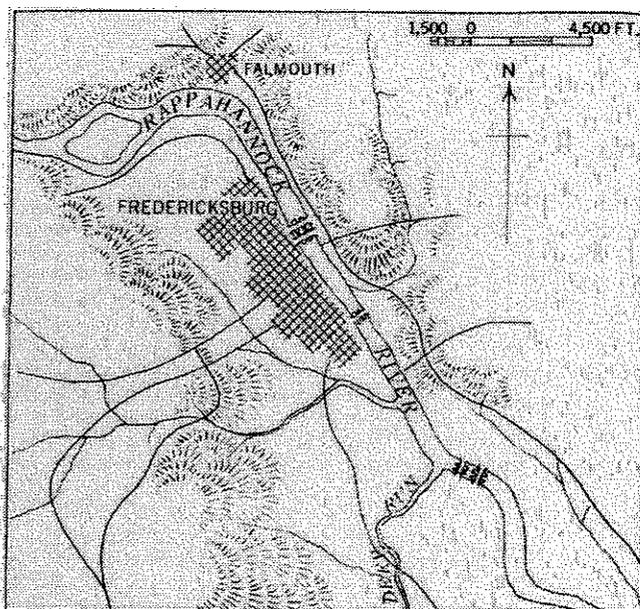


Combat Engineers: Fredericksburg, 1862

Jesse Remington

On November 9, 1862, Major General Ambrose E. Burnside replaced Major General George B. McClellan as commander of the Army of the Potomac. That same day he sent to Washington a plan for employing the Army. Burnside's objective was Richmond. After reorganizing the Army into three grand divisions, he proposed to drive to the Confederate capital by the way of Fredericksburg. President Lincoln approved this plan on November 14. On the 19th, Burnside moved his headquarters from Warrenton to Falmouth across the Rappahannock River from Fredericksburg. When preparations were completed, the grand divisions would cross the river on ponton bridges to be built by his engineers and attack General Robert E. Lee's army.

Burnside had two engineer organizations at his disposal. One, the Engineer Battalion, a Regular Army unit, was commanded by Lt. Charles E. Cross; the other, the Volunteer Engineer Brigade, composed of the 15th and 50th New York Regiments, was led by Brigadier General Daniel P. Woodbury. The Regulars, and detachments of the 15th under Major James A. Magruder, and of the 50th, under Major Ira Spaulding, were ordered to build the bridges. Five were needed: three opposite Fredericksburg, and two near the mouth of Deep Run, a mile below the town. Spaulding's men would throw the three upper bridges; Magruder's and Cross's men would build the two downstream.

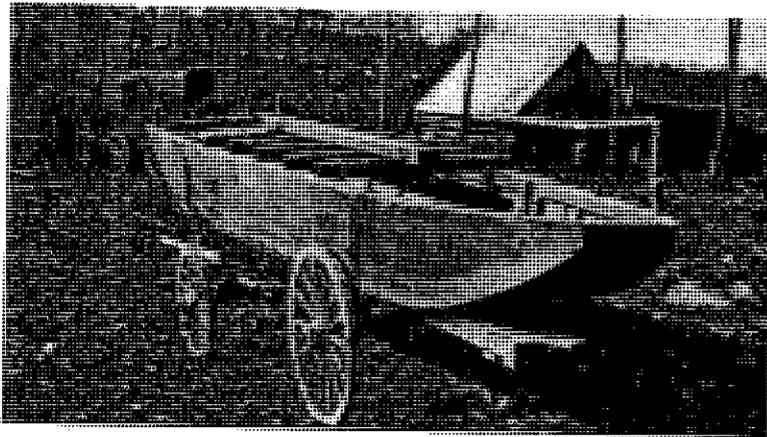


The planned Union crossings at Fredericksburg

Building these bridges, particularly the ones opposite the town, would be difficult. At this point the Rappahannock was approximately 400 feet wide. Although Confederate artillery on the hills above Fredericksburg could not sweep the river without damaging the town, elements of Brigadier General William Barksdale's Mississippi Brigade, well posted in the houses, cellars, and rifle pits, could be counted upon to make the bridging of the river a costly undertaking. To protect the bridge builders and cover the crossings, Burnside's chief of artillery, Brigadier General Henry J. Hunt, massed his guns on the heights above the Rappahannock. In addition, the commanding general assigned a regiment of infantry to protect each of the bridge detachments. On the morning of December 11, the engineers would attempt to span the river.

Before dawn bridge trains began to move to their places along the east bank. By 7 o'clock work was under way on the two lower bridges. Cold and ice hampered progress. Slowly the bridges were extended toward the shore. Suddenly, the enemy opened fire on Cross's men, wounding one and taking prisoner two others who were working close to the bank. Magruder's engineers did not get off as lightly, although they, too, were not attacked until the bridge was nearly completed- for as they were laying the balk in the last bay, they were fired upon by the enemy. Six were wounded and several pontoons were damaged. Federal infantrymen and engineers along the shore promptly returned the fire and from the heights the artillery opened on the enemy, sending them scurrying for cover. At nine o'clock the first bridge was completed, and shortly thereafter the second one was in place. Neither the Regular Battalion nor the 15th New York had encountered serious opposition. The enemy's most determined resistance was reserved for the builders of the three bridges opposite the town.

Closer to the scene of his work than Cross and Magruder were to theirs, Major Spaulding had gotten off to an early start. By 6 o'clock his 50th Engineers had built two of the bridges two-thirds of the way across, and the other one, a quarter of the way. Early



Civil War-era ponton

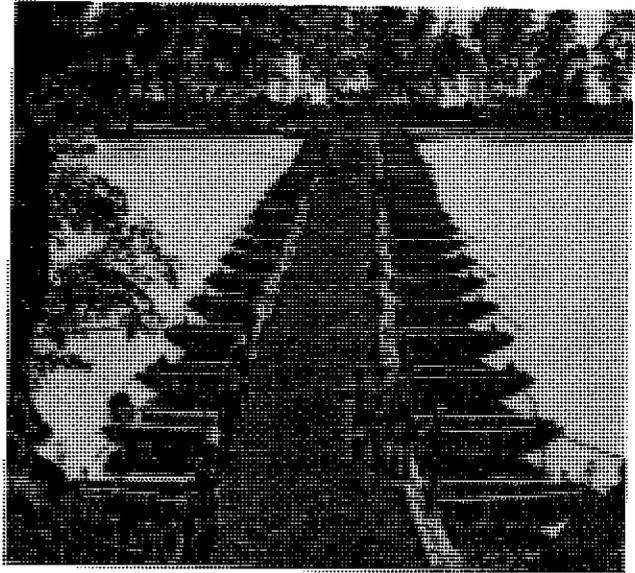
success seemed assured. But the Confederates willed it otherwise. From well-concealed positions near the water's edge, only some 25 yards from the unarmed engineers, the Mississippians opened a galling fire, killing three engineers and wounding several others. The covering forces that Burnside had provided were of little help. The

range of 400 yards reduced the effectiveness of the fire of the infantry units and, although the artillery continued to thunder, a thick fog made it impossible for the gunners to distinguish their targets. After each barrage, the Confederate riflemen would emerge from cellars and trenches to pick off the engineers as they rushed from cover to resume their work. Until Barksdale's men were driven off, the work would remain at a standstill.

Around noon the fog lifted and Federal artillery fire became more effective. Enemy fire slackened. Burnside called in Hunt and Woodbury and asked them what should be done. Hunt recommended that infantry be ferried across the river in pontoons to pry the Mississippians from their strongholds. Burnside accepted this proposal, telling Woodbury to complete the bridges as soon as the enemy was dispersed. It was decided to send 120 men of the 7th Michigan Infantry across in six boats. Each boat would be rowed by three engineers of the 50th New York. Second Lieutenant James L. Robbins of Company A was given the task of steering the lead boat to its landing point on the far shore.

Once again Hunt's artillery went into action and continued to pound away until the enemy fire died out. Then, as the guns fell silent, the boats pushed off with the engineers straining at the oars. As the pontoons touched the river bank, the infantrymen dashed ashore and drove the enemy from their positions. Shortly thereafter, engineers of Magruder's command ferried 100 men of the 89th New York Infantry across the river. Enemy resistance was quickly overcome. Soon the engineers were back at work on the bridges and by later afternoon all were in place.

That evening Burnside's grand divisions began to file over the bridges. On the morning of December 12, Fredericksburg was occupied and by nightfall the Army of the Potomac was ready for battle. Burnside attacked the next day but was unable to budge Lee from the ground he had chosen to defend. The following day both sides lay on their arms. On the 15th, Burnside ordered his troops to return to the east bank of the river. When all had crossed, the engineers dismantled the bridges.



Civil War ponton bridge

At Fredericksburg the skill and courage of Burnside's engineers had been fully tested. The casualty rate had been high. Of the units that participated in the bridging of the Rappahannock, the one commanded by Major Spaulding had suffered the greatest losses: 8 killed and 42 wounded. The volunteer engineers had performed creditably, but, in the opinion of a number of high-ranking line officers, they had not stood up to the enemy's fire as they should have. General Woodbury was at first displeased because the men would not continue work under the intense fire. A visit to the other shore after the bridges were built gave him a better appreciation of what they had been up against. In his report he wrote:

I found a loop-holed blockhouse, uninjured by our artillery, directly opposite our upper bridges, and only a few yards from their southern abutment. I also found in the neighborhood a rifle-pit behind a stone wall, some 200 feet long, and cellars enclosed by heavy walls, where the enemy could load and fire in almost perfect safety. There were many other secure shelters... It is generally considered a brave feat to cross a bridge of any length under fire, although the time of danger may not last more than a minute or two. How much more difficult to build a bridge exposed for hours to the same murderous fire, the danger increasing as the bridge is extended.

Burnside agreed with the appraisal. To his superiors in Washington he reported: "No more difficult feat has been performed during the War than the throwing of these bridges in the face of the enemy by these brave men. It was gallant work."

Source *Military Engineer*, Volume 53, No. 351, pp. 16-17. Reprinted by permission of the Society of American Military Engineers. Photographs have been replaced for clarity.

The 7th Engineers Bridge the Meuse

Captain W.M. Hoge
Corps of Engineers

The crossing of the Meuse River by the 5th Division, during the early part of November, 1918 is thought to be worthy of citation, because it is believed to be a typical example of such an operation. There were no unusual problems to be solved, or conditions to be met, in its execution. The most striking thing, to the writer's mind, was how closely it followed the principles laid down by textbooks for such an operation. Almost every principle given for the typical crossing may be found exemplified in this instance.

As a background for this maneuver, it is necessary to review briefly the progress of the Meuse-Argonne offensive from September 26, to November 1, 1918. The attack of the 1st Army, A.E. F (American Expeditionary Force), was launched astride the Meuse River, driving north. For the first few days, the divisions remained practically abreast, but, gradually, those divisions to the west of the river bulged ahead of those to the east. As early as the middle of October, the two divisions just west of the river were being harassed by a crossfire from the Germans on the east bank, and there was considerable interference with traffic on the corps axial road through Esnes, Malancourt, and Montfaucon. Excellent observation of the rear areas was afforded by the high hills to the east of the Meuse. Because the hills to the west were a series of ridges, in general perpendicular to the river line, reverse slopes in these forward areas offered little protection from this cross-fire. When the second phase of the drive began on November 1st, this condition became even more acute.

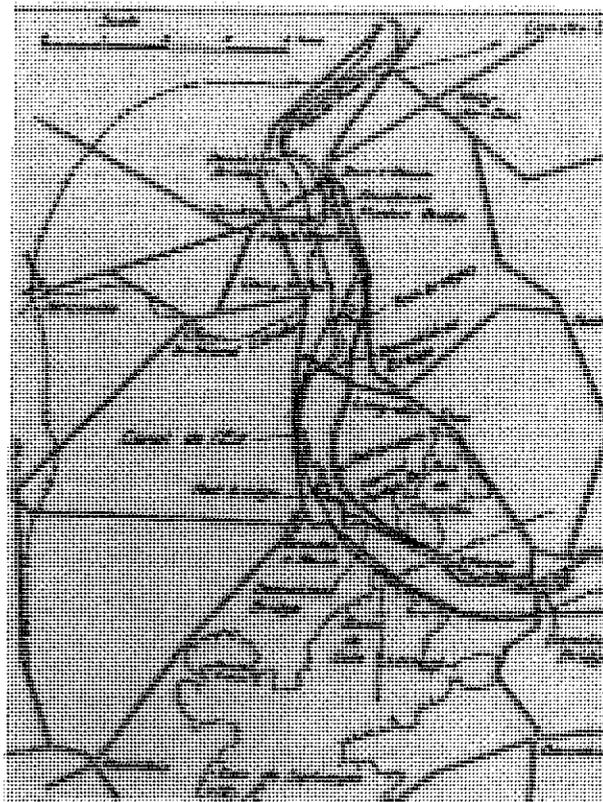
The part to be played by the Third Corps in the November 1st attack of the First American Army was given in Field Order 39, Third Corps, dated October 28, 1918. It was this order, which really initiated the crossing of the Meuse. It gave as the mission of the 5th Division the protection of the right flank of the corps, and the reconnaissance east of the Meuse River from Vilosnes to Dun.

In anticipation of the crossing, the 5th Division, on the 31st of October, issued Field Order 65, a warning order. This gave the zones of advance of the division and brigades east of the Meuse, and specified the crossing points for the brigades, and the artillery support for the attack. One company of the 7th Engineers was attached to each brigade to facilitate the advance. The division engineer was instructed, with the remainder of the regiment, to construct footbridges for the infantry in each brigade sector, a ponton bridge at Liny suitable for the passage of 75's (75mm guns), and a heavy ponton bridge at Dun to carry all divisional loads.

On November 2nd, the Third Corps, by Field Order 47, directed that the high ground overlooking the Meuse at Dun, Sassey, and Halles be carried and that strong patrols be pushed east of the Meuse in the direction of Mouzay and Stenay.

By November 3, the attack of the First Army had penetrated to such a depth that an extension of the operation east of the river became imperative and the Third Corps ordered the 5th Division to throw two ponton bridges over the river between Liny and Dun and to secure a bridgehead on the line Lion-Murvaux-Fontaines. The crossing was to be supported by the artillery of the corps. The corps engineer was directed to place permanent bridges over the Meuse near Dun, as soon as the necessary protection had been secured.

We will now turn back a few days, and follow the part played by the engineers in this operation. The 7th Engineers, divisional engineers of the 5th Division, after a brief rest, returned to the line with the division on October 27. The sector occupied by the division was that adjacent to the Meuse on the west. The engineer regiment was bivouacked in the southwestern corner of the Bois de Septsarges.



Map of the 7th Engineers' Crossing of the Meuse River

Upon receipt of Field Order 65 (October 31), the division engineer was notified that a train of French ponton equipment for use in bridging was sheltered in the Bois de Cuisy, about three kilometers south of Montfaucon, and was placed at the disposal of the division engineer. Company A, 7th Engineers, was detailed to make use of this equipment.

This company had had no ponton drill for over a year, and that drill had been with American equipage. In order to refresh the officers and men in the ponton work, and to familiarize them with the French equipage, this company, with the assistance of the French engineer officer attached to the regiment, held two ponton drills in the Bois de Cuisy. With the French equipage, was also delivered two units of the new Lampert Footbridges, the first of this equipment to be issued to combat troops. The companies of the 2nd Battalion, 7th Engineers, were drilled in the construction of the footbridges, all work being, of necessity, done under the cover of the woods and on dry land.

In addition to the above, Company C, 7th Engineers, constructed thirty rafts and a quantity of fascines in the abandoned German engineer dump near Brieuilles, as expedients to be used by the infantry in forcing a crossing.

As a preliminary to the attack of November 1, and, later, preparatory to crossing the river, it was necessary to insure uninterrupted communications as far forward as possible.

To this end, the divisional engineers spent considerable time on the opening of roads and reconstruction of bridges. One of the first of these tasks was the removal of traps (booby traps and land mines) from the Nantillois-Brieulles road. The first vehicle over this road, an ambulance, had been blown up. Company C removed about fifteen traps from this road the following day, October 30. This same company also constructed a trestle bridge over the Andon creek in the vicinity of Clery-le-Grand.

The Cunel-Clery—Clery-le-Grand road was in such condition from shell fire and mining, and so obstructed by fallen trees, that timbers for the bridge could not even be snaked to the site until the road had first been cleared and repaired. This road was open for wagon traffic on November 2. The road from Brieulles to Clery-le-Petit was also opened by Company B the night of November 3, so that bridge equipment could be moved to Clery-le-Petit and Dun. On the same night, Company B constructed a bridge over the Andon at Clery-le-Petit. The above road and bridgework were in addition to the usual maintenance and repair of roads in the sector, and had a direct bearing on the crossing of the Meuse.

The reconnaissance for this work began with a close study of the maps of the sector, which revealed two natural points of crossing, one at Vilosnes in the sector of the French Seventeenth Corps, the other at Dun. At these points, the roads on both sides of the river converged and assured communications, once the bridges had been rebuilt. There were also two other points worthy of investigation; one at Brieulles, where the roads converge on the west side of the river but not on the east, the other, opposite Liny where the maps indicated some form of bridge.

Airplane photographs showed that all bridges had been destroyed except the one opposite Liny, the condition of which was uncertain. These were also studied, to determine the approximate widths of the river and the canal, which were about 110 feet and 60 feet in width, respectively. Other information gathered from the airplane photographs was that there were tow-paths along both banks of the canal, and that suspicious looking sloughs and ponds appeared in the river-bottom between the canal and the river. All of these points were noted and made the subject of investigation on the ground. About this time, the infantry reported that they had seen a German wagon ford the river to the northeast of Brieulles.

The first location to be eliminated as a result of this information was the crossing at Vilosnes. In the first place, it was so far south that a crossing there would be of small value, and the airplane photos showed that the bridge had been so completely destroyed that it would be easier to make the attempt at some new point. A reconnaissance at Dun showed that the destruction there had been complete, five bridges having been demolished in the causeway that crossed the flats. A thorough investigation was also made of the bridge opposite Liny. This was a pile bridge about 600 meters long, extending from high ground to high ground. Fourteen complete bents had been destroyed in this bridge, and portions of others partially destroyed. In addition, the timbers and flooring were in such condition as to require almost complete reconstruction in order to carry a 75-millimeter gun. A party also searched for the ford near Brieulles, but was

unable to find any place suitable for the purpose. All companies of the engineer regiment had from one to three patrols out each night from October 30 until November 3, also several daylight patrols. Most of these patrols were commanded by officers, the others by experienced non-commissioned officers.

In addition to the information listed above, it was learned that the river valley, from 600 to 800 meters wide between Dun and Briulles, was very marshy, in most places too soft to bear the weight of a man. This condition was due to the meandering, sluggish nature of the river, and to the fact that, in several places, the canal bank had been cut and water was flowing from the canal into the lowland. The most northern point at which a crossing could be made, without extensive corduroy and approach work, was found opposite Briulles. Here the river bends to the east side of the valley and the soil to the river's edge would support a loaded wagon. The principle objection to this location was the lack of an exit on the east bank. Upon consulting the attached French engineer officer, it was learned that the tow-path of the canal was metaled and about three meters in width, sufficient for a one-way road. (This information he had gained from the reports of the Department of Bridges and Highways.) Reconnaissances further established that the German engineer dump near Briulles contained a quantity of railroad ties, and that the German dump near Clery-le-Petit contained a large quantity of lumber and miscellaneous engineer material.

From a consideration of the above data, it was tentatively planned, subject to the approval of the division commander, to make the first crossing at Briulles, crossing sufficient troops and material to establish a bridgehead. The bridge at this point was to be a normal ponton bridge to carry only horse-drawn transportation. Footbridges were to be established also near Clery-le-Petit. After clearing Dun and the adjacent heights of the enemy, it was planned to construct a reinforced ponton bridge at Dun and, later, fixed bridges for all loads along the causeway into Dun.

Field Order 49, Third Corps, November 3, 1918, ordered the forcing of the crossing by the 5th Division, directed that two ponton bridges be established between Liny and Dun. Representations were immediately made to the Corps Engineer, Third Corps, outlining the information given above as to terrain, bridges, et cetera. In view of this information, the bridge for the 10th (southern) Brigade was designated to be near Briulles.

A division of ponton equipage was moved from the Bois de Cuisy to the northwestern corner of the Bois de Septsarges the night of November 2, and hidden in the woods at that point. The other division of equipage was left temporarily in the Bois de Cuisy. The footbridge equipage was moved to the abandoned German dump west of Briulles on the night of November 1.

The engineer regiment was then divided into three battalions. The commanding officer, 1st Battalion, utilizing Companies A and C, was charged with the ponton bridge at Briulles and with the opening of communications for the 10th Brigade. The commanding officer, 2nd Battalion, with Companies E and F, was charged with the footbridges at Briulles and the opening of communications for the 9th Brigade. The

lieutenant colonel, with Companies B and D, was charged with the construction of footbridges for the 9th Brigade between Liny and Dun and with the construction of a reinforced ponton bridge at Dun. The corps engineer, with the 308th Engineers, corps engineer regiment, was charged with construction of permanent bridges at dun after the establishment of the bridgehead.

The night of November 2-3, Company F, 7th Engineers, after a detailed reconnaissance of the river at Briulles, ferried a patrol of infantry across the Meuse in the footbridge boats and, between 4 and 5 a.m., November 3, constructed a footbridge over the river. Company E, 6th Infantry, crossed this bridge and, accompanied by a detachment of



7th Engineer Regiment footbridge over the Meuse River.

Company F, 7th Engineers, with footbridge material for crossing the canal, started across the flat between the river and the canal. This party was subjected to heavy machine-gun fire and forced to seek the cover of the canal bank, where they remained all the day of the 3rd. On the night of November 3-4, Company F, 7th Engineers, threw two footbridges over the canal. Company E, 6th Infantry, being reinforced by Company G, 6th Infantry, made several attempts to cross the canal during the night, but were prevented from doing so by heavy machine-gun fire.

While these attempts were being made to force the canal, Companies A and C, 7th Engineers, with a division of ponton equipage, were held in readiness just west of Briulles to bridge the stream in case the attack succeeded. When daylight came without a lodgment having been made east of the canal, these latter organizations returned to their camp in the Bois de Septsarges.

On November 4, the Third Corps became insistent that the crossing be forced immediately, and orders to that effect were received by the 5th Division about 2 p.m. that date. Some time was consumed in transmitting this order to the organizations but at 4 p.m. two platoons of Company B, 7th Engineers, supported by the 3rd Battalion, 61st Infantry, echeloned in depth, attempted to throw a footbridge across the river east of Clery-le-Petit. This sally was met by a hurricane of machine-gun and artillery fire. Both infantry and engineers suffered heavy casualties, and the footbridge boats were shot to pieces and sunk as fast as they were launched. It was not humanly possible to construct the bridge under these circumstances, and the attempt was postponed until nightfall.

During this same afternoon, Companies A and C and the French ponton train returned to Briulles, arriving there at about 4:30 p.m. The battalion commander and adjutant, in the meanwhile, reconnoitered the streets of Briulles to determine the route to be followed by the bridge train and the location of the road over the flat to the river. This party was driven in by fire from a German one-pounder on the east bank. The streets of

the town were littered with debris from demolished buildings, and obstructed by fallen trees and telephone poles, so as to be impassable for the ponton train. The gate at the railroad crossing was closed, and in such perfect order that it looked as if a trap (booby-trap, mine) had been placed under the crossing to be sprung when the gate was raised.

