaining the tempo of *6. Armee*.

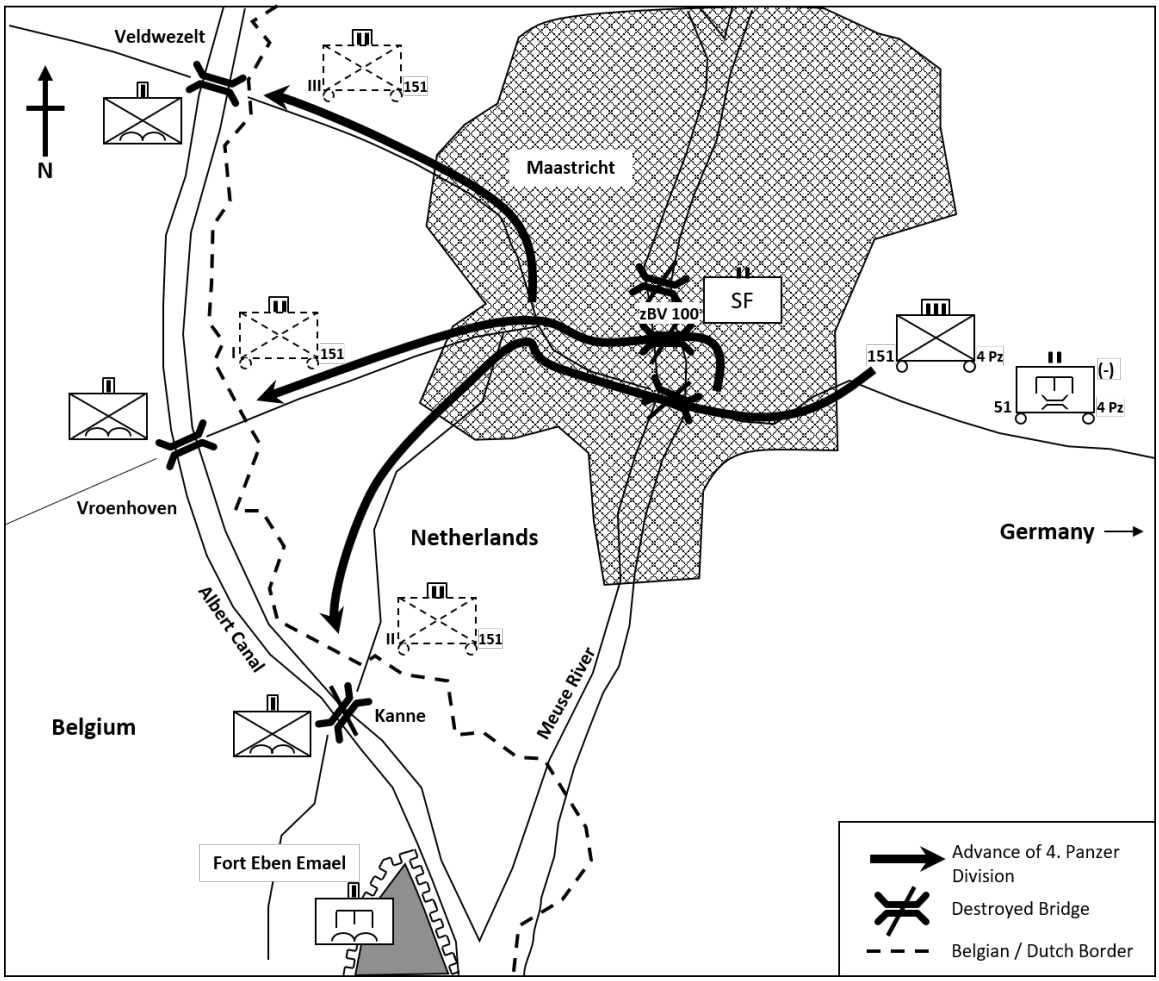

Figure 2. German advance across the Meuse River and Albert Canal at Maastricht. Author's rendition of a maps in Tim Saunders, *Fort Eben Emael* (South Yorkshire, Great Britain: Pen & Sword Books, 2005), 159, 174.

The initial assaults by *Fallschirmjäger* and *Besonderen Verwendung 100* achieved mixed results. The glider-borne *Pioniere* suppressed Fort Eben Emael's gun batteries and prevented them from providing effective fire support to the defending Belgians at the Albert Canal

[58] Saunders, *Fort Eben Emael*, 153-156.

Bridges.[59] The glider-borne *Infanterie-Pionier* assault teams seized two of the three bridges over the Albert Canal intact at Vroenhoven and Veldwezelt. Belgian engineers managed to destroy the third bridge at Kanne despite German *Fallschirmjäger* having seized the crossing site.[60] The most serious setback for the German plan was the discovery of *Besonderen Verwendung* soldiers prior to reaching the bridges across the Meuse at Maastricht.[61] A confused fire fight ensued between Dutch border guards and Germans dressed in Dutch police uniforms. The Germans were unable to remove the pre-installed explosive charges and the bridges remained in Dutch hands.[62] The *4. Panzer Division* would have to force its way across the Meuse.

Shortly after crossing the Dutch-German border, the *4. Panzer Division* received early reports of the *Fallschirmjäger* success on the Albert Canal.[63] The failure of the *Besonderen Verwendung* to seize the Meuse River bridges became painfully clear when all three of the bridges "blew up into the air in front of advanced units of the *4. Panzer Division*."[64] Months of advanced planning for *Fall Gelb* however prepared the Germans for such contingencies. Accompanying the advanced units of the *4. Panzer Division* were two companies of the *51. Pionier Bataillon* which included obstacle crossing equipment prepared for immediate use.[65] Within an hour of arriving in Maastricht, the *Pioniere* began taking infantry and light vehicles across the Meuse in assault rafts. These infantry from *151. Infanterie Regiment* then advanced to relieve the *Fallschirmjäger* defending the two intact bridges over the Albert Canal.[66]

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[59] Saunders, *Fort Eben Emael*, 153-163; Horne, *To Lose a Battle*, 257.

[60] Saunders, *Fort Eben Emael*, 160-171; Horne, *To Lose a Battle*, 257.

[61] Saunders, *Fort Eben Emael*, 156-157.

[62] Horne, *To Lose a Battle*, 254.

[63] Saunders, *Fort Eben Emael*, 171.

[64] Ibid., 172.

[65] Ibid.

[66] Ibid., 172-175.

The crossing of the *151. Infanterie Regiment* was vital to holding the Albert Canal bridges against Belgian counterattacks. However, to maintain a high-speed advance into central Belgium, the commander of the *4. Panzer Division* needed more combat power across the Meuse River and Albert Canal. German commanders on the east bank of the Meuse could not help but notice the "depressing sight of mile upon mile of *Panzers* and vehicles jamming the roads."[67] To remedy this threat to culmination and regain the tempo of the attack, the *51. Pionier Bataillon* focused next on the large Maastricht bridges destroyed by the Dutch. These inadequately destroyed bridges became sites for improvised foot bridges to carry across additional infantry and support troops. Simultaneously, the *Pioniere* laid the first rafts capable of carrying heavier four-ton and eight-ton vehicles. Across these rafts and foot bridges, infantry and light vehicles began to make their way forward to the two bridgeheads across the Albert Canal established by the *151. Infanterie Regiment*, only two and one-half miles away.[68]

As ferry operations slowly increased German combat power west of the Meuse, the *Pioniere* worked to construct numerous ferries and bridges capable of crossing the *4. Panzer Division* tanks and heavier vehicles.[69] This was the critical task for the *Pioniere*. Without the armored and motorized elements of the *4. Panzer Division* across the Meuse and Albert Canal, the German advance would culminate in the face of increasing Allied resistance. As early as the afternoon of May 10, advance elements of the 3rd French Light Mechanized Division had arrived to increase pressure on the lightly held German bridgeheads across the Albert Canal.[70] By dawn on May 11, just twenty hours after the Dutch destroyed the Maastricht bridges, the *Pioniere* opened the first sixteen-ton bridge across the Meuse. The twenty-hour delay caused a potentially disastrous situation for *6. Armee's* advance into Belgium—one which risked completion of its

[67] Horne, *To Lose a Battle*, 254.

