To the Far Side: Engineer Support to Division and Corps Wet-Gap Crossings

A Monograph

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Abstract

To the Far Side: Engineer Support to Division and Corps Wet-Gap Crossings, By MAJ Joseph Kendall, US Army, 49 pages.

This monograph assessed the ability of the current engineer force capability and capacity, to conduct multiple division and corps level wet-gap crossings, during large-scale combat operations. Using a structured and focused comparison, the research evaluated the engineer force structure available and used during two river crossing operations during World War Two. The research compared the findings with an evaluation of a theoretical and contemporary, division wet-gap crossing, using current US Army doctrine and force structure. The research exposed potential shortfalls in the division's organic engineer assets as well as, engineer bridging capability and capacity within the US Army's active component.

Contents

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Acronyms

ADP	Army Doctrine Publication
ADRP	Army Doctrine Reference Publication
ATP	Army Techniques Publication
BEB	Brigade Engineer Battalion
EAB	Echelons Above Brigade
LSCO	Large-Scale Combat Operations
FM	Field Manual
MOS	Military Occupational Specialty
NDS	National Defense Strategy
MRBC	Multi-role Bridge Company
SHAEF	Supreme Headquarters Allied Expeditionary Force

Illustrations

Tables

Introduction

Background of the Study

The 2018 National Defense Strategy (NDS) describes the challenge to US security as the reemergence of long-term strategic competition with state actors. The NDS describes two of these state actors, Russia and China, as revisionist powers that seek to leverage military operations and other instruments of national power to create an environment consistent with their values and world view.[1] This near peer competition presents a challenge to US military superiority. Near peer competition requires a more lethal, resilient, and capable force, that will prevail in state-on-state conflict.[2] In October of 2017, the US Army began to address state versus state conflict, and near peer competition with the publication of *Field Manual (FM) 3-0, Operations*. The publication of *FM 3-0,* ushered in a new era for the US Army, with a return of focus on a division and corps centric fighting force.

The shift from a brigade, to a division and corps centric fighting force, is one of many changes the US Army is making, to meet the challenge of near peer competition. The new *FM 3-0,* explains that the experiences of fighting counterinsurgency style conflicts at brigade and below, does not represent the most dangerous threat the US Army might face in the future.[3] In order to prepare for future conflict, *FM 3-0* states that, "US Army forces must be organized, trained, and equipped to meet worldwide challenges against a full range of threats."[4] To ensure the US Army can operate within the demands of increased operational tempo and lethality, key

[1] US Department of Defense, *National Defense Strategy (NDS)* (Washington, DC: Government Printing Office, 2018), 2.

[2] Ibid., 1.

[3] US Department of the Army, *Field Manual (FM) 3-0, Operations* (Washington, DC: Government Printing Office, 2017), 1-2.

[4] Ibid., 1-2.

enablers and other warfighting functions must maintain the ability to support the movement and maneuver of divisions and corps during large-scale combat operations.

As the US Army transitions from a brigade to a division and corps centric fighting force, a review of key enablers at the brigade and echelons above brigade must occur. The force structure, doctrine, and equipment in these organizations must be optimized to support the movement and maneuver of multiple divisions and corps on the modern battlefield. Engineers serve as an important enabler for movement and maneuver, and operate at the brigade level and echelons above brigade. Engineers ensure mobility for military forces, which permits them to maneuver freely and mass effects at select locations.[5] Freedom of maneuver allows friendly forces to maintain tempo and momentum during offensive operations.[6]

Crossing rivers, as well as natural and man-made gaps, presents a major obstacle to maintaining freedom of maneuver and offensive momentum. *Army Techniques Publication (ATP) 3-90.4, Combined Arms Mobility*, describes wet-gap crossings as "the most critical, complex, and vulnerable combined arms operations mission."[7] Evaluating engineer capability and capacity to enable a wet-gap crossing provides a small portion of the review of critical enablers. This monograph assesses the impact current engineer force structure and doctrine has on the ability to conduct large-scale combat operations by asking the following question; does the current engineer doctrine and force structure used to conduct wet-gap crossings support divisions and corps in maintaining mobility and tempo during large-scale combat operations? The problem explored in this study is that the US Army may be unprepared doctrinally and ill-equipped to conduct wet-gap crossings during large-scale combat operations. This review will help uncover

[5] US Department of the Army, *Army Techniques Publication (ATP) 3-90.4, Combined Arms Mobility* (Washington, DC: Government Printing Office, 2016), 1-2.

[6] Ibid.

[7] US Army, *ATP 3-90.4* (2016), I-2

capability and capacity gaps within these enablers that may hinder the execution of large-scale combat operations

Current engineer doctrine has a publication that pre-dates the 2017 release of the *FM 3-0* series of manuals. Additionally, there is currently no capability or capacity within the division or corps to conduct a deliberate wet-gap crossing over eighteen meters. Any wet-gap beyond eighteen meters requires the use of an improved ribbon bridge. This bridge capability is in the echelons above brigade, multi-role bridge companies. Compounding the lack of capacity at the division, is that the preponderance of the multi-role bridge companies are in the National Guard and Reserve components.[8] The active component maintains only four of the twenty-six total multi-role bridge companies. The potential gap in doctrine, capability, and capacity present the need for analysis of the requirements to conduct deliberate wet-gap crossings during large-scale combat operations.

Purpose of the Study

The purpose of this research was to examine potential gaps in engineer force structure, doctrine, capability, and capacity at the division and corps level. The research supported the understanding of doctrine and force structure requirements for engineers to support deliberate wet-gap crossings during large-scale combat operations. To establish a base of knowledge, the research focuses on division and corps level wet-gap crossings conducted during World War Two. Understanding how the US Army conducted deliberate wet-gap crossings during previous large-scale combat operations allowed for the assessment of current doctrine, capability, and capacity.

[8] US Department of the Army, *Field Manual (FM) 3-34, Engineer Operations* (Washington, DC: Government Printing Office, 2014), 1-13.

Definitions of Key Terms

This study uses several key terms, concepts, and engineer units throughout the paper. Army Doctrine Publications and Army Field Manuals provided the primary references for the terms.

Engineer Combat Group: In 1943 this unit served primarily as a tactical command group composed of a headquarters, a headquarters company, and attached engineer units. During large-scale combat operations they would provide engineer command and control support to divisions, corps, and armies. Their mission was to supervise the operations of engineer combat battalions, and to other task organized engineer units.[9]

Engineer Combat Battalion: During World War Two, this battalion was an organic part of the division. Their mission was to increase the division's combat effectiveness by conducting general engineer work consisting of creating combat roads and trails, large-scale breaching, force protection construction, and gap crossing operations. Its wet-gap crossing equipment consisted of assault boats, pneumatic reconnaissance boats, and pneumatic floats.[10]

Engineer Brigade: Current doctrine outlines that an engineer brigade is typically allocated to the corps for most operations. The brigade can control up to five mission tailored engineer battalions that are not organic to maneuver units. They provide mission command for assigned or attached units, and operational control of groups of non-engineer units performing missions in support of deliberate gap crossings.[11]

Brigade Engineer Battalion: Under the current force structure, the brigade engineer battalion (BEB) provides organic engineer planning and execution capabilities to the brigade

[9] US Department of the Army, *Field Manual (FM) 5-5, Engineer Troops* (Washington, DC: Government Printing Office, 1943), 36.

[10] Ibid., 48.

