



The Evolution of River Crossing Doctrine, 1918 to 1944

By Captain Robert Toguchi

Italy's Rapido River was shrouded in heavy fog as darkness fell shortly before 6 p.m. January 20, 1944. The soldiers of the 141st Infantry Regiment, 36th (US) Infantry Division, anxiously awaited movement to the water's edge for an assault river crossing. The regiment's commander, Lieutenant Colonel Aaron A. Wyatt, Jr., moved among his men as they made final preparations for the crossing.¹

The first group of troops took their assault boats from a nearby depot, and departed for the river at 7 p.m. Pathways thick with mud made it a difficult journey. Barely 30 minutes later, more than sixteen battalions of friendly artillery began firing on defending German positions of the 15th Panzer Grenadier Division. German batteries replied, raining down

shells on the Americans trying to make their way to the riverbank. Within minutes, one company lost 30 men.

The situation got worse as engineer guides lost their way in the artillery fire, and the advancing Americans entered friendly minefields. By 8 p.m., 25 percent of the boats and footbridges needed for the assault were lost. Radio and landline communications broke down. Some of the troops that managed to reach the river found that their boats had been pierced by shrapnel and sank when placed in the water. Other boats were swept away by the swift current before they could be loaded, and some sank because the crews paddled improperly. Of four footbridges designated for the crossing, one was destroyed in a minefield enroute to the riverbank, one was defective, and the

remaining two were destroyed by artillery fire. By salvaging bits and pieces from each bridge, engineers managed to construct a single footbridge by 4 a.m., nearly seven hours after the designated crossing time.² By 6:30 a.m. on the 21st, only half a battalion of a three-battalion force had managed to get across the river.

With the approach of dawn, LTC Wyatt tried to put together a daylight operation to sustain the small force across the river. He considered using of smoke to conceal continued crossing operations. But much to his chagrin, Wyatt discovered that no smoke-generating equipment was available. Six hundred smoke pots were available at a rear depot, but the 141st was not notified of their availability until it was too late.³

Without concealment, the small foothold on the far shore of the



River crossing failures in the early days of World War Two cannot be laid entirely at the feet of the soldiers on the line. Institutional flaws in doctrine were a significant factor (U.S. Army photo).

Rapido was doomed. Consequently, Wyatt ordered the evacuation of the soldiers who had already crossed. Subsequent assaults the following day by the 141st and an adjoining regiment also failed. The 36th Division suffered 1,681 casualties and was forced to cancel the river crossing operation.⁴

The Rapido operation was one of the earliest attempts by the Army to conduct a river crossing in World War II—and it was a fiasco. Combat engineers had a critical role in support of the crossing, and—as a whole—they performed poorly. Prior to the operation, the regimental engineer had developed a crossing plan without consulting the infantry regiments. Pre-paratory bridging drills were not conducted. Pre-liminary roadwork was not accomplished. Bridging equipment was not adequately inspected. Coordination measures had not been established with the infantry. And these were just a few of the problems

that led to one of the worst military disasters in American military history.⁵

Military doctrine provides the foundation and framework for commanders to build successful operations. The absence of river crossing doctrine was a key factor in the poor performance of the 141st Regiment and the 36th Division. In an attempt to analyze the state of U.S. Army Corps of Engineers' doctrine at the start of World War II, this article will focus on the evolution of river crossing doctrine during the pre-war period and during the war itself, during the years 1918 to 1944.

Traditional histories of the Rapido river crossing have placed the overwhelming burden of responsibility squarely on the shoulders of senior commanders. I believe the factors influencing the operations's failure are far more complex than merely pointing the finger of culpability at local battle

captains. To a certain degree, operational historians have a penchant for emphasizing the obvious while ignoring that Army systems can affect individual battles. This has resulted in traditional studies that have not always revealed the institutional flaws that doom certain battles before the first shot is fired. I contend that the Rapido river crossing operation was just such a battle, and that fundamental flaws existed in the Army's ability to produce viable crossing doctrine before World War II.