[68] Saunders, *Fort Eben Emael*, 173.

[69] Ibid., 173-175.

[70] Ibid., 175.

ultimate objective of fixing the Allied armies in place in central Belgium. However, with two bridgeheads across the Albert Canal served by intact permanent bridges and a temporary bridge across the Meuse now crossing *Panzers* and all other heavy vehicles of the *6. Armee*, the routes into central Belgium were now open.[71] As a result, the *6. Armee* pressed into central Belgium with speed and mass prompting the Allies to commit to a defense of Belgium. In the next phase of *Fall Gelb,* the Germans would exploit this commitment of the Allies, and once again, crossing the Meuse River would prove to be the key to success.[72]

Armee Gruppe A – Sedan

France's eastern frontier with Germany is historically vulnerable to invasion. The German invasions of 1870 and 1914 demonstrated that a battle lost on the Franco-German frontier could result in German forces at the gates of Paris within weeks.[73] In 1914, after the stabilization of the front, the French, British, and later American Army defended a continuous line of ill-protected trenches that stretched from Switzerland to the North Sea. This experience taught the French the power of the defense and the primacy of artillery on the battlefield.[74] After much internal debate, the French government adopted a law authorizing the construction of a system of continuous linear defensive positions to defend against another German invasion.[75] The resulting system of forts, the Maginot Line, stretched for approximately eighty-seven miles along the Franco-German border from Switzerland to the converging French, Belgian, and Luxembourg

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[71] Saunders, *Fort Eben Emael*, 176.

[72] Deighton, *Blitzkrieg*, 272-273.

[73] Geoffrey Wawro, *The Franco-Prussian War: The German Conquest of France in 1870-1871* (New York: Cambridge University Press, 2003), 95-120, 236-256; Holger H. Herwig, *The Marne, 1914: The Opening of World War I and the Battle That Changed the World* (New York: Random House, 2009), 108-117, 225-265.

[74] James S. Corum, *The Roots of Blitzkrieg: Hans von Seeckt and German Military Reform* (Lawrence, KS: University Press of Kansas, 1992), 48.

[75] Horne, *To Lose a Battle*, 58-60.

borders. It did not extend to the English Channel along the Franco-Belgian border for several civil, political, and military reasons.[76]

Dominating the convergence of the French, Belgian, and Luxembourg borders is the Ardennes forest. This region is "full of narrow twisting roads, through dense woods, between steep slopes, over hump-backed bridges, and deeply cut by streams which are at some places unfordable."[77] The French believed this region to be "impenetrable provided special dispositions are effected there."[78] Unfortunately plans to create obstacles or defensive fortifications to provide these "special dispositions" did not materialize for fear of disrupting French cavalry and reconnaissance screens in the event of war.[79] It was through this region that *Armee Gruppe A* sought to circumvent the Maginot Line, penetrate the French defenses, force a crossing of the Meuse River, and envelope the whole of the French Army and BEF driving into Belgium to meet the advancing German *Armee Gruppe B* (See Figure 1, page 16).[80]

Leading the advance into the Ardennes through Luxembourg and southern Belgium was General Heinz Guderian's *XIX Panzerkorps*. The XIX *Panzerkorps* comprised of three *Panzer divisions*, two motorized infantry divisions, and the elite *Großdeutschland* infantry regiment; it was the greatest concentration of armor and motorized units that the world had ever seen.[81] Mobility support for this armored *Schwerpunkt* fell on the divisional *Pionier-Bataillons* of the *1*., *2*. and *10. Panzer Divisions*. Although the Belgians and advanced units of the French army offered only limited resistance in the Ardennes region, the *XIX Panzerkorps* advance was not un-opposed. The restrictive terrain and countermobility efforts from Allied engineers presented the

[76] Ibid., 60-64.

[77] Deighton, *Blitzkrieg*, 273.

[78] Horne, *To Lose a Battle*, 102.

[79] Ibid., 226.

[80] Manstein, *Lost Victories*, 103-105.

[81] Deighton, *Blitzkrieg*, 275.

divisional *Pioniere* with abatis roadblocks, minefields, and destroyed bridges.[82] The most vital of these Allied obstacle belts defended the route from Bouillon to Sedan. *Pioniere* from the *1. Panzer Division* quickly reconnoitered ford sites across the Semois River, cleared road blocks and minefields, and began construction of a bridge near Bouillon. Guderian's *XIX Panzerkorps* had overcome their first serious threat to the advance through the Ardennes and could now focus on the capture of Sedan and crossing of the Meuse River.[83] This relatively easy reduction of obstacles was possible because the Allies did not properly provide overwatch or integrate these defensive obstacles into the overall defensive plan. Their intended effect of disrupting the tempo of the advancing Germans, providing early warning, and forcing early culmination did not materialize.

The first German units to cross the Meuse however belonged not to the *XIX Panzerkorps*, but to *Generalmajor* Erwin Rommel's *7. Panzer Division*. Rommel's division did not go through the densely forested Ardennes, instead its orders had it skirt the northernmost edge, resulting in a faster rate of advance than the *XIX Panzerkorps*.[84] After unsuccessful attempts to seize intact bridges across the Meuse at Dinant and Yvoir, both of which blew-up in sight of the advancing Germans, Rommel's reconnaissance motorcycle battalion forced a crossing across a weir located at Houx on May 12. French reinforcements quickly sealed of the bridgehead created by the motorcyclists and these first Germans across the Meuse soon found themselves trapped on the west bank.[85]

Persistent small arms and artillery fire from the defending French continued to hamper the *7. Panzer Division's* attempts to reinforce the motorcyclist's bridgehead. Rommel personally directed the attack as he brought forward armor and artillery to place direct fire on the west bank

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[82] Citino, *The German Way of War*, 284.

[83] Heinz Guderian, *Panzer Leader* (1952; repr., New York: Da Capo Press, 2002), 98-100.

[84] Deighton, *Blitzkrieg*, 277.

[85] Ibid., 278-279.

as well as setting structures on fire to establish a badly needed smoke screen.[86] Slowly the infantry and *Pioniere* trickled across the river to reinforce the motorcyclists. By noon on May 13, *Pioniere* completed an eight-ton ferry and crossed twenty anti-tank guns to the west bank, however to maintain the tempo of his divisions advance, he needed armor and motorized units across the river. Rommel personally ordered the ferry converted to a heavier sixteen-ton variant to facilitate the crossing of the light *Panzers* and armored cars. Simultaneously, the *Pioniere* began construction on a bridge capable of crossing the division's heavier *Panzers* and motorized units.[87]

By dawn on May 14 the *Pioniere* has crossed fifteen tanks across the Meuse while continually under heavy French direct and indirect fire.[88] This small number of *Panzers* was not enough for Rommel to continue his advance into France, however it did provide the combat power necessary to repel expected French counterattacks, thus preserving the bridgehead, and preventing culmination of the *7. Panzer Division* on the Meuse.

The first crossing of the Meuse by Rommel's *7. Panzer Division* on May 13 presented a threat to the French, however a much more serious threat developed further south at Sedan. Here the *XIX Panzerkorps* executed the decisive operation of the German invasion. At the most vital sector of *XIX Panzerkorps* was the *1. Panzer Division* reinforced with artillery battalions from the *2.* and *10. Panzer Divisions* as well as corps artillery and an additional *Pioniere Battalion*.[89] This reinforced division executed its crossing just upstream of Sedan at the village of Glaire, while the supporting crossings of the *2*. and *10. Panzer Divisions* took place west and south of Sedan respectively.[90]

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[86] Deighton, *Blitzkrieg*, 280; Horne, *To Lose a Battle,* 312-314.