[11] US Army, *FM 3-34* (2014), 1-9.

combat team. The two engineer companies provide the brigade combat team with the minimum capability to support offensive and defensive tasks.[12]

Multi-Role Bridge Company: The multi-role bridge company provides personnel and equipment to transport, assemble, disassemble, retrieve, and maintain all standard US Army bridging material. The typical assignment is to a corps and can be further task organized to divisions and brigades. Its designed capabilities include fixed and float bridging. When the unit conducts float bridging, it can construct a ribbon bridge to a maximum length of 620 feet long. There are currently four multi-role bridge companies in the active component, eleven in the National Guard, nine in the Army Reserve, and one in US Army prepositioned stock.[13]

Tempo: The relative speed and rhythm of military operations over time with respect to the enemy. It reflects the rate of military action.[14] Tempo also refers to considerations of when to employ capabilities, and the duration of their use in order to achieve the effects necessary at various echelons of command.[15]

Simultaneity: The act of doing multiple things at the same time. It is the execution of related and mutually supporting tasks at the same time across multiple locations and domains. Simultaneity requires the capabilities to conduct multiple operations in depth, integrated in time and space throughout the area of operations.[16]

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[12] US Army, *FM 3-34* (2014), 1-7.

[13] "MRBC Narrative" *FMSWeb*, last modified October 1, 2018, accessed on January 23, 2019, https://fmsweb.fms.army.mil/protected/webtaads/UICFrame.

[14] US Department of the Army, *Army Doctrine Reference Publication (ADRP) 3-0, Operations* (Washington, DC: Government Printing Office, 2017), 2-7.

[15] US Army, *FM 3-0* (2017), 1-26.

[16] US Army, *ADRP 3-0* (2017), 3-13.

Vignettes

The monograph used three vignettes to organize the research and analysis of the proposed hypotheses. The first vignette took place during World War Two and focused on the XIIth Corps' operation as it crossed the Rhine River from the 22nd to the 25th of March, 1945. This vignette allowed the examination of doctrine and capabilities during large-scale combat operations. The vignette also provided insight in to how corps and divisions leveraged engineer capability and capacity to enable mobility and tempo. The XIIth Corps' crossing of the Rhine River used one division as an initial assault crossing force. This vignette provided insight and evidence on how doctrine was implemented for a single division crossing within a corps river crossing operation.

The second vignette also took place during World War Two, and focused on the XIIIth Corps' crossing of the Roer River as part of Operation Plunder. This vignette provided a different perspective from the first, in that it shows two divisions conducting simultaneous crossings as part of a multi-corps river crossing operation. This major difference, allowed the researcher to better assess the resources required to conduct simultaneous division size crossings during a multi-corps operation. This developed a greater understanding of the resource intensive nature of the operation, and the exclusive nature of the support to each division provided by separate engineer battalions and engineer groups.

The third vignette is a conceptual wet-gap crossing, and uses current doctrine and force structure. This vignette sought to replicate an operation similar in nature to those conducted in the previous vignettes during World War Two. The vignette involved a multi-corps attack, similar to vignette one, where two corps conducted single division wet-gap crossings. This vignette depicted the current operating force executing a deliberate wet-gap crossing during large-scale combat operations. The units were selected for their resemblance to the type of units depicted in the first two vignettes. Like the previously depicted vignettes, the evidence and discussion

focused on the division of only one of the corps executing the operation. The next section discusses the research questions used to examine the empirical evidence in each vignette.

Research Questions

The monograph used five research questions to collect data and derive evidence for each vignette. Primary and secondary sources provided the evidence and data for answering the research questions. The research questions enabled the comparison of each vignette and provided the evidence for analysis of the hypotheses. The following outlines the questions and their importance to the structured analysis and comparison.

Research question one asked what was the doctrine used for deliberate wet-gap crossing operations. The question provided the doctrinal outline for the conduct of deliberate wet-gap crossings over time. The answer to this question provided the details of the engineer task organization requirements to conduct a deliberate wet-gap crossing.

Research question two was what were the resources and capabilities available to the engineer planner for the wet-gap crossing. This question developed an understanding of the engineer force structure accessible to the planner for use in a deliberate wet-gap crossing. This question provided insight into the arrangement of engineer forces and their capabilities and capacities.

Research question three was what engineer resources and organizations were employed during crossing operations. This question developed an understanding of the engineer force required to conduct the deliberate wet-gap crossing operation. This question identified any capability gap between the allocated means and the engineer support requirement.

Research question four was how was the crossing executed. This question was broken into two parts: how many crossing sites were established and what was the flow rate of the division across the river. This question illuminated the employment of engineers in support of the

deliberate wet-gap crossing. Additionally, the question provided necessary insight into the task organization of engineer capability and capacity.

Research question five was were engineers supporting other simultaneous corps level river crossing operations. This question provided the scope and scale of engineer support to corps and divisions during large-scale combat operations. Additionally, it displayed the amount of engineer support required during simultaneous corps level operations.

Hypotheses

The first hypothesis states that to maintain mobility that enables tempo in movement and maneuver during large-scale combat operations, corps and division size operations require resident capability and capacity to conduct multiple and simultaneous river crossing operations. The resource intensive nature of a wet-gap crossing, in conjunction with the rapid pace of operations expected on today's battlefield, creates a necessity for constant mobility to enable tempo. Historically, corps and division commanders deliberately crossed rivers by creating multiple crossing sites, with numerous units simultaneously. This hypothesis suggests that the simultaneity necessary to cross division and corps level units requires an engineer capability and capacity to be readily available on the battlefield.

The second hypothesis states that the current engineer force is ill-suited to support multiple division and corps wet-gap crossings during large-scale combat operations due to doctrine, organization, capability, and capacity. This hypothesis suggests that the last seventeen years of concentrating on brigade-centric operations and developing a force structure centered on low-intensity conflict has degraded the ability to conduct deliberate wet-gap crossings for divisions and corps.

This monograph presents its information and findings in eight sections. Section one, the introduction, contains the background of the study, the problem statement, the purpose of the study, definitions and key terms, hypotheses, and organization of the study. Section two will

review and examine the relevant literature regarding wet-gap crossings. Section three provides the methodology used to conduct this research project. Sections four, five, and six present three vignettes examining the phenomena of a deliberate wet-gap crossing during large-scale combat operations. Section seven provides the findings and analysis for the monograph and the hypotheses. Lastly, section eight presents a conclusion which includes a summary of the monograph at large, a final review of the findings, the overall implication for the engineer regiment and US Army, and recommendations for additional research.

Review of the Literature

Introduction

This literature review presents a portion of the relevant body of knowledge surrounding the research problem. This section examined examples of engineer doctrine, capabilities, and capacity for wet-gap crossings, and how it affected the US Army's ability to conduct large-scale combat operations. The literature review revealed two themes that helped organize the research. The themes showed that wet-gap crossings are resource-intensive operations and that multiple, simultaneous crossings are critical to tactical success.

Review

Wet-gap, or river crossings, create an impediment to mobility and operational tempo for a maneuver unit. The modern battlefield described in *FM 3-0,* is intense, lethal, and brutal with complex and uncertain conditions.[17] In his doctoral dissertation, Robert Toguchi described a similar battlefield where the size of forces and their mobility increased lethality. Toguchi offered that on this battlefield the ability to conduct deliberate wet-gap crossings is a crucial element in warfare.[18] Brett Boyle added to this sentiment in *Into The Breach,* where he described rivers as

[17] US Army, *FM 3-0* (2017), 1-2.

[18] Robert M. Toguchi, *The Evolution of United States Army River Crossing Doctrine and equipment, 1918-1945* (Ann Arbor, MI: UMI Dissertation Services, 1994), 25.

some of the most significant obstacles to the offense during World War Two.[19] He asserted that crossing a river is resource intensive, and required a massive effort in leveraging boats and bridges.[20] Toguchi's writings are in agreement that the nature of the operation is resource intensive, and added that understanding the requirements to conduct a river crossing is essential to create the necessary engineer doctrine, capability, and capacity.[21] Toguchi and Boyd, in conjunction with current doctrine, framed the critical nature of deliberate wet-gap crossings.