Doctrine, in military usage, is a word of fairly recent origin.⁶ During the 14th century, the word "doctrine" was used to describe fundamental truths concerning a special field of knowledge. The

term "military doctrine" does not appear to have entered American military jargon until the early 20th century. *The Dictionary of United States Army Terms* defines it as the: "compilation of principles and policies, applicable to a subject, which have been developed through experience or by theory, that represent the best available thought, and indicate and guide but do not bind in practice..."⁷

Official doctrine for the Corps of Engineers was provided primarily in the form of published field manuals or field service regulations that instructed soldiers and leaders on how to fight on the battlefield.⁸ Subjects were diverse, ranging from basic survival techniques, to unit logistics, to combined arms operations. The field manual was the normal authority on the specific techniques or tactics to be used in a given battlefield situation.⁹ So, to understand doctrine development

during this period, we must look at the progressive changes made in those manuals.

The Corps first addressed the subject of river crossing doctrine in the 1862 *Manual for Engineer Troops*, a compilation of doctrinal instructions adopted from British, Austrian, and French manuals.¹⁰ Since the Army had not developed such related doctrinal instructions prior to this time, the Corps translated and adopted the procedures then in use by foreign armies. This practice of copying the doctrinal instructions of the major European powers was quite common for developing military establishments of the period.

Only one of the five chapters within the manual was devoted to river crossings. This chapter provided 27 pages of instruction that focused primarily on the technical aspects of pontoon bridge construction. It discussed construction materials, river conditions, bank preparations, fording, ferrying operations, and basic pontoon drills. While the manual provided valuable advice on methods of streamlining speed of construction, it did not provide instruction on tactics or coordination with the infantry.¹¹

A revised version, *The Engineer Field Manual*, was published in 1904. This manual provided river crossing doctrine under a section devoted to floating bridges.¹² Again, instruction focused largely on the technical aspects of construction, and dealt only briefly with military tactics. The manual provided technical details on American bridging equipment, in-



Despite the advent of highly mechanized maneuver forces, river crossing doctrine did not keep pace—often limiting the usefulness of those forces (U.S. Army photo).

corporating changes in bridge design since the 1862 manual.

This basic manual was popular, undergoing four revisions by 1917.¹³ Interestingly, the floating bridge portion of the manual remained virtually the same. Basic pontoon bridge design did not experience significant change between the Civil War and World War I. As a result of the satisfactory results experienced during the Civil War, the Engineer Corps decided in 1869 to retain the Civil War pontoon bridge designs.¹⁴

In the years between the wars, engineer offices that played a key role in the development of river crossing doctrine included the Office of the Chief of Engineers, the Engineer Board, and the Engineer School. The Chief of Engineers was the primary authority for the formulation of engineer policy, and was responsible for the technical performance of all officers and enlisted men within the Corps.¹⁵ The office was divided into two divisions, Civil Works and Military. The Military Division was responsible for personnel, in-

telligence, operations and training, construction, railways, and supply. The division also directed the activities of the two field agencies, the Engineer Board and Engineer School.¹⁶

The Engineer Board served as the Corps' proponent agency for research and development on all Army engineer equipment. The board also developed procedures that covered the technical aspects of construction, maintenance, handling, and storage of engineer equipment. The Engineer School, on the other hand, was responsible for the training of Army engineers, and for the development of engineer tactical doctrine. Both agencies submitted their concepts of doctrine and equipment to the Office of the Chief of Engineers for review.¹⁷

A contributing factor to the slow development of river crossing doctrine was the Engineer School's concentration on individual training for soldiers. Concerns other than engineer instruction received limited attention, and suffered considerably.

The school simply did not provide any formal provisions or institutional structure to ensure the consistent review and generation of river crossing doctrine. Similarly, the Office of the Chief of Engineers failed to ensure that the school updated and formulated the Army's river crossing doctrine.