[87] Horne, *To Lose a Battle*, 316.

[88] Deighton, *Blitzkrieg*, 283.

[89] Ibid., 293-295.

[90] Ibid., 294.

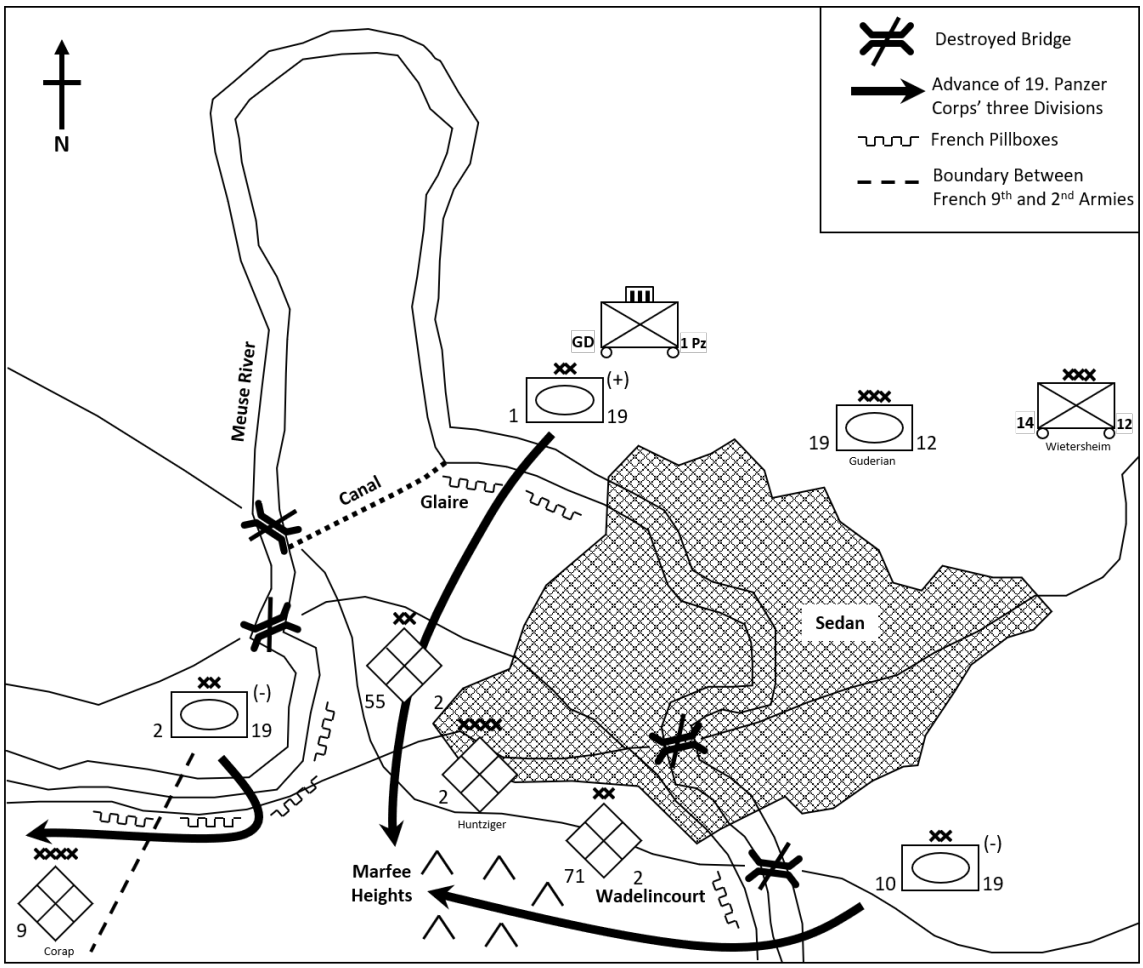

Figure 3. *XIX Panzer Corps* attack across the Meuse at Sedan. Author's rendition of map in Len Deighton, *Blitzkrieg: From the Rise of Hitler to the Fall of Dunkirk* (Great Britain: Jonathan Cape, 1979), 294.

The key to the battle of France would be the *XIX Panzerkorps'* ability to maintain its tempo by forcing a crossing of the Meuse at Sedan, consolidate the armor and motorized formations of its three *Panzer Divisions* on the west bank, and extend its operational reach by driving northwest behind the French army and BEF to the English Channel. Waiting behind the *XIX Panzerkorps*, the XIV Motorized Corps prepared to exploit the success of the *Panzer Divisions*.[91] However, none of this would be possible until the *Pioniere* managed to cross enough infantry to establish an initial bridgehead, and secondly, construct bridges capable of crossing the

[91] Horne, *To Lose a Battle*, 323.

armor and motorized formations.[92] Failure of the *Pioniere* in any of these tasks would result in culmination of the *XIX Panzerkorps* and jeopardize the entire German offensive.

For the *1. Panzer Division* the crossing went off "as though it were being carried out on maneuvers."[93] A fierce bombardment from the *Luftwaffe* that lasted all morning and afternoon, coupled with additional artillery support from augmented artillery battalions, demoralized the French defenders who offered little resistance. Only French infantry located within concrete bunkers along the west bank of the Meuse defended against the infantry and *Pionier* assault across the river. *Pioniere* quickly knocked out these bunkers with explosive charges. By 7:30 p.m., six battalions of the *1. Panzer Division* established the initial bridgehead. However, the *1. Panzer Division* still had no tanks, anti-tank guns, artillery, or motorized formations across the river. The division's main priority now became the construction of ferries and bridges before a French counterattack might throw the unprotected infantry and *Pioniere* back across the river.[94]

Even as the infantry and *Pioniere* crossed the river, the *1. Panzer Division's* bridging column began construction of the first pontoon bridge. Although the crossing site lacked natural cover, the *Pioniere* took advantage of cover offered by a factory on the east bank. Here they constructed the bridge sections necessary to cross the seventy-meter-wide river. Despite intermittent French artillery fire and occasional bombing raids from the British Royal Air Force (RAF), the *Pioniere* had the first light ferry operating within thirty-eight minutes of the initial assault. Shortly before midnight the *Pioniere* completed a sixteen-ton bridge as the column of *Panzers* and motorized units queued up behind to cross.[95]

To the south of Sedan, the *10. Panzer Division* faced stiffer resistance. Without the support of its divisional artillery battalion its first assault wave sustained forty-eight out of fifty

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[92] Horne, *To Lose a Battle*, 322.

[93] Ibid., 341.

[94] Ibid., 342.

[95] Horne, *To Lose a Battle*, 343; Deighton, *Blitzkrieg*, 296.

assault boats damaged.[96] Once across the river the task of destroying the French bunkers once again fell to the *Pioniere*. The success of the *10. Panzer Division's* assault resulted largely from the initiative of the *Sturm-Pioniere*. Specially equipped with explosive charges, they proved capable of knocking out the bunkers that survived the *Luftwaffe* attacks earlier in the day. By nightfall on the May 13, the division held a small but firm bridgehead on the west bank.[97]

The last of *XIX Panzerkorps* divisions, *2. Panzer*, arrived late to the Meuse crossings due to their action while crossing the Semois river the night before. As soon as it arrived on the Meuse it attacked the seam between the French 55th Infantry Division and the 102nd Fortress Division. These divisions each belong to a different French Army and represented a particularly vulnerable sector of the French defense.[98] Strategically, the *2. Panzer Division's* mission was to force a penetration of this hinge in the French defense opening the gap in which the *XIX Panzerkorps* could then exploit and push to the English Channel.[99]

Determined to destroy the French bunkers defending the selected crossing site, *Sturmpionieren* persuaded the *Panzer* crews to carry them and their assault rafts down to the river. Under intense fire the *Pioniere* loaded into their inflatable boats and began the crossing.[100] Although *1. Panzer Division's* crossing represented the main effort for the Meuse crossing, once the three *Panzer* divisions succeeded in consolidating their three separate bridgeheads, the *2. Panzer Division* then assumed the main effort for the exploitation. The success of the *Pioniere* in establishing this bridgehead, and subsequently crossing the motorized elements of the *2. Panzer Division* represented a key task in the *XIX Panzerkorps* mission.