The theme that wet-gap crossings are intensive in nature during large-scale combat operations finds additional support in the literature surrounding river crossing operations during World War Two. Addressing the Rhine River crossing, LTC George Dyer, who was the XIIth Corps' unit historian, described the Rhine River crossing as a tactical engineering feat of the most significant magnitude.[22] The attack across the Rhine by the XIIth Corps required a magnitude of engineer resources described as similar to those seen during the Normandy landings.[23] Barry Fowle noted that engineers played a critical role in the assault crossings of the Rhine River. He discussed in detail how the massive amount of engineer assets assembled were used to enable the successful crossing.[24] The Roer River crossing served as an additional example of the resource-intensive nature of a deliberate wet-gap crossing. Beck, Bortz, Lynch, Mayo, and Weld detailed that a primary reason for success during the Roer River crossing was the engineering capability

[19] Brett Boyle, *Into the Breach*, ed. Florian L. Waitl (Fort Leavenworth, KS: Army University Press, 2018), 107.

[20] Ibid., 105.

[21] Toguchi, *The Evolution of United States Army River Crossing Doctrine and equipment, 1918-1945*, 25.

[22] George Dyer, *XIII Corp, Spearhead of Patton's Third Army* (XII Corps History Association, 1974), 360.

[23] Ibid., 366.

[24] Barry W. Fowle, *Builders and Fighters: U.S. Army Engineers in World War II* (Fort Belvoir, VA: Office of History, 1992), 475.

and capacity to create and repair multiple bridge sites.[25] The resources required showed that establishing multiple crossing sites were needed in order to support the commander's battle plan.

A wet-gap crossing is resource intensive due to the necessity to develop multiple and simultaneous crossing sites to mitigate the negative impact on mobility and tempo. Carl von Clausewitz noted in his chapter on river crossings that, "if the attacker limits himself to a single bridge his actions will be significantly hampered."[26] Writing about the American Civil War, COL T.T. Jones, pointed out that the ability to conduct river crossings at multiple points is essential for success at the tactical and strategic level.[27] Immanuel and Gotwals, discussed the tactical aspects of river crossings during World War I. Their journal outlined three deliberate wet-gap crossings, and noted that multiple crossing sites helped to generate the speed and tempo necessary for maneuver units to ensure operational success. The engineer capability and capacity to produce more than one crossing site in each instance played a critical role in operational success.[28] Successful river crossings also depended on the engineer structure present within the division.

Lieutenant Colonel F.S. Besson described the necessary engineer force requirements for a division to maintain mobility, flexibility, and tempo in his article for *The Military Engineer*. Besson offered that a resident engineer capability and capacity maintained rapid tempo and

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[25] Alfred M. Beck, Abe Bortz, Charles W. Lynch, Lida Mayo, and Ralph Weld, *The Corps of Engineers: The War Against Germany* (Washington, DC: Center of Military History, 1985), 496.

[26] Carl Von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984), 532.

[27] R.P. Howell Jr., "An Historical Example of Forcing a River Crossing: The Federal Cavalry at the Pamunkey River, VA, May 27, 1864," *Professional Memoirs, Corps of Engineers, United States Army, and Engineer Department at Large* 7, no. 36 (November-December, 1915): 754, accessed November 12, 2018, https://www.jstor.org/stable/44580115.

[28] Oberst Friedrich Immanuel, and John C. Gotwals, "Three River Crossings in the European War: Tactical-Technical Considerations," *Professional Memoirs, Corps of Engineers, United States Army, and Engineer Department at Large* 8, no. 40 (July-August, 1916): 512, accessed November 12, 2018, https://www.jstor.org/stable/44698065.

mobility.[29] He argued that due to the increased lethality and speed of the battlefield, forward units cannot rely on critical enablers to be task organized from the rear to conduct vital operations.[30] Engineer requirements during river crossing operations gained specific attention in Besson's article due to the critical nature of the capability they bring to the maneuver unit when conducting a wet-gap crossing.

To effectively execute a gap crossing with tempo, Besson argued that an infantry division must contain organic pontoon bridging and footbridge construction assets. He claimed as motorization and the weight of vehicles increased, as seen in an armored division, the necessity for organic bridging equipment to conduct a river crossing operation increases.[31] In his article, COL Cole detailed that the engineer capability resident in units must be such that the unit crosses the river just as fast as it drives up to it.[32] MAJ Brett Boyle countered this argument by offering that it is not feasible for the division to maintain a resident capability to conduct a deliberate wet-gap crossing.[33] While Boyd disagreed with Besson on the suitable command level and location for the assets, they agree that there must be enough engineer capability and capacity to allow flexibility, mobility, and tempo.[34]

Much of the literature displayed wet-gap crossings as a resource-intensive operation driven by the necessity of constructing multiple crossing sites. These themes are evident through authors' examinations of multiple conflicts. The literature review showed these themes form opposing views on the necessary force structure and command level for enabling engineer forces.

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[29] F.S. Besson, "Engineer Requirements for the Infantry Division," *The Military Engineer* 29, no. 163 (January-February, 1937): 44, accessed November 12, 2018, https://www.jstor.org/stable/44555340.

[30] Ibid.

[31] Besson, "Engineer Requirements for the Infantry Division," *The Military Engineer*, 46.

[32] John D. Cole, "Mobility Through a River Line," *The Military Engineer* 53, no. 353 (May-June 1961): 215, accessed November 12, 2018, https://www.jstor.org/stable/44568793.

[33] Boyle, *Into the Breach*, 120.

[34] Ibid.

The next section of this monograph outlines the methodology used to conduct the research, findings, and analysis.

Methodology

Introduction

The research objective of this study was to analyze how engineers support deliberate wet-gap crossings for multiple division and corps sized operations. Viewed through the lens of doctrine and operational art this study proposed two hypotheses to discuss how the ability to conduct multiple simultaneous river crossings ensures mobility and enables tempo. This study used three vignettes to support the overall research objective, and to test the proposed hypotheses. To develop evidence and focus the research five research questions examined the significance of engineer capability, capacity, and doctrine used during deliberate wet-gap crossings. This section divides into four parts: introduction, case study, methodology, and summary.

Case Study

Alexander George and Andrew Bennett describe the case study method as allowing the researcher to identify and measure indicators that represent theoretical concepts the researcher intends to measure.[35] The research strategy must then select case studies that allow the analysis of a single phenomenon.[36] This monograph analyzed the phenomenon of wet-gap crossings executed during large-scale combat operations.

To analyze wet-gap crossings, this monograph used two historical wet-gap crossing operations and one current theoretical wet-gap crossing using present-day US Army doctrine and force structure as vignettes. The first vignette focused on engineer support during the Rhine River, specifically, the crossing operation executed by the XIIth Corps in March of 1945. The

[35] Alexander L. George, and Andrew Bennet, *Case Studies and Theory Development in the Social Sciences* (Cambridge, MA: MIT Press, 2005), 19.

[36] Ibid., 69.

second vignette focused on engineer support during the Roer River crossing operation performed by the XIIIth Corps in February of 1945. The third vignette used current doctrine and force structure to propose a deliberate wet-gap crossing operation using IIIrd Corps maneuvering two infantry divisions and one armored division. The operations were selected because the units depicted in the three vignettes closely resemble the description of the size and composition of elements expected to maneuver during large-scale combat operations. The similarity of the size and capability of the units executing the river crossings, allowed the examination of how the Army executed wet-gap crossings in different and dynamic situations.

Research and Data Collection

Evidence collection for this monograph came from primary and secondary sources as well as current and historical doctrinal publications. Primary sources provided first-person accounts and observations of the unit's actions at the crossing sites. Secondary sources provided in-depth analysis and details of the events within the vignettes. Doctrinal references provided definitions as well as tactical and operational guidance on the conduct of wet-gap crossing operations.

Crossing the Rhine River

Introduction

This section presents the XIIth Corps' Rhine River crossing operation from the 22nd to the 24th of March, 1945. This vignette describes the doctrine as well as the engineer requirements and force structures used to execute a wet-gap crossing during World War Two. This vignette serves as an example of a single division river crossing as part of a multi-corps river crossing operation.