Interestingly enough, many of the doctrinal concepts during the interwar period were developed by individual soldiers—independent of any support from the engineer hierarchy. Following World I, a number of after-action reports were written about the Army's European river crossing experiences. A young engineer, Captain William M. Hoge, completed a book in 1918 that provided frank after-action comments about the 5th Infantry Division's crossing of the Meuse River.

Despite the success of the operation, the soldiers of the 7th Engineer Regiment had to overcome several difficulties. The Meuse valley, about 600 meters in width, consisted of marshy flats that made ingress and egress difficult on both sides of the river. The hills overlooking the valley provided commanding fields of observation and fire for enemy artillery. The necessary use of French bridging equipment, which the Americans were not familiar with, compounded the regiment's problems.¹⁸

The engineers were able to overcome these obstacles through meticulous planning. Prior to the crossing, one engineer company received the dedicated mission for road preparation, infantry guides were designated, fascines were constructed to facilitate passage over mud, ramps were constructed over high banks, wagon loads were prioritized, and assault engineers were attached to the infantry brigades.¹⁹ All of these measures were planned and executed prior to the crossing. While Hoge's book covered seemingly simple tactical

procedures, it was the combination of all these techniques that paved the way for the success of the Meuse crossing.

From his review of the operation, it is evident that Captain Hoge captured valuable insights into the difficulties of organizing engineer assets for river crossing operations. He presented these ideas in a well-written book entitled *Engineers in the Crossing of the Meuse*. Unfortunately for the Army, none of this material was incorporated as approved doctrine into the engineer manual. The next revised version of the manual, which was published in 1932, did not include Captain Hoge's well-reasoned and coherent thoughts on river crossing.²⁰

Other veterans of the war provided similar grass roots doctrinal material based on practical experience. In early 1920, Colonel R.R. Ralston, the Fourth Corps Engineer of the American Expeditionary Force, published an article in *The Military Engineer* that included discussions on World War I river crossings. The work titled "Engineers' Duties in the Field of War" was a compilation of senior officer comments on engineer doctrine.²¹ While the article presented several perceptive insights from highly experienced senior officers, none were used for the formulation of crossing doctrine during that period.

In the article, Colonel John C. Lee, chief of staff for the 89th Division, stressed the importance of traffic control. He recommended prioritizing traffic, controlling local traffic with engineers, and having military police provide general traffic control.²²

Colonel John Kingman, chief of staff for the 90th Division, recommended a three-phase approach for river crossings: (1) an infantry footbridge, (2) standard pontoon bridge, and (3) a timber trestle structure.²³ Kingman believed that a phased approach would

preclude increasing the load capacity of the standard pontoon bridge.

During the period between the wars, traditional concepts of war slowed development of the Army's mechanized forces, further delaying the development of river crossing doctrine and equipment. The attitude among some Army planners was "the next war should be fought like the last one."²⁴ For example, the infantry branch was initially given responsibility for the organization and development of the tank corps. As perhaps an expected consequence, their concept of tank employment called for armor to play an infantry support role—rather than take its place as a large, mechanized maneuver force. This attitude, though not pervasive, limited the development of a mechanized force which would have forced planners to rethink river crossing operations.

Despite a reduced interest in warfighting concerns, the Corps updated the *Engineer Field Manual* in 1932, incorporating new material on modernized bridging equipment. The manual added technical details on the M1926 light bridge and the M1869 heavy bridge. The new instructions focused primarily on bridge construction techniques, bridge specifications, transportation, maintenance, and load capacities. Some tactical instruction was provided, with a recommendation that bridging operations be divided into four phases:

- pontoons to ferry infantry
- light pontoons to cross combat wagons
- heavy pontoons to cross heavy trains
- fixed bridging

While the manual was an improvement over earlier versions in many respects, tactical procedures filled no more than one page of instruction.²⁵



While many valuable field reports were available from experienced combat engineers, doctrine writers often failed to use the information (U.S. Army photo).