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[96] Horne, *To Lose a Battle*, 334.

[97] Ibid., 336-338.

[98] Deighton, *Blitzkrieg*, 296-297.

[99] Horne, *To Lose a Battle*, 344.

[100] Ibid., 345.

Supported by fire from the *Panzers* directly from the riverbank, the *Sturmpionieren* made their way across the Meuse. The duel of German tank fire and French anti-tank and artillery fire continued as the *Sturmpionieren* reached the west bank. Shortly after the crossing, the *Panzer* crews began to observe signal flares from the *Pioniere* as they seized the French positions. Although no vehicles or heavy guns crossed on May 13, the *2. Panzer Division's Pioniere* had gained a bridgehead over the Meuse.

On May 14 the *XIX Panzerkorps* continued to push as many *Panzers* and motorized units across the Meuse bridges as possible. Without these formations, the German bridgehead was dangerously susceptible to French counterattack. Although the French planned their main counterattack at 7:00 a.m., a hasty French attack at dawn with infantry and light tanks succeeded in overwhelming a formation of *Panzers* from the *1. Panzer Division* as they refueled.[101] This attack illustrated the precarious situation of the German bridgehead. The hasty attack eventually failed at the hands of *Pioniere* using *Hohlladung* charges to break the tracks on the French tanks. Heavy anti-aircraft guns then destroyed the immobilized tanks.[102] By 7:00 a.m. the *1. Panzer Division* managed to cross most of its *Panzers* across the Meuse and repulsed the French counterattack. French units across the whole front at Sedan began to withdraw as Guderian's three *Panzer Divisions* consolidated their combat power on the west bank. The successful crossing of the *XIX Panzerkorps* had ripped a large gap in the French defenses.[103] The efforts of the *Pioniere* at the Meuse soon reaped its benefits as Guderian began his advance to the English Channel.

[101] Deighton, *Blitzkrieg*, 300-301.

[102] Ibid., 301.

[103] Ibid., 301-303.

Conclusion – The Meuse

"Gap-crossing operations are essential to enable combat and supporting forces to do their mission."[104] The German experience crossing the Meuse at both Maastricht and Sedan in May 1940 demonstrates this excerpt from current US military doctrine. The mission of *Armee Gruppe B* directed fixing of the Allied forces in Belgium while *Armee Gruppe A* penetrated the Allied defenses at Sedan. This enabled the decisive operation of *Armee Gruppe A's* envelopment of Allied forces in Belgium.[105] The keys to success were the extension of both *Armee Gruppe's* operational reach and maintaining their tempo of advance. The largest obstacle and greatest opportunity for the French to disrupt the German plan was along the two chosen crossing sites of the Meuse River: Maastricht and Sedan.

At Maastricht, a significant delay to *Armee Gruppe A* would have disrupted the German tempo as it attempted to fix Allied forces in Belgium. To ensure the Allies committed its mobile forces to the defense of Belgium, the Germans quickly advanced through Holland, across the Meuse, and across the Albert Canal.[106] The Germans realized during the planning that overcoming these significant natural obstacles, as well as the manmade obstacle of Fort Eben Emael, would be critical in maintaining the tempo of the attack. Failure to overcome these obstacles would create an immediate culmination of the *6. Armee* as it attempted to force its way through an established defensive position formed by the combined weight of the British, French, and Belgian armies. German senior commanders feared such a failure would result in a repeat of the stalemate encountered in 1914 to 1918.[107] These fears did not materialize as the operational plan of *Fall Gelb* included a multi-domain approach that relied heavily on the ability of the

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[104] US Department of the Army, FM 3-90.12, *Combined Arms Gap Crossing Operations* (Washington DC: Government Printing Office, 2008), 1-1.

[105] Manstein, *Lost Victories*, 103-105.

[106] McRaven, *Spec Ops,* 33.

[107] Cooper, *The German Army*, 179.

Pionier to ensure the army's mobility across these obstacles and extend its operational reach into central Belgium.

At Sedan, a coordinated French defense offered the opportunity to repulse the *XIX Panzerkorps* and force culmination of the entire German decisive operation. The French defense, while heroic and determined at the tactical level, was far from coordinated at the operational and strategic levels of war.[108] Nevertheless, the intricate German plan still risked culmination as the Guderian's *Panzer Divisions* found themselves straddled over the Meuse on May 13 to 14. The integrated and task-oriented method of employment of the *Pioniere* proved vital to mitigating this risk. The *Pioniere* played a vital role in establishing, consolidating, and defending the initial bridgeheads across the Meuse. Simultaneously, the *Pioniere* accomplished the essential task of crossing the armored and mobile formations of the *XIX Panzerkorps*, enabling Guderian to execute his advance to the Channel Coast and envelope the BEF and French Armies in Belgium.

Assaulting Fortified Positions – Stalingrad: October to November 1942

Following the surrender of French forces and the establishment of the Vichy government on June 22, 1940, German forces dominated Western Europe. The United Kingdom remained the sole major European power in the war against Germany and Italy. After the *Luftwaffe's* failure in the Battle of Britain to gain air superiority over the English Channel and British Isles from the RAF, Germany abandoned plans for Operation *Seelöwe* (the amphibious and airborne invasion of Great Britain). Although Germany committed forces to North Africa, Yugoslavia, and Greece in support of their Italian allies, their primary focus turned eastwards towards the Soviet Union.[109]

On June 22, 1940, one year after the defeat of France, three million German troops violated the Molotov-Ribbontrop non-aggression pact and invaded the Soviet Union. Operation *Barbarossa* included three Army Groups aimed at the objectives of Leningrad, Kiev, and

[108] Deighton, *Blitzkrieg*, 357.

[109] Cooper, *The German Army*, 246.

Moscow with the ultimate end state of defeating the Soviet Red Army in six weeks.[110] By September, *Armee Gruppe* North surrounded Leningrad, *Armee Gruppe* Center seized Smolensk and postured for the final assault on Moscow, and *Armee Gruppe* South seized Kiev. In total, nearly two million Soviet soldiers were now prisoners of war.[111] The armored thrusts of the *Wehrmacht's Bewegungskrieg* seemingly achieved the end state of defeating the Red Army. However, in October, the Russian weather changed to rain and the roads to Moscow collapsed under the weight of armored vehicles. The German advance stalled until November when subzero temperatures froze the roads, allowing the advance to continue.[112] With the addition of forces from the Far East, Soviet resistance stiffened and defeated the German attempt to seize Moscow.[113] After withstanding a fierce Soviet counterattack that drove the Germans back from Moscow, Hitler and *OKW* began planning efforts for a renewed German offensive in 1942 to defeat the Soviet Union.

The German summer offensive of 1942, *Fall Blau*, directed a series of encirclement attacks to destroy Soviet forces along the Don river and seizure of the city of Rostov. Following destruction of Soviet Armies along the frontier, *Armee Gruppe B* would advance eastward into the great bend of the Don river to establish a strong flank defense for *Armee Gruppe A's* advance southward to the Caucasus oil fields.[114] The German order for the offensive mentioned the city of Stalingrad only in passing as part of securing the flank of *Armee Gruppe A*: "Every effort will be made to reach Stalingrad itself, or at least to bring the city under fire from heavy artillery so that it may no longer be of any use as an industrial and communications center."[115] However, as

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[110] Paul Carell, *Hitler Moves East 1941-1943* (New York: Bantam Books, 1966), 5-7.

[111] Citino, *The German Way of War*, 294.

[112] Ibid., 297.

[113] Ibid., 298-301.