Vignette One: Crossing the Rhine River

Following the Normandy landings and during the breakout through France, allied forces began planning operations that would allow them to cross the Rhine River, and attack into the

heartland of Germany. The Rhine River, created a great obstacle that prevented the seizure of major German communications networks and industrial centers.[37] As allied armies marched east, a race to cross the Rhine developed between Field Marshal Bernard Montgomery, commander of the 21st Army Group, and General Omar Bradley, commander of the 12th Army Group. Attacks by both army groups continued through the winter of 1944, and by early March of 1945, both army group commanders prepared their forces to cross the Rhine River.

It appeared that Field Marshal Montgomery and the 21st Army group would win the race across the Rhine River when his plan, Operation Plunder, was selected to serve as the main effort to conduct the crossing. Operation Plunder was a multi-corps operation planned by the 21st Army Group to cross the Rhine River between the German towns of Rees and Wesel. This left Bradley's 12th Army Group to serve as a supporting command developing crossing sites along the Rhine River to enable Operation Plunder.

In the days leading up to Operation Plunder, General Dwight Eisenhower, the Supreme Allied Expeditionary Forces Commander, viewed operations conducted by the 12th Army Group as a diversionary attack in support of Field Marshall Montgomery's decisive effort in the north.[38] However, as time drew closer to the execution of Operation Plunder, General Eisenhower determined that the 12th Army Group's mission was "equal in scope and importance" to Field Marshal Montgomery's operation.[39] General Eisenhower directed the 12th Army Group to establish a bridgehead over the Rhine near Frankfurt, and advance in strength toward the town of Kessel. This was planned in order to provide an alternate crossing site if Operation Plunder

[37] Peter Allen, *One More River: The Rhine Crossings of 1945* (New York: Charles Scribner's Sons, 1980), 19.

[38] Ibid., 228.

[39] Ibid., 229.

halted. General Bradly subsequently ordered General Patton to use his 3rd Army to "take the Rhine on the run."[40]

The Rhine crossing operations necessitated extensive training and supply preparations to establish multiple crossing sites. Pre-planning, obtaining, and staging equipment were essential to the operation since General Bradley planned to cross the Rhine with all of his armies simultaneously. Executing the crossing simultaneously meant that there was no ability to share or re-task organize engineer personnel or equipment once the operation began.[41] Understanding the operational requirements, armies in the 12th Army Group requested and received excess tactical bridging to compensate for possible losses, and a reserve. The 12th Army Group acquired approximately 100,000 tons of engineer supplies, equal to ten times the standard requirement.[42]

General Patton directed each of his corps to cross the Rhine River simultaneously, but at separate locations. The XIIth Corps initiated the 3rd Army's assault across the Rhine River on the morning of the 22nd of March, 1945.[43] Major General M.S. Eddy, commander of the XIIth Corps, directed the 5th Infantry Division to conduct the initial assault crossing in order to establish a bridgehead, and conduct bridge construction. The 5th Infantry Division's operation to cross the Rhine River began at 2200 hours, on the 22nd of March, 1945.[44] The plan for the division's crossing used two infantry regiments abreast, and one regiment in reserve.[45] Serving as the initial

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[40] Ibid.

[41] Timothy P. Henry, *The Rhine Crossing: Twelfth Army Group Engineer Operations* (Port Belvoir, 1946), 20.

[42] Ibid.

[43] Russell F. Weigly, *Eisenhower's Lieutenants: The Campaign of France and Germany 1944-1945* (Bloomington: Indiana University Press, 1981), 936.

[44] Robert J. Liddell, Section 19 Staff Group A, *Rhine River Crossing Conducted by Third U.S. Army and Fifth Infantry Division, 22-24 March 1945: Offensive, Deliberate Assault, River Crossing* (Fort Leavenworth, KS: Combat Studies Institute, 1984), 34.

[45] Ibid., 35.

assault division, the 5th Infantry Division received support from over seventy-five hundred engineers to complete the crossing.[46] This is shown on the map in figure one.

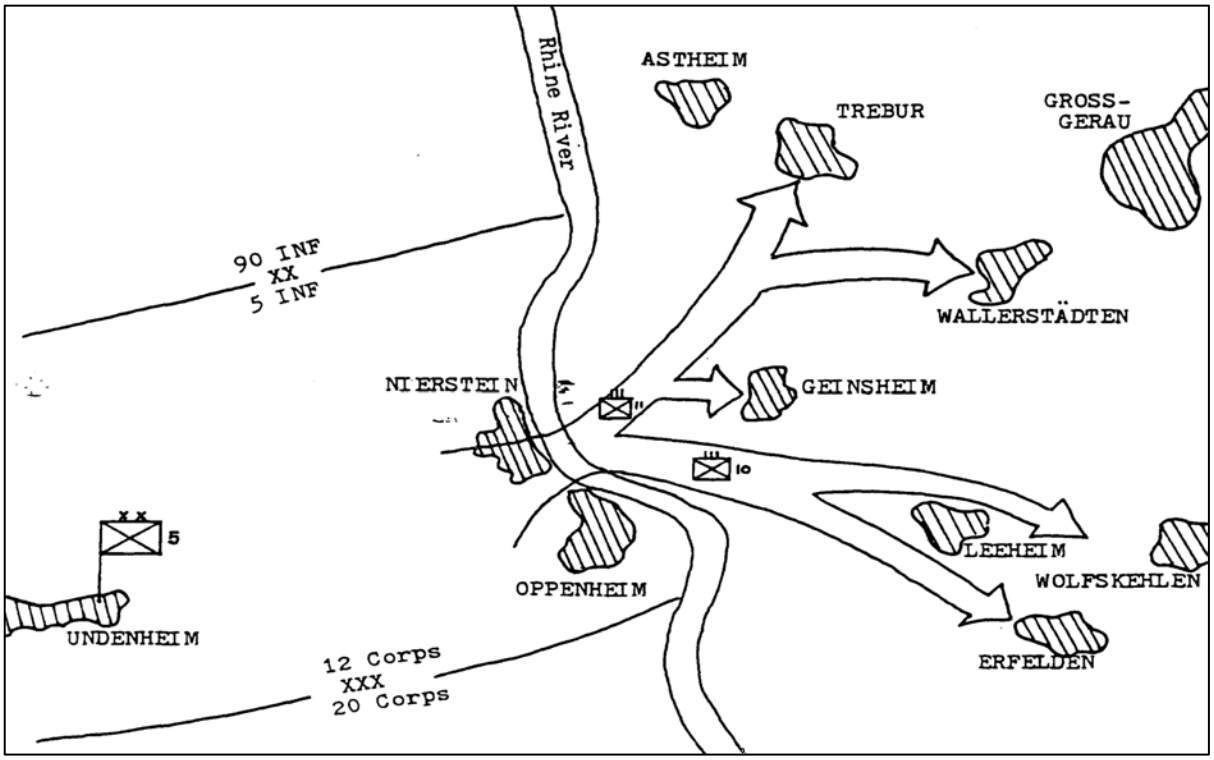

Figure 1. The 5th Infantry Division's Area of Operations
Source: Robert J. Liddell, Section 19 Staff Group A, *Rhine River Crossing Conducted by Third U.S. Army and Fifth Infantry Division, 22-24 March 1945: Offensive, Deliberate Assault, River Crossing* (Fort Leavenworth, KS: Combat Studies Institute, 1984), Crossing Map.

The engineer doctrine published in 1943 provided the framework for the Rhine River crossing executed by the 5th Infantry Division. *Field Manual (FM) 5-6, Engineer Field Manual, Operations of Engineer Field Units*, described in detail to division engineer planners the type and amount of engineer capability required to conduct a division river crossing. Doctrine stated that the division engineer battalion did not have the necessary capability and capacity to conduct river crossing without significant augmentation.[47] The force structure presented in *FM 5-6*, stated that

[46] Henry, *The Rhine Crossing: Twelfth Army Group Engineer Operations*, 37.