As early as January 1941, the Office of the Chief of Engineers was aware of the extreme complexity of river crossing operations.²⁶ German crossing operations in May 1940 were reported in German publications and translated by Captain Paul W. Thompson, an American military observer stationed in Germany prior to our entry into World War II. Complete accounts of step-by-step crossing sequences, timetables, operational diagrams, fire support, equipment characteristics, bridge sites, and orders issued by the participating German units were available to the American engineers.²⁸ These materials were published in 1941 in several articles appearing in *The Military Engineer*. Later that year, Captain Thompson published a book, *Modern Battles*, that depicted modern German doctrine for assault river crossings.²⁹ In 1942, now-Lieutenant Colonel Thompson published two more

books, the *Army Engineer and Engineers in Battle*, which provided material superior to doctrinal literature then available on river crossing.³⁰

While detailed reports on successful river crossing operations were flowing out of Europe, where were the doctrinal writers in the Engineer Corps? Thompson's publications were a valuable and cost-free opportunity for the Corps to update existing crossing doctrine. Engineers in the field needed more definitive guidance than the general overview of crossing operations officially available at the time. But strangely enough, comparable changes to the existing river crossing doctrine did not occur until 1943.

In 1941, the river crossing doctrine contained in FM 5-5, *Engineer Field Manual: Troops and Operations*, was an improvement over previously available literature, but did not provide enough detail at the tactical level. The

manual included general instructions on planning, command and control responsibilities, equipment characteristics, reconnaissance, and site selection. However, doctrinal writers made no attempt to flesh out the problems encountered in the support of tactical river crossings.

The prescribed doctrine viewed a crossing as an end in itself, rather than as a means to accomplish a definite wartime objective.

No plans were made to continue the attack once the crossing was achieved. Was the whole operation supposed to grind to a halt once the river was crossed, leaving a complacent bridgehead vulnerable to counterattack? To the detriment of soldiers in the field, plans for securing initial, intermediate and final objectives were not included in the 1941 doctrine.³¹

Combined arms coordination is critical to the success of

military operations, a fact not unrecognized in 1941. But the 1941 manual scarcely addressed instructions on how engineers should fit into the combined arms team. For example, the preparation of engineer estimates, the allocation of assembly areas within the division's sector, the incorporation of engineer units into the communications net, and the use of a deception plan were just a few of the techniques that were absent from engineer doctrine in 1941.³²

The same manual also lacked detailed instructions for the assault phase of a crossing, whereby the infantry secured the far shore prior to the construction of rafts and bridges. Probably the most difficult phase of a crossing operation, the assault is normally conducted under direct enemy fire. Timing, speed, and organization are critical to the operation's success. Hence, extremely detailed engineer planning in shore party organization, timetables, boat crew breakdowns, far shore objectives, ferry round-trip times, marked routes, and other techniques were expected to be addressed in tactical manuals. In 1941, two pages of general instructions addressed the assault phase, whereas ten pages were used in the 1943 manual.³³

Further, details on control and coordination measures to direct the actions of the crossing units were practically nonexistent in the 1941 text.³⁴ Interestingly, these measures were discussed in Captain Hoge's after-action reports in 1918, but were not incorporated in later texts. Coordination measures are necessary to ensure that the maneuver force knows the plan for linking up with the engineers, the location of key crossing assets, assembly areas, and routes to and from the crossing sites. Without these procedures, the probability of disorganization and mission failure

increases considerably—even for the simplest operation.

The lack of doctrinal coordination measures was a sure sign that both engineer and maneuver units were operating with the cards stacked against them. In 1941, a mere thirteen pages were used to describe an extremely complex operation that had already been described earlier in voluminous detail by American and German engineers with combat experience.