[114] David M. Glantz and Jonathan M. House, *When Titans Clashed: How the Red Army Stopped Hitler* (Lawrence, KS: University Press of Kansas, 1995), 133.

[115] Ibid., 133-134.

Armee Gruppe B advanced further east towards Stalingrad, both Hitler and senior German commanders became mesmerized by the symbolism of Stalin's namesake city.[116]

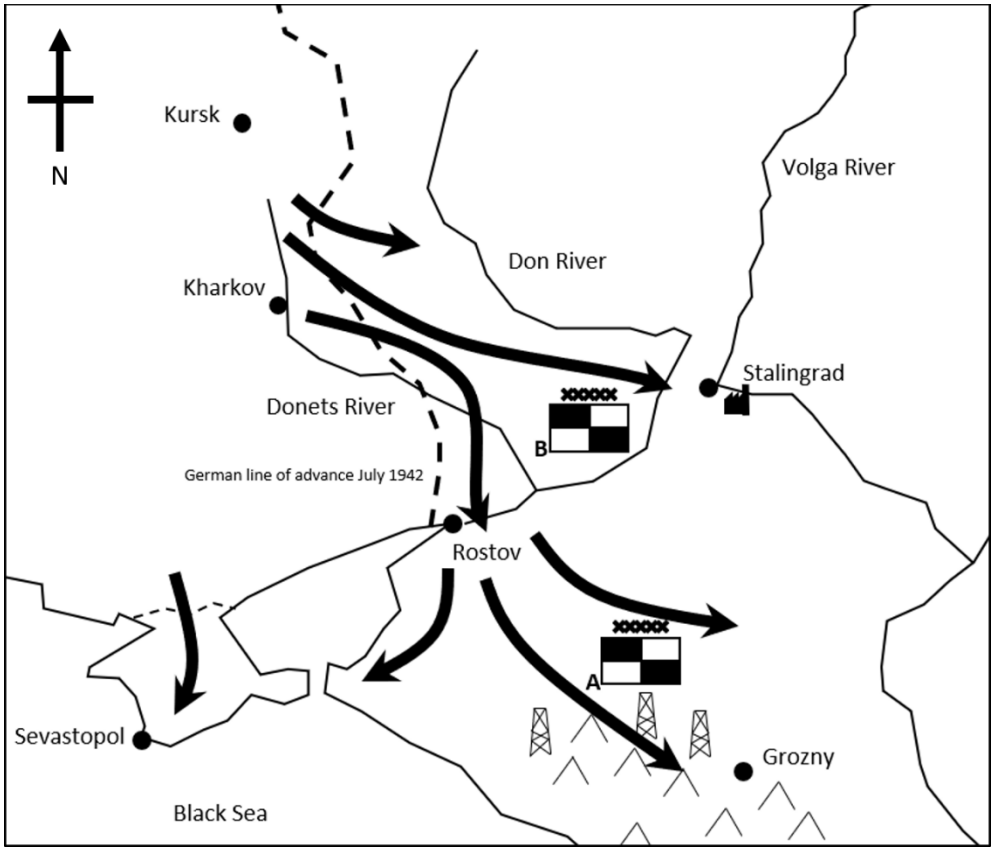

Figure 4. *Fall Blau*, The German summer offensive of 1942. Author's rendition of map in David M. Glantz and Jonathan M. House, *When Titans Clashed: How the Red Army Stopped Hitler* (Lawrence, KS: University Press of Kansas, 1995), 133-134.

On August 23, 1942, the *16. Panzer Division* departed its bridgehead on the Don River and advanced eastward toward the Volga River and the city of Stalingrad.[117] The Soviet Army received orders from Stalin to hold his namesake city to the last man. The Soviets mobilized all available labor from within the city and transformed its large apartment complexes and factories

[116] Glantz and House, *When Titans Clashed*, 134.

[117] Heinz Schröter, *Stalingrad* (New York: Ballantine Books, 1960), 29; David Glantz and Jonathan M. House, *The Stalingrad Trilogy, Volume 1: To the Gates of Stalingrad, Soviet-German Combat Operations, April – August 1942* (Lawrence, KS: University Press of Kansas, 2009) 333-336.

into fortresses.[118] By September 14, the Germans had encircled the city from the north and south and elements of the *71. Infanterie Division* had pierced the Soviet defenses, reaching the Volga river, and securing the city center.[119] However, the Soviets maintained several small bridgeheads within the city with the Volga river forming the eastern base of each pocket. Reinforcement of both men and material was only possible by crossing the river, which the Germans kept under constant direct and indirect fires, as well as aerial bombardment from the *Luftwaffe*.[120]

By mid-October, the German offensive was losing momentum and *6. Armee* commanders drew up plans for an assault to seize the remainder of the city still occupied by the Soviets. The operation would commence in the northern sector of the city that included most of the industrial factories, including the Dzerzhinsky Tractor Factory and the Barrikady Gun Factory. In Phase I the *14. Panzer Division* and *305. Infanterie Division* would drive east to seize the Tractor Factory. After securing their gains along the Volga riverbank to prevent Soviet reinforcement from the east bank, these divisions would turn south in Phase II to capture the Gun Factory and Volga River crossing sites. Phase III, largely dependent on the success of Phases I and II, would involve completing the seizure of the city by the *14. Panzer*, *305. Infanterie*, or possibly other divisions located in the southern sector (*100. Gebirgsjäger Division*, *295. Infanterie*, or *24th Panzer*), depending on available combat power for each.[121]

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[118] Carell, *Hitler Moves East*, 583.

[119] Carell, *Hitler Moves East*, 582.

[120] David M. Glantz and Jonathan M. House, *The Stalingrad Trilogy, Volume 2: Armageddon in Stalingrad, September – November 1942* (Lawrence, KS: University Press of Kansas, 2009), 107.

[121] Jason D. Mark, *Into Oblivion – Kharkov to Stalingrad: The Story of Pionier-Bataillon 305* (Sydney, Australia: Leaping Horseman Books, 2013), 328.