[47] US Department of the Army, *Field Manual (FM) 5-6, Operations of Engineer Field Units* (Washington, DC: Government Printing Office, 1943), 125.

two engineer battalions and three additional bridge companies were the minimum engineer capability augmentation required.[48] The XIIth Corps and the 5th Infantry Division acknowledged this in their request for additional engineer assets. The 5th Infantry Division received additional engineer augmentation in the form of one engineer combat group, and two engineer battalions. The engineer group provided additional command and control, and the additional bridging capability and capacity required by doctrine.[53] The XIIth Corps and the 5th Infantry Division planners request for additional forces met the doctrinal requirements for a successful division level river crossing.

The increase in the engineer task organization of the 5th Infantry Division allowed it to conduct the assault boat crossings and bridge construction operations outlined in *FM 5-6*. The doctrine detailed that effective sequencing of the river crossing operation required infantry regiments to conduct an initial assault crossing using boats or rafts to secure the bridgehead construction site.[49] During the operation two engineer battalions facilitated the assault boat crossing of the 5th Infantry Division's lead infantry regiments. In the initial portion of the assault boat crossing, the 5th Infantry Division's organic engineer battalion began bridge construction. The engineer combat group assigned to the XIIth Corps used its heavy pontoon bridge company to augment the construction of the initial treadway bridge, and emplace a twenty-five-ton bridge. The heavy pontoon bridge company also aided in the construction of a second steel treadway bridge.[50] The 5th Infantry Division was able to execute the river crossing operation successfully due to the additional engineer reinforcement.

During the operation the engineers that supported the 5th Infantry Division constructed three of the four bridges that supported the XIIth Corps' crossing. The 5th Infantry Division built

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[48] US Army, *FM 5-6*, (1943), 125.

[49] US Army, *FM 5-6*, (1943), 90.

[50] Fowle, *Builders and Fighters: U.S. Army Engineers in World War II*, 469.

a footbridge and treadway bridge during its initial crossing on 22nd of March, 1945, and completed an additional treadway bridge the following day.[51] The XIIth Corps' engineer combat group also completed a reinforced, twenty-five-ton pontoon bridge by noon on the 25th of March, 1945. These bridges enabled the throughput of five divisions, supplies, and supporting troops by the 27th of March 1945.[52] The assault boats, footbridge and first treadway bridge allowed the 5th Infantry Division to complete the crossing in just under ten hours.[53] The XIIth Corps crossed the remaining five divisions, its necessary supplies, and supporting troops in less than three days.[54]

General Patton ordered the XIIth Corps, the VIIIth Corps, and the XXth Corps to cross the Rhine River simultaneously. The synchronous and simultaneous nature of the crossings required separate engineer reinforcement for each corps.[55] Each corps in 3rd Army, received the same, if not more, engineer support as the XIIth Corps[56]. The next vignette depicts a corps river crossing where two divisions construct crossing sites simultaneously as part of a multi-corps operation.

Crossing the Roer River

Introduction

The XIIIth Corps' crossing of the Roer River took place from the 23rd to the 25th of February, 1945. The Roer River crossing executed by the XIIIth Corps was a multi-division wet-gap crossing. The XIIIth Corps was able to cross the 102nd Infantry Division and the 84th Infantry Division simultaneously across a span of two hundred and fifty feet. The 102nd Infantry

[51] Beck et al., *The Corps of Engineers: The War Against Germany*, 526.

[52] Fowle, *Builders and Fighters: U.S. Army Engineers in World War II*, 470.

[53] Ibid., 469.

[54] Ibid., 470.

[55] Beck et al., *The Corps of Engineers: The War Against Germany*, 530.

[56] Ibid.

Division completed its crossing in sixteen hours, and the 84th Infantry Division completed its crossing in just under twenty-four hours. This vignette describes how a corps managed simultaneous division wet-gap crossings during large-scale combat operations.

Vignette Two: Crossing the Roer River

As part of the race to the Rhine River, Field Marshal Bernard Montgomery proposed to General Eisenhower two simultaneous assaults to secure the west side of the Rhine River.[57] Operation Grenade would be the southern portion of the assault, and focused on crossing the Roer River with the 1st and the 9th US armies. The dual assault would allow armored forces to move into the Rhineland Plain, forcing the German opposition into a retreat over the Rhine River or face destruction.[58] Operation Grenade was set to commence on the 10th of February, 1945, and would be led by the 9th US Army, commanded by General William Simpson.[59]

Operation Grenade's objective was to deliver a paralyzing blow to German forces west of the Rhine River.[60] The 9th Army planned to cross the Roer River with three corps simultaneously.[61] The conclusion of the operation would place General Simpson's 9th US Army on the west bank of the Rhine within forty-eight hours.[62] General Simpson staked the success of the operation on the crucial support provided by his engineers.[63] In direct support of infantry

[57] W. Denis Whitaker, and Shelagh Whitaker, *Rhineland: The Battle to End the War* (New York: St Martin's Press, 1989), 13.

[58] Ibid.

[59] Charles B. MacDonald, *The Last Offensive* (Washington, DC: US Government Printing Office, 1984), 145.

[60] Ibid.

[61] Ibid., 142.

[62] Whitaker, and Whitaker, *Rhineland: The Battle to End the War*, 30.

[63] Ibid., 77.

operations, the engineers were expected to operate and guide assault boats to ferry infantry soldiers across the river while they concurrently constructed multiple bridges.

The planners for Operation Grenade selected crossing sites between Linnich and Duren, Germany due to the narrow banks of the river in that location. However, flooding conditions on the river forced considerable adjustments to the planned crossing sites and assault operations.[64] The XIIIth Corps, commanded by General Alvan Gillem, planned to assault the most northerly position near Linnich with the 84th and the 102nd Infantry Divisions.[65] Follow on operations for the XIIIth Corps and the 9th Army demanded the swift construction of the multiple crossing sites to maintain operational momentum and tempo. General Simpson's plan for relentless pursuit in order to destroy German forces following the crossing, necessitated maximum engineer support for each of the 9th Army's divisions.[66] Following nearly two weeks of postponement, Operation Grenade began in the early morning on the 23rd of February, 1945.[67] Figure 2 shows the XIIIth Corps' area of operations.

[64] Whitaker, and Whitaker, *Rhineland: The Battle to End the War*, 78.

[65] Ibid.

[66] Ibid., 174.

[67] Ibid.

Figure 2. The XIIIth Corps Area of Operations
Source: H. K. Reamy, and Section 19, Staff Group B, USACGSC Class of 1984, *Roer River Crossing Conducted by the Ninth US Army, XIII Corps, and the 84th Infantry Division* (Fort Leavenworth, KS: Combat Studies Institute, 1984), XIII Corps Area of Operations Map.

On the morning of the 23rd of February, 1945, Operation Grenade commenced, at 0245 hours, when over two thousand allied guns delivered a forty-five-minute bombardment of enemy defensive positions on the far side of the crossing.[68] Following the initial bombardment, six infantry divisions of the 9th Army began moving with engineers into assault boats to cross the Roer River.[69] In the XIIIth Corps sector, the 84th Infantry Division, and the 102nd Infantry

[68] Whitaker, and Whitaker, *Rhineland: The Battle to End the War*, 174.

[69] MacDonald, *The Last Offensive*, 145.