In 1943, finally, the Corps of Engineers developed viable river crossing doctrine. The new manual, FM 5-6, *Engineer Field Manual: Troops and Operations*, fully incorporated many of the detailed tactical procedures that were missing from the 1941 publication. For the first time, the manual differentiated between conducting hasty and deliberate river crossing operations.³⁵ It also outlined initial, intermediate, and final objective phases of a crossing. Unfortunately, it was made available to the field only after American forces had been deployed. Had the manual been published earlier, units—both engineer and infantry—could have familiarized their soldiers with these techniques under training conditions. As it was, most had to learn the hard way—under enemy fire.

The 1943 manual also provided detailed instructions for conducting the assault phase of river crossings. Initial assembly areas were added to assist in the control of traffic movement to the crossing sites. Traffic control plans were assigned with specific routes of march, a time sequence for group assembly areas, and specific frontages designated for boat groups. Specific boat battle drills were added to the doctrine specifying boat crew conduct, boat navigation, paddling techniques, and loading/unloading procedures. The techniques of successive trips were discussed, and con-

centrated on the responsibilities of engineer guides for the return boat trips.³⁶

In addition to specific tactical instructions, the manual also provided engineer planning data for river crossing operations at the division and corps levels. It specified the quantity of bridge equipment and the number of engineer units required to support different types of infantry and armor units. It also included construction and crossing times to assist the maneuver commander in planning his operation.³⁷

The manual was refined in 1944 with the addition of instructions for the use of heavy weapons companies in lead battalions to provide supporting fires at the river.³⁸ It also addressed the use of specialized equipment, like Bangalore torpedoes, to facilitate the passage of obstacles during the assault wave. It also continued to update the engineer time tables for bridge construction, equipment use, and ferrying operations.

A historical review of official doctrine clearly reveals that the Corps of Engineers did not develop effective or timely river crossing doctrine during the period 1918 to 1944. While many tactical insights were readily available from both American and German engineers with significant combat experience, none gave birth to badly-needed initiative or forethought among those responsible for such doctrine.

While those insights were available in many informal forms—magazines, after-action-reports, and books—this did not ensure that the knowledge would be incorporated into the Army mainstream. Such experience was often gained at a great cost in human lives, and the loss of such experience weighed heavily on the combat readiness of Army engineers.

Have we developed viable river crossing doctrine to meet the

demands of modern tactical operations? Indeed, a hard look at the doctrine in FM 90-13, TC 90-13-1, and FC 90-13 reveals areas that could be addressed in greater detail. For example, the current concept of conducting the assault phase solely with armored personnel carriers (APCs) presents itself well on paper, but cannot be the rule for all river crossings. Far shore bank conditions can often preclude or seriously hamper the use of APCs. Too, dismounted infantry is often needed to breach obstacles and secure difficult terrain prior to the movement of APCs. Moreover, in a full mobilization, many combat units may find themselves short of their full complement of APCs.

So, before we become complacent in our satisfaction with current doctrine, let's take a lesson from the past. I submit that we need to consistently review a wide variety of writings—including foreign publications—on engineer operations, promptly process experiences from the field, and rapidly produce draft doctrinal publications for review. In addition, greater institutionalization of combined arms tasks can be accomplished by assigning doctrinal proponenty to specific combat units. Only through painstaking effort and consistent command emphasis can we ensure that there will never be another Rapido.

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Notes:

¹Martin Blumenson, *Bloody River: The Real Tragedy of the Rapido*, (Boston: Houghton Mifflin Company, 1970), p.83.

²Ibid. 82-85.

³Ibid. 87.

⁴Ibid. 110.

⁵Ibid. 71-111.

⁶Jay Luvaas, "Some Vagrant Thoughts on Doctrine," (March 1986): 56.

⁷Department of the Army, *Dictionary of United States Army Terms* (Washington, D.C.: Government Printing Office, 1950), p. 78, as quoted in Jay Luvaas, "Some Vagrant Thoughts On Doctrine," (March 1986): 56.