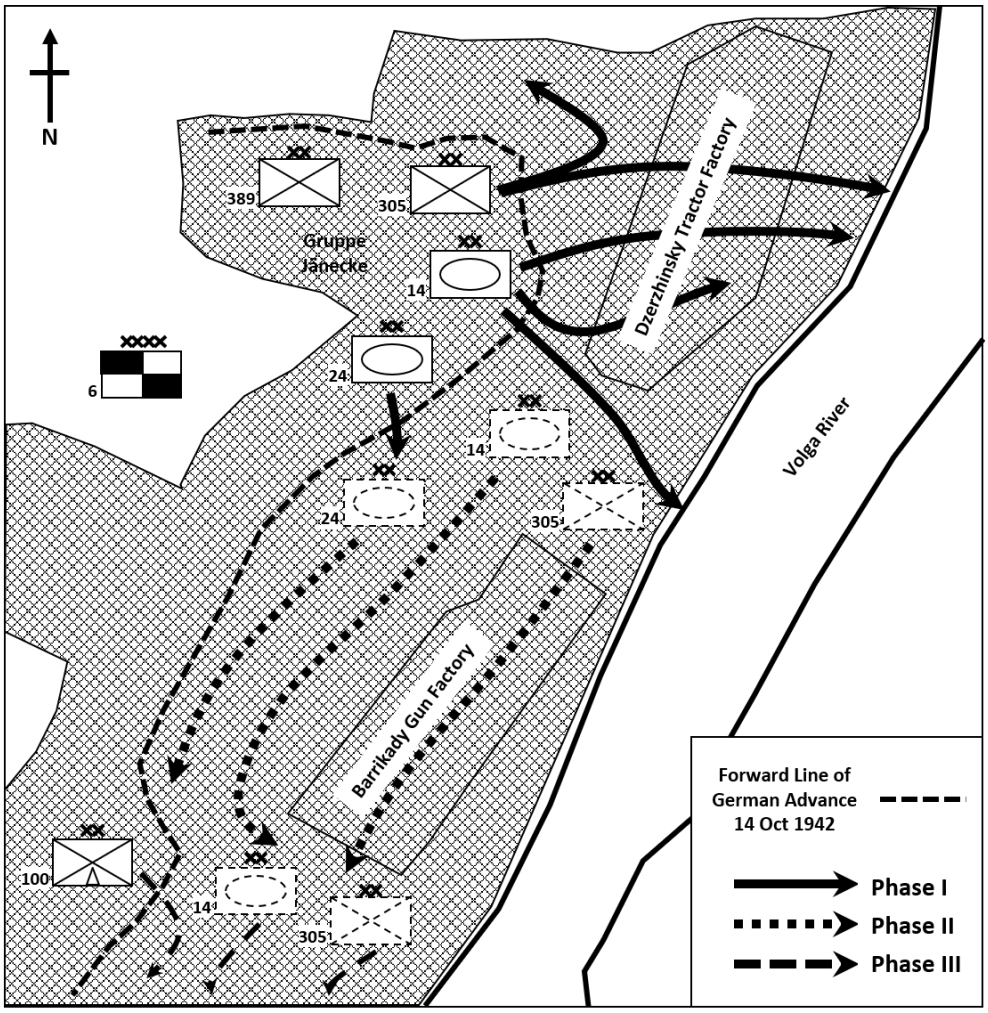

Figure 5. German plan of attack to completely occupy Stalingrad, October 1942. Author's rendition of a map in Jason D. Mark, *Into Oblivion – Kharkov to Stalingrad: The Story of Pionier-Bataillon 305* (Sydney, Australia: Leaping Horseman Books, 2013), 329.

Phase I - The Dzerzhinsky Tractor Factory

The assault to capture the remainder of the city began on October 14, 1942. The *14. Panzer Division* led the initial assault, supported by two infantry regiments from the *305. Infanterie Division* and *389. Infanterie Division* following in support. Designated as *Gruppe Jänecke,* this combined arms team employed regimental-sized infantry units each supported by

one battalion of tanks, one company of engineers, and a minimum of two artillery batteries per infantry battalion.[122]

The initial assault faced open sloping ground observed by multi-story apartment buildings occupied by Soviet infantry. Approximately 1,500 meters to the east of these apartment complexes lay the Dzerzhinsky Tractor Factor, the objective of Phase I.[123] The Soviet 37th Guards Rifle Division stood opposite *Gruppe Jänecke*.[124] These veteran soldiers fortified themselves in the dense urban terrain turning each building into a strongpoint. Motivated by Stalin's order to defend the city to the last man, they would prove a determined enemy.[125]

Supported by a rolling artillery barrage and waves of JU-87 "*Stuka*" dive-bombers, the German advance crossed the sloping terrain without difficulty.[126] As the assault neared the apartment complexes, the German advance stalled in the face of a series of Soviet bunkers. *I. Kompanie, 305 Pionier Bataillon,* attached to *II. Bataillon*, *578. Infanterie Regiment*, moved into action. German infantry provided support by fire as the *Pioniere* worked their way through the apartment blocks destroying the bunkers with demolition charges. After vicious house-to-house fighting, the *Pioniere* eliminated the enemy positions enabling the battalion to maintain its momentum towards the Dzerzhinsky Tractor Factory.[127]

This pattern of assault continued throughout October 14. Infantry supported by assault guns, indirect fires, and *Luftwaffe* CAS would advance until encountering enemy bunkers and strongpoints, when they called *Pioniere* forward. Using this method of attack, *II. Kompanie*, *305. Pionier-Bataillon* supporting the *576. Infanterie Regiment* advanced along Komsomolskaya

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[122] Mark, *Into Oblivion*, 328, Generalleutnant Jänecke, Commander of the 389. *Infanterie Division*. German naming convention named task forces after the commander of the group; Ibid., 340.

[123] Mark, *Into Oblivion*, 341.

[124] Ibid., 338.

[125] Carell, *Hitler Moves East*, 583.

[126] William Craig, *Enemy at the Gates: The Battle for Stalingrad* (New York: Ballantine Books, 1973), 125-126.

[127] Mark, *Into Oblivion*, 341-344.

Street while *I. Kompanie* and the *578. Infanterie Regiment* continued along Kultarmeiskaya Street. As described by historian Jason D. Mark, these two "phalanxes of armor and *Pionier*-backed infantry surged eastward" towards the Tractor Factory.[128] During the night of October 14 to 15, German infantry relied on the *Pioniere* to penetrate and seize the remaining Soviet strongholds in the apartment complexes. Using demolition charges to blast through walls and barricaded doorways, the *Pioniere* then cleared the buildings floor by floor with flamethrowers and hand grenades.[129]

The final push to the Tractor Factory commenced at 7:00 a.m. on October 15. As the *I.* and *III. Kompanies* of *305. Pionier-Bataillon* escorted infantry into the factory it quickly became apparent the Soviets abandoned their positions during the night. General Chuikov, commander of the Soviet 62nd Army directed the remnants of the 37th Guards Infantry Division to relinquish the factory and establish a new defensive line further south.[130] The previous attack from German troops had decimated the Soviet defenses in northern Stalingrad.

The Germans' use of *Pioniere* to support the infantry in assaulting fortified positions resulted in a rate of advance greater than the rate at which Soviet defenses could react and reinforce against. By maintaining this tempo, *Gruppe Jänecke* forced the Soviets to culminate in their current defensive position. This resulted in the abandonment of a highly defensible position due to lack of sufficient forces. The potential defensive value of the Dzerzhinsky Tractor Factory would soon become evident to the German forces as they began Phase II and entered the Barrikady Gun Factory.

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[128] Mark, *Into Oblivion*, 348-349.

[129] Ibid., 356-357.

[130] Ibid., 359.

Phase II – The Barrikady Gun Factory

The attack into the Barrikady Gun Factory began on the morning of October 16 with the *14. Panzer Division.* The division's *Panzers* and infantry immediately faced stiff resistance at the hands of the Soviet 84th Tank Brigade supported by well-placed rocket and artillery fire.[131] By mid-morning *Generalleutnant* Jänecke ordered the *305. Infanterie Division* into the factory between *14. Panzer Division* left flank and the Volga River.[132] All three regiments of the division moved into positions for the southerly advance into the factory with each regiment supported by one *Pionier Kompanie* and multiple assault guns.[133]

The ensuing fight for the factory was vicious, cruel, and up close. Both sides' weapons of choice proved to be hand grenades, flame throwers, pistols, and hand-to-hand combat.[134] By late in the afternoon, despite heavy Soviet resistance, the *Pionier*-supported infantry regiments believed they held most of the factory buildings; a task that eluded the infantry-supported *Panzers* in the morning hours. Soviet counterattacks with fresh troops halted the German advance on the afternoon of October 17. The up-close and chaotic fighting resulted in both sides believing they held the factory grounds.[135] The three-dimensional battlefield allowed Soviet soldiers to filter through German defenses below ground in sewers and conduits, or overhead in the factory work halls across catwalks or elevated floors. This routinely forced the German infantry and *Pioniere* to clear their rear areas in lieu of continuing the advance.[136]

Unknown to the Germans, from October 15 to 17, the Soviets successfully crossed the 650th Regiment, 768th Regiment, and 344th Regiment across the Volga under the cover of

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[131] Anthony Beevor, *Stalingrad: The Fateful Siege: 1942-1943* (London: Penguin Books, 1998), 196.

[132] Mark, *Into Oblivion*, 364-365.

[133] Ibid., 379.

[134] Mark, *Into Oblivion*, 380; Glantz and House, *The Stalingrad Trilogy, Volume 2,* 166-167.

[135] Mark, *Into Oblivion*, 379-383.