Under cover of the growing darkness, one platoon of Company C was ordered to clear the streets of the town for the ponton train, and to wire the railroad gates in place and then saw off the arms. One squad of Company C was detailed to accompany the battalion commander to be used as guides through the town and across the flat to the river. All of these engineers who acted as guides in the town of Brioules were casualties during the night, several of them being killed outright. The remainder of Company C was assigned to opening and maintaining a road across the railroad embankment, across the flats to the river and canal, and to building a ramp up the canal embankment (about 12 feet high at this point." To Company A, was assigned the construction of bridges over the river and the canal, and any ferrying that might become necessary.

Just at dark, shortly after 5 o'clock, Companies E and G, of the 6th Infantry, under cover of a box barrage by the artillery, rushed the footbridges over the canal. Company F, 7th Engineers, assisted this assault by holding up certain sections of the footbridges that had been destroyed, and replacing these and others as fast as they were demolished. The infantry, reinforced by the remaining companies of their battalion, spread out on the east bank of the canal and covered the placing of the ponton bridges.

Almost simultaneously with this assault by the infantry, Companies A and C of the engineers, with the bridge equipage, started their march through the town to the river bank. The bridge equipage arrived at the river bank with the loss of only one wagon, which was struck by a shell on entering the town. This incident demonstrated the value of loading all equipage for one bay on one wagon. There was no necessity for rearrangement of the train because of this mishap. The wagon was quickly pushed to one side of the road and the train moved on.

As soon as the equipage was unloaded, construction of the bridge commenced. However, the first boat launched leaked so badly that it promptly sank. The second boat in the bridge was struck by a shell, and it also sank. The same shell wounded the company commander of Company A, who was directing the work at the head of the bridge, but he refused medical attention and stayed on the job until it was completed. Another shell knocked out the abutment and wounded several men. All of these setbacks were quickly overcome and, from this time on, there was no interference from the enemy. The slight interference from enemy fire was attributed to two conditions. First, the river bridge site was defiled from rifle fire by the canal and from artillery fire by the abrupt rise of the hill immediately east of the canal where a cut had been made through the hill. The second condition was the existence of targets below and above the actual bridge. These were the footbridge to the north and a demolished pile bridge to the south, both of which were subjected to heavy artillery bombardment during the night.

The principal interruption to the bridge construction was caused by the necessity for ferrying the infantry. Soon after work was started on the bridge, the infantry began to arrive and had to be ferried over the river. Several pontoons were carried overland and launched in the canal, being used for ferrying.



7th Engineer Regiment pontoon over the Meuse River

canal bank, which was very steep and about 12 feet above the flats. Railroad ties were carried from the German dump at Brioules and used for cribbing under a ramp that paralleled the bank. Such a ramp necessitated a right-angle turn at the top of the bank onto the canal bridge, but this was necessary under the conditions as to time and material. With careful supervision and driving, no accidents were caused by this approach.

The two bridges, roadway and ramp, were completed at 3:30 a.m., November 5, and, by dawn of the fifth, both infantry regiments, all their accompanying transportation, and the supporting artillery of the 10th Brigade had crossed to the east side of the canal and were ready to take position.

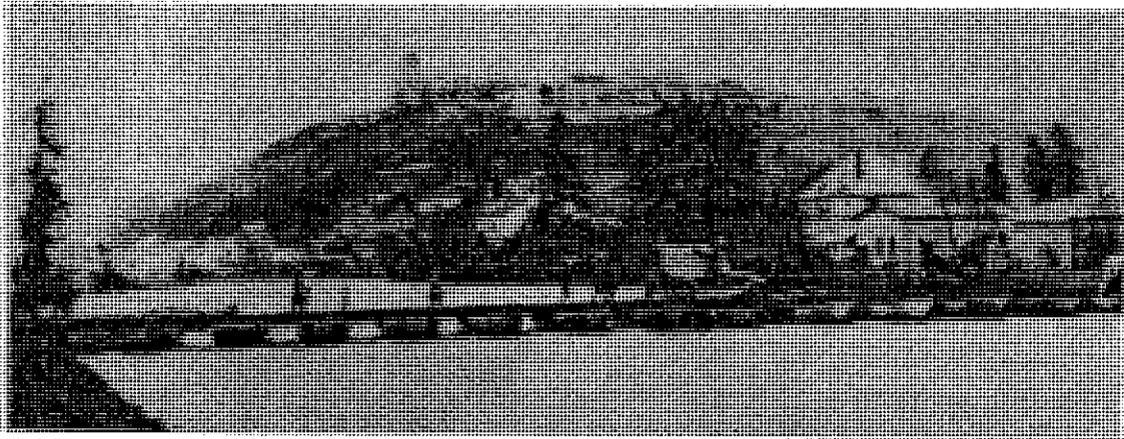
While the action recited above was taking place at Brioules, Company D, 7th Engineers, was busily engaged with bridging to the north. As related above, the attempt of the 9th Brigade to cross on the afternoon of the fourth had failed. As soon as darkness fell, however, Company D gathered up the remaining footbridge equipment at Brioules and, with men heavily laden, carried this equipage over the Brioules--Clery-le-Petit road, under heavy shell and machine-gun fire.

The bridge site, this time, was chosen about a kilometer south of the scene of the attempt of the afternoon. Company D, supported by Company M, 61st Infantry, went quietly to work, and by midnight, a footbridge was across the river. The Germans were probably deluded by the attempt of the afternoon; at any rate, not until construction of the canal footbridges began, did the Germans detect the attempt. They immediately opened a heavy fire and machine guns and artillery, drenching the area with fire. By taking

While the bridge was being build, Company C cleared and constructed a road across the flats. The principal difficulty in this work was in getting from the level of the bottom flats to the top of the

advantage of the intense darkness of the night, and the lulls in the fire, one footbridge was completed shortly before daybreak. The other bridge was repeatedly destroyed after every attempt to repair it.

Daylight found two battalions of infantry in the basin between the river and the canal. Each battalion had one company across the canal, but both footbridges were shot away. The situation was precarious for the attackers. Company D, of the engineers, however repaired the bridge material as best they could and, by using parts of both bridges, was able to construct one bridge from the damaged two. Later, it was necessary for the engineers to support the leaky boats by standing in the icy water and, at times, they bore the weight of the bridge on their shoulders while the infantry crossed above them. The infantry of the 9th Brigade crossed at this point. A part of one company was forced to swim the canal when the footbridges were temporarily out of commission because of the hostile fire. By noon of the fifth, the enemy had been cleared from the hills in front and to the flanks. By evening of the fifth, the first ridge of hills to the east of the Meuse, from Milly to Vilosnes, had been cleared of the enemy and the bridgehead was established.



7th Engineer Regiment ponton bridge over the Meuse River with dominant terrain in the background.

The next urgent call on the engineers was for the establishment of a ponton bridge at Dun for the trains of the Ninth Brigade. As soon as darkness fell on the fifth, a ponton train was started forward from Clery-le-Grand. This equipage had been brought forward from the Bois de Cuisy on the night of the fourth. The night of the fifth and sixth, Company B, 7th Engineers, assisted by detachments from Companies E and F, 7th Engineers, constructed a normal ponton bridge.

The river flats here were too soft to support the traffic, so that a plank road was constructed, 1,500 feet in length, from the main highway opposite Doullon to the bridge. This bridge was later reinforced by material from the Briulles bridges. By loading boats heavily with men, they were floated into position midway in the span of the normal bridge. The number of balk was increased and the flooring doubled. This bridge, as reinforced, carried the motor transportation of the division and the 155-millimeter howitzers, pending the completion of a more permanent bridge. This bridge and roadway were several times bombed by airplanes, but traffic was never seriously interrupted. The

engineers guarding the bridge mounted a captured German machine-gun and assisted in driving off the enemy planes.

Immediately following the construction of the reinforced ponton bridge at Dun, the corps started the replacement of the demolished bridges along the causeway between Doullcon and Dun. There were five bridges along this road to be replaced, one over the river, one over the canal, and three over flood channels of the river. The 308th Engineers, corps engineer regiment, replaced these bridges with two-way, trestle-bent bridges, capable of carrying army loads.

The German units who opposed this operation of the 5th Division consisted of three regiments, plus two sharpshooter machine-gun detachments at the river line, and eight regiments, plus elements of two others in reserve. The effective strength of these regiments, however, was very low, probably not greater than from three to four hundred. The infantry strength in this front was probably about four thousand men.

Some of the valuable principles emphasized by this operation were:

First- The value of thorough reconnaissance, a searching of all sources for information as to the nature of the obstacles to be overcome and the means of accomplishment. This data was obtained by a study of maps, from airplane photographs, from civilian sources, and by a thorough reconnaissance of the ground itself, and of sources of materials that might be used.

Second- The value of making the effort on a broad front, thus dispersing the attention of the enemy over the entire front of attack. In this crossing, there were five points where a crossing was either made or threatened; at Dun, opposite Clery-le-Petit (afternoon of fourth), 1 kilometer south of Clery-le-Petit, opposite Liny, and opposite Briouilles.

Third- The stages of development of such a crossing, from a crossing by swimming, ferrying, and footbridges, to a permanent bridge for all traffic. Ponton bridges were used for the crossing of artillery and supplies in establishing the bridgehead. In this connection, it is well to note that the first bridge for transport was located at a point which, at first glance, appeared to be entirely unsuited because of poor connection with highways to the east of the river. It, however, served its purpose admirably.

Fourth- The part played by chance in such an undertaking. This point is particularly well illustrated by the diversion caused by the attempted crossing on the afternoon of the fourth. It is demonstrated also by the defilade offered by the abrupt slope opposite Briouilles, to the wagon bridge at that point, and the effect of the demolished bridge near that point in drawing enemy fire. The sky was clouded and observation poor throughout the operation, which allowed more freedom of movement to the attacker.

From a mere consideration of the width of the Meuse River, and the canal where the crossings were made, it appears that they were really insignificant obstacles until one remembers that the entire valley of the Meuse, about 600 meters in width, was the obstacle in this case, with its marshy flats dominated by the commanding hills. In some respects, it was more difficult to cross such marsh-land than it would have been had it been entirely covered by water.

Only by a thorough study of all conditions, close cooperation of all arms, a firm determination to succeed, making numerous attempts or feints on a broad front, taking

advantage of all cover and of darkness, and a fair amount of luck, can such a crossing succeed against a determined defense.

In summing up this operation, it might be well to quote the words of the Commander-in-Chief, A.E.F., who wrote the division commander as follows, in a letter dated April 30, 1919:

The feat of arms, however, which marks especially the division's ability as a fighting unit, was the crossing of the Meuse River and the establishment of a bridgehead on the eastern bank. This operation was one of the most brilliant military feats in the history of the American Army in France.

Source: *Military Engineer*, Volume XVIII, No. 97, pp. 24-29. Reprinted by permission of the Society of American Military Engineers. Photographs have been replaced for clarity.

Editor's Note: The author of this article, Captain William Hoge won the Silver Star during the St. Mihiel offensive which preceded the crossing of the Meuse River. His heroism as the commander of the 7th Engineer Regiment's 1st Battalion earned him the Distinguished Service Cross. In 1942, as a brigadier general Hoge supervised the construction of the Alaskan-Canadian (ALCAN) Highway. He then commanded the Provisional Engineer Special Brigade Group which landed at Omaha on D-Day. In early 1945, he commanded Combat Command B, 9th Armored Division when that unit captured the Ludendorf Bridge at Remagen. Following World War II, he was the Commandant of the Engineer School. He commanded the IX Corps during the Korean War. His final assignment was as Commander in Chief, US Army Europe (USAREUR).

RIVER CROSSINGS EUROPEAN THEATER OF OPERATIONS- WORLD WAR II

Engineer operations are conditioned primarily by the terrain in which tactical operations are to take place, just as tactical operations are conditioned by the ability of Engineers to overcome unfavorable terrain conditions. Thus, the geography of Northwestern Europe, where the initial Continental operations occurred, is the geography of a land crossed and criss-crossed by many rivers and canals of varying width. This meant that river crossing functions of Army Engineers would be strained to the utmost, just as it meant that the success of the operation from the assault landing onward, would depend to a large degree upon the ability of Divisional and Corps Engineer units to quickly effect tactical crossings and pass modern armies with their vehicles and armor across streams the enemy would surely use as defense lines. Early in 1944 a dossier of tactical bridging was prepared in the Office of the Chief Engineer ETOUSA (European Theater of Operations United States Army), with this knowledge in mind. This dossier became the basis of tactical bridging to be supplied, the type of bridging to be supplied, the type of bridging to be used in varying circumstances, and the allotment of Engineer troop strength necessary for various types of crossings. The dossier was unit-devised, dealing with bridging by footage, so that, as the troop strength of the invasion forces became firm and crossing requirements were known and exact stream-sites chosen, the dossier could be applied. The dossier was not intended to replace the judgment of Army, Corps, or Divisional Engineers, but was prepared first, as a basis of supply and procurement, enlarged to include troop strength required for its employment. It recognized that every bridging problem was peculiar and individual and that variations and revisions would be made according to the local situation by the commanding officer in charge.

Corps Bridging Operations of World War I, World War II Compared

The organization for tactical bridging operations of World War II differed greatly from that employed in World War I. In the first World War, when protracted warfare was the rule and a slow war of attrition was fought, tactical bridging requirements were met, for the most part, by Division Engineers, while Corps Engineer units corresponded more closely to the Services of Supply (SOS) units of this war, being charged with the responsibility of maintaining lines of communications between rear areas and the Army. In this war (World War II), however, it was expected that campaigns of quick movement would be fought, and since a primary Engineer mission is removal of those obstacles the enemy might employ in blocking such movement, the task of Engineer forces in combat would be greatly enlarged. Bridging operations on large streams were viewed in a dual way: first, there was the stream crossing, accomplished usually in storm and assault boats, followed by bridging; and second, the clearance of bridgeheads on the far shore and the movement of the Division inland from bridgeheads, an operation so closely following the crossing as to be almost simultaneous.

To meet this dual responsibility in the present war, Corps Engineers were usually made responsible for all major river crossings, with Division Engineers being ferried across as passengers. The responsibility of Division Engineers commenced on the far shore where they were charged with keeping the Division moving forward in that area.

Early Bridging on the Continent

From the time the push to widen the lodgment area in Normandy began, together with the drive down the Cotentin Peninsula for an early capture of the Port of Cherbourg, the river crossing operations of Army Engineers began. Fourteen crossings of the Vire River were affected by Engineers on that one stream alone, the crossings usually following the pattern of:

- a. Crossing in storm and assault boats
- b. Clearing a bridgehead area on the far shore of small arms fire and, when possible, observed artillery fire
- c. Construction of a treadway or floating ponton bridge and Infantry support bridge and foot bridge
- d. Construction of a Bailey Bridge (not usually a floating Bailey in the narrow Normandy streams)
- e. Replacing of the Bailey by a timber bridge, so that the Bailey material could be lifted and moved forward for other operations

Usually, in these bridging operations, the floating bridge was left in until the Bailey was ready for use, a new approach to the Bailey being cut from the approach road by bulldozers so that traffic was not interrupted. The Baileys in turn, for the same reason, were left in until timber trestle was ready for traffic.

Two crossings of the Vire were typical of Normandy bridging operations. One was a treadway constructed by the 246th Engineer Combat Battalion on 7 July; the other, a treadway constructed by the 247th Engineer Combat Battalion, the 992nd Engineer Treadway Bridge Company, and the 503rd Engineer Light Ponton Company, on 8 July 1944.

In the crossing, made by the 246th Engineer Combat Battalion, the enemy was strongly defending the ground south of the Vire and Taute Canal, the two streams being side-by-side at this point. The banks of the canal were sown with Schu mines which promised that any crossing by foot troops would be a costly one. Under heavy artillery and mortar fire, improvised footbridges were constructed from lumber-made duck boards similar to those on a foot bridge over which assault elements could pass through a marshy terrain in order to pass over the mined area. (42-3-6)

The Infantry attack had not progressed far enough to capture a bridgehead; yet a bridge was needed across the canal for combat vehicles. Observed enemy artillery fire made the bridge site upon which the 246th Engineer Combat Battalion was to work (a demolished bridge) untenable. After much discussion between the Engineer commander and the

Infantry commanders as to the advisability of using smoke, the Division commander decided that smoke would be used in this situation. The three sections of treadway necessary to span the blown gap were constructed in a rear area and placed on Brockway



Engineers assemble treadway sections. Brockway truck is on the left.

trucks. Three sections of the treadway were pinned together and suspended in the rear of the truck from chains attached to the hoisting arm. Three trucks were loaded in this manner, two to be used in the operation and one held in reserve.

On a time signal, the artillery laid down smoke on the bridge site and the Brockways advanced to the site. Under cover of the smoke, a half squad of Engineers laid the treadway over the demolished span of the existing bridge, heaving and prying until the six tons of steel were in place. A sergeant in charge lost a foot in the operation from a Schu mine. From the time that the first loaded Brockway truck reached the site, only 13 minutes elapsed until the bridge was ready for the armor to pass over.

In the second crossing, the enemy held the far shore of the river for three weeks prior to an assault crossing by the 30th Infantry Division. In the crossing of that Division, smoke was also used and in twenty minutes, an unsupported treadway was placed across the Vire at the site of a demolished bridge under cover of the screen. The enemy was strongly entrenched on the far shore with his artillery registered on the crossing site. On the approach to a bridge site, a 2 ½ ton, 6X6 truck was stalled after being hit by artillery several days before. The driver, dead, still sat behind the wheel. Two other soldiers, also dead, were behind the truck in mute testimony to the deadly fire the enemy was laying down upon this position. When the first assault wave passed, the knocked-out truck was winched away from the site by another truck. Concentrated artillery fire in the area made it impossible to keep telephones in operation, so that radio and foot messengers were the

only reliable means of communication. The 247th Engineer Combat Battalion began construction of an unsupported treadway bridge across the gap in the existing seven-arch



Engineers use Brockway track beam to lay temporary structure across destroyed span.

bridge that was at St. Fromand. The site was shelled heavily during and immediately after construction of this bridge and the 247th suffered heavy casualties, mostly burns incurred from white phosphorous shells. Upon completion of this gap, two other bridges, one a floating treadway constructed by the 247th Engineer Combat Battalion with the 992nd Engineer Treadway Bridge Company, and the other a reinforced Infantry support bridge constructed by the 503rd Engineer Light Ponton Company, were constructed simultaneously just upstream from the first bridge. As the Infantry support bridge was completed, a direct artillery hit damaged two spans which had to be replaced. However, this bridge was the first to carry vehicular traffic over the Vire River. At the time of completion, the far shore had not been completely cleared of enemy troops; enemy mines also were encountered on the far shore. The Infantry support bridge was later completely destroyed by artillery fire and was sunk with a half track on it. It was replaced by another Infantry support bridge constructed several hundred feet downstream because of the frequency of direct hits by artillery fire on the original site.

In the by-passing of St. Lo, for example, it was necessary to construct approximately two miles of road over extremely difficult terrain, to approach the only bridge site which could be employed without working under heavy artillery fire. In that instance three D-7 dozers were unloaded just before day-light about a mile from the river. These were put into operation in echelon and followed a guide across fields. The bulldozers passed the Infantry outposts, breaking a road for the bridge trucks to follow to the river. The noise of the on-coming dozers, which the enemy apparently thought was caused by tanks, discouraged any great amount of enemy action. While the road was being completed, a Bailey bridge and a floating treadway bridge were being constructed over the Vire River.

Bridging Problems in a War of Movement

When the breakthrough occurred, the slow warfare of the hedgerows was transformed into a quick warfare of movement in which armor sliced and slashed organized German resistance into disorganized bands which were scattered across the face of Western France, leaving them for the motorized Infantry combat teams which followed to mop up. The enemy was on the run for his homeland, although he spared few bridges in what was otherwise a headlong retreat. In many cases, the bridges had been prepared in advance for demolition. During this period the Army Engineers' chief problem was in moving bridge supply forward fast enough to keep the armies moving rapidly. Colonel John F. Conklin, Engineer of Third U.S. Army, said that every unit of transportation, organic and otherwise, which could be pressed into service was used to haul tactical bridging forward.

The additional problem of replacing the Baileys with timber trestles so that Bailey bridging could be moved forward was also adding a severe strain to both Third and First U.S. Army personnel. Because of the shortage of trained Engineer combat battalions at the time Third Army became operational, 1 August 1944, two Engineer general service regiments had been placed in support of the Army, and by the middle of August this support was increased by the assignment of three additional general service regiments for the purpose of building timber trestles in the rear areas, and to assist in the maintenance of vital highways along which support for the rapidly advancing armies was moving.

The Seine Crossings

The Seine River, a major river crossing in every sense of the work, was reached so much sooner than had been foreseen that little planning for its crossing had been possible. Actually, the Seine was crossed at eight major sites as various units reached the Seine banks and, almost without pause, crossed. A typical Seine crossing was that of the 179th Engineer Combat Battalion, supporting Combat Command A of the 7th Armored Division, in the face of sporadic artillery fire.

The 179th less one platoon of Company B, which was maintaining and guarding bridges in the vicinity of Cherisy, had been assigned in direct support of Combat Command A, by the 1139th Engineer Combat Group, XX Corps. The combat command was attempting to cross the Seine River north of Melun with the territory to the north and east of Melun as its objective. The Division was stopped by the demolition of all the bridges in its sector of advance, and at 1000 hours a divisional decision was made in favor of an assault crossing of the river somewhere in the vicinity of Ponthierry. Reconnaissance for the assault crossing sites was made by Engineers together with representatives of Combat Command A Headquarters and attached Infantry and Artillery units. Two sites were selected in the vicinity of Tilly. The battalion was given the mission of operating the assault boats in the first and succeeding waves. The 509th Engineer Light Ponton Company supplied 76 assault boats for the operation.

The assault crossing was made at the two selected sites, separated by about 300 yards. Company A with one platoon of Company B attached was responsible for the operation of boats on the north site; Company C with one platoon of Company B attached was responsible for the operation of boats at the south site.



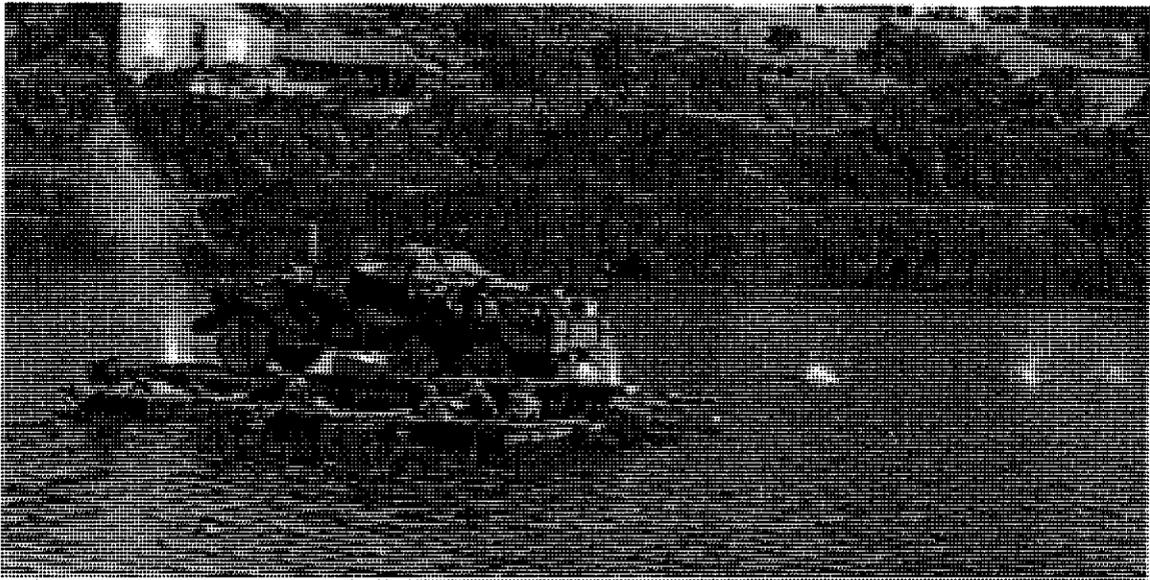
Engineers and infantry near M3 assault boats in the crossing of the Seine.