Division began their assault across the river near Linnich.[70] The 84th Infantry Division began its assault at 0330 on the 23rd of February, 1945. The 84th Division's mission was to establish a one battalion-wide crossing site, and establish a bridgehead that extended fifteen hundred yards toward Korrenzig.[71] The 102nd Infantry Division's mission served to establish a crossing site near Linnich to pass the 5th Armored Division through its lines.[72]

The XIIIth Corps plan required two divisions to construct multiple crossing sites to ensure the rapid movement of the 9th Army. To support the tactical plan that directed two division crossings, engineer groups were task organized to each division. The engineer groups filled their doctrinal role which provided additional command and control and the required bridging capability and capacity.[73] The engineer groups facilitated the initial assault boat crossing, and augmented bridge construction effort in the divisions' areas of operation. The bridging units that were not task organized to the divisions constructed additional bridges to serve as crossing points for the corps.[74]

Following the doctrinal requirements outlined in *FM 5-6*, the 102nd Division received a task organization increase of two engineer battalions. The additional engineer battalions enabled the initial assault boat crossing for two infantry regiments. They also constructed a steel treadway bridge and a light pontoon bridge.[75] The crossing executed by the 84th Infantry Division near Linnich received similar engineer support.

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[70] MacDonald, *The Last Offensive*, 145.

[71] Theodore Draper, *The 84th Infantry Division in the Battle for Germany November 1944-May 1945* (New York: The Viking Press, 1946), 148.

[72] MacDonald, *The Last Offensive*, 145.

[73] Beck et al., *The Corps of Engineers: The War Against Germany*, 494.

[74] Ibid., 497.

[75] Ibid.

The 84th Infantry Division crossed the Roer River near Linnich. The restricted terrain forced the division to cross on a single battalion frontage instead of using two regiments. In addition to the engineer group, the division received the support of three additional engineer combat battalions.[76] The restricted nature of the crossing created a reduced force requirement of only one engineer battalion to augment the assault boat crossing. With the smaller requirement for assault boat crossing operations, the other battalions started the additional task of bridge construction.[77] The augmentation and task organization of the additional battalions, as well as the engineer group, enabled the 84th Division to conduct its initial assault boat crossing in conjunction with bridge construction.

The XIIIth Corps constructed six bridges between the crossing sites established by the 102nd Infantry Division and the 84th Infantry Division. These sites enabled the corps to cross all divisions and supporting elements in less than three days. The 102nd Infantry Division and supporting engineer units constructed two footbridges, a light pontoon bridge, and a steel treadway bridge. The initial assault boat crossing and bridge construction allowed the 102nd Infantry Division to cross in sixteen hours. Simultaneously, the 84th Infantry Division constructed a light pontoon bridge and a steel treadway bridge.[78] Crossing on two bridges and assault boats, the 84th Infantry Division completed its crossing in twenty-four hours.[79]

The 9th Army executed Operation Grenade as a multi-corps attack across the Roer River using the XIIIth Corps and the XIXth Corps. To achieve its operational objectives on the far side of the Roer River, the 9th Army's plan required multiple corps to cross the river simultaneously.

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[76] Beck et al., *The Corps of Engineers: The War Against Germany*, 497.

[77] Ibid.

[78] Theodore W. Parker Jr., and Willian J. Thompson, *Conquer: The Story of Ninth Army, 1944-1945* (Washington, DC: Infantry Journal Press, 1947), 170.

[79] H.K. Reany and Section 19, Staff Group B, *Roer River Crossing Conducted by the Ninth U.S. Army, XIII U.S. Corps, and the 84th Infantry Division, 23 February 1945: Offensive, Deliberate, Assault, River Crossing* (Fort Leavenworth, KS: Combat Studies Institute, 1984), 4-13.

The rapid pace of the operation, created the requirement for each of the corps to execute their crossing with multiple divisions simultaneously.[80] Each division wet-gap crossing, required separate engineer resources and capability. This vignette provided an example how a corps managed a multi-division wet-gap crossing, while executing the operation as part of a multi-corps attack across a river.

Wet-gap Crossing Today

Introduction

This vignette used current forces and doctrine to create a theoretical wet-gap crossing scenario, mirroring the large-scale combat operations in World War Two. It describes a multi-corps attack requiring a division river crossing using present doctrine and capabilities. It mirrored the previous vignettes, and used one corps executing a single division crossing. The unit selected for the crossing is a light infantry division because it most closely resembled the assault divisions from the previous two vignettes.

Vignette Three: Wet-gap Crossing Today

Army Doctrine Publication (ADP), 3-0, Operations stated that, "large-scale ground combat is the most demanding and lethal end of the combat spectrum and the benchmark against which the Army is equipped and trained."[81] *Field Manual 3-0*, described large-scale combat operations as lethal and complex, and used examples of the Hurtgen Forrest and the battle of Kasserine Pass to provide scope and scale.[82] Doctrine also established that the corps can serve as a tactical land headquarters within a joint operational area, or it can serve as multinational land component command. Executing its duties as a tactical headquarters, the corps would control

[80] Beck et al., *The Corps of Engineers: The War Against Germany*, 492.

[81] US Army, *ADP 3-0* (2017), 3.

[82] US Army, *FM 3-0* (2017), 1-2.

between two to five divisions, along with supporting theater level assets.[83] Based on doctrine's description of large-scale combat operations and the designation of the corps as a tactical headquarters, the vignette focused on a corps river crossing as part of a multi-corps attack across the river. The vignette used the current US Army organizational force structure for the selected divisions serving under the corps.

The previous vignettes used operations during World War Two to describe actions relevant to river crossing operations during large-scale combat operations. Following the examples outlined in *FM 3-0,* this vignette described a multi-corps attack. The units assembled for the attack are the IIIrd Corps with the 1st Armored Division, the 101st Airborne Division, and the 10th Mountain Division. The IIIrd Corps' mission is to conduct an attack that requires crossing a four hundred-foot wide river. The width of the river selected is less the maximum distance the improved ribbon bridge spans. This width is less than the Rhine River crossing and longer than the Roer River crossing depicted in the previous two vignettes.

For the attack, the IIIrd Corps directed the 101st Airborne Division to conduct the wet-gap crossing, and construct the bridges necessary to maintain operational tempo. The 101st Airborne Division conducted the crossing fighting two brigades abreast, with its third brigade serving as the breakout force. The execution of the crossing using two brigades corresponded to the doctrinal outline provided in the 2016 version of *Army Techniques Publication (ATP), 3-90.4, Combined Arms Mobility*.[84] Task organized engineer brigades, and the multi-role bridge companies augment the crossing based on force tailoring requirements. This augmentation reflected the example task organization provided in *FM 3-0,* and took in to account force tailoring outlined in *Field Manual (FM), 3-34 Engineer Operations*.[85]

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[83] US Army, *FM 3-0* (2017), 2-11.

[84] US Army, *ATP 3-90.4* (2016), I-1.

[85] US Army, *FM 3-34* (2014), 1-10.

The current doctrine used to conduct wet-gap crossing operations is *Army Techniques Publication (ATP), 3-90.4, Combined Arms Mobility*, published on the 8th of March, 2016. Doctrine stated that the division is typically the smallest organization that can conduct a deliberate wet-gap because of the mission command requirements, and the resource intensive nature of the operation. The operation is usually a task that is part of a broader mission directed by the corps.[86] The corps supported the deliberate crossing by providing force tailored augmentation of engineer resources, and conducted deception operations.[87]

Current doctrine divides a deliberate wet-gap crossing into five sequenced and successive phases. The phases are advance to the gap, assault across the gap, advance from the far side, secure the bridgehead line, and continue the attack. Objectives help deny the enemy's ability to disrupt the crossing, and secure the operating space necessary for the breakout force to assemble and conduct follow on operations.[88] Assault crossing and bridge construction occurred during phases II and III. Phase II focused on assault boat crossing and initial bridge construction preparation. Phase III focused on heavy rafting and ribbon bridge construction. Phase IV focused on managing crossing activities for elements of the assault brigades. The final phase V, continuation of the attack, commenced when the breakout force was in attack positions, and the division gap crossing was complete.[89]

As in previous historical examples, to conduct this operation, divisions and brigade combat teams would require significant augmentation.[90] When a division conducts a deliberate river crossing there is typically a task organization change, adding an engineer brigade to provide

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[86] US Army, *ATP 3-90.4* (2016), I-1.