[136] Mark, *Into Oblivion*, 383; Glantz and House, *The Stalingrad Trilogy, Volume 2,* 166-167.

darkness.[137] This influx of 1,700 men of the 138th Rifle Division under the command of General Lyudnikov renewed the Soviet resistance that slowed and finally halted the German assault through the Barrikady Gun Factory. This increased troop strength of the Soviets, coupled with ammunition and labor shortages of the *305. Infanterie Division* resulted in a fierce back and forth struggle for the factory work halls that brought the German offensive to a standstill.[138] Despite this stalemate in the Barrikady Gun Factory, the role and success of the *Sturmpionieren* in Stalingrad had not gone unnoticed.[139]

As the Germans and Soviets fought for control of the factories of Stalingrad, *OKW* was paying special attention to requests from the *6. Armee* for additional troops to insert into the city. Aside from the fight inside the city, the *6. Armee* also struggled to maintain its northern and southern flanks where the Soviets continuously launched counterattacks to relieve pressure on the defenders inside Stalingrad. This contributed to a shortage of available troops within *6. Armee*.[140] *Generaloberst* Friedrich Paulus, commander of the *6. Armee*, requested additional troops from *OKW* and specifically requesting the transfer of the *29. Infanterie Division* .[141] However, Adolf Hitler and *Generaloberst* von Richtofen (commander of the *4th Luftflotte*), had noticed the impact of the *Pioniere* in the urban fighting of the Dzerzhinsky Tractor Factory and Barrikady Gun Factory.[142] Their solution arrived at *6. Armee* headquarters on November 3 in the form of an order that read:

> *6. Armee* will be supplied on 4 and 5.11 [November 4 and 5] with five *Pionier-Bataillons* – organized as assault battalions – These battalions should be combined under

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[137] Mark, *Into Oblivion*, 382; Glantz and House, *The Stalingrad Trilogy, Volume 2,* 407-410.

[138] Mark, *Into Oblivion*, 382-383.

[139] Glantz and House, *The Stalingrad Trilogy, Volume 2,* 612.

[140] Jason D. Mark, *Island of Fire: The Battle for the Barrikady Gun Factory in Stalingrad: November 1942 – February 1943* (Sydney, Australia: Leaping Horseman Books, 2006), 11.

[141] Mark, *Island of Fire*, 14.

[142] Glantz and House, *The Stalingrad Trilogy, Volume 2,* 612.

particularly qualified staffs of grenadier regiments and be complemented by heavy companies from grenadier regiments.[143]

With that order, five powerful and experienced *Pionier-Bataillons* came under the *6. Armee's* control. From combat divisions spread across southern Russia, *OKW* directed the reassignment of the *45. Pionier*, *50. Panzer Pionier*, *162. Pionier*, *294. Pionier*, and 336. *Pionier-Bataillons* from their organic parent divisions to the *6. Armee*. Through a mix of ground and air transport, these *Pionier-Bataillons*, including their light assault equipment, soon joined the *305.Pionier* in what the Germans planned as the final assault to seize the Barrikady Gun Factory and Stalingrad.[144] "The arrival of these *Pionier-Bataillons* caused excitement within the ranks of the beleaguered infantry within Stalingrad. The common soldier respected the skill and bravery of the *Pionier*. An attack carried out with the help of *Pioniere* always stood a better chance of succeeding, especially when the objective was a fortification or other type of fiercely defended position."[145]

The German assault began in the early morning hours of November 11 with a fierce artillery barrage on the Soviet positions. The *Luftwaffe* added to the bombardment with attacks on known Soviet artillery positions on the east bank of the Volga river.[146] Once the barrage lifted the *Sturmpionier* teams advanced forward and succeeded in eliminating the various points of resistance, enabling them to reach their objectives. However, the second assault wave comprised of the supporting infantry were too weak to consolidate the ground won.[147] Once again the three-dimensional battlefield played havoc on the German advance. They frequently found themselves defending positions inside buildings they had just captured. Lacking sufficient infantry support during the assault and in consolidating gains, the *Pioniere* could not maintain the tempo of the

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[143] Mark, *Island of Fire*, 24.

[144] Mark, *Island of Fire*, 24; Glantz and House, *The Stalingrad Trilogy, Volume 2*, 612.

[145] Mark, *Island of Fire*, 53-54.

[146] Ibid., 93-95.

[147] Schröter, *Stalingrad*, 36.

attack and the advance soon culminated short of pushing the Soviets into the Volga. Although only a small 100-meter-deep bridgehead remained in Soviet hands, they continuously received reinforcements and supplies from across the Volga and managed to withstand the German assaults.[148] By November 15, the Germans halted the assault on the Barrikady Gun Factory, having suffered a 40% casualty rate in the attacks of the few previous days.[149] The Germans never again accumulated enough combat power to launch additional offensives aimed at seizing the remainder of the city.

The experience of this attack shows that the *Pioniere* could only carry out their tasks with strong infantry support. Unfortunately, the infantry regiments accompanying the attack had suffered so many losses during the preceding weeks of combat that they were no longer able to provide effective support to the attack. On the evening of November 11, the day of the *Pioniere* assault, *Oberst* Herbert Selle (the *6. Armeepionierführer*) informed General von Seydlitz (commander of the 51st Army Corps) that "to achieve results of this sort it is essential to bring up an infantry regiment and armor to reinforce the assault. My engineer battalions are a specialist force. In present circumstances they are bleeding to death."[150] Both *Generaloberst* Paulus and *Oberst* Selle understood the vital nature of a combined assault that included both infantry and *Pioniere.* However, the ensuing massed employment of *Pioniere* proved to be just as unsuccessful as a massed infantry assault. The ability of these additional *Pionier-Bataillons* to maintain the tempo of the attack, extend operational reach, and avoid culmination did not materialize due the single sightedness of senior *OKW* officials, whom viewed the success in the Dzerzhinsky Tractor Factory as an instance of *Pionier* success, in lieu of a holistic instance of combined arms cooperation.

[148] Glantz and House, *When Titans Clashed*, 123.

[149] Schröter, *Stalingrad*, 38.

[150] Ibid., 37.

Conclusion – Stalingrad

The German experience at Stalingrad provides a documented case study on the effects of employing combat engineers in the assault of fortified positions. The combined infantry – engineer organization used on the assault through the Dzerzhinsky Tractor Factory gave a violent and steady tempo to the assault that ground down Soviet defenses, forcing them to abandon the most defensible part of the factory. However, this assault included complements of infantry that were fresh and of sufficient strength. The ensuing attack on the Barrikady Gun Factory did not include the *Pioniere* and quickly stalled in the face of fierce Soviet resistance. General Jänecke quickly committed the *305. Infanterie Division's* regiments augmented with *Pioniere* resulting in the seizure of most of the factory grounds. This attack eventually culminated due to the lack of infantry support and sustainment operations. Blinded by the allure of specialty assault troops to bring the battle of Stalingrad to a close, the German *OKW* opted to maximize the numbers of *Pioniere* committed to the final assault on the Barrikady Gun Factory without committing the required supporting infantry. By infusing five additional *Pionier-Bataillons*, the Germans achieved quick overwhelming success against the Soviet fortified positions. However, due to the lack of follow-on infantry support the Soviets repulsed the German offensive and retained their foothold within the city.

Analysis

These case studies show the capability of combat engineers to overcome natural and manmade obstacles and enable the mobility of friendly forces in sustained major ground combat against a peer or near-pear enemy. This mobility offered the means to sustain the German forces' tempo, extend their operational reach, and prevent culmination. The divisional *Pioniere* of the *XIX Panzerkorps* provided the means to sustain their tempo when faced with opposed crossings of the Meuse River. This linear obstacle provided an opportunity for the Allies to force culmination of the entire German offensive. By overcoming this obstacle, the *Pioniere* provided

the mobility to sustain tempo and extend the operational reach of German forces into Central Belgium and France. Similarly, the assault tactics employed by the *305. Pionier-Battalion* in Phase I of the October 1942 assault in Stalingrad pushed the Soviet defenders within less than 100 meters from the Volga river. This enabled a tempo of advance that not only out-paced the Soviets ability to respond to their actions, but also induced culmination of the defenders in the Dzerzhinsky Tractor Factory forcing its abandonment.