At 1615 hours the artillery preparation, which was the signal for the assault, began. The boats of the initial and succeeding waves at the north site crossed without casualties. After the Infantry had been across Company A continued to operate the assault boats bringing casualties and prisoners back from the far shore. Meanwhile, units from the 33rd Engineer Armored Combat Battalion together with elements of the 179th, started construction of a treadway bridge at the north site, and a minimum number of Company was left at the river bank to operate boats. Others were sent back to the assembly area approximately one-fourth mile west of Tilly. At about 1900 hours the assembly area was heavily shelled by 88mm guns, and there was a direct hit on a Company A truck which resulted in five men being killed.

At 1615 hours the initial wave at the south site crossed without casualties and the succeeding waves were subjected only to sniper fire which resulted in two members of the Battalion being killed.

Immediately after the Infantry had been crossed, a D-7 bulldozer was brought to the north site to prepare the near approaches to the bridge. The enemy occupied the town of St. Fargeau, which was north of the crossing site and which provided observation of the crossing site. The operator of the bulldozer, T/5 Jess C. Michalowski, continued his work in spite of heavy mortar and artillery fire, and when a ferry had been constructed the dozer was taken to the shore where, also under mortar, artillery, and sniper fire, he prepared the approaches to the bridge from that side. At the south site a ferry was used in

place of a bridge for crossing. This area was also under direct observation and under sniper, mortar, and artillery fire. It was prepared for the movement of vehicles by Private William Lewis, and Sergeant Louis C. Hall, who operated the company bulldozer in shifts in preparing the landing slips. When the ferry slip on the near shore was completed, the bulldozer was ferried to the far shore where it assisted a squad from the first platoon of Company B, working with hand tools and demolitions, in preparing the slip on the far shore.



Industry support built under fire on the Seine River.

Up and down the Seine River, similar crossing operations were occurring with but little pre-design and planning despite a severe shortage of material due to the rapid movement of the preceding three weeks. In the next six weeks the war of rapid movement continued and the problem of tactical bridging became even more intense, but seldom were the movements of the Armies held up by failure of Engineers to cross them over the streams which they faced. The Marne, the Loire, the Meuse, the Mass, and the Wurm Rivers were crossed by Army forces almost as rapidly as they had moved along the highways. Crossing of the Wurm River was a key to the assault upon Aachen and was one of the first penetrations of the Siegfried Line, for the line of the Wurm and the dragon teeth defenses which lined its far shore were a part of the Siegfried defenses.

The Wurm Crossings

XIX Corps, assigned the mission of crossing the Wurm into the heavily fortified Siegfried Line and circling southward to join with VII Corps to cut off the city of Aachen, came up to the Wurm early in October. All bridges across the Wurm were destroyed and every possible crossing site was covered by artillery and small arms fire. However, the 30th Infantry Division forced a crossing of the stream. The 105th Engineer

Combat Battalion, attached to the 30th Division, was supported in the operation by the 1104th Engineer Combat Group. Five ponton bridges across the Wurm were constructed by the 1104th Engineer Combat Group under small arms and intense artillery fire. The first bridge was a treadway at Marinsberg.

This bridge was constructed rapidly, although it was necessary for the Engineers on the job to take time off and silence an enemy machine gun less than 100 yards from the site. Just before daylight on the morning following the initial assault a Bailey was constructed at the site of a demolished bridge, but just as the ramps were being placed on the bridge a shell made a direct hit on one of its panels which had to be replaced. Two dry treadway bridges were also constructed at the site near Rimburg under very heavy artillery fire from the castle just across the stream. These were the first bridges across the stream put into actual use. The 1104th Engineer Combat Group was in close support of the 30th Infantry Division and, following the bridging of the Wurm, supported the advance of the combat teams in breaching the dragon teeth and other barricades, thus enabling armored and combat vehicles to pass through.

During the period of the advance from the Seine to the Siegfried Line many combat battalions were building as high as a Bailey bridge a day during the periods of movement, Major General C.R. Moore, the Chief Engineer, informally estimated that during this period each Army was building an average of 10 bridges per day, but it is likely that many more, considering the short span and culvert type bridges across small streams and canals not reported by the constructing units, were actually constructed.

The Moselle Crossings

To the south, Third Army was also coming up against strongly defended river lines. When the failure of the direct assault upon the Metz fortresses caused a change in tactics, success of the newly undertaken operation depended upon two river crossings of the Moselle, flooded and outside its banks. The crossings, in the vicinity of Malling and Ukange, were highly successful, but behind them- or at least behind the crossing at Malling, since that at Ukange was started as a feint and converted to an actual crossing in a tactical change of plans later- was much detailed work and training.

On 31 October, the 206th Engineers began training with the 359th Infantry in assault river crossing, in usage of Infantry support rafts and construction of Infantry support bridges. This training was conducted at a selected site on the Moselle River, near Pagny. Training was accomplished by A, B, and C Companies consecutively, each relieving the other at the training site, so that current operational tasks would not be neglected. Day and night training was given, and the training was completed on the night of 3 November 1944.

Following the bridge training, the Engineers began day and night training in ferrying operations and use of assault boats. On 5 November, at a site west of Erroville, Companies A, B, and C instructed the 1st, 2nd, and 3rd Infantry battalions in the proper

methods of loading and carrying an assault boat. This phase of training brought together the Engineer company commanders and the Infantry battalion commanders as well as the Engineer platoon leaders and Infantry battalion commanders who were going to work together in the actual crossing. A full scale "dry run" assault crossing was planned for the night of 5 November at a site northwest of Croanes, which resembled the actual crossing area as closely as possible. This maneuver was considered successful by those involved, although the unit commanders agreed that much more careful planning on the part of both Engineers and Infantry was needed.

At 1800 hours, 7 November, the 206th, less a headquarters detachment left at Angebillers, moved out to establish a bivouac in the vicinity of Sentsich in preparation for forcing a crossing of the Moselle River near Malling. After their move to the vicinity of Sentsich, the battalion marched in total blackout five miles to an area east of Bousse for its final "dry run". Boats were not used, but all signs and tracing tapes were placed on specified azimuths. On 8 November, final preparations and reconnaissance were made. At approximately 1800 hours a forward CP was established in the basement of a building in Favisse and wire crews began laying wire to the assault site. At 2330 hours, 8 November, Companies A, B, and C moved out of the bivouac area to take up positions with the 359th Infantry to form boat loads for the assault. Each assault boat crew consisted of three Engineers from the 206th Battalion as crew and one Engineer guide. Companies B and C operated 34 assault boats, and Company A maintained 16 boat crews in reserve.



Engineers used long poles to manage boats in the crossing of the Moselle River.

H-hour was 0330 hours, 9 November, with Company B ferrying the 1st Battalion of the 359th Infantry, and Company C ferrying the 2nd Battalion. The operation was completed at approximately 0415 hours, each battalion of Infantry being taken across in two waves. Enemy resistance at the point of crossing was slight, Company B getting one

wave of Infantry across before a shot was fired by the enemy. Later, at 0600 hours, Company C ferried the 3rd Battalion across. Tactical surprise was achieved and work of bridging was ordered to begin.

At 0430 hours, 9 November, Company A of the 206th Engineers with the 315th Engineer Combat Battalion, began construction of a footbridge, but because of constant harassing machine gun and mortar fire progress was slow and the attempt abandoned.

At about 0600 hours, construction of an Infantry support bridge began. When this bridge was three-fourths completed, and infantry support raft ferrying a truck across the river, ran into and snapped the bridle line holding the bridge. The bridge was thereby lost down stream at 1100 hours on 9 November.

Immediately upon the loss of the support bridge, salvage operations were started which resulted in regaining some of the lost equipment. Preparations were made to construct a treadway bridge at the same site. Construction began at 1800 hours, 9 November and continued throughout the night and following day. The bridge was completed approximately at 1700 hours on 10 November, but at 0655 hours, 12 November, enemy artillery fire fell in the bridge area and five pontoons were punctured. Traffic was temporarily suspended. While repair crews patched the punctured pontoons, replacement pontoons were sent for and traffic was shortly resumed, but at approximately 0755 hours additional shelling further damaged the bridge. A TD (tank destroyer) which was partially across at the time, continued across, but the bridge was weakened and would not bear the weight of the vehicle. As the TD neared the far shore, the bridge sank into the water at an angle so that the force of the current added to the weight of the vehicle caused the bridge to break loose. This bridge was lost downstream at 0810 hours, 12 November. Again salvage proceedings were initiated and preparation to reconstruct the treadway bridge began. Some delay was encountered in bringing up additional equipment as it was necessary to go to dumps as far away as Toul. But preparation of the abutments was commenced and laying of anchor cable completed before the battalion, less Company B, was relieved by the 160th Engineer Combat Battalion. Company B remained, attached to the 160th, until the bridge was completed later the same day.

Because of the difficulty in bridging the river, the following operations were maintained through the period of the crossing. A ferry system was established operating three types of ferries. Infantry support rafts were operated by the 315th Engineer Combat Battalion to haul Jeeps, weapons carriers, and anti-tank guns. This ferry, started the morning of the 9th, was the one that knocked out the Infantry support bridge, and in so doing broke its own cable and was put out of operation.

A second type (of ferry) was a class 40 ponton ferry constructed of 5 M-2 pontoons and treads, powered by three power boats snubbed to the raft. This ferry was operated by the 206th Engineers and transported medium tanks and TDs. By 1700 hours, 12 November, a company of tanks and a company of TDs had been crossed. In addition a ferry system, comprising 12 storm boats with 55-horsepower motors and light assault boats joined together in groups of two and powered by four 22-horsepower outboard motors plus

power boats, was put into operation. This ferry began on 9 November and the boats were operated almost continuously 24 hours per day, stopping only when it was necessary to move or extend the piers due to changing water level. Two platoons, one from company A and one from Company B maintained the ramps and acted as stevedores in the loading and unloading of the boats. These boats carried ammunition, rations and similar stores to the far shore and evacuated wounded to the near shore.

About the time of the assault the water level began to rise and reached flood stage. By the evening of the 10th the flood water had reached the edge of Gavisse with a maximum recorded depth of 54 inches on the road leading to the bridge site; all the approach roads to the bridge ended on an incline at the river bank, thus forming an isle at the bridge site during flood stage. For this phase of the operation, M5 tractors were used to tow vehicles through to the island, so they could then cross the bridge under their own power. The M-5s were also used to tow 8-ton, 16-ton and 20-ton trailers, on which were loaded Jeeps, supplies, through the water and across the bridge to where they were unloaded on the far shore. Two cranes, one in Gavisse at the truck control point and one across the river, were used for the loading and unloading of supplies. The crane across the river had been previously towed across by one of the M-5 tractors.

Bridging and ferrying operations continued during the flood stage. The water reached its crest at approximately 1200 hours, 11 November. Constant check of the water depth was made as movement of vehicles depended upon the recession of the water. The wading depth of 6-ton Brockway trucks is 42 inches; of tanks, 30 inches. As soon as the water had reached wading depth, traffic control was notified that vehicles could be sent through. Thus the bridge, completed and ready for use the evening of the 10th, was not utilized until 1500 hours on the 11th. Ten Brockway trucks loaded with supplies, Jeeps, five light tanks, and three TDs crossed the bridge before it was lost. The receding flood waters also washed out parts of the approach roads to the bridge so that reconstruction of 100 feet of heavy road was also necessary on 12 November.

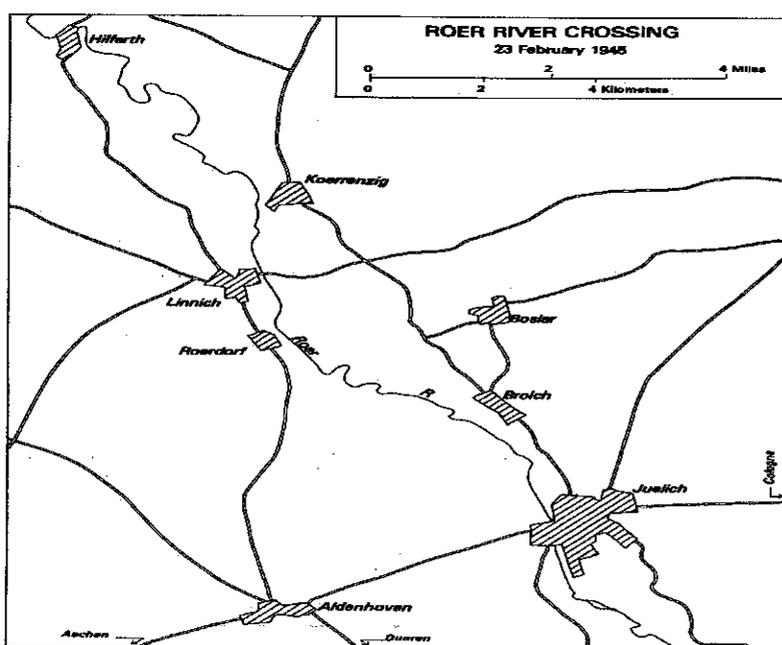
The Roer: Dress Rehearsal for the Rhine

By the end of November, elements of First Army and of Ninth Army were on the Roer River. Although plans had been made to force the Roer as the Seine had been forced as the first units touched the banks, intelligence caused a complete change. The Germans had constructed two dams upstream and, with huge reservoirs behind these dams, could control the flow of the river and precipitate at will floods disastrous to a crossing. Two attacks with the capture of the dams as their objective, were launched and repulsed by the enemy who, in defense of his own homeland, fought bitterly and with grim determination. Several heavy bombing attacks also failed to do material damage to the structures.

The breakthrough in the Ardennes sector dismissed all thoughts of crossing the Roer for the time being as VII Corps was shifted to the breakthrough area and XIX Corps moved southward to take over VII Corps' sector. Troops in the over-extended XIX

Corps area were engaged in extensive mine field operations plus other fixed and temporary defense works. In addition, roads in the area were in bad condition. The freeze caused icy surfaces on all roads which, coupled with several heavy snow-falls, kept Engineers in the area fully occupied.

When the German drive in the Ardennes was stopped and our counterattack developed, XIX Corps began a limited objective attack to secure the dams containing the waters of the Roer. Working at times in blinding blizzards, day and night, Corps Engineers of the 1104th Group aided the attack by building an assault bridge (in the vicinity of Hammer) across the upper Roer, the first bridge to be constructed over any part of that river. Thirteen bulldozers were lost during that construction job by running into mines in the deep snow.



On 5 February XIX Corps was returned to the northern sector opposite Julich, to prepare again for the crossing of the Roer, a decision having been taken in higher headquarters that the main effort would be made opposite Julich and that the 29th Infantry Division would make the main effort. A thaw having occurred, all roads in this sector were rapidly becoming impassible and only

by working night and day were the Engineers able to arrest their deterioration and improve them for the heavy traffic which would immediately precede and follow the Roer assault.

The attack toward the dams progressed well until 9 February when, with U.S. troops in sight of the dams, the enemy destroyed the discharge tubes, causing flood conditions which lasted approximately two weeks.

Again the crossing had to be delayed until the flood waters receded sufficiently to assure the success of the operation. Although the risk entailed was great, Colonel R.U. Nicholas, Engineer of Ninth Army, advised the Commanding General of that Army to attack 24 hours before the recession began in spite of the width of the river and the speed of the current. This was in order to deceive the enemy, strongly entrenched on the opposite side. This advice was followed and the operation was undertaken 23 February.

As indicated above, river crossings up to this time were handled with standard organizational equipment on hand and were based on normal intelligence and data. The Roer crossing, which was to provide an excellent dress rehearsal for the Rhine Crossing being planned simultaneously at Twelfth Army Group, was a carefully planned operation for which a careful build-up in material and accumulation of technical data were made.

The Roer River, in northwestern Germany, presented one of the major natural obstacles to the advance of American Armies to the Rhine. As of 23 February 1945, our front line had advanced generally along the line fronting on the Roer from Linnich to Duren. The river was a natural water barrier of which the German Army took fullest advantage. It lies in a geologically old valley which is very wide and flat. The valley is approximately one mile wide and the river itself flows generally in the western third of the valley, commanded on both sides by high ground. The German held high ground north and east of Julich, which gave them a decided tactical advantage.

Engineer planning for the crossing of the Roer started in November 1944, was halted by the Battle of the Bulge, when the 1104th Engineer Combat Group, which had been assigned to make the study and plans for the crossing, was shifted to the Hurtgen Forest area. On 5 February, the Group returned to the Julich sector and, within three weeks after their arrival there, Engineer plans calling for three foot bridges and three vehicle bridges, initially, another foot bridge and two additional vehicular bridges to follow, were completed.

The main engineering difficulties at the time of the crossing were caused by the fact that impounded waters of the large reservoir in the Hurtgen Forest were released by the enemy causing flooding conditions. Studies were made to determine the time at which the flood waters would recede and the river level again reach normal. The studies revealed that between 26 February and 1 March these conditions would prevail.

Reconnaissance played a big part in Engineer planning for the crossing. As early as 1 December 1944, reconnaissance parties from the 1104th Group, together with elements of the 29th Infantry Division, proceeded under cover of darkness to observation posts along the river with principal points of observation being Hassenfeld Gut, near what was termed bridge site No. 5 in planning; the Sportplatz, near site No. 3; and a group of buildings near site No. 2. These parties remained under cover during daytime and observed the river characteristics, the bank conditions and the approaches on both near and far shores. Sketches were made of the conditions at each site and, under cover of darkness the next night, these reconnaissance parties returned to headquarters. Continual air reconnaissance, with photographs both vertical and oblique being taken, were also assembled and studied. During the early part of February, practically all officer personnel concerned in the planning for the crossing made aerial flights in Artillery liaison planes along the front, paying special attention to the sector along which their particular assignment lay.

With the completion of the plans for the crossing, the 1104th Group immediately began work on the road net with particular emphasis on the MSR for both the 29th Infantry Division and the 83rd Infantry Division. The MSR for the 29th was the road Aachen-Hongen-Aldenhofen-Julich; for the 83rd, the road Alsdorf-Bettendorf-Giresdorf-Durbeslar-Aldenhofen-Engelsdorf-Koslar and thence across the river at the site of a second foot bridge to be constructed when the flood had receded. As mentioned above, much new road construction had to be initiated because of the thaw which occurred in late January causing sub-grades of all roads to fail completely.

Continual training was conducted by the group for its combat battalions in the construction of the various bridge types to be used with attempts to conduct this training on streams comparable in size and width to the Roer River during flood stage. Much of this training occurred on the Maas River near Maastricht. Results of the training indicated that the main obstacle to be overcome in all construction, was getting the anchor cable across initially, an extremely difficult operation due to the fact that a swift current swept all types of boats downstream of the landing point on the enemy shore and floating equipment was extremely difficult to handle under such circumstances. By his demolition of the highway bridge, the enemy created what amounted to a rubble dam across the river at this point. This dam partially blocked the water upstream and, during flood stage, caused the width of the river from the demolished highway bridge to a point approximately 400 yards upstream to be from 280 feet to 400 feet. The dam further decreased the velocity of the water in the river upstream from the demolished bridge. Existence of this dam played a great part in the selection of sites for the bridges. For this reason the bulk of the vehicle bridges were located above the demolished highway bridge.

D-Day was originally set for 16 February. On 14 February, at a meeting called by the group commanders of all unit commanders it was ascertained that personnel and equipment was in place and ready for the operation. However, at this time, the outlet control mechanism of the Schwannanauel Dam in the Hurtgen Forest was destroyed by the enemy releasing the impounded waters and causing the level of the river to rise to such an extent that D-Day was postponed until 23 February.

The week following was one of suspense. During this period reconnaissance elements of the group established a river gauging station from which readings were taken every two hours in an effort to determine the rate of rise or fall of the river. As the peak of the flood was reached and the water gradually receded, a curve was prepared which indicated that the water level would be at normal some time between 26 and 28 February. It was believed by the staff of the 1104th Group that the crossing would be made some time after that date. The field order received on 16 February however, placed D-Day on 23 February with H hour at 0330. Since the crossing was to be made at flood stage, certain revisions of the plans were necessary. These were made at another meeting of unit commanders called for the evening of 17 February to familiarize those concerned with the details of the change.

On the basis of these revisions, with H hour set for 0330 hours 23 February 1945, the schedule for the construction of the bridges was to be:

- 3 foot bridges, construction to start at H hour
- 1 Infantry support bridge, construction to start at H hour
- 1 treadway bridge, construction to start at H+1 hour
- 1 heavy ponton bridge, construction to start at H+1 hour
- 1 Bailey bridge to start as soon as flood waters receded sufficiently to permit work on intermediate piers
- 1 treadway bridge, to start upon recession of flood waters
- 1 foot bridge, to start upon recession of flood waters

An important feature of the planning was the assembling of the bridge trains at designated bridge assembly areas. These bridge trains were phased in such a way that no traffic tie-ups would occur. The bridge trains started to roll, at 1900 hours on 22 February, into their respective assembly areas. Advantage was taken of every possible concealment for them. Sixty-yard interval was strictly adhered to in convoy but the tremendous size of the trains precluded the possibility of complete concealment. At 2000 hours, 22 February, all bridge trains were in their respective assembly areas ready for the operation, and anxious moments were spent in anticipation that enemy air strikes of the previous night might be repeated or that a flare dropped from an enemy plane would disclose the entire plan from the assembly of the bridge trains. Fortunately, the night was quiet as far as enemy air activity was concerned. As later confirmed by PW (Prisoner of War) reports, the attack starting at 0330 hours gained complete tactical surprise.

Although surprised by the action, the enemy with his artillery and mortars sited all along the defense line of the far shore and commanding the valley from the high ground opposite, was quick to bring this artillery into action. Artillery and mortar fire, coupled with terrific small arms fire and added to a strong current which hampered manipulation of the storm and assault boats, took a heavy toll in the assault crossing. More than 600 storm and assault boats were lost in the operation, a loss which was to affect the later Rhine crossing because such boats were in short supply as a result of this loss. However, it was the opinion of the Ninth Army Engineer that the sacrifice of materials to gain tactical surprise in the initial phases of the assault was worthwhile, since the crossing was difficult in the face of an enemy who was unsuspecting, and would have been severely costly against an alerted enemy.



Infantry cross in M2 assault boats

Simultaneously with the assault crossing, construction of three foot bridges upstream from the destroyed masonry arch bridge was started. Foot bridge equipage previously had been carried to the vicinity of the bridge site under cover of darkness. As was

expected, the anchor cable proved to be the main problem in the construction of the bridges. Rifle, pistol, and machine gun fire from the shell-torn houses on the far shore of the river was directed against Engineers building these bridges. One foot bridge was completed at 0424, but a few minutes later an assault boat carrying infantry was swept down stream by the current, crashed into the foot bridge, and broke the span in the middle. Work immediately proceeded on the repair of this bridge, and continued on the other two bridges.