[87] Ibid.

[88] Ibid.

[89] Ibid., I-8.

[90] Ibid., 4-1.

additional mission command. This element enables the execution of the crossing plan and scheme of maneuver.[91] In addition to the engineer brigade, the division required additional augmentation that included bridging and mobility augmentation companies.[92] Forecasting the additional engineer augmentation during wet-gap crossing used a planning factor of creating two assault boat or vehicle swim sites and two raft, or bridge sites per brigade combat team.[93] This planning factor required an additional task organization at the brigade combat team level of at least one other engineer battalion headquarters. This engineer battalion headquarters provided mission command over the designated multi-role bridge company assets, and mobility augmentation companies.[94]

ATP 3-90.4 Mobility Operations, details three types of bridging categories for crossing a gap. Tactical bridging and support bridging are the two categories of note for deliberate wet-gap crossings. These categories provide mobility and enable tempo as part of the movement and maneuver warfighting function.[95] Current capabilities limit tactical and support bridging for wet-gaps over eighteen meters to the ribbon bridge.

The improved ribbon bridge provides the singular means to conduct a wet-gap crossing over eighteen meters. This capability resides only in the multi-role bridge company. The multi-role bridge company is also the only unit in the US Army that maintains the watercraft necessary to cross wet-gaps via assault boat.[96] Based on the 2018 tables of equipment, there are thirty inflatable zodiac assault boats capable of transporting dismounted troops during the crossing. In

[91] US Army, *ATP 3-90.4* (2016), 4-14.

[92] Ibid., I-1.

[93] Ibid., 4-16.

[94] Ibid., 1-3.

[95] Ibid., I-4.

[96] Ibid., E-7.

addition to float bridge construction, the ribbon bridge maintains the capability to conduct rafting operations. However, the multi-role bridge company cannot conduct rafting operations simultaneous to bridge construction because they require the use of the same resources. The construction rate for the ribbon bridge is six hundred feet per hour, and can cross two hundred vehicles per hour up a seventy military load class.[97] This means that this bridge can support the crossing of all vehicles on the table of equipment in armored and light divisions. There are currently four multi-role bridge companies in the active component, eleven in the US Army Reserve, and nine in the National Guard.

The current engineer force structure places an engineer battalion within each brigade combat team. The brigade engineer battalion (BEB) is comprised of two engineer companies, neither which have the capability to conduct a wet-gap crossing over eighteen meters. None of the engineer companies in the BEB maintain the military occupational specialty (MOS) 12C, the bridge crew member.[98] The 12C MOS is an engineer specifically trained to construct the bridges in the US Army inventory. While not experts in bridge construction, the engineers in the BEB can assist in bridge construction and assault boat operations as necessary. The brigade engineer battalions provide mission command for engineer operations, unless there is a maneuver enhancement brigade, or engineer brigade task organized to the division. Echelons above brigade (EAB) engineer force structure uses the engineer brigade to provide mission command for mission-tailored engineer units. The engineer brigade is typically allocated to the corps for operations, and maintains mission command of up to five baseline or specialized engineer battalions.[99]

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[97] US Army, *ATP 3-90.4* (2016), E-17.

[98] Ibid., 1-9.

[99] US Army, *FM 3*-34 (2014), 1-10.

At the crossing, the division fights two brigades forward, conducting the crossing with a third brigade designated as the breakout force. Based on the width of the river and the doctrinal planning factor of two crossings for each brigade there is a capability augmentation requirement of four multi-role bridge companies to the division. Following the doctrinal allocation of forces, an engineer brigade is task organized to the division to provide mission command for engineer operations at the crossing sites. The engineer augmentation required to conduct this operation was four multi-role bridge companies, two engineer battalion headquarters, and one engineer brigade.

The 101st Airborne Division received the required support and constructed four crossing sites. The established crossings allowed the infantry divisions and the armored division to cross at two hundred vehicles per hour per site. When combined with the construction rate for the ribbon bridge, the 101st Airborne Division can cross with most of its combat power in approximately sixteen to twenty hours.[100] The crossing time for the corps was approximately 60-72 hours when factoring in the opposed rate of march for a division.[101]

In this scenario, two corps-level river crossing operations occur simultaneously. Both corps conducted crossings using a similar three division task organization, and execute the wet-gap crossing using one division. Based on the minimum reinforcement required to conduct the crossing operations in the IIIrd Corps' area of operations, the other corps can expect to require similar augmentation to conduct their river crossing operation. In this instance the additional engineer resourcing is not possible without mobilization of reserve component multi-role bridge companies, because the 101st Airborne Division exhausted the active component resources.

[100] "101st Infantry Division Structure Chart," *FMSWeb*, last modified October 1, 2018, accessed on January 23, 2019, https://fmsweb.fms.army.mil/protected/struct/3levelchart.

[101] Patrick H. Young, *25th Infantry Division Planning Data and Considerations* (Schofield Barracks, HI: 25th Division Headquarters, 2018), 23.

Findings and Analysis

Introduction

The purpose of this section is to conduct a comparison of the findings in the three vignettes presented. The findings from the research questions allowed for the examination of key facts and data from three different events. This section is divided into four portions, the introduction, findings, analysis, and conclusion.

Findings

The doctrine examined across the vignettes provided a similar prescriptive and comprehensive guide on the capability, and type of engineer augmentation that divisions required to conduct a wet-gap crossing. Doctrine presented in vignettes one and two provided an approximate force template for the required engineer augmentation to conduct a division level wet-gap crossing. Doctrine presented in vignette three provided crossing site planning factors, and types of units required to conduct crossing operations.[102] In each vignette the divisions received the augmentation required by doctrine to execute crossing activities. The examination of doctrine and its application presented patterns of engineer force requirements for a division wet-gap crossing.

The evidence presented in each of the vignettes displayed a change in the type of capability and capacity used during the crossings. In vignettes one and two the engineer force structure in the division resided in the division combat engineer battalion. The division engineer battalion in vignettes one and two maintained engineer force with the capability to conduct a portion of the wet-gap crossing.[103] This capability and capacity are not available in the brigade engineer battalions examined in vignette three. Additionally, the bridge length capability in

[102] US Army, *ATP 3-90.4* (2016), I-4.

[103] US Army, *FM 5-6* (1943), 126.

vignettes one and two were significantly longer than the improved ribbon bridge used in vignette three. Bridges in vignettes one and two may span the width of a 1000-foot river, while the bridges in vignette three could only span a 620-foot width.[104] An examination of the amount of capability presented a drastic decrease from vignettes one and two, to vignette three. There were eighty-nine bridge companies available at the time of execution for vignettes one and two, and only four available during vignette three. Additional bridge companies in vignette three may be available if mobilized from the National Guard and US Army Reserve, and available prior to execution.

The capability and capacity of the engineer force structure in vignettes one and two provided the necessary support to enable multiple division and corps level simultaneous wet-gap crossing operations. The force structure in vignette three required the employment of all the active component bridging capability and capacity with no assets held in reserve. In vignette three, the other corps could not execute its crossing operation without leveraging bridging capability and capacity from the US Army Reserve or the National Guard. Without significant mobilization from the reserve component, the engineer force structure described in vignette three does not provide the capacity and capability to conduct simultaneous division and corps level river crossing operations.