However, just as important as the capabilities offered by the combat engineer is the limitations of such formations. As demonstrated in the Barrikady Gun factory in Phase II, engineers alone cannot achieve the desired effects of tempo, operational reach, and culmination. The *Pioniere* did achieve these effects the previous day in the Dzerzhinsky Tractor Factory but only when properly organized and supported with infantry, armor, artillery, and CAS. The analysis of the Meuse crossings details the level of task organization of supporting arms that the German forces utilized. It is no far stretch to surmise that *Pioniere* tasked to execute these crossings in lieu of supporting arms would result in disaster for the operation. The accompanying infantry proved vital to seizing and consolidating bridgeheads while the artillery, *Panzers,* and CAS provided essential fire support that suppressed Allied defenders. Furthermore, the crossing of the Meuse and piercing the Allied defenses succeeded due to the timely crossing of armored and mechanized forces enabled by the synchronized operational approach used by the Germans. This supporting relationship by all combat arms is what was lacking and ultimately prevented the Germans from seizing all of Stalingrad during their second phase of the October 1942 offensive.

Recent experiences of US Army combat engineers employed in Iraq and Afghanistan illustrate this dependency of combat engineers on other combat arms. After the shift from major combat operations of US forces in Iraq in 2003 (as described above), combat engineers transitioned to a predominately assured mobility mission set focused on deliberate route clearance

operations.[151] Most of these operations included a single engineer platoon tasked with conducting deliberate route clearance on a set of routes designated by a higher headquarters. The criteria for choosing which routes usually depended on the length of time since the last deliberate clearance. Measures of performance depended on the number of IEDs found or destroyed and the total kilometers of routes cleared. Route clearance patrols (no longer referred to as engineer platoons) assumed a role of an echelon above brigade enabler that dictated the timing and planning of missions, in lieu of a supporting and enabling role factored into mission planning.[152]

As a result, routine route clearance operations rarely supported a specific maneuver effort. Engineers cleared routes in isolation of a brigade or lower scheme of maneuver and accomplished little in enabling friendly forces mobility.[153] They would clear a route of IEDs, often at a great cost of life and resources, only to have insurgents 'reseed' the route with IEDs only hours or minutes later.[154] Thus, when not integrated into greater scheme of maneuver, their greatest contribution to the counterinsurgency fight was the forcing of consumption of enemy resources and IED-making materials. Engineers were unable to exploit battlefield success without dedicated support from infantry or armored units. This lack of combined arms support or support to maneuver operations prevented holding the terrain that they had cleared.[155] Attempts to provide route clearance support to large convoy movements often resulted in poor cooperation between clearance and maneuver elements allowing for insurgents to 'reseed' a cleared route prior the supported convoy's movement.[156]

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[151] D'Aria and Moore, "Adapting the Army: Institutionalizing Counter-IED Training Efforts."

[152] US Department of the Army, "IED-D: Tactics, Techniques, and Procedures," Center for Army Lessons Learned, Bulletin 1 (FY09): 82-82.

[153] James B. Weakley and Eric P. Ng, "Redefining Route Clearance for Future Operations," *Engineer*, May to August, 2014, 17-18.

[154] US Army, "IED-D: Tactics, Techniques, and Procedures," 27.

[155] Weakley and Ng, "Redefining Route Clearance for Future Operations," 17-18.

[156] US Army, "IED-D: Tactics, Techniques, and Procedures," 82-83.

The lessons learned provided by the preceding case studies of the German *Pionier* surface in recent efforts by the US Army to correct their employment of engineers. By 2013 the US Army focused its operations in Afghanistan on the retrograde of coalition forces from outlying bases.[157] This required numerous large logistical convoys to transport troops, supplies, and equipment to enduring bases such as Bagram, Kandahar, and Jalalabad. Due to increased enemy attacks on engineers executing independent route clearance missions, United States Forces – Afghanistan (USFOR-A) mandated the use of a combined arms route clearance operation (CARCO) concept.[158] The CARCO concept required the following of all route clearance operations; minimum of one engineer platoon supported by one platoon of a maneuver element, dedicated indirect fire support through accompanying dismountable mortars or long range artillery, dedicated persistent air coverage through continuous support from rotary wing aviation or unmanned aerial vehicles, dedicated and accompanying maintenance support to recover disabled vehicles, a minimum of one embedded explosive ordnance disposal team, the CARCO must be in direct support of a planned operation coordinated through time and space, and commanded by a company commander from either the parent engineer or maneuver element.[159] This company team of combat power proved very effective at providing assured mobility for their supported convoy movements. Enemy forces proved hesitant to engage a CARCO. A single engineer platoon proved vulnerable to a coordinated attack from insurgents while a CARCO included all combat elements to not only repel an attack but to also purse and destroy the insurgent forces.

This positive effort by USFOR-A to return to a combined arms approach to mobility operations optimistically demonstrates the knowledge of proper employment of engineers still

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[157] Kevin N. Braam, "A Team-of-Teams Approach: Combined Arms Route Clearance During the Retrograde," *Engineer*, January to April, 2015, 15.

[158] Ibid., 14.

[159] Ibid., 14.

exists in the higher echelons of the US Army. However, the skepticism and parochial thoughts experienced at the brigade level and below remains a cause for concern as supporting units question their formation's support to an 'engineers' mission; a stereotype created by seventeen years of engineer-centric route clearance operations in Afghanistan and Iraq.[160]

Conclusions / Recommendations

The evidence supplied by these case studies demonstrates that during sustained ground combat with a peer or near-peer adversary, combat engineers are highly versatile formations that when properly employed in a combined arms concept can maintain friendly forces tempo, disrupt enemy tempo, prevent the culmination of friendly forces, initiate enemy culmination, and extend the operational reach of friendly forces. Considering the lessons drawn from these case studies, the US Army's Engineer Regiment must train its soldiers and leaders to plan and execute major combat operations as outlined in the current version of US Army operational doctrine which emphasizes the use of combined arms as one of its six principles of unified land operations.[161] Simultaneously, it must retrain itself and other supported or supporting branches of the US Army on the capabilities and proper employment of combat engineers. The Engineer Regiment must accomplish this through professional education, discussion, and most importantly, displaying its competence and capabilities through combined arms training. By accomplishing these two lines of effort, the US Army and the US Army Engineer Regiment will avoid a future setback in the execution of major ground combat operations such as the employment of engineer-pure route clearance patrols versus the employment of a combined arms route clearance operations.

In future conflicts, adversaries of the United States will employ a combination of traditional and irregular capabilities. The enemy will seek to interdict US forces attempting to enter any crisis area. It will use complex terrain and urban environments to offset the United

[160] Weakley and Ng, "Redefining Route Clearance for Future Operations," 17.

[161] ADP 3-0, *Operations*, 4,7,12.

States' advantages by employing conventional obstacles, mines employed in-depth, and IEDs.[162] Mobility operations will be critical to enhance friendly movement and maneuver to overcome these enemy efforts to interdict any United States' entry operations. As seen with the experiences of the *Pionier*, US Army Engineers employed in a combined arms mobility role will be critical to facilitating these entry operations by influencing the elements of operational art of tempo, operational reach, and culmination.

This monograph focused on the mobility aspect of the combat engineer's core competencies and its relation to the elements of operational art. Additional research and analysis should focus on the engineer's core competencies of countermobility and survivability. Their relationship to the elements of operational art and recommendations for future employment against a peer or near-pear adversary in sustained ground combat will provide similar valuable lessons learned to prepare the US Army and the US Army Engineer Regiment for future wars.

[162] US Department of the Army, Army Techniques Publication (ATP) 3-90.4, *Combined Arms Mobility* (Washington DC: Government Printing Office, 2016), viii.

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