All foot bridges were completed by 0700 hours, after Engineers had made repeated attempts to get the anchor cables across the river. Ironically enough, two Germans were the first to use the foot bridges. As soon as the first bridge was complete, these German soldiers came out of an emplacement on the far side and surrendered to the Engineers. One foot bridge was never used to any great extent by the Infantry because until H+4 hours the near shore approach to the foot bridge was covered by machine gun fire from a strong point in a house on the far bank.



Damaged trestle bridge over the Roer River

Construction on the heavy ponton bridge started at H+1 hours and this bridge site too was under continuous small arms fire until approximately 0800 hours, and, from that time, under mortar and artillery fire for the rest of the day. This bridge was finally completed at approximately 1600 hours. The principal difficulty encountered in construction was again the swiftness of the current. This bridge was the first vehicular bridge completed, and armored vehicles of several types passed over the bridge before darkness of D-Day. Colonel David McCoach, III, executive to the Ninth Army Engineer, pointed out that the heavy ponton bridge, definitely not a favorite of Engineers during early bridging operations on the Continent, had proved so effective in the Roer crossing that plans for its greater employment in the forthcoming Rhine crossing were made, and procurement ordered on a basis of increased use.

The centerline of the treadway bridge was selected about 75 feet upstream from the demolished masonry arch bridge, and construction was started at H+1 hours. This site

received continual small arms fire until 0900 hours and from then through D-Day was subjected to mortar and observed artillery fire. Construction proceeded at an excellent rate, and approximately 132 feet of bridge was constructed when probably the most unfortunate incident in the operation occurred.

At about 0930 it was estimated that seven rounds of heavy artillery came in on this bridge site; and all rounds landed on the bridge itself, sinking the floats and severely damaging the treadway. The bridge itself was destroyed with high casualties to the construction unit. Two officers and four enlisted men were killed; one officer and 17 enlisted men wounded. It was decided that the center line of the bridge should be shifted upstream, since the enemy, beyond question, had registered his artillery on this point and that, since artillery fire was still concentrated in the area, a repetition of the catastrophe might occur. The new center line of the treadway bridge was shifted to a point approximately 100 yards upstream from the demolished highway bridge and construction started at the new work site at approximately 1400 hours. This site also was subjected to observed artillery fire, but construction proceeded regardless throughout the night of 23-24 February, with the principal difficulty remaining the swiftness of the current in which unwieldy floats had to be maneuvered into place. This bridge was completed at 1100 hours on D+1, and was subjected to observed artillery fire until its completion.

The Infantry support bridge, downstream from the masonry arch bridge, was started at H hour, and according to plan should have been the first vehicular bridge in. The reverse was true. It proved to be the most difficult, because the river at this site was canalized, the current extremely swift, being approximately five miles per hour. In addition, the site was subjected to intense small arms, mortar, and artillery fire throughout D-Day and D+1. Each time working crews appeared on the river bank they drew a scattered fire from houses on the far shore.



Infantry Support Bridge over the River H hour

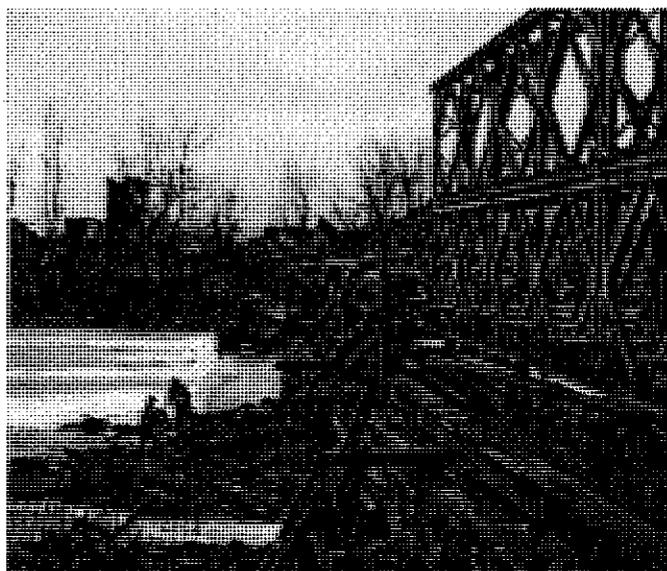
The approach road to this bridge had previously been swept for mines by Division Engineers, but it was found that non-metallic Topf mines had been used in the road and on its shoulders. When construction of the bridge first started, the bridge train proceeded to the site, and casualties to equipment caused by these non-metallic mines were: 2 tractors, 1 10-ton wrecker, and 2 dump trucks.

The road was again swept and probed for mines, an operation consuming six hours. When actual construction of the bridge began, the working crews were each time driven back by mortar fire from the citadel in the town of Julich. In some cases the working crews were forced to infiltrate, one by one, to the bridge site from the Sportsplatz. An interesting side-light was that an Artillery observation plane overhead would convoy members of the Engineer crews from their cover to the bridge site. This was done by the plane flying overhead parallel to the road from the Sportsplatz to the bridge site and looking for the muzzle flash, either from artillery or mortar, as the men approached the site. With the plane overhead enemy artillery withheld its fire rather than reveal its position and the men were thus able to reach the bridge site.

During the afternoon of D-Day, and the night of the 23-24 February, repeated attempts were made to get the anchor cable for the bridge across the river. But at each attempt, the swift current either overturned the boat trying to cross or swept it downstream to ground in the vicinity of the site of the treadway bridge to be constructed when the flood water receded. In one case the assault boat overturned, throwing all of the occupants into the water, and one Engineer officer was swept one-fourth mile downstream before he was able to make his way out on the far bank. He then worked his way back through extensive minefields to Julich and across the river on one of the completed bridges. At approximately 1000 hours D+1, the anchor cable was across the river and the construction of the bridge carried on. The bridge itself was open to traffic at approximately 1530 hours D+1. So heavy was enemy artillery fire laid down on this bridge site that at one time Corps Artillery had 11 observation planes in the air over this area in an attempt to spot the sources of enemy fire so that they could be neutralized. On D+1 it was decided that the river had receded sufficiently to permit the construction of the treadway bridge at site No. 5, along with a foot bridge. This construction started at approximately 1600 hours, D+1, and continued through the night, being completed at approximately 2100 hours, D+1. The foot bridge was started at approximately 2100 hours, D+1. This bridge site was subjected to artillery fire and to aerial bombing by jet propelled enemy planes. Difficulties encountered in the construction of these two bridges were principally the swiftness of the current of the Roer River, and destruction of a quick-way crane, vital construction equipment, by enemy air activity.

On D+2 it was decided that the river level had receded sufficiently so that work could start on the intermediate piers for the Bailey bridge over the demolished highway bridge at site No. 2. Work was started on D+2 at 0700 hours. No enemy activity hampered the construction of this bridge, and the only difficulty encountered was the normal

engineering difficulty expected in the building of a Bailey bridge of this length and the preparation of the intermediate piers. The Bailey bridge was open for traffic at 1710 hours, D+4. No construction was carried on during the hours of darkness due to the fact that extreme care had to be taken in preparing the piers and bringing them to proper level with the timber grips, and in the preparation of the articulation joints at each pier. Since four vehicular bridges were open to traffic, it was decided not to risk dropping the Bailey in the gap, excepting under good working conditions, and consequently all construction took place during daylight hours. The completed bridge was a double-triple Bailey bridge, total length 300 feet.

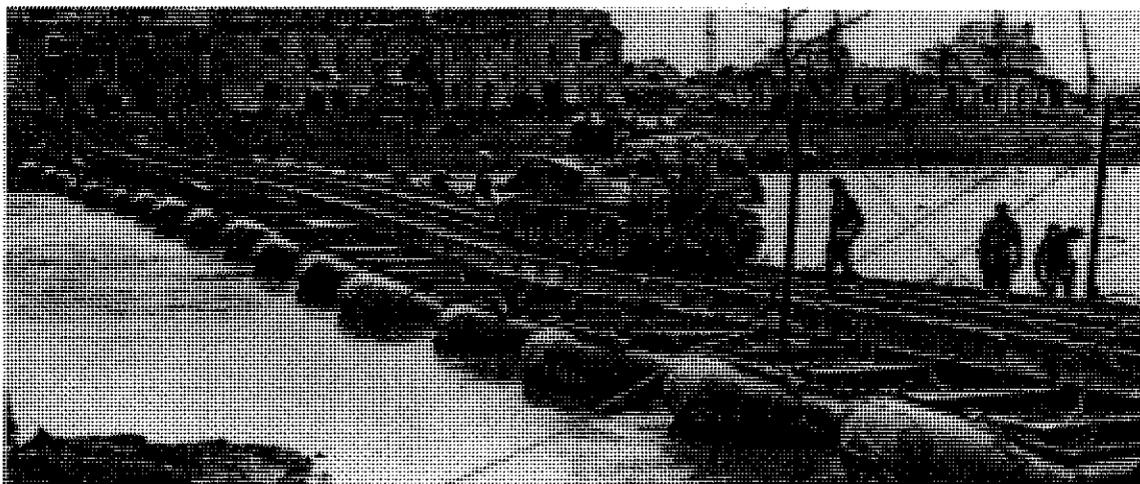


Launching the Bailey bridge over the Roer River at Julich

The three foot bridges upstream from the masonry arch bridge and the Infantry support bridge and treadway bridge downstream from the masonry arch bridge were constructed by the 246th Engineer Combat Battalion. The treadway bridge upstream from the masonry arch bridge and the Bailey bridge over the demolished bridge were constructed by the 247th Engineer Combat Battalion. The heavy ponton bridge was constructed by the 554th Engineer Heavy Ponton Battalion, while the 208th Engineer Combat Battalion constructed the floating anti-mine boom upstream from the first three bridges. The 503rd Engineer Light Ponton Company constructed the foot bridge upstream from the highway bridge and furnished foot bridges and an Infantry support bridge to the 246th Engineer Combat Battalion and the Bailey bridge to the 247th Engineer Combat Battalion. The 992nd Engineer Treadway Bridge Company furnished treadway bridge equipage to the 246th and the 247th Battalions. The 611th Engineer Light Equipment Company furnished equipment and operators to the 246th and 247th, while the 978th Engineer Maintenance Company furnished emergency repair trucks and crews and on-site repair for the equipment knocked out by enemy action. Maps of the crossing sites and defense overlays of the town of Julich were reproduced and furnished by the 67th Engineer Topo Battalion, while additional trucks for hauling missions before and during the operation were provided by the 582nd Engineer Dump Truck Company.

The Engineer operation of crossing the Roer River at Julich, crossing which were later extended along the whole Ninth Army line of the Roer as well as into areas of First Army, was one of the most difficult river crossings of the war both from a tactical and technical view point. The enemy knew where the bridges would be constructed since the river, both upstream and downstream from Julich was wide and impracticable for bridging. The river at Julich was generally canalized and the road nets limited accessibility to the river to three sites. That it was necessary to cross at one or the other

of these sites, so as to take advantage of the existing road net, was a foregone conclusion since it was impossible to construct new roads in mid-winter and on short notice when maintenance of existing roads required night and day service. This permitted the enemy to concentrate his fire power on such crossing sites making the Engineer mission extremely hazardous and difficult. Technical difficulties encountered were primarily those of crossing a river of this width and current velocity under small arms, mortar, and observed artillery fire.



1104th Engineer Bridge over the Roer River at Julich

Colonel Hugh W. Colton, commanding the 1104th Engineer Combat Group, concluded from this operation “that it was extremely difficult to construct foot bridges of the length put in at Julich under direct small arms fire and with only small bridgeheads established. With the current characteristics such as the Roer River had at the time of the crossing, it would probably have been extremely difficult to construct such a long foot bridge even if (an) adequate bridgehead had been established prior to construction.” These conclusions led to the determination of the Army Engineer to avoid the use of foot bridges in the Rhine crossing, although Engineers had already virtually decided against the use of foot bridges on the Rhine because of its great width.

Colonel Colton also concluded that thorough and continuous reconnaissance contributed heavily to the success of deliberate operations such as the Roer crossing. Plans for the Roer River crossing were made far in advance and in complete detail. These plans were finally decided upon were carried through during the operation. Certain adjustments were made, not in the basic plan, but in the method of prosecution of work, such modifications being caused by the tactical situation. Information previously obtained by reconnaissance, was accurate and adequate and the profit derived from actually having unit commanders down to platoon commanders and platoon sergeants view the site contributed greatly to the success of the operation. The policy of having all men involved in the operation thoroughly familiar with what was to be done, when it was to be done, and who was to do it, was considered absolutely essential to the success of the operation, Colonel Colton said.

The Roer crossings provided an excellent dress rehearsal for the Rhine River crossings. For the first time in the Continental operation a deliberate, pre-planned and massive river crossing was undertaken and successfully completed.

Source: Liaison Section, Intelligence Division, Office of the Chief Engineer, "Combat Engineering: Report No. 10, August 1945.

The Naktong River Crossings in Korea

Emerson C. Itschner

Colonel, Corps of Engineers

Just eight days after the key staff of I Corps arrived in Korea, and five days after the Corps became operational, Corps and Divisional Engineer units started a rapid series of bridges, ferries, and assault crossings which within a week were to cross one division over the Kumho River, a tributary of the Naktong River, and three divisions and a brigade across the Naktong. These were historical occasions, since they were the first river crossings made by United States divisions under combat conditions since World War II. The engineer work was of necessity accomplished with a minimum of equipment and a maximum of improvisation, and shuttling of equipment from job to job, with attendant additional work, loss of time, and decreased efficiency.

The operation comprised four phases. The first was the crossing of the Kumho into a small bridgehead that had been retained throughout the period when United Nations forces were on the defensive. The other three were completely independent assault crossings of the Naktong River by the 24th Infantry Division, 1st Cavalry Division, and the 1st Division, ROK (Republic of Korea).

Crossing the Kumho

During the latter part of the period when United Nations Forces in Korea were on the defensive a crossing often erroneously called an "underwater bridge" had been constructed across the Kumho. It consisted of an upstream and a downstream wall of sandbags, with a roadway between the two walls filled with gravel and sandbags. Two culverts made of gasoline drums, with the heads blown out, had been constructed through the fill. (One had been crushed by tanks and was ineffective.) The culverts were not intended to have sufficient capacity to accommodate a significant portion of the flow of the river; hence, over 98 per cent of the flow passed over the top of the causeway. The flow was rather evenly distributed and provided an improved roadway surface for the ford. All vehicles except jeeps could ford the 30-inch maximum depth of water, although $\frac{3}{4}$ ton trucks occasionally drowned out.

An Infantry Support Raft was used adjacent to the ford to transport jeeps and a portion of the $\frac{3}{4}$ ton trucks. It was operated by lines hauled by trucks on each bank. Since the road on one side was very narrow, a power-operated hoist (had one been available) would have been a great



"Underwater bridge" and infantry support raft on the Kumho River.

improvement over the truck, which had to maneuver in congested traffic. The speed of a truck winch is too slow to warrant its use for this purpose.



Jeeps waiting to cross the ford on the Kumho River.

With the enemy holding firmly on the left flank 1 mile downstream from this site and being thrown back slowly after stubborn resistance 10 miles up the Naktong, the plan was to send a division across the Kumho into the bridgehead already lightly held and up the east bank of the Naktong several miles to make an assault crossing of the Naktong to the west. The movement began the afternoon of September 18. By dark that night traffic was backed up for 5 miles bumper-to-bumper, waiting to cross the sandbag bridge or on the ferry. Jeeps

awaiting passage on the ferry were pulled out of the column and parked in a field near the site, so that the faster-moving, heavier vehicles could cross without waiting for the jeeps. Units became widely separated. When a high priority rearward-moving convoy of about forty vehicles was crossed, it became entangled with forward-moving convoys on the narrow road, and there was a period of two hours when not a vehicle moved toward the front.

When it became apparent that the crossing would be used for several days as a main supply road for the operation, a decision was made to commit part of the only available treadway bridge as a supplemental means of crossing the Kumho, then to cut out a 60-foot section of the sandbag causeway, which was considered sufficiently large to accommodate the entire flow and construct a trestle bridge, floored with extra treadways from the treadway bridge, in the gap, leaving the remaining portion of the sandbag fill as a dry causeway. The treadway pontoon bridge then would be removed, as there were only 864 feet of it available, and that amount was insufficient to span both the Kumho and Naktong.

Getting the large Brockway trucks carrying the treadway bridge past miles of convoys at night in a fog of dust on a narrow Korean road was a job for a magician or a contortionist, but by 10:50 the next morning, September 19, all equipment was at the site and construction of the bridge began. The bridge, 276 feet long, was completed in slightly more than nine hours, and the traffic started across at 8:20 p.m.

That night, timber trestles were prefabricated to insert in the sandbag bridge, and the bridge was completed the next day. As there appeared to be a lull in traffic, removal of the floating treadway bridge, with the concurrence of the division using it, commenced two hours prior to completion of the substitute trestle and causeway bridge. This ended the first phase of the crossing operation.

Assault Crossing of the Naktong

The second phase comprised the assault crossing of the Naktong by the 24th Infantry Division with the 27th British Commonwealth Brigade attached, followed by the construction of a 50-ton floating treadway bridge. The only permanent bridges across the Naktong for many miles were at Waegwan, where there was a steel through-truss highway bridge and twin steel through-truss railroad bridges. One span of each of these bridges had been dropped by our forces in the withdrawal. Although the North Koreans had improvised ladders to permit one of the bridges to be used by foot traffic crossing on top of the dropped span, no other attempt at repair had been made, and it was judged that much time could be saved by constructing a floating bridge rather than trying to tow a trestle or pile-Bailey bridge across the dropped span, which was slightly over 200 feet long on the highway bridges. However, the highway bridge and one of the twin railroad bridges were repaired later by a unit working directly under Army, using pile bents and a Bailey bridge for the highway span, and piling with I-beam stringers for the railroad span.

During the morning that the sandbag bridge was being opened, September 20, the 3rd Engineer Combat Battalion, organic engineers of the 24th Division aided the division in making an assault crossing of the Naktong River using 112 assault boats, more than half of those then available in all southern Korea. At one of the crossing sites there was very little opposition. At the other, resistance was stubborn and the Engineers, as well as the Infantry assault units, suffered many casualties. Boat operators demonstrated the same courage, resolution, and attention to duty that has built up a high tradition in the Corps of Engineers during our country's wars.

That same day the site for the floating bridge across the Naktong River near Waegwan was cleared of small arms fire and the construction of a treadway bridge across the river at that point became urgent. The treadway bridging that was not already in place on the Kumho was on trucks 20 miles away from the site over a winding, narrow, steep, mountainous road commonly referred to as the "Burma Road." This road had just been cleared of the enemy and pockets of resistance remained in the mountains on both sides. By midnight a convoy of twenty-three trucks carrying this bridging, driving with blackout lights, was under way and it reached the bridge site by daylight September 20. Two Brockway and two 2 ½ ton trucks went off the road but all loads were recovered for use in the bridge and the vehicles were picked up later. Extremely dense clouds of dust, resulting from heavy road traffic had a large part to play in these accidents. In the meantime, the treadway bridge across the Kumho was lifted and rushed to the site.

The bridge site was selected at an old concrete ferry ramp, where the river was 648 feet wide, with an additional 48 feet of water a few inches deep before reaching a wide dry bar extending from the far shore. The approach road on the far bank was passable, but required some work, whereas the main road on the near shore passed within 100 yards of the abutment. The river was as much as 8 feet deep, but there were several shallow places where the pontoons barely floated with a load.

The river banks were 25 feet above the water surface, necessitating considerable bulldozing in order to provide a place on which to unload the Brockway trucks and to work. This preparatory work had been commended early in the morning. Through anxiety to get the bridge under construction a serious error was made in not providing enough space to permit trucks to back freely; also, the slope to the river was left so steep that trucks could back to unload only with the greatest of difficulty. This factor alone resulted in several hours of lost time.



Engineers lay pierces steel planking next to destroyed bridges at Waegwan

Assembly of the floats began at 10:00 a.m. September 21, using two unloading points for the treadway sections. That afternoon a third unloading point was constructed and put into operation. It was hard to back the Brockway trucks down the 20 per cent slope. Several drivers jerked their trucks so hard that the heavy

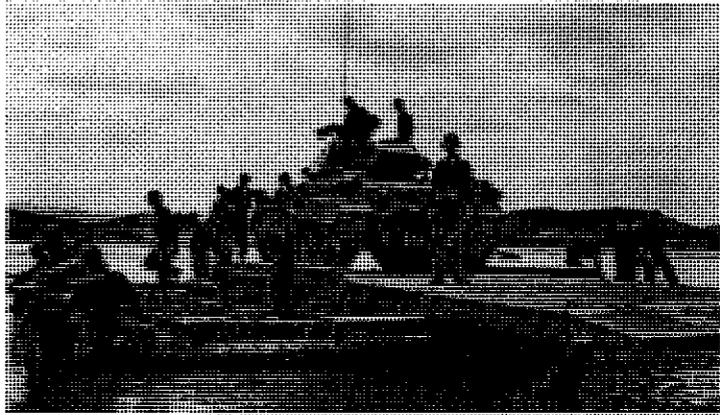
load slipped to the rear too far for the hoists to unload. The load then had to be slowly skidded back into place by use of the Brockway crane. Since only one operating outboard motor was available, it was necessary to pull complete floats by hand along the anchor cable, or paddle or pole them into place. A six-float raft was assembled with which to ferry a bulldozer to the far shore, but it grounded on several bars in the river during the night and never reached its destination. The ferry was returned to the near shore to be incorporated into the bridge after paddling, poling, and dragging it over several sandbars. At one time it seemed that it would surely be lost downstream.

Although the moon was bright through three-quarters of the night, progress was slow. The most serious bottleneck was in joining sections to the completed bridge. In one particularly bad hour only four of these connections were made. It seemed that the bridge, which probably had been used several times before, was sprung and battered.

It was impracticable to raft the heavy treadway shore sections for the far shore and the crane to handle them across the river because of the sand bars. Consequently, the treadways were loaded on a 2 ½ ton truck, which was backed across the bridge behind a crane after the near shore connection was made. The last operation in constructing the bridge was to swing these sections into place.

A division started to cross at once, a sight that was ample reward for the troops who commenced the construction after two almost sleepless nights and then worked at full speed continuously for 26 hours.

While the treadway bridge was being constructed, an M4A2 ferry, capable of handling 46-ton tanks, was erected to cross the Naktong at a site several miles south. A footbridge also was constructed at the same location. An enemy high-velocity gun emplaced close enough to use direct aimed fire soon riddled the pneumatic floats of the ferry, and for two days any vehicles arriving at the site were promptly fired at. Fortunately, though his direction was perfect, his range was faulty and little other damage resulted. When the enemy gun was silenced, an



M4A2 raft carries a light tank across the Naktong River

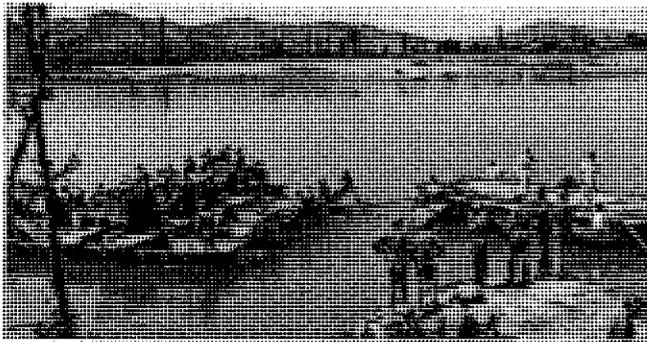
Infantry Support Raft capable of handling a loaded 2 ½ ton truck, was placed in operation at this site. The footbridge suffered no damage at any time and was used extensively.