⁸Training Regulations (TR) 10-5. *Military Training*, War Department. (Washington D.C., 10 August 1935), p. 1.

⁹G.B. Troland, "Decade of Progress in Military Engineering," *Military Engineer* 20 (November-December 1928): 524-525.

¹⁰Captain J.C. Duane, *Manual for Engineer Troops* (New York: D. Van Nostrand, 1862), p.1.

¹¹Ibid. 7-33.

¹²Office of the Chief of Engineers, *Engineer Field Manual*, Part II. Professional Papers No. 29. (Washington D.C.: Government Printing Office, 1904).

¹³Office of the Chief of Engineers, *Engineer Field Manual*, Parts I-IV. Professional Papers No. 29. 4th revised edition, with addenda. (Washington D.C.: Government Printing Office, 1917).

¹⁴Kohloss, "The Status of Pontoon Bridge Development," p. 1.

¹⁵War Department, *Corps of Engineers, General Provisions*. AR 100-5. (Washington D.C.: Government Printing Office, 1942), pp. 1-3.

¹⁶War Department, *Report of the Chief of Engineers*. Office of the Chief of Engineers (Washington D.C.: Government Printing Office, 1921), p. 3-4.

¹⁷Blanche D. Coll, Jean E. Keith, and Herbert H. Rosenthal, Report of the Chief of Engineers, Office of the Chief of Engineers (Washington, D.C.: Government Printing Office, 1921), p. 3-4.

¹⁸Blanche D. Coll, Jean E. Keith, and Herbert H. Rosenthal, *The Corps of Engineers: Troops and Equipment* (Washington D.C.: Office of the Chief of Military History, 1958) p. 4.

¹⁹William M. Hoge, *Engineers in the Crossing of the Meuse River* (Ft. Leavenworth, KS: Command and General Staff School, 1918), pp. 1, 5-6.

²⁰Ibid. 1-18.

²¹Colonel R.R. Ralston, "Engineer Duties in the Field in War," *The Military Engineer* 12 (January-February 1920): 67-80.

²²Colonel R.R. Ralston, "Engineer Duties in the Field of War," *The Military Engineer* 12 (January-February 1920): 67-80.

²³Ibid. 75.

²⁴Ibid. 73.

²⁵Mark Skinner Watson, *Chief of Staff: Prewar Plans and Preparations* (Washington D.C.: Historical Division, 1950), pp. 23-25, 35.

²⁶Office of the Chief of Engineers, *Engineer Field Manual*, Military Engineering, Volume II. (Washington D.C.: Government Printing Office, 1932)

²⁷Captain Paul W. Thompson, "Engineers in Battle," *The Military Engineer* 33 (January-February 1941): 1-5.

²⁸Ibid. 1-5.

²⁹Ibid. 1-5.

³⁰Major Paul W. Thompson, *Modern Battle* (Richmond, Virginia: Infantry Journal, 1941), p. 1-209.

³¹Major Paul W. Thompson, *The Army Engineers*, (New York, N.Y.: W.W. Norton, 1942); *Engineers in Battle*, (Harrisburg, P.A.: Military Service Publishing Company, 1942).

³²Office of the Chief of Engineers, *Engineer Field Manual: Troops and Operations*, FM 5-5 (Washington, D.C.: Government Printing Office, 1941), pp. 252-261.

³³Ibid. 252-261.

³⁴Ibid. 252-261.

³⁵Ibid. 252-261.

³⁶Office of the Chief of Engineers, *Engineer Field Manual: Operations of Engineer Units*. FM 5-6 (Washington D.C.: Government Printing Office, 1943). pp. 85-87.

³⁷Ibid. 85-97.

³⁸Ibid. 116-124.

³⁹Office of the Chief of Engineers, *Engineer Field Manual: Operations Of Engineer Units*. FM 5-6 (Washington, D.C.: Government Printing Office, 1944), pp. 1-15.