Analysis

The first hypothesis stated that to maintain mobility that enabled tempo in movement and maneuver during large-scale combat operations, corps and division commands must possess an engineer force with resident capability and capacity to conduct multiple and simultaneous river crossing operations. A comparison of the findings across the three vignettes suggested support for this hypothesis. Doctrine in each of the vignettes called for significant engineer augmentation of the division to conduct deliberate wet-gap crossings. Although doctrine changed over time, both manuals directed additional engineer support to the division and brigade levels. Noting that

[104] US Army, *ATP 3-90.4* (2016), I-4.

current doctrine described large-scale combat operations as multiple divisions and corps fighting on the battlefield, each vignette displayed a requirement for separate, or additional allocation of engineer resources. The forces necessary to conduct deliberate wet-gap crossings cannot mutually support separate and simultaneous division and corps level crossings. Even though the divisions in vignettes one and two maintained resident assault boat crossing capability, they still required additional augmentation. The current force structure outlined in vignette three provided no resident crossing capability, and left the division completely reliant upon additional forces. The evidence presented a pattern showing that divisions in each vignette require additional engineer augmentation in the form of command and control, combat engineering, and bridging assets. Therefore, for a division or corps to maintain mobility without sacrificing tempo there should be a resident engineer force structure, within the command, capable of conducting a deliberate wet-gap crossing.

The second hypothesis stated that the engineer force was ill-suited to support multiple division and corps wet-gap crossings during large-scale combat operations due to current engineer doctrine, organization, capability, and capacity. A comparison of the findings across the three vignettes suggested mixed support for this hypothesis. Comparison of the capability and capacity of the engineer force structure during World War Two, to the current engineer force structure in vignette three displayed an overall decrease. The amount of force structure available in vignette two allowed for the divisions to execute a wet-gap crossing simultaneously. Evidence presented in vignette three showed that a single division wet-gap crossing exhausted the active component capability and capacity. Next, the change in engineer force structure from vignettes one and two, indicated a capacity decrease in assault boats, and a lack of footbridge capability. The assets displayed in vignettes one and two provided flexibility and throughput for the infantry divisions to conduct the crossing. Last, the current wet-gap crossing capability crossed fewer vehicles per hour and had a narrower maximum span than those of vignettes one and two. Noting the decline in vehicle throughput in vignette three, the corps still crossed in approximately three

days. Given these observations, the researcher can conclude that the current doctrine combined with the current engineer force is less capable of supporting a deliberate wet-gap crossing, but can still execute a single division crossing.

Table 1. Summary of Analysis

Hypothesis	Vignette 1	Vignette 2	Vignette 3	Outcome
1. To maintain mobility that enables tempo in movement and maneuver during large-scale combat operations, corps and division commands must possess an engineer force with resident capability and capacity to conduct multiple and simultaneous river crossing operations.	Supports	Supports	Supports	Supports
2. The current engineer force is ill-suited to support multiple division and corps wet-gap crossings during large-scale combat operations due to current engineer doctrine, organization, capability, and capacity.	Supports	Supports	Mixed	Mixed

Source: Created by the Author.

The analysis showed support for the first hypothesis and mixed results for the second hypothesis. The next section of the monograph provides a conclusion which summarizes the research, discusses additional research potential, and the implications for engineer planners and division and corps commanders.

Conclusion

Summary

In 2017, the US Army published new doctrine that detailed how it planned to operate in today's peer-to-peer threat environment. *FM 3-0* states that the resulting conflict in a state versus state, near peer threat, is large-scale combat operations. Doctrine defined it as, "major operations and campaigns aimed at defeating an enemy's armed forces and military capabilities in support of

national objectives."[105] This is a drastic departure from the counter-insurgency operations conducted over the past two decades. The manual goes on to describe the battlefield of large-scale combat operations as increasingly lethal and complex.[106] The change from a brigade-centric fighting force to a division suggests that further changes in engineer doctrine, capability and capacity may be necessary to enable large-scale combat operations.

This monograph examined the phenomena of a multi-division and multi-corps deliberate wet-gap crossing, and how its execution affected mobility and tempo during large-scale combat operations. The purpose of the study was to understand the demands this operation would make on engineer doctrine, capability, and capacity, and to highlight any gaps that might prevent or degrade its execution. This study allowed the researcher to examine whether engineer doctrine, capability, and capacity, adequately align with the changes outlined in *FM 3-0.*

This research project examined two historical vignettes which consisted of river crossings executed during World War Two. The analysis provided evidence detailing how the US Army successfully maintained mobility and enabled tempo when it conducted wet-gap crossings during previous large-scale combat operations. This study also developed a contemporary and conceptual third vignette comprised of an attack similar in nature to those conducted during World War Two. This research provided evidence on how the current engineer force structure, doctrine, capability, and capacity ensured mobility and enabled tempo during wet-gap crossings.

Key Findings

Comparison of the three vignettes provided the analysis necessary to confirm the first hypothesis and present mixed results for the second hypothesis. The conclusion of the analysis detailed that wet-gap crossings are resource intensive. The resource-intensive nature of the operation resulted in high levels of organizational augmentation to the corps and divisions. The

[105] US Army, *FM 3-0* (2017), 1-2.

[106] Ibid., 1-2.

similar and consistent type of augmentation needed for divisions to conduct wet-gap crossings supported the assertion that divisions and corps require resident engineer capability and capacity to conduct deliberate wet-gap crossings. This conclusion does not rest solely on the necessity for augmentation, but also the need to execute multiple division or corps level wet-gap crossings in support of large-scale combat operations. The vignettes showed that resources dedicated to one division or corps for crossing operations could not mutually support another. The evidence indicated that current doctrine, capability, and capacity resident in the active component enabled a single division crossing in support of large-scale combat operations. However, the evidence presented also showed that a single division crossing exhausted the active component wet-gap crossing capability and capacity. Thus, multi-corps or multi-division wet-gap crossing operations require significant mobilization and use of assets currently in the reserve components.

Implications

One of the most substantial obstacles to offensive operations is a river.[107] The significance of overcoming this obstacle makes the ability to conduct a wet-gap crossing an essential part of the planning and execution large-scale combat operations. The research in this study captured key implications on the US Army's ability to conduct wet-gap crossings during large-scale combat operations. The key implications were based on the examination of the current doctrine and force structure compared to the requirements detailed in large-scale combat operations during World War Two.

The first implication is that the US Army's active duty component engineer structure does not appear to support simultaneous division and corps level wet-gap crossings. Large-scale combat operations during World War Two maneuvered multiple divisions and corps and made multiple simultaneous wet-gap crossings. Current doctrine uses World War Two as its example for large-scale combat operations, suggesting that the US Army force structure must support

[107] Boyle, *Into the Breach*, 107.

multiple division and corps level operations. Most of the multi-role bridge companies, which maintain the only wet-gap crossing capability in the US Army, are located in the National Guard and the US Army Reserve. Without prior mobilization, which requires months of advance notice, the ability to conduct multiple division wet-gap crossings is severely limited. Based on the evidence, the US Army may need to examine if it needs to move some of its multi-role bridge companies from the reserve component to the active component.

The second implication is the speed and lethality of large-scale combat operations may not allow the necessary time for the significant re-task organization and engineer force augmentation required to conduct a wet-gap crossing. The examination of the evidence presented in each vignette displayed a pattern that wet-gap crossings are resource intensive, and divisions required significant engineer force augmentation. This pattern suggested that divisions may lose operational momentum and tempo if they wait for a significant amount additional support to overcome this obstacle. The US Army may need to examine a force structure update that ensures divisions maintain the ability to exploit windows of opportunity and dictate tempo.

Conclusion and Research Opportunities

The research examined the current engineer structure, doctrine, capability, and capacity to conduct wet-gap crossings in support of offensive operations during large-scale combat operations. Evidence from World War Two suggested the need for additional capability and capacity to be resident at the division level in order to maintain mobility and tempo. Examination of the evidence found gaps in current engineer capacity and capability required to support wet-gap crossings as the scale of combat operations increased to multiple divisions and corps.

There are multiple opportunities for additional research within this topic as part of reviewing engineer doctrine and force structure for other engineer missions. There is research potential in the examination of the multi-role bridge company's ability to support multiple divisions simultaneously. A detailed examination of this topic may provide additional force

structure recommendations. The engineer regiment conducts multiple tasks that ensure mobility for offensive operations. A review of all engineer tasks, doctrine, and force structure requirements would develop a greater understanding of the support required to conduct multi division and corps level operations during large-scale combat operations.

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