The M4 Bridge was developed during World War II, but it was not produced in time to be used operationally. Normally the M4 bridge utilizes aluminum alloy pontoons, but the M4A2 modification is supported on the 18-ton pneumatic floats which are standard in the familiar treadway bridge. These pneumatic floats were used exclusively in the operations described here. Saddles, saddle adapters, and removable gunwales are placed on the floats. On these are laid longitudinal aluminum alloy balk, which are the unique feature of this bridge. These balk serve as both stringers and flooring. They are placed in contact with each other. The balk are practically square in cross-section and are sealed so that they will float. Balk are held in place by lugs that fit into the gunwales and are pinned in place. Trestle sections also are provided for use in water too shallow to float pontoons or over dry gaps. Most of the parts can be man-handled, a great advantage under some field conditions.

Bridging North of Waegwan

In the third phase of the Naktong crossings, the best ferry and bridge site on the Naktong north of Waegwan was selected by the 1st Cavalry Division at a location 27 airline miles north of the Waegwan treadway bridge. The enemy had improved a long ford at this site by the use of sandbags. One of his tanks that had run off the ford still remained half submerged.

An extended Infantry Support Raft capable of handling two trucks and two jeeps, and a M4A2 ferry capable of handling the heaviest tanks were in operation on September 23. However, the operation was very slow, and the total capacity of the two ferries averaged only about six trucks or tanks and ten jeeps or trailers every two hours. The light ferry



Engineers cross jeeps and trailers on an Infantry Support Raft

was paddled back and forth originally. Later it was hauled by long lines pulled by a truck on each shore. The M4A2 ferry was pulled in a similar manner. Neither outboard motors nor utility boats were available.

Since it was apparent that a division could not cross in several days on the ferries, an

M4 trestle bridge 90 feet long was constructed over the existing sandbag ford. Work on the bridge started at daybreak September 24 and was completed at 6:50 p.m. that day. The old sandbag ford was torn out beneath two 30-foot interior spans of the bridge and correspondingly decreased the depth of the water over the remainder of the sandbag ford. While the gap was insufficient to dry up the sandbag ford, it reduced the depth of water to an extent that all vehicles except jeeps could pass readily. Tanks, however, tore up the sandbags so badly that they were ferried across. Four hundred Korean laborers were used night and day to fill thousands of sandbags with which to widen and strengthen the sandbag bridge.

The last crossing was made by the ROK Division early on September 25 between the bridge just described and the treadway bridge at Waegwan. Fifty assault boats were used to cross the river unopposed, and an Infantry Support Raft was constructed to ferry up to 2 ½ ton trucks. The few heavier vehicles used the northern crossing site, which had been previously described.

While I Corps was making these crossings, IX Corps units, comprising the 2nd and 25th Divisions were crossing the Naktong farther to the south. Lacking heavy pontoon bridging, they were obliged to resort to ferrying or the use of expedient bridges.

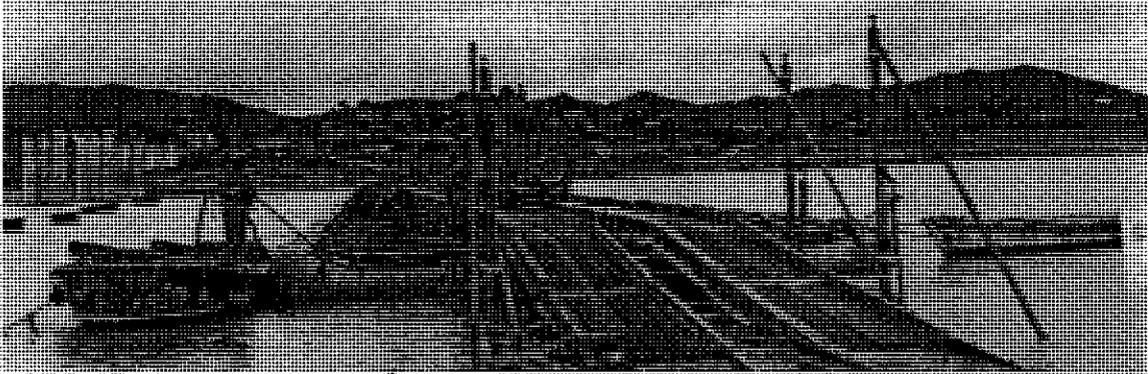
Lessons from the Operation

Many lessons were driven home during these operations. Probably none of them is new. Troops must be trained for the specific tasks they are expected to perform. Time is at a premium when a tactical bridge must be built, and the speed with which it is constructed is in large measure determined by the previous training of the Engineer troops engaged on the operation.

The mechanics of the construction of ferries and floating bridging, and other engineer tasks can be learned under "school" conditions, during good weather with near-perfect site. This training might be compared with known-distance firing on a rifle range. It should be followed by what corresponds to combat firing and maneuvers. Bridge construction training must include work under inclement weather conditions, at night, and in difficult types of terrain. The poor work sites and the presence of many sand bars in the rivers of Korea during the dry season made the construction of floating bridges and

the operation of ferries difficult and time consuming. More experience in constructing bridges under these unfavorable conditions would have improved the operation.

Equipment must be kept in condition to accomplish its intended function. A situation sometimes arises when the performance of one piece of equipment, such as the crane used to place the far-abutment sections of treadway on the Waegwan floating treadway bridge, can vitally affect the success of an entire campaign; it can result in the saving of many lives. The problem becomes increasingly difficult as World War II equipment wears out in normal use. Equipment operators should be carefully selected men, thoroughly trained in both maintenance and operation of their equipment to get the maximum service from it.



Mid Span Treadway Bridge built by the 55th Engineer Treadway Bridge Company over the Nakdong River in September 1950

Engineer equipment and supplies should be rugged, simple, and dependable. If avoidable, reliance should not be placed on types of equipment, which require highly skilled operators, since such operators may not be available in an emergency. As an example, every effort should be made to develop a completely reliable outboard motor.

Since time is of such vital importance in most tactical bridging operations, sufficient bridging equipment and materials should be available to permit speedy construction. Improvisation consumes much additional time and manpower.

Units Engaged

The 3rd Engineer Combat Battalion (24th Infantry Division), the 8th Engineer Combat Battalion (1st Cavalry Division), the 11th Engineer Combat Battalion (Corps), the 14th Engineer Combat Battalion (Corps), the 55th Engineer Treadway Bridge Company, the 65th Engineer Combat Battalion (light equipment platoon only), and the 72nd Engineer Combat Company participated in these operations. They worked hard and effectively against more than a normal number of obstacles. It was the first time that most of the personnel had participated in a river crossing operation in war. They learned a great deal from the experience, and through their operations they became seasoned veterans.

Source: *MILITARY ENGINEER*, Volume XLIII, No. 292, pp. 96-100. Reproduced with permission of the Society of American Military Engineers. Original photos replaced for clarity.

THREE RIVER CROSSINGS

CPT Richard P. Lepke, 3rd Engineer Combat Battalion

The 3rd Engineer Combat Battalion (24th Infantry Division) was in a rest area at Kyongsan on 17 September 1950, after a series of long moves and fights around the Naktong perimeter. I commanded Charlie Company. At 2300 the battalion staff and company commanders were summoned by the battalion commander (LTC Peter C. Hyzer). He told us that we were to make a series of assault crossings of the Naktong River, carrying the entire 24th Infantry Division. The operation was to jump off at 0245, 19 September 1950, south of Waegwan and northwest of Taegu.

Able and Charlie Companies were to get the tough jobs of carrying the two assault regiments of the 24th Division. Able would carry the 19th Infantry, while Charlie was responsible for the crossing of the 21st Infantry. The regiments would cross the Naktong simultaneously, some six miles apart.

At the time of this meeting, not even the battalion commander had had a chance to make a reconnaissance or examine aerial photos of the crossing area, even though the operation was to begin in twenty-seven hours. The battalion had no assault boats but we were promised these at the crossing site by the corps engineers. Further, we were to receive one boat per company the following day in order to familiarize the men with the equipment.

A few days before this order was issued we had received a hundred Koreans for each company as replacements. We had started a training program for them but we had not made much progress because of our constant preoccupation with combat. We had a language barrier and all communication was channeled through their interpreters and through one of our NCOs who spoke fluent Korean. The infantry regiments also had Korean filler personnel.

None of the engineers had received any assault training in Korea, and many of the people who had had practice in Japan were now casualties. Probably not over ten per cent of the U.S. personnel had launched an assault



Engineers unload assault boats prior to the crossing of the Naktong River in 1950

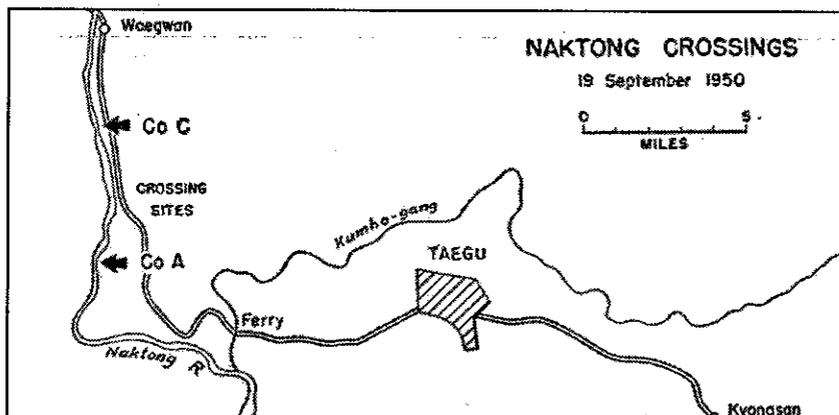
boat since their days of basic training. The infantry was also without assault river-crossing experience. There wasn't time for much coordination between the engineers and the infantry. To top it all, our Korean replacements had never seen an assault boat.

The next day (18 September), while the engineers were familiarizing themselves with the one boat per company, the company commanders and key officers of the battalion staff joined the infantry in a reconnaissance of the Naktong. Our reconnaissance party was much too large, involving six jeeps and twenty persons. Near the river bank we came under enemy observation and received some rounds of mortar fire. No one was injured.

The engineer battalion was bivouacked twenty-five miles from the proposed crossing sites. The route to the crossing sites crossed the Kumho River, but all of the bridges had been blown. An underwater (sandbag) bridge had been operated by the North Korean Army and was being used by the U.S. troops, but this would not handle light vehicles because of the depth of the water. All jeeps had to be carried on a small ferry.

As we returned from our reconnaissance we found traffic backed up for a couple of miles, bumper to bumper, east of the ferry. The road was only one and a half lanes wide and the heavier vehicles were unable to move to the underwater bridge until the jeeps, which were mixed in the column, moved onto the ferry. These were 24th Division vehicles moving up for the crossing mixed with vehicles of corps engineers (repairing the underwater bridge), and a scattering of trucks from other units.

When I returned from my reconnaissance at 1700, I found Charlie Company loaded and ready to go. Attached to us for this crossing were a platoon from Baker and one from Dog. Since we had only our organic personnel and equipment, and carried no assault boats to reveal our intentions, we were allowed to move during daylight. We moved independently of the battalion.



There was no traffic control but we moved normally until we approached the ferry. Then we had to move slowly and last a full hour. Still we reached our initial assembly area south of Kaksan-gong by 1930.

3rd Engineer crossing sites over the Naktong River.

I left Charlie Company in defilade and moved forward to the crossing site with the two platoon leaders who were each to be responsible for moving an assault infantry company. We planned to cross the two companies abreast, about a hundred yards apart.

I showed the lieutenants their sites, found an abandoned foxhole near the river bank which I claimed as my forward CP, then returned alone to the company.

I had to infiltrate the company out of the initial assemble area, for it was not quite dark and enemy mortar fire was being concentrated on one flat stretch of road. We closed unharmed in our forward assembly area at 2100. It was an apple orchard just three hundred yards behind the crossing sites. A prominent house nearby came to be a favorite target for artillery fire next day.

The Naktong River at this point was some four hundred feet wide, and had a moderate current. The river bank at one site was a sheer drop of some seven feet. This was cut down by the 2d Platoon after dark. At the second crossing point the bank was cut by a path which led to the beach. From the bank to the water's edge ran a flat, sandy beach about a hundred yards wide, punctuated only by some abandoned tactical wire. The beach was not strong enough to hold vehicles.

I assigned the 1st Platoon to the first crossing site, the 2nd Platoon to the second site. The 3rd Platoon was to unload the boats when they arrived and to organize the infantry into boat crews. To the attached Baker Company platoon I gave the job of laying a pierced-plank road (of airstrip type) over the beach as soon as the first wave was landed. This would facilitate jeep-ambulance and ammunition traffic. The attached Dog Company platoon was to stand by to await orders.

The infantry started arriving in the final assembly area at 2300 and closed in the area by 0100. We had plenty of time to break them down into boat crews and give them elementary instructions since the assault boats still had not arrived.

The commander of the infantry regiment was much upset over the delay, but there was nothing we could do. I saw him talking to Colonel Hyzer several times and I know that messengers were sent out to try to locate the missing boats. At one time the regimental commander mentioned calling off the attack, as it did not appear that the crossing could be made during darkness.

Finally, at 0400, the twenty-eight assault boats arrived. They were loaded both on pole-type trailers and in the beds of 2-1/2 ton trucks. It is hard to unload an assault boat from the bed of a truck, and this slowed down the operation. Worse, however, the drivers simply disappeared as soon as the trucks halted. We had to locate our own drivers to spot the trucks and trailers.

After all twenty-eight boats and their engineer crews were lined up along the road near the river bank, the infantry came forward. Daybreak came as the first wave was on the water. There was no enemy fire at first, but as our boats reached the center of the stream an extremely heavy volume of small-arms fire hit them. Mortar and SP fire began to strike the near bank and assemble area.

Apparently our simple instructions had not been understood by the Korean infantrymen, for they refused to leave the boats, and a few returned to the near shore. Sergeant Weird broke his carbine over the hand of one man to get him to release his hold on the guide rail.

As soon as the infantry landed on the far shore, the boats immediately started back. Eight of the twenty-eight assault boats did not make it back. In some cases the current carried them too far downstream and the inexperienced paddlers could not return them. In others, the boats were so riddled that they sank and their engineer crews returned in other boats. Of the Korean engineers who went with the first wave, none was known to return. Maybe they misunderstood their mission and stayed with the infantry. Maybe they drowned- we had no life jackets. Later, when we tried to round up all of our Koreans for replacements, we could locate only 22 of our original 100. Many had just conveniently disappeared for a short time, however.

As the returning boats reached the near shore, the enemy turned his fire on the second wave as it moved by to the beach. These infantrymen took cover on the beach by lying on their bellies near the water's edge until Sergeant Weird called for them to get loaded and help their buddies on the other side. Hearing this, one sergeant jumped up and yelled, "If the engineers can stand up and take it, so can we!" To a man the infantry hurried to the water's edge and loaded up.

As soon as we counted our boat losses we sent an urgent request to battalion for replacements. In an hour we received sixteen. We also got a boat-repair detachment which was attached to battalion for this operation- but these men claimed they had no equipment with which to make repairs. Only their sergeant would leave the cover of the orchard and go onto the beach to survey our damaged equipment.

The fire on the near beach made it impossible for the platoon of Baker Company to lay its roadway. Some self-propelled guns kept firing on our assembly area and beach until 0930.

The infantry on the far shore reorganized quickly but had strong resistance from the enemy. Our artillery helped and so did the Air Force. When the planes began to use napalm some of the North Koreans panicked and ran. These were immediately shot like quail.

The fighting on the far shore lasted about thirty minutes. The infantry carried air-identifications panels on their backs and we could see little envelopments and assaults taking place. Our men were aggressive and moved right up to the enemy without hesitation. So we watched the panels moving up the draws, over the crest, and out of sight.



3rd Engineers operate a ferry across the Naktong River after the initial assault crossings.

We kept crossing the infantry into the afternoon. By this time we had crossed two battalions of the 21st Infantry and were working on the third. The crossings had cost my company 42 men, only 8 of whom were U.S. troops. What happened to these men I don't know, since we had no time to locate the missing after the operation was over.

At noon, while we were still paddling the 21st Infantry across the Naktong, I was alerted for another crossing. Charlie Company was selected to cross the Naktong again that very evening, this time carrying the 5th Infantry above Waegwan. We were selected because we were the only company in the battalion assembled at one nearby site. Dog Company was to take over our present operation and support the 21st Infantry on the far shore.

I took my executive officer and a sergeant with me on a reconnaissance. We joined Colonel Hyzer and some of his staff officers, and proceeded to Waegwan where we met the commander of the infantry regiment (Colonel Throckmorton). Colonel Throckmorton told us that his regiment was clearing the bank of the Naktong as far north as Hill 303, where he was to make a juncture with friendly troops. Hill 303 was the key to the operation because of its commanding height, but it had not yet been taken. In any case, it would be necessary to cross at least one battalion that night, even if the east bank were not cleared of the enemy.

The attack was parallel to the river bank and Hill 303 was some ten miles north of Waegwan. I was given leeway to select the crossing site anywhere in this ten-mile zone. I moved my small party to the rear of the lead company of the 5th Infantry. We had to hit the ditch several times when the enemy put up small bits of resistance.

At 1430 the infantry still had not reached Hill 303, so I decided that to get a daylight reconnaissance I would have to select a crossing site somewhere between my present location and Waegwan. Two miles north of town I found a site where the banks, turnaround, assemble areas, approaches, and the far shore looked pretty good. By radio I ordered the company to meet me on the road, and I started back to Waegwan.

In Waegwan I learned that the 21st Infantry, which we had crossed that morning, was moving along the far shore of the Naktong. This meant we could make an administrative crossing. I inspected a blown-out bridge in Waegwan and decided this would be a good site. Charlie Company reached town almost as soon as I did, and the boats were delivered to us by corps engineers within another thirty minutes. By 1700 or 1730 we began to land the infantry on the far shore. We improvised a ferry and began moving men, jeeps, and equipment on it. We had one battalion across within forty-five minutes.

Our company kitchen was set up in an orchard in Waegwan and we fed the men in shifts. But before I got a chance to eat, I was ordered to cross the other two battalions of the 5th Infantry eight miles north of Waegwan near Hill 303, which we now held. I moved out to make a reconnaissance before it became completely dark.

We selected a site, but as the infantry seemed in no hurry to cross, we held off until the following morning (the 20th). We continued to operate the ferry at Waegwan all night of 19-20 September and left one platoon in Waegwan for that purpose. The other two platoons moved up to the new site.

In the crossing the next morning our site was defiladed, we had infantry on both flanks to give covering fire, mortars were emplaced, tanks and self-propelled guns were registered, and the air support was excellent. The Air Force bombed and strafed a village near the crossing site and maintained armed reconnaissance overhead. The crossing was unopposed.

We crossed two battalions before noon and I loaded my men to move on. I reported to battalion in Waegwan- hopeful that we could get a rest. Instead we were ordered to support the 19th Infantry in an attack on Sangju. We gave general engineer support in this operation. The encounter was brief because the enemy was surprised by the flanking attacks our river crossings made possible.

Within three days Charlie Company had received orders for, had planned, and had executed three river crossings, supporting two different regiments. During the same period it had given general engineer support to a third regiment in attack.

In the crossing of the Roer River in Germany, my engineer battalion had three months of preparation (I then commanded the 2nd Platoon of Company B, 121st Engineer Combat Battalion (29th Infantry Division)). We actually formed the exact crews and carried the same groups of infantry in dry-run crossings of a similar river under similar conditions. How different was Korea!

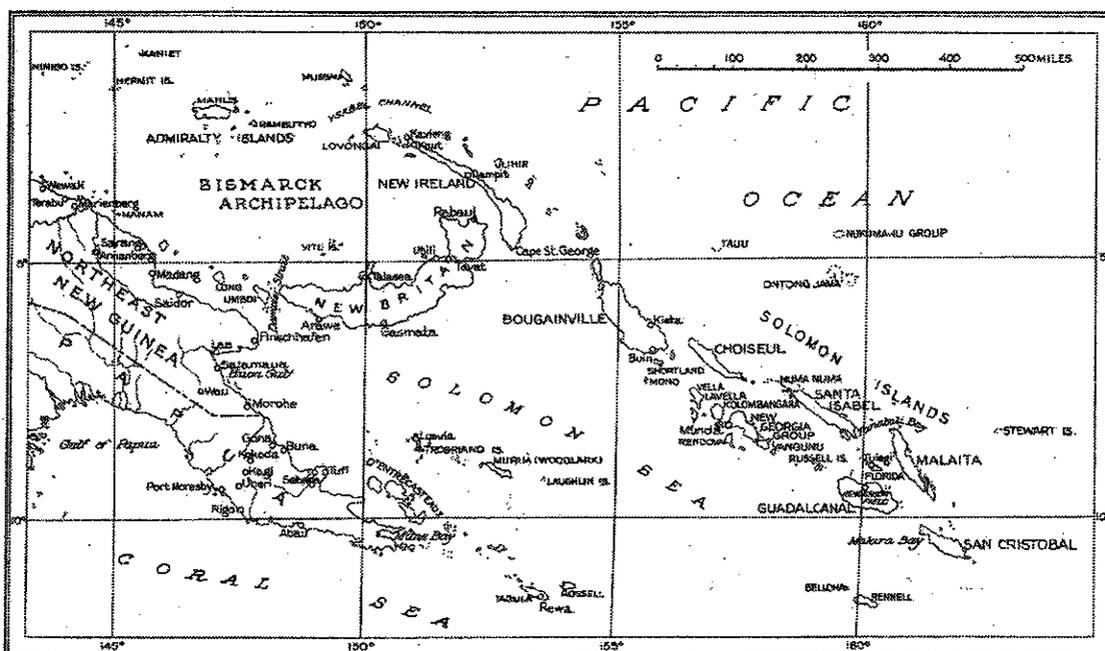
(Source: Westover, John G., Combat Support in Korea, Washington, D.C.: Center of Military History, reprint edition 1987, pp. 5-10)

Combat Engineers in Jungle Operations

George F. Dixon, Jr.

Lieutenant Colonel, Corps of Engineers

The role of the Combat Engineer Battalion in battle is not a glamorous one. The Combat Battalion does not share the limelight with its brothers-in-arms, the Aviation Engineers or the Airborne Engineers. Shoulder to shoulder with the "Queen of Battles" it quietly does the indispensable. However, it is for those who are interested in this mission and in the hope that other Engineer Battalions may get a clearer concept of the problems encountered in the jungle that there are related here some of the experiences of the Engineer Battalion of a Triangular Infantry Division operating against the Japanese on Guadalcanal and later on New Georgia Island.



Eastern New Guinea and the Solomon Islands

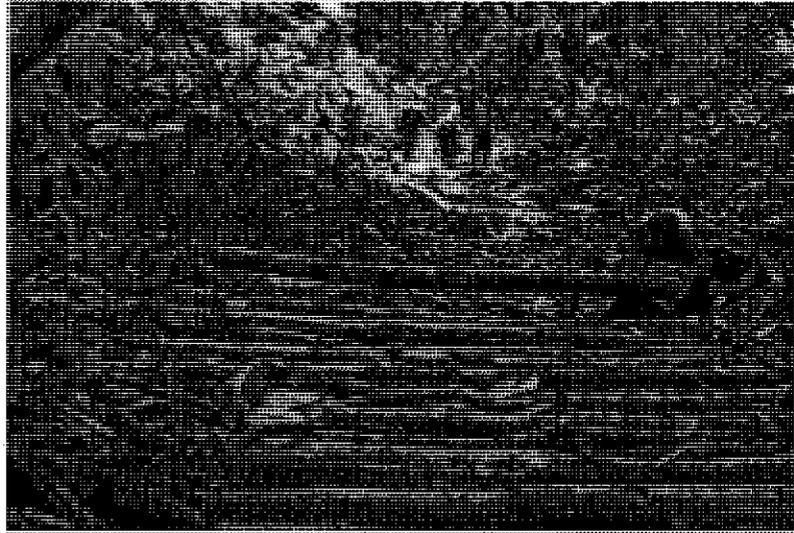
Engineering in the Solomon Islands is a nightmare. The torrential rains, the dense jungle, the spongy soil, and the mountainous terrain make road building, the combat engineers' number one problem, exceedingly difficult; and this is especially so when the pressure is on for rapid road construction behind the advancing Infantry. Unlike most other theaters of operations, this area has no usable roads; every foot of road required has to be built. Road construction in the most inaccessible places has to be attempted and in some manner completed.

Operations on Guadalcanal

The combat operations for the Division during the period January 1 to February 10, on Guadalcanal, were confined to the foothills on the north shore of the island between the coconut plantation and an average distance inland of 5,000 yards. This terrain was

characterized by dense jungle, and by deep, precipitously-sloped ravines. Many of the hilltops and ridgelines were covered with jungle grass. The Division drove to the west from southwest of Henderson Field along a line roughly paralleling the beach, in an effort to encircle the Japanese forces at Kokumbona. The Engineers primary job was to build supply routes behind these advancing forces. There roads were hurriedly-constructed, bulldozed trails, which fortunately, because of the tactical situation (we having complete air superiority and the

Japs having little artillery), could be placed along the ridge lines where drainage was simplified. Where the roads were necessarily aligned through the ravines, the problem was complicated by the density of the jungle and the difficult drainage. In these places the roadway had to be laboriously corduroyed with jungle timber. This was a slow task at best, and was made



65th Engineers construct a corduroy bridge in the Southwest Pacific.

still slower because the road had to be used while corduroying progressed.

In general, because of the shortage of equipment and the extremely difficult terrain, it was found impractical to build supply roads fast enough to keep up with the advancing Infantry. Supplies had to be packed in and wounded packed out on foot beyond the end of the road, using natives as well as the Service Companies and the Bands of the Infantry. These carrying parties were aided where practical by Engineer-installed cableways. In one case, a battalion of Infantry occupying inaccessible high ground was supplied up the Matanikau River by the "Push-a-Marū" which consisted of captured Japanese collapsible half-boats propelled where possible by outboard motors, but more generally pushed by hand over the shallow rapid water.

Bridge construction was varied, with native timber being used almost entirely. Some of the bridges were of timber trestle construction using gasoline drums welded together, driven into the soft mud river bottom by air hammers then filled with ballast. One bridge utilized Japanese steel trusses from Henderson Field. All culverts installed were welded gasoline drums.

The cessation of active combat was by no means the end of engineer work. The usual occurred. When the situation became stabilized and "housekeeping" started, everyone discovered he needed Engineer assistance: miles of local roads had to be constructed, malarial control measures involving extensive drainage had to be undertaken, camp

conveniences had to be constructed. It was a period of improvisation. Bamboo poles took the place of pipe; tin cans served as shower heads. Gasoline drums were made to serve a multiplicity of purposes. They were used as culverts, air raid shelters, water tanks, ovens, incinerators, even floating bridge pontoons. The Engineer Motor Pool constructed everything from a General's silver "stars" made from half dollars to road sprinklers made from salvaged water tanks.

Operations on New Georgia

New Georgia Island presented other problems. The terrain differs considerably from that of Guadalcanal. The ground is not as rugged, the jungle, though not quite so thick, covers the entire island without a break. There are no grassy knolls. Road building remained the number one problem.

Road building along the south edge of New Georgia from the beachhead westward to Munda was relatively easy. The weather was rather dry and a mere clearing through the jungle was sufficient to serve 2 ½-ton trucks and jeeps. During the initial phase of the campaign, an Engineer Company with a D-7 angledozer and a R-4 angledozer was able to stay immediately behind an advancing Infantry Regiment, building a mile of road a day on the average. This made it possible to truck rations and ammunition right up to the front lines; also it enabled the wounded frequently to be picked up from where they fell and loaded directly into jeep ambulances. Of course these roads could not be ditched, drained, or surfaced at this speed by the limited number of Engineers available. As was later proved, it was the weather that determined whether or not these "roads" were 2 ½-ton truck roads, footpaths, or merely canals. Luckily from the Engineer viewpoint,



Mud was a major challenge to road builders on New Georgia

Munda Airfield was in our hands before the heavy rains set in. Unfortunately though, the rains began before the march cross country from Munda to drive the Japs out of Bairoko Harbor, 10 air miles away but many more jungle miles to the north, were completed.

The extremely heavy rains, the jungled hills, and the presence of extensive swamps made monumental the problem of constructing and maintaining passable

roads behind the Infantry advancing to Bairoko. Artillery could only be displaced by means of tractors. With the rain, the roads previously constructed in dry weather quickly turned into impassable "hog wallows". Even the coral side-hill cuts would not stand up under the heavy traffic. The coral was weathered, very soft and not well suited for road surfacing. This material turned into soup when mixed with the soft mud and the copious amounts of water always present. During one moderately heavy rain it was noticed that an upturned helmet filled with water in ten minutes. Faced with such weather, there was no alternative but to corduroy. With the help of Infantry and Artillery personnel, several miles of road were corduroyed. In some places 3 to 4-inch poles were laid transversely across the road and held in place by the cohesive mud. In other places the corduroy was laid on sleepers and staked down with curbs. Both methods were found to be entirely satisfactory.

While the enemy was being forcibly pushed back, the roadway had to follow the line of advance of the Infantry that was, in general, along either a Jap or native trail. For this reason the best alignment was not always made. However, proper road location was exceedingly difficult at all times due to the sameness of the jungle as viewed both from the air and from the ground. Unlike on Guadalcanal where the well-defined ridges and grassy knolls made aerial reconnaissance and the study of stereo-pairs of photos particularly profitable, such study was almost useless on New Georgia. Consequently, the easiest route was not always followed.

In this advance to Bairoko complete supply by truck was impossible. Consequently other means were utilized. The Infantry laboriously packed on foot, without the help of natives, numerous tons of supply over the muddy native and Jap trails. The Air Corps dropped supplies to our troops by parachute. The Engineers hauled supplies in by trailers pulled by tractors.

Water Supply

Water supply in jungle operations is the usual number two Engineer problem. A proper location of water points well forward is highly important to cut down the water haul and to help insure water supply when the roads become bogged down. Thorough, continuous reconnaissance is necessary to locate possible sources of water as the troops advance. Fortunately, both on Guadalcanal and New Georgia water presented little problem. Guadalcanal abounded in fresh water streams that furnished adequate water. On New Georgia where there were very few streams, wells (which were very frequently bomb craters) were easily dug. However, on many of the smaller coral islands bordering New Georgia, distillation units had to be employed.

Lessons Learned

These operations clearly demonstrated the acute need for heavy angledozers. The Combat Engineer Battalion is a well-balanced, flexible organization, but it is too dependent for heavy equipment on Corps and Army Engineers, which are so frequently not on hand. Such was the case in Guadalcanal and New Georgia. Instead of its allotted

three R-4 dozers, the Combat Engineer Battalion should have six caterpillar D-7s or equivalent. It is highly desirable that there be two D-7 dozers behind each Infantry Regiment in line: one to pioneer the road, the other to follow up, widening and improving the roadway and at the same time being available if the leading dozer should break down.



Engineer D-7 works on a road near Bairoko, New Georgia

For best operation the engineer equipment should be ready to push off with the Infantry and it should be adequate to keep construction immediately behind the front line as the advance progresses. In such a position the maximum good is given to the Infantry and a maximum of protection to the equipment is afforded. Where the road construction falls behind, the Engineers are more subject to enemy action through infiltration tactics. As it was, even with this protection, several dozer operators were killed by snipers. To counter this, one Engineer unit resorted to shielding the operators with steel plates. However, guarding the equipment with an alert, armed patrol that moves with the dozer is more effective. Also, by keeping close behind the front, the communications men do not have time to lace both sides of the trail with telephone wire before the dozer arrives. The wires, if already up, slow down construction and invariably result in cut lines, bringing on the wrath of all concerned. All signal parties should be made to place wire well off the road and to one side, so that if time permits the road can be widened and turnouts can be constructed without interference.

The Combat Engineer should give more attention to surveying both with plane table and transit. Oftentimes, the front-line units operating in dense jungle do not know where they are on the map or the aerial photo. An Engineer survey party augmenting the Artillery survey, can help considerably in this particular by at least tying in the regimental command posts and possible the battalions.

Other than as local security for equipment and working parties, the use of Combat Engineers as Infantry in the Pacific area will be exceedingly rare. The lack of roads, bridges, and established water points requires full-time employment on purely engineering projects. It will be more normal to employ combat troops to assist the Engineer than vice versa. Consequently, other than for basic combat training, emphasis should be placed on the training of equipment operators and other technicians. An Engineer Battalion in this area is called upon to operate all kinds of equipment and in far greater quantities than the Table of Organization anticipates. Also, to make maximum use of the equipment several relief operators have to be provided. Any movement overland through the jungle entails a major engineer undertaking, and should be avoided whenever a movement by water can accomplish the same purpose.

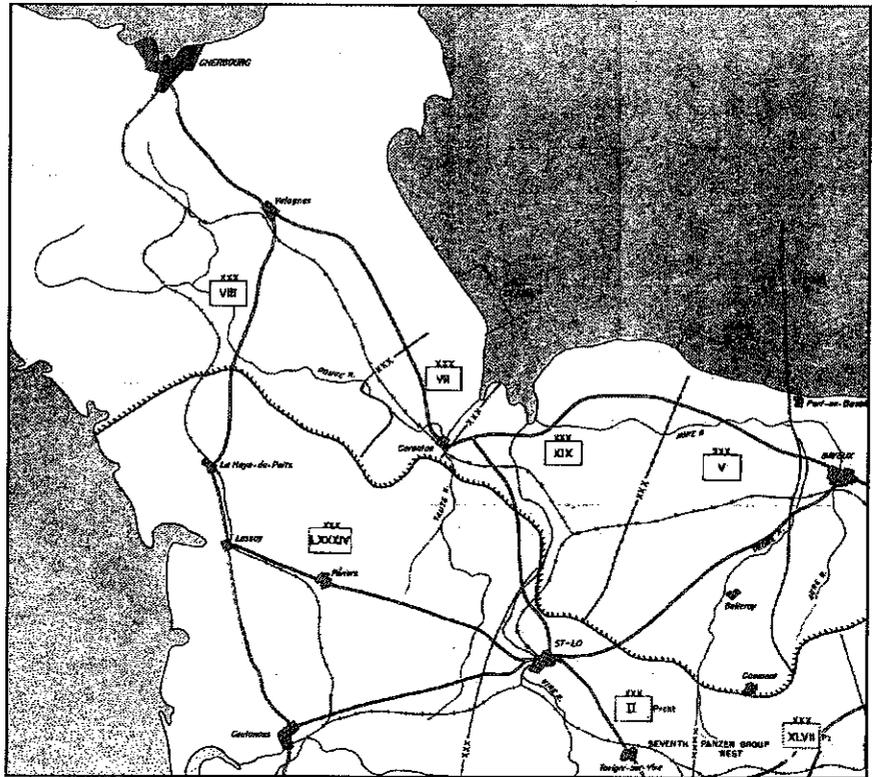
Source: *Military Engineer*. VOL XXXV, No. 218, pp. 598-601. Reprinted by the permission of the Society of American Military Engineers. Photographs replaced and added to improve clarity and for illustration.

Combat Engineering European Theater of Operations- World War II Operations After Landing

The landings on the beaches were followed by two operations that proceeded simultaneously. One was the operation of penetrating inland from the beaches and fanning out in a narrow strip of coast skirting the beaches. The primary objective of this operation was to join firmly with the British to the west, and to the east to penetrate the Cotentin Peninsula and quickly take the port of Cherbourg. The second operation was that of building up the beachhead area into a huge supply depot to support offensive operations.

The Hedgerow Fighting

When the capture of Cherbourg seemed assured, the drive eastward to the base of the Cherbourg Peninsula and generally eastward along the whole line of our lodgment area was to begin. Much of the operation was based upon the arrival of the VIII Corps, belonging to the Third U.S. Army, but attached to the First U.S. Army for this operation. VIII Corps landed on 14 and 15 June, and became operational at noon of the latter day. It was given the mission of protecting the southern flank of VII Corps, while that Corps pressed its attack northward, toward Cherbourg. At this time V Corps, VII Corps, VIII Corps, XIX Corps were operational on the continent and an attack was planned for 22 June. This had to be postponed because of a severe storm in the English Channel which interrupted supplies and restricted ammunition expenditures.



Disposition of American forces in the days following the Normandy landings.

A general attack, designed to be a general Army effort directed at objectives extending from Coutances on the west, through St. Lo, across the entire front, began on 3 July with a coordinated attack to the south by VIII Corps. This attack was slowed down tremendously by the fact that most of the unit involved were fighting the severest type of "hedgerow" warfare. Fields in Normandy were small, surrounded by rows of trees and high brush hedges, along the bases of which earth has been heaped and naturally piled through the years forming dirt parapets from 3-10 feet thick and from 3-4 feet above ground level. Many of the enclosed fields contain orchards or other woods. This made bitter and difficult the advance of small subordinated units, upon which the movement of divisions and corps are phased, and required careful and determined application of minor tactics by



Engineers clear mines in a small lane between hedgerows.

units of company size and similar. There was an increased demand for small arms and mortar ammunition. Fire was short-ranged and heavy. But there was also an increased demand for close Engineer support in the breaching of what was in effect miniature fortified lines.

At first the tactics of assaulting these lines was simply to move Infantry forward until it could move no further, dig into foxholes, lay a heavy barrage immediately ahead of it (the hedgerow), so that the Infantry could move forward. This fighting was a slow yard by yard affair in which units were assigned frontage according to specific fields and hedgerows instead of by yardage. Units attacked in mass concentration and the intervals between tactical formations was reduced. With careful organization, each rectangular compartment enclosed by hedgerows became a formidable obstacle to advancing Infantry. By tying in adjacent compartments to provide machine-gun supporting fire, a more or less continuous band of strongpoints had been developed across the front. Handicapped by lack of observation, difficulties in maintaining direction, and inability to use all supporting weapons to their maximum advantage, attacking troops, in the first phase of this operation, were forced to adopt a form of jungle or Indian fighting, in which the individual soldier played a dominant part.

As the fighting to widen the lodgment area bogged down in this type of warfare, it became increasingly clear that there could be no substitute for tanks, since tanks were able to close in on the hedgerows with machine gun fire and deliver pointblank artillery fire against the hedgerow corners. In a tank offensive, the Infantry would be deployed in depth with a leading element moving just abreast of or in the rear of tanks to provide

them with protection from anti-tank grenades and bazooka fire. During the advance, fire from mortars, grenades, automatic weapons and tank guns was directed against the hedges and especially against the hedge corners, whether or not the enemy was definitely located. Some of the supporting tanks moved along the hedgerows, parallel to the enemy-held line, while other tanks moving in the direction of advance covered the hedgerows. As the tanks crossed each hedgerow, the Infantry mopped up and occupied the hedge, protecting the further advance of the tanks from attack by hostile bazooka and AT grenades. Definitely, this compartmentized type of terrain was not adapted to blitz action by armor. Much of the success of the operation depended upon the quick opening of the hedgerows for passage of tanks by Divisional Engineers and by Corps Engineers in support of the Division.



The most effective tool against the hedgerows was the hedgerow cutter. It allowed the tank to dig into the base of the hedgerow, cutting the roots, and push the vegetation out of the way. It eliminated the need for demolitions which generally alerted the enemy of the operation.

The weapon that proved most effective in opening gaps in the hedgerows was the tank dozer, a comparatively new development in armored warfare, the newness of the development resulting in a shortage on hand. But in cooperation with Ordnance units in Normandy, ordinary Sherman tanks were converted into tank dozers by the addition of a blade mounted in front. Such dozers were used by the 8th, 90th, and 79th Divisions in their advance against bitter resistance.

Lieutenant Colonel Carroll H. Dunn, Commanding Officer of the

105th Engineer Combat Battalion, of the 30th Infantry Division, reported that in smaller and less dense hedgerows, the tank dozer was able to doze an opening through which supporting tanks could push without additional aid from the Engineers. For the most part, however, the hedgerows were so thick that the dozer was unable initially to penetrate them. In such instances the Engineers prepared satchel charges, advanced under the cover of heavy artillery fire, and when it was available, a close, "almost too close", air support, placed the satchel charge in the thick hedgerows, and set them off. The dozer could clean up the breach and widen it.

Gradually, as this new technique of assaulting the hedgerow was developed, the rate of advance increased and the staff of First U.S. Army felt that by concentrating great power on a narrow front, the enemy line could be pierced. This plan was based upon the assumption that progress could be made during the middle of the month until the general line followed the line of the Lessay-Periers—St. Lo road, pivoting on the V Corps front on the left. This plan for piercing the enemy defense line was known as the plan COBRA.

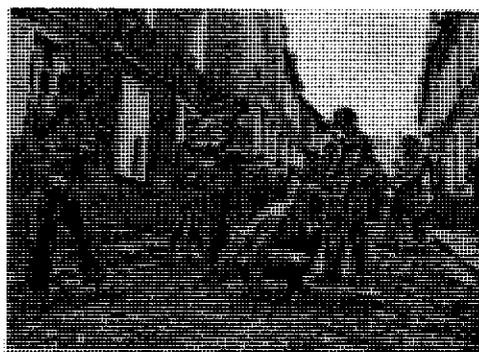
The Breakthrough

When COBRA was put into effect and the bulk of the force of American might on the Continent concentrated into the small Lessay-Poeriers-St. Lo area, a breakthrough out of the Normandy beachhead quickly developed. The ability of the American Army to take advantage of the preliminary advantages gained, depended in large part upon the ability to pass the Army quickly through the narrow corridor thus formed at Avranches. In this situation the enemy, pressed for manpower and fearful of similar attacks in other areas, made an excellent use of mine fields and terrain in his effort to delay pursuit.

In the second phase of COBRA, VIII Corps was to bear the brunt of the offensive. The hour of 0530, 26 July, was chosen as H-Hour. The line of the Ay River from its mouth to the village of Lessay was swampy and so strongly shelled that an advance southward by the 79th Division was impossible. The Lessay bridge was demolished and the only possible ford in the river was impassible because of mines and a cross-fire which prevented their removal.

The 90th Division was similarly situated and the front of the 8th Division, two kilometers wide, was the only suitable area for attack. So, the 8th was assigned the task of overcoming the enemy defenses to the south and establishing a bridgehead between the south bank of the Ay and the Lessay-Perrier railway. Through the gap the 79th Division was to fan out southwest, ripping the German lines along the western sector of the river line from the flank. Spearheaded by the 8th Division, the 90th and the 6th Armored Division were to by-pass the German strongpoints to the east, containing the attack on the southeast.

At H-hour, 26 July, the attack started. By 1500 hours the enemy's main defensive position was penetrated by the 28th Infantry, reaching the Lessay-Perrier road and rendering untenable the entire enemy position along the Corps Front. By the evening of the 28th of July, the mass retreat of the German Seventh Army had begun.

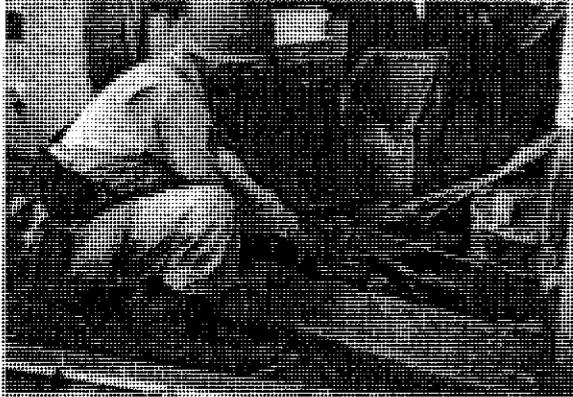


Engineers clear mines in the streets of St. Lo.

But it was no disorganized retreat. Behind him the enemy left some of the most widely-sown minefields and booby-trapped villages encountered on the Continent. On that evening, 28 July, Colonel W.R. Winslow, VIII Corps Engineer, directed the Engineer Technical Intelligence Team (ETIT) attached to VIII Corps and certain other hastily organized teams from Engineer combat battalions of the Corps to instruct armored division troops of the 4th and 6th Armored Divisions, which were assigned the mission of following the Infantry troops through the breach and exploiting it, in the removal of new types of mines found on the Continent.

Throughout the night, these teams, working with actual mustard pot mines, Schu mines, and bouncing Betties, gave demonstration after demonstration to the armored

troops in their assembly areas. They continued the demonstrations up to the moment the units rolled across the bridge at Lessay, the 4th Armored then moving across the base of the Brest Peninsula and the 6th Armored advancing down the center of the Peninsula to Brest. Captain James Ball, commanding the VIII Corps ETIT, reported: "When we went down across the bridge the next morning, we saw men from the 4th Armored taking out mines they had never heard of before like veterans."



Engineer cuts wire on booby trapped champagne bottle.

Booby traps were almost as bad. In the village of Lessay, where only two thousand people had lived in normal times, VIII Corps Engineer units removed more than 300 booby traps on the afternoon of 29 July. Other villages in the narrow corridor through which the troops passed were equally mined and booby-trapped. Within four hours from the start of the movement through Lessay, the main highway was completely cleared of mines and blocks, properly taped off so that the two divisions could pass through. In the

next two days, other subsidiary roads essential for the passage of infantry troops and supplies were cleared and ready.

By early morning of 28 July, the treadway bridge across the Ay River near Lessay was completed by the 24th Armored Engineers. The pursuit divisions were able to roll across close on the heels of the retreating German Seventh Army. Minefields that had been sown by the enemy in hope of winning days, actually won him only hours. The breakthrough was exploited to the maximum.

With the breakthrough, the character of the war underwent a complete change. The war of stalemate and position became a war of movement. Armor, spearheading the hydraheaded pursuit of the retreating enemy, flowed across France almost unimpeded. But there were impediments. The country was criss-crossed by rivers, streams and canals that had to be bridged quickly before the enemy had a chance to pause and build new defensive lines. And the roads had been mined, roadblocks built across them, intersections cratered.

War of Movement

In the type of fighting which now ensued, Engineer armored combat battalions were to play a vital part. The 24th and 25th Engineer Armored Combat Battalions, accompanying the 4th and 6th Armored Divisions, respectively, removed literally thousands of mines before they had effectually sealed off the Brittany Peninsula and sealed in the defense forces of the enemy at Lorient, St. Nazaire, and Brest. They also removed many

roadblocks and constructed many bridges. Because speed in bridging is the key to successful armored tactics, an organic bridge company that is attached to the battalion for operations usually supports the Engineer armored combat battalion.

In the march across France, elements of the Engineer armored combat battalions were usually in the forefront of the move. Engineer armored combat battalions operated differently from the ordinary Engineer combat battalion. Where a strong measure of control and command is exercised by the Engineer combat battalion commander, with attachments to regimental combat teams occurring infrequently, the Engineer armored combat battalion is constantly broken up into platoon, each platoon assigned to an armored task force and operating under the command of the task force commander. Only the remotest degree of control and command is exercised from battalion. The organic transport of these platoons is three armored half-tracks. Groups in support of the battalion, and bridge companies which support the battalions, are usually assigned through battalion upon request of the platoon commanders as various jobs develop.

Armored Division operations, being operations of swift movement differed from those of the Infantry Divisions; and so the operations of Engineer armored battalions differed from those of the Engineer combat battalion. In the march across France, various armored task forces would roll for miles before being stopped by a demolished bridge, a minefield, or a roadblock across a funneled area in which the only usable roads were so blocked. If the roadblock was defended, it might be a matter of hours, and sometimes of days, before the roadblock was reduced and the armored force moved forward again. Each delay meant that other blocks farther beyond could be prepared by the enemy and task of the Engineer platoon assigned to that task force increased. Thus speed in the reduction of obstacles became the essence of Engineer armored operations.



Engineers remove a log roadblock in France

Roadblocks, according to their construction and strength could sometimes be removed by a tank dozer alone, but usually demolitions were required after which a tank dozer cleaned up the highway. Minefields and roadblocks composed of mines across highways were lifted by hand. Bridging was done by the platoon or battalion whenever possible. Bridging of larger streams usually was done by Corps. Contrary to usual divisional processes in stream crossings, Armored Engineers made few assault crossings. When Armor was needed at an early phase of a river crossing, it was usually ferried across by the Infantry Division or Corps making the assault. As a general rule, Armor crossed streams after the Infantry was well entrenched upon the far shore.

These were practices used in the march across France, Belgium and into Germany. They were used behind the 15 or 20 task forces of Armor which slashed and sliced the

German Army into little isolated bands in various stages of the pursuit. These were the tactics which brought the striking force of the Army into position finally for breaching the Siegfried Line and crossing the Rhine.

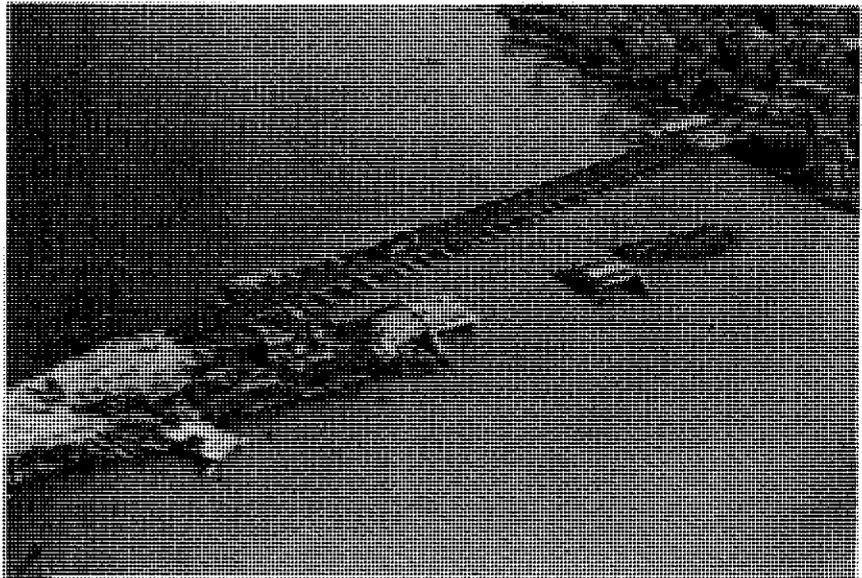
Source: Liaison Section, Intelligence Division, Office of the Chief Engineer, "Combat Engineering: Report No. 10, August 1945, pp. 29-39

Luzon: The Drive on Manila and the Diversions at Subic Bay and Nasugbu

As the invasion progressed, opposition continued to be light on the plain, but I Corps encountered stiff resistance on the left flank in the hilly country near Baguio, and on the right flank of the XIV Corps sector in the vicinity of Clark Field and Fort Stotsenburg enemy action regained its familiar fanatical pattern. At no time, however, were the Japanese able to descend into the plain and cut off the American advance by flank attacks as they had hoped. The extending line from the Gulf was too strongly supported and too firmly maintained for that. Achievement of this enviable situation in the swift, complex advance down the Central Plains was predicated upon the most expeditious solution to all immediate engineering problems and the closest possible integration of engineer effort on the part of Sixth Army, ASCOM, 5202d Engineer Construction Brigade, and the Corps. Even at the height of the campaign, the Engineer, Sixth Army, held conferences twice a week with the commanding officers of the engineer units directly under Sixth Army control. These conferences were especially important in the early days of the operation when construction troops were naturally scattered over a wide area and constantly dispersed forward; it was then more than ever vital that all work be coordinated and engineer effort and materials properly utilized. Throughout the campaign civilian labor was recruited and used by nearly all units to reinforce engineer personnel. Filipino labor, both skilled and unskilled, proved particularly valuable in unloading cargo at beach dumps, clearing camp areas, and maintaining roads. Natives were also widely employed in mosquito control and base construction projects.

There was no change in engineer missions as the drives by both Corps continued south to envelop Manila. The main emphasis remained upon road and bridge construction.

Floating bridges were necessary to support the rapid advance of the troops and fixed bridging had to be constructed for highways and railroads. The next concern of the engineers was with clearance of mine fields, provision of water supply, and reconstruction of railroads. They were also engaged, although with diminishing emphasis, upon airfield and oil storage construction.



M2 Steel Treadway Bridge on Luzon, Philippine Islands

The few roadblocks encountered by the advancing forces offered no serious hindrance. Mine fields were not common except in the Baguio and Fort Stotsenburg areas. In most

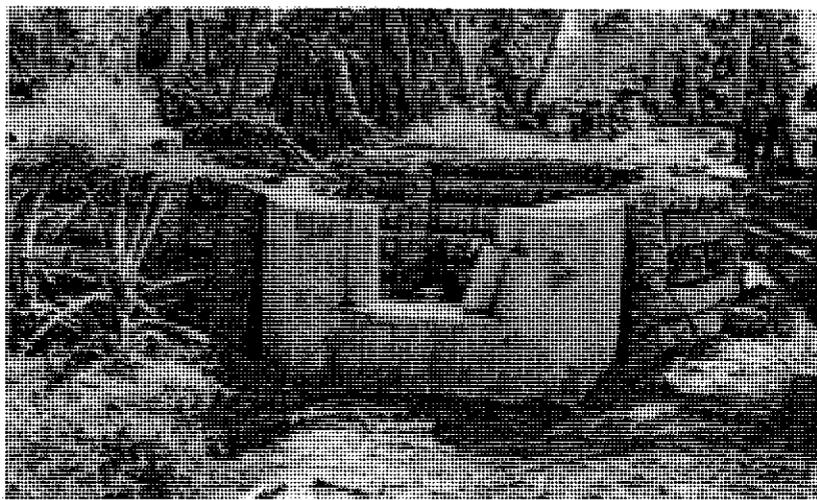
instances disposal was easy since the Japanese had been good enough to leave shipping boxes lying about and nearby, usually, the bomb plugs as well. Water supply offered no special difficulty because an artesian basin underlay this part of the island; moreover, many municipalities had water systems available—a new experience for the engineers in the Southwest Pacific and there were innumerable streams and rivers. Another new development for war in this Theater was the fact that very few airfields were needed; for the first time construction of air facilities was not of primary importance because the American forces, with the Lingayen Gulf fields in operation, had almost complete air superiority. This attainment also obviated the necessity for as much camouflage activity as had been planned. And just enough petroleum installations were constructed to support the forward movement of the Corps and to supply the needs of the air forces. Railroad construction, on the other hand, continued to be important in view of the inadequate road network and the critical shortage of truck transportation. But nothing was allowed to interfere with the road projects; on these depended the success of the entire campaign.

From the beginning, General Krueger had been confronted with the delicate problem of balancing on the one hand his urge to push the leading elements of I and XIV Corps toward Manila as rapidly as possible and, on the other, the need to achieve foolproof supply and support. He managed to attain that balance by the use of brilliant tactics and by driving his engineers to the utmost. A significant illustration was provided by the situation on 3 February when advanced units of XIV Corps reached Manila. The main supply road and its bridges had been rebuilt and restored for fast two-way traffic to get the most good out of the extremely limited available truck transportation. Two-way traffic had been established all the way from Lingayen Gulf, more than 100 miles, together with rail traffic as far south as Tarlac. Nevertheless, there was a limited supply of rations at the San Fernando Army Depot for troops operating to the south. This was indeed cutting it fine, but the balance was obviously on the safe side. The Sixth Army historian, discussing the success of General Krueger's tactics, points out that everything was to be gained and nothing lost by this procedure:

On the other hand, if the leading troops had been rushed pell-mell on Manila, and not properly supported by a substantial line of communication, it is evident that this course of action would have constituted the only possible way in which a serious, if only temporary, setback to our forces could have been achieved by the enemy.

On 29 January, as the spearhead of the advance from Lingayen Gulf was nearing Manila, XI Corps of Eighth Army made a diversionary landing near the town of San Narciso on the west coast of Luzon above Subic Bay (MIKE VII). While Eighth Army planned and executed this action, control of operations was to pass to Sixth Army the day after the initial assault at San Narciso for integration with the main drive against Manila. The landings were supported by units of the 2d Engineer Special Brigade. No enemy opposition developed and no underwater mines or other obstacles were encountered, but sandbars at both Red and Blue Beaches blocked the approaches of LST's and LSM's. These craft had to ram the bars at full speed to grind their way into deep water at Blue Beach, but delays of as much as 20 hours were caused here. At each beach the steep angle from the water's edge and the loose sand made it necessary to pull all wheeled vehicles 100 feet to solid ground.

The engineers had to build new roads in the Blue Beach area, but an existing road from Red Beach to Highway 7, which ran parallel with the coast, and lack of enemy resistance enabled the assault forces to consolidate their gains and move rapidly inland before control was handed to Sixth Army. At this time the beachhead flanks and San Marcelino airdrome had been secured as well as the towns of Subic and Olongapo on the inner shores of Subic Bay. The



Japanese concrete and log roadblock

leading elements of XI Corps were also well advanced along Highway 7 toward Zig Zag Pass where prolonged bitter fighting was to take place. Two weeks of the most intense combat at Zig Zag Pass was required to clear the way for the integrated drive by Sixth Army. Meanwhile strategic Grande Island in Subic Bay had been seized so that the bay area could be opened for use as a base; and by a flanking movement a regiment managed to make contact with elements of XIV Corps which had been pushing down from Lingayen Gulf. The combat engineers directed their main effort during this period to mine removal and the reduction of enemy fortifications. The place of their activities in the advance is indicated by the fact that they destroyed 199 caves and 70 pillboxes during the drive through Zig Zag Pass. The joining of the two forces accomplished the main mission of the Subic Bay operation; the neck of the Bataan Peninsula had been throttled, the enemy escape route to Bataan from Manila and the area to the north had been blocked. The peninsula was entirely sealed off. The corollary mission here was accomplished by the engineers who, aside from their active close support of the tactical units, constructed San Marcelino airdrome, restored the Subic Bay port facilities, and constructed oil facilities for the establishment of a supply and naval base."

Two days after the landings above Subic Bay, on 31 January, a second diversionary landing was made at Nasugbu (MIKE VI), at what might be called the Achilles' heel of Luzon, just south of the entrance to Manila Bay. As in the Subic Bay assaults, Eighth Army planned this operation and accomplished the landings whereupon control was transferred to Sixth Army; but here the shift did not take place until 10 February. Since the basic assault force was the 11th Airborne Division, all engineer planning was accomplished by the organic unit, the 127th Airborne Engineer Battalion, which conducted a hurried but comprehensive study of terrain conditions through aerial photographs and ground reconnaissance. This division had still been engaged against the enemy on Leyte in the middle of January when the first warning of action on Luzon was

received. While preparations for the assault were being made, the 40 landing craft of the 2d ESB to be used in the operation had to make the 300-mile journey from Leyte to Mindoro across rough seas in one leap before proceeding with the naval task force to Luzon. The landings at Nasugbu were also unopposed, but the beaches were even worse than those at San Narciso. Landing craft could not be beached and most of the equipment had to be winched to shore until the tide came in. Five of the six LST's in the convoy managed to get within 60 feet of shore by repeatedly retracting and ramming the ob-



Engineers manually unload cargo from landing craft

structing sandbar at high tide. Beach party responsibilities normally handled by the Engineer Special Brigade had to be assumed by the divisional engineers in the absence of an assigned amphibian shore unit. Egress roads and dumps were completed with dispatch and a spur was built to the

24-inch gauge railroad which was operative in the vicinity. This railroad construction proved invaluable in moving supplies off the beach and in alleviating the critical shortage of truck transportation. Since the move inland was comparatively easy at first, the engineers were able to concentrate on repairs. Later, heavy road barricades were encountered with mine fields adjacent and farther on all the roads were mined. At various spots along the way, the enemy was concealed in pillboxes and caves from which they directed devastating fire at the advancing forces. The engineers demolished each roadblock under fire, removed mines, destroyed pillboxes by demolition, and sealed up all caves. While the advance elements pushed on, units of the engineer battalion in the beach areas were completing five airstrips and restoring the docks which retreating American forces had partially demolished in 1941.

With the completion of the Subic Bay and Nasugbu operations, the scene was set for the fall of Manila. The Bataan Peninsula was cut off; XI Corps was in contact with XIV Corps. The 1st Cavalry Division had landed at Lingayen Gulf just before the Subic Bay assaults and was assigned to XIV Corps ready to spearhead the drive on Manila from the north with the 37th Division. I Corps was ready to push against the southeast area, continuing its original left flank operations. And the 11th Airborne Division, driving east from Nasugbu, had reached the vicinity of Nichols Field where the enemy was putting up a determined fight. Manila was beset from three directions. On 3 February elements of the 1st Cavalry Division entered Grace Park, captured Santo Tomas University, and liberated thousands of Allied internees. The 37th Division, hampered along its line of March by numerous major stream crossings, entered the city 2 days later and

consolidated its forces on the north bank of the Pasig River. But enemy resistance suddenly stiffened at this point. The Japanese retreated into the area south of the Pasig River known as Intramuros, where they determined to make a suicidal stand.

On 7 February elements of the 37th Division ferried across the river in assault boats to seize a strong bridgehead in the vicinity of Malacanan Palace. The enemy fought fanatically in Intramuros, but on 10 February, the Cavalry was able to cross the Pasig north of Makati, near the Philippine Race Track, without opposition. At the same time the 11th Airborne Division, as has been noted, was approaching the city from the south; after severe fighting near Nichols Field, it drove as far north as the Manila Polo Club. After a week of these skirmishings, cavalry and airborne elements made contact inside Fort McKinley and pushed northward into the city. On 23 February the 37th Division launched its major attack on the Intramuros district where heavy fighting continued for 8 days. While the capture of Manila was tactically complete on 25 February, it was not until 4 March that the last enemy pocket of resistance in the city was eliminated."

During the approach to Manila, the engineers had been confronted with numerous problems and special responsibilities. The enemy seemed belatedly to be learning the art of demolition, and destruction was progressively more complete. All important bridges were found to be destroyed and the rivers unfordable. The entire credit for this destruction cannot be given to the Japanese, despite their noticeably increased efficiency. Much of the condition against which the engineers now had to strain was the result of American demolitions in 1941 and the more recent very effective bombings by the American air forces. In the early days of the campaign it had been urgently necessary to impede enemy efforts to reinforce and supply the Central Plains from Manila and the southern provinces. Construction of bridges near Manila was a monumental task because of the critical shortage in bridging equipment, inadequate transportation facilities, and the imperative need for rapid completion of all projects. In fortunate contrast, the roadwork required for the assault from the north necessitated a minimum of engineer effort. The main highways were all-weather roads that needed only maintenance and the clearance of obstacles and debris. But the provincial roads along which the 1st Cavalry made its flanking movement required extensive repair and maintenance.

In the city itself, a most important task was the bridging of the Pasig River; this was accomplished at a number of places, frequently under fire. Another vital engineer mission was the removal of mines and other obstacles. In the northern part of town, mines were only occasionally



Engineers disarm a naval shell fuzed to function as a land mine.

encountered, but south of the Pasig they were numerous and effectively laid. They took a heavy toll of American troops. The Japanese naval garrisons in Intramuros even employed beach mines and depth charges to impede the American advance and, since all mine fields were covered by fire, troops and armored vehicles could not negotiate these areas until the engineers had cleared the way. There were also obstacles of various types that had to be cleared tank traps, rails embedded in concrete across roadways, barbed - wire entanglements, and pillboxes. Gun positions and fortifications stippled the inner city and engineer troops had to give close support to the infantry until the very end in the destruction by demolition of fortified points. Demolition was also necessary to wipe out the intricate system of caves and strong points constructed in and around the public buildings in Intramuros. In fact, the last enemy pocket of resistance to hold against the concerted American attack was located in the Finance Building.

Even before the final capitulation of Manila, the first steps had been taken toward rehabilitation of the devastated city. The extensive engineer activities in this direction were carried out simultaneously with the combat phase. Engineer troops went to work as soon as an area or engineer objective was captured, usually under enemy sniper and mortar fire. At the end of January, the commanding general, Sixth Army, was directed to initiate the rehabilitation program which earlier information had indicated would be under civilian control. But there were no evidences of any planning or preparation to this end as the American forces drew closer to their objective; and reports continued of Japanese progress in destruction of the city. Immediate action was taken by Sixth Army to organize an engineer command for Manila as the guiding agency for the rehabilitation of lines of communication and public utilities, protection of property, and clearance of debris, monumental tasks in a modern metropolis. This command, composed of personnel from the 5202d Engineer Construction Brigade, ASCOM, the Engineer Section, Sixth Army, and civilian specialists, was placed under the commanding general, XIV Corps. The immediate availability of the construction brigade as an integrated command to participate in the rebuilding of the city once more italicized the lucidity of Sixth Army advance planning in view of the possibility that all contained units might easily have been dispersed throughout Luzon during the campaign. Early in February, the commanding general, ASCOM, who had been given control of all service troops in Luzon, sent a reconnaissance detachment to Manila. With ASCOM headquarters established at Far Eastern University, reconstruction of permanent facilities within the city limits was shortly under way, While the north piers, sheds, warehouses, and access railways were in fairly good condition, other sections of the city were in shambles. On 13 February ASCOM was redesignated Luzon Base Section (LUBSEC) and as such carried on the mission of reconstruction. Two days later, General Casey was relieved of his ASCOM command for return to his basic assignment as Chief Engineer, GHQ, SWPA."

Source: Office of the Chief Engineer, General Headquarters Army Forces, Pacific, *Engineers of the Southwest Pacific 1941-1945: Volume I- Engineers in Theater Operations*, 1947, pp. 237-255. Photographs replaced for clarity.

Breaching the Siegfried Line

Antonin M. Sterba

Major, Corps of Engineers

On September 19, 1944, the 30th Infantry Division, after continuously successful operations against the enemy through France, Belgium, and Holland, reached a north-south line generally one-half mile west of the Wurm River between Teveren, Germany, and Kerkrade, Holland, and prepared to attack east through the Siegfried Line upon Corps's order.

The planning work and operations of the 105th Engineer Combat Battalion, supported by the 1104th Engineer Combat Group, in the breaching of the Siegfried Line, by the 30th Infantry Division, are described here. This operation is typical of the work done by the divisional combat engineers. It is hoped that the experiences described will be of interest and help to other units confronted with similar problems.

The Siegfried Line in Division Area

The Siegfried defenses in this zone took full advantage of the terrain features. From west to east, the defenses consisted of the following:

- a. The flat, exposed, soft soil, farm land west of the Wurm River Valley, made up of pasture land, plowed fields and beet fields.
- b. A wooded drop of about 30 meters to the valley floor. The valley floor in this area consists of woods, pasture, and plowed clay soil.
- c. Destroyed highway bridges over the Wurm at Marienberg and Rimburg.
- d. The Wurm river, a natural tank obstacle with a width of 20-30 feet, depth of 4 to 5 feet, banks 2 to 4 feet high, current of 2 to 3 feet per second, mud bottom.
- e. An intermittent antitank ditch.
- f. The railroad, running either cut or fill at the base of the enemy side of the valley.
- g. The partially wooded east side of the valley. Built into the landscape were numerous pillboxes with fields of fire covering the valley and other pillboxes. These pillboxes were either visible, camouflaged as houses and haystacks, or hidden in the woods and brush. Scattered among the pillboxes



German pillbox camouflaged as a house.

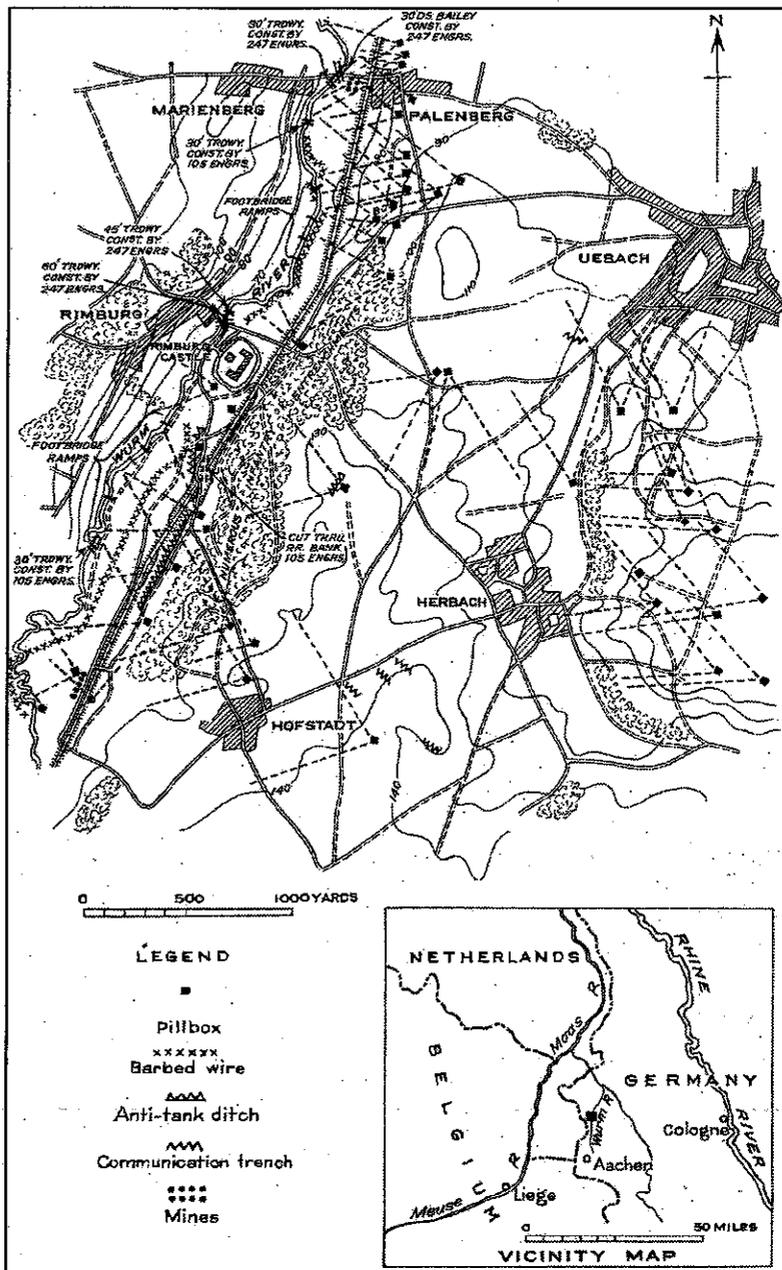
were well-dug in slit and "v" trenches and gun emplacements. The town of Palenberg, a sniper's paradise and suspected of being heavily mined, was in the northern part of the Division Zone. Rimbürg Castle, an old-world dwelling and also a sniper's haven, was at the base of the east side of the valley in the center of the zone.

h. The flat terrain east of the valley into which were built pillboxes with supporting fields of fire, and numerous recently dug slit and "v" trenches and incomplete antitank ditches. These diggings daily increased throughout the zone until the day of the assault.

Intelligence Work

Prior to our arrival in position for the assault, the intelligence section had assembled, studied, and disseminated information on the area received from the Corps Engineer, Prisoner-of-War reports, military intelligence reports, maps, and aerial photographs.

When the division moved into position for the attack, great effort was made to augment and verify this information. Numerous reconnaissances were made by engineer patrols and infantry patrols with engineers attached. Most of the reconnaissance work was done at night, since, during daylight hours, the enemy very actively opposed with artillery and small arms fire any visible movement in the valley. The information brought back by these patrols accurately established the dimensions of the Wurm River



30th Infantry Division area of operations

and the two demolished bridges, type of soil in the valley, location of tactical wire, location and dimensions of the antitank ditch and railroad cut or embankment, and the characteristics of some of the closer pillboxes.

The Engineer Plan

The Division planned to attack with the 117th and 119th Infantry Regiment abreast, supported by air, tanks, tank destroyers, and artillery. The 120th Infantry Regiment had the mission of initially a holding operation and latter support of the 117th and 119th Infantry Regiments.

Plans of engineer support covering an attack with one, two or three regiments abreast were prepared prior to September 19, by Major John A. Allison, S-3. Elements of the plan are as follows:

1. Companies A and B, 105th Engineer Combat Battalion, commanded by Captain James P. Rice and Captain James K. Turner, respectively, support the 117th and 119th Infantry Regiments with the following missions:

a. Attachment of 3-man demolition teams to the infantry assault teams. These 3-man teams were armed with bangalore torpedoes and sachel charges and had the missions of blowing or clearing the initial breach in any personnel obstacle encountered and assisting the infantry by further demolition and mine clearance work.

b. Provision and placement of foot crossings of the Wurm River in each regimental sector. Lightweight 20 to 30-foot duckboards were constructed for this purpose.

c. The supply of assault materials (pole and sachel charges and flamethrowers) to the infantry assault teams prior to H-hour and continuous resupply of assault materials as needed after H-hour.

d. Clearance of routes of mines and obstacles for the supporting tanks and supply roads to the infantry battalions.

e. Destruction or sealing of captured pillboxes by demolition or welding and bulldozing earth cover over the openings.

2. Company C, 105th Engineer Combat Battalion, initially support Companies A and B, 105th Engineer Combat Battalion, with the following missions:

a. Construction of two class-40 crossings, one in each regimental sector behind the assault troops, and necessary roads to these crossings. Three methods of crossing were planned: an expedient under fire crossing (pipe and log culvert-sleds to be installed by tanks and tankdozers were later evolved); two 40-foot log mats to lay upon tank-dozed fords; treadway bridges to be constructed at the infantry crossing sites after a bridgehead, cleared of direct and observed artillery and small arms fire, had been established

b. Maintenance of these crossings until relieved by the 1104th Engineer Group. Upon relief, revert to battalion reserve, prepared to support the 120th Infantry Regiment or to support either Company A or B, 105th Engineer Combat Battalion.

c. Additional demolition and flamethrower to be prepared in case the 120th Infantry Regiment later had assault missions.

3. The 1104th Engineer Group commanded by LTC Hugh W. Colton, was prepared to support this battalion with the following missions:

a. Construction of two class-40 crossings, one in each regimental sector, spanning or by-passing the existing demolished bridges at Marienberg and Rimbürg.

b. Clearance of regimental supply roads, one of which would become the main supply road for the Corps.

c. Supply of gravel to locations as required by division engineers.

d. Engineer support of the 120th Infantry Regiment, until Company C, 105th Engineer Combat Battalion, took over this support, and engineer support in forward areas if required.

e. All types of engineer work up to work-phase line upon request of the Division Engineer.

Preparations for the Assault

With the completion of the detailed plans, work was begun on the assembling and fabrication of the assault equipment (expedient footbridges, class-40 expedient bridges, pole and satchel charges) and the establishing of an engineer dump and gravel pit. A water point was installed in a forward position.

Companies A and B were issued their assault materials and each company established a mobile dump to follow closely behind the infantry advance. Reserve flamethrowers were charged and

ready to exchange for used flamethrowers that would be immediately recharged. Assault materials for the future use of the 120th Infantry Regiment were issued to the 1104th Engineer Group, which had the mission of supporting the 120th Infantry Regiment until relieved by Company C, 105th Engineer Combat Battalion.



Engineer assembles pole charges for use against pillboxes.

For several days prior to the assault, all companies assisted the infantry in assault training in terrain similar to the Wurm Valley in the rear areas. Treadway bridges, demolitions, and flamethrowers used. Equipment and flamethrower fuel that were expended were replaced in the mobile dumps. Prepared demolitions were continually checked for dampness and faults, and doubtful parts were replaced with new material. Spot tests of the pole and sachel charges were frequently made.

A gravel pit with shovel was established close to the area of operations for the use of Division and Corps engineers. For the construction of the class-40 assault crossings, it was planned to have three means of crossing available to Company C, 105th Engineer Combat Battalion. Expedient tank crossing experiments were made by the 295th Engineer Combat Battalion. These experiments were as follows:

a. The attachment of 36 feet of assembled treadway bridge to the front of a medium tank. This was held up at an angle of 30 degrees to the horizontal by cables to be released by a following tank. The weight of the bridged caused the nose of the tank to burrow excessively into the soil. Also the length of the rig was too great for the sharp turns and slopes involved.

b. A similar experiment was tried with a 30-foot section of counterbalanced Bailey bridge, but the results were the same.

c. Sled culverts made up of 30-inch culvert pipe with 6-inch steam pipe and encased in 6-inch logs were later constructed by Company C, 105th Engineer Combat Battalion. The method of using these expedient culverts is as follows: A tankdozer followed by a tank towing the culvert-sled advances to the stream. After the tankdozer cuts and approach ramp in the bank, it backs off and the tank pulls the sled up into position, then moving behind the sled, the tank pushes it into the stream. The culvert, which has been built to span the stream, enables the tankdozer to cross and cut an exit ramp in the far bank.

These expedients worked satisfactorily in practice and were ready for the assault. For the surfacing of a possible ford in each regimental area, two 40-foot log mats, 12 feet wide, made of 6-inch logs and woven with four stands of cable were made up and coiled in 6-foot rolls on sleds.

The third method of crossing was by treadway bridge. This type of crossing was to be constructed after a bridgehead, with observed artillery and small arms fire, had been established by the infantry. On the evening of October 1, 1944, it was known that H-hour would be 1015 on the following day. After it grew dark the fabricated footbridges were carried to the line of departure and concealed and the last minute details were prepared for the operation.

The Assault

At 1015, October 2, 1944, after thirteen days of rain and cloudy weather, the attack jumped off. The day began clear with bright sunlight. Forty-five minutes before H-hour, dive bombers came in on schedule, dousing the line of fortifications with fire bombs. The leading elements of the infantry—the assault teams with engineers attached—were waiting at the no advance line. Low-flying clouds came over before the high-level bombers could get on the target, preventing these planes, which were circling overhead, from releasing their bombs.

Division and Corps Artillery since daylight had gradually enlarged their volume of fire so that at 1045, continuous fire was being accurately brought down on visible pillboxes, suspected emplacements, and road areas.

At 1045, under friendly artillery shells and circling aircraft, the infantry moved rapidly forward. At 1100, the tanks began to move forward, sled-culverts towed by tanks, followed by tankdozers moved to the infantry crossing sites. The soil in the valley was very soft due to the previous wet weather, and neither expedient crossing was successfully completed.

In the 117th Infantry sector, during heavy artillery and small-arms fire, the culvert was satisfactorily placed in the stream, but due to the soft soil, the tankdozer could not work up into the far bank.

In the 119th Infantry sector, the sled broke up while being pulled through soft plowed soil. Despite heavy small-arms fire from the woods directly east, the individual culverts were cut loose and attached to tanks which dragged them to the crossing site. Here they were manhandled into the stream while the tanks deployed along the stream, firing at available targets. The soil at this site also was too soft to support the tankdozer which was pulled out by a nearby tank. It was considered impractical to try the construction of a ford at either site because of the soft soil.

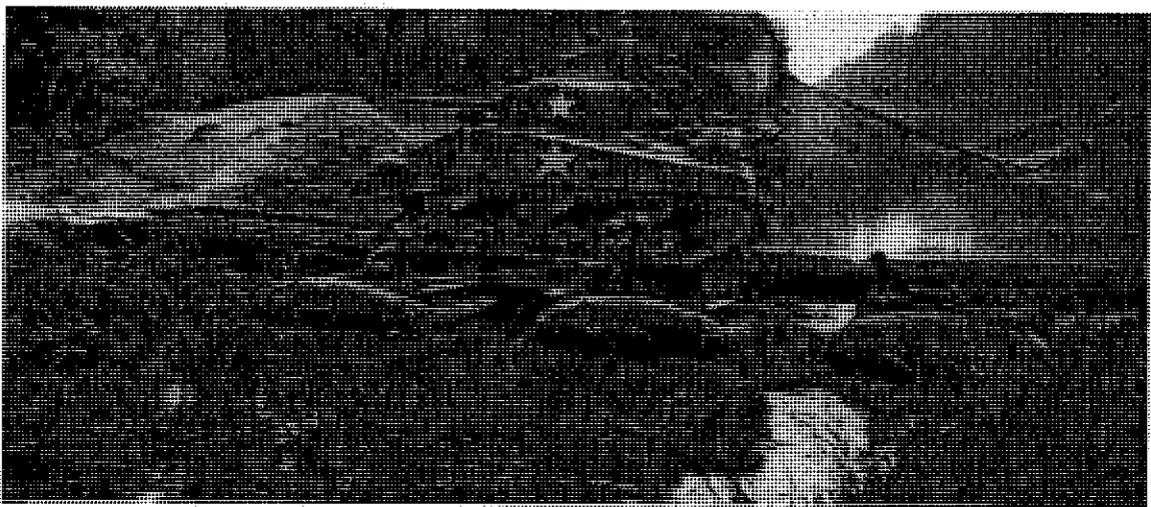
While a portion of the 1st Platoon of Company C, 105th Engineer Battalion, worked on the above site, the remainder of the platoon began the construction of a 45-foot treadway bridge in a wooded area that escaped enemy observation. This bridge was completed by 1500 and several tanks were crossed. In the 17th Infantry area, the infantry had worked to the right of, and into Palenberg and was cleaning out pockets of resistance, snipers, and artillery observers.

Construction of a 30-foot treadway was begun by the 2nd Platoon, Company C, 300 yards south of the blown bridge in spite of some sniper fire. The work was almost completed when heavy-caliber shells began to come over the site at one minute intervals, the first round landing 200 yards to the rear, and each round landing closer to the

bridge. Work continued at a faster rate until the bridge was completed. By this time shells were coming in just overhead and the work parties were dispersing when a heavy concentration landed on the bridge area. Fortunately, there were no casualties and the bridge was intact. Tanks were crossed but were unable to get far because of the darkness. After the completion of these bridges, the reserve platoon of Company C, which had been ready to assist, moved to support the 120th Infantry.

At 1745, this same day, the 247th Engineers began construction of a 45-foot treadway at Marienberg, adjacent to the blown bridge. At this point also, the enemy still had observation and brought down fire on the site whenever work parties appeared. The bridge was completed by 2400 in spite of intermittent fire. At 0600, the next morning, construction of a 50-foot Bailey bridge was begun by the 247th Engineers spanning the blown bridge. This was completed by 1000, giving two-way traffic behind the 117th Infantry.

At midnight of the first day, the 247th Engineer Battalion began construction of a 60-foot, 1-trestle treadway spanning the blown bridge at Rimburg. This bridge was completed by 0700 the next morning in spite of intermittent, observed artillery and mortar fire. The observation point apparently was in the northern sector and continued to operate despite strenuous efforts in that area to locate and remove it.



Sherman tank crosses over a 50-foot M2 Steel Treadway Bridge

By 1825, the third day another treadway bridge was constructed by the 247th Engineer Battalion, adjacent to the first bridge, giving two-way traffic behind the 119th Infantry. Artillery projectiles continued to fall in the area during this work; one round damaged the first bridge, but repairs were quickly made. During the operation, the soil in the valley dried up considerably, and the treadways constructed by Company C, 105th Engineer Battalion, were left in as reserve bridges. The remainder of Company C moved to support the 120th Infantry Regiment.

During this river crossing work, Companies A and B continued their mission of close engineer support to the assault regiments, by the clearance of roads of mines and debris and the demolition of captured pillboxes. Company command posts moved forward whenever practicable. During the fifth day of the operation, one battalion of the 120th Infantry moved to the support of the 119th Infantry Regiment, and the platoon of Company C in support of this battalion was attached to Company B of the 105th Engineer Battalion for this period.

To open the highway crossing over the railroad to the southeast of Rimbürg, the overpass having been destroyed, one platoon of Company B constructed a bypass by cutting through the banks of the railroad cut. This work was done using the R-4 tractor with armored cab and picks and shovels, under intermittent artillery and mortar fire on the area. The close-by abandoned pillboxes afforded good cover for the work parties whenever this fire became too intense. During the remainder of the break-through operation, engineer work consisted of the removal of mines and obstacles; the laying of mines when areas were consolidated for the night; clearance of rubble in the streets; maintenance of roads, and the sealing or destruction of pillboxes.



Engineer bulldozer covers entrance to abandoned pillbox.

Some of the pillboxes were sealed by welding shut the steel doors and ports, and covering the entrances by bulldozing. Most of the pillboxes were destroyed by demolitions; after placing TNT either along the walls of the rooms or in the center of the rooms, the openings were sealed and the charge detonated. The number of pounds of TNT used per pillbox approximately equaled the cross sectional area in square feet of the pillbox walls, with an average of 400 pounds of TNT per pillbox. This type of demolition

invariably blew out the walls and overturned the roof.

In the first six days of the operation, 17.4 miles of road were cleared of mines; 74 Tellermines, 39 Riegel mines, and 3 "S" mines were removed; and 20 pillboxes were destroyed. A continuation of this operation was the 30th Division's fighting south of the Siegfried Line to aid the 1st Division in the sealing off and reduction of Aachen.

Source *Military Engineer*, Vol XXXVII, No. 235, pp. 176-179. Reprinted with permission of the Society of American Military Engineers. Pictures added for illustration and clarity.

Engineers in Operation TOUCHDOWN

Robert W. Love

Colonel, Corps of Engineers

By mid-September 1951 the 2nd Infantry Division had won the desperate battle for Bloody Ridge, the rugged terrain lying between the valley settlements of Kong-dong on the west and Pia-ri on the east. Northward in the Division sector lay three mountain masses: Paeksok-san (Hill 1142-1024), Hill 931, and Kachil-bong (Hill 1243, east of Satae-ri) separated by the deep tortuous valleys of the Suip-chon and So-chon Rivers. Good progress had been made in the east; Hill 1243 and the ridge running southeast from it to Hill 868 had fallen to the 38th Infantry. On the west, the 9th Infantry was poised for a drive northwest from Kobangsan-ni toward Hill 1024. But in the center, between and dominating the two valleys which were the only practicable supply routes for a continued advance to Mundung-ni and Satae-ri, lay a narrow, rocky spine running north and south with three principal peaks, Hills 851, 931, and 894, like a two-edged sword specially forged to split and advance and slice it to ribbons. This ridge was the key terrain feature in the sector. The enemy knew this, too. Taking it cost the Americans heartbreak but finally broke the back of the enemy defenses.

After desperate attacks throughout the latter half of September, the 9th Infantry took 894, the southern peak of Heartbreak Ridge, and 1024, northwest of Kobangsan-ni. The 23rd Infantry cut the ridge between 931 and 851, resisting all the enemy's fanatical attempts to thrust them off. The month of September cost the enemy 20,000 casualties. American losses while much lighter, were still heavy.

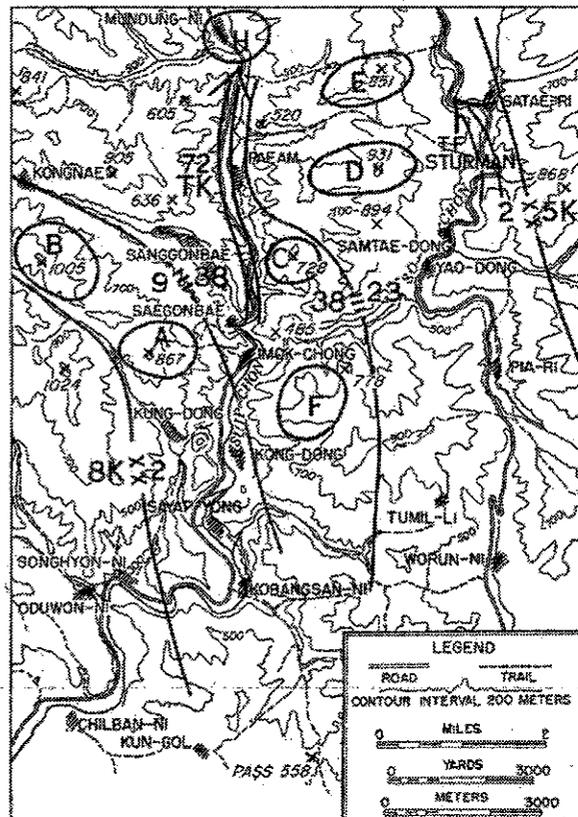


Figure 1 Second Infantry Division objectives in Operation TOUCHDOWN

Plan of Operation

A new plan, ordered by the 2nd Division Commander was for all regiments to attack simultaneously on the Division front with a strong tank-infantry attack up the Mundung-ni valley on the west coupled with an armored task force foray up the Satae-ri valley on the east, the tank force to break behind the enemy lines, disrupt his defenses, and inflict

heavy casualties. This plan was named Operation TOUCHDOWN. The enemy would be forced to disperse his mortar fire over a wider front; a line established on the objectives would require fewer troops to secure than the line then occupied; and a considerable saving of manpower would be effected by placing in reserve the units holding the hills dominated by the objectives of the proposed operation.

Engineer Study and Preliminary Work

The target-date for the attack was October 5, 1951; the hour, 9 p.m.. Assigned zones of action and initial objectives were as shown in Figure 1. The essence of the plan was speed and co-ordination of movement of all the forces of the division.

To the Division Engineer this seemed to call for battalion control and application of the engineer effort, to insure that each attacking element had engineer forces, supplies, and equipment tailored to its particular mission, and not limited to the resources of the company that normally operated in its direct support.

The 2nd Engineer Battalion staff made a study of the requirements of the operation, the difficulties to be overcome, and the assessment and allocation of the means available. It was evident that the engineer support would involve all the specialized skills and equipment of the battalion and would require shifting effort from the eastern to the western corridor, neglecting maintenance and developmental work in rear areas, and possibly calling on the Corps Engineer for relief from some of the MSR (Main Supply Route) maintenance responsibility in the Division sector. Requirements for large quantities of explosives and for tactical bridging in excess of that carried in the bridge platoon were foreseen.

Advance up the western valley, leading north from Kobangsan-ni to Mundung-ni would require the greatest effort. Kobangsan-ni could be reached by vehicle only on the twisting mountain road leading 21 miles from the south through the sector of the 8th ROK (Republic of Korea) Division. Eight miles of this road was suitable for only one-way controlled traffic. An alternate route was possible over pass 558 but would be a major construction project. From Kobangsan-ni north the existing road was barely 10 feet wide and 4 ¾ miles of it consisted of a ledge cut into rock cliffs from 40 to 100 feet directly above the streambed. The major defiles were opposite Sayap-yong, opposite Kong-dong, from Imok-chong to Saegonbae and from Saegonbae to just north of Sanggonbae. The portions of this road that had been taken were heavily mined. Several rock and wire barricades, and innumerable craters, which could be seen in aerial photographs, would have to be cleared or the road by-passed and eventually rebuilt and widened to support the movement. Pioneering of a spur in the valley toward Dung-dong would be necessary to assist the attack of the 9th Infantry on objectives A (Hill 867) and B (Hill 1005). It could be seen in photographs that the bridge at Saegonbae was damaged and unusable. Finally, gun positions would have to be provided in the valley as the attack progressed and the artillery displaced forward.

The eastern valley leading to Satae-ri presented much the same problems. Heavy mining and cratering had been encountered already in advancing through Pia-ri. The road forward was narrow, and carved from the steep sides of the gorge, and a bridge would be required at Samtae-dong as well as one or more footbridges across the So-chon for the 23rd Infantry attack on objectives D and E.

The five days before the attack was to start proved to be ample for preparation. Reconnaissance was made on the ground, by flights in liaison aircraft, and by study of aerial photographs. Flights made by the Engineer Battalion Commander, Assistant Division Engineer, and Battalion S-3 were especially helpful in planning and estimating work on routes of advance in areas controlled by the enemy. When the engineer plan was complete, flights were arranged for company commanders and the commander of the platoon selected to accompany the armored thrust to Mundung-ni, giving them a valuable advance sight of the obstacles they would encounter. Study of aerial photographs was possible down to platoon level and, along with aerial observation, served to channel subsequent ground reconnaissance, saving considerable time and effort. While ground reconnaissance was, of course, essential throughout the advance, the prior study insured that the effort was placed where positive and helpful results were likely to be gained.

Examples of this were:

- (1) Determination that the streams bed offered a practicable alternative route for tanks north of Satae-ri, but not south of that point, where the road would have to be relied upon entirely;
- (2) That the gorge of the So-chon River west from the road between Pia-ri and Satae-ri just south of Yaedong could not be developed as a lateral road connecting the two valleys in a reasonable length of time;
- (3) That the road in the defile between Imok-chong and Saegonbae could not be repaired in less than five days but that rough by-passes could be constructed by developing a trail over a saddle to the west or by crossing the river and climbing over the point opposite of Saegonbae; and
- (4) That the defile north of Saegonbae could not be by-passed and would require a major effort to force.

To provide the extraordinary engineer support that would be required in the restricted area on the western half of the Division sector, the decision of the Division Engineer was to operate the battalion, less one company, as a unit from a forward headquarters in direct support of the two infantry regiments and the divisional tank battalion to be committed there. Some unit assignments were to be functional rather than geographical and some pooling of company equipment, such as mine detectors, bulldozers, demolition chests, et cetera was planned. In this way the battalion staff was expected to be more fully utilized, and some unproductive movement of the Engineer companies avoided, which might not have been possible had the companies been attached to or placed in a direct support of individual regiments. However, operation of one company with geographical responsibilities in direct support of the regiment in the eastern valley and the attachment of a platoon to the tank battalion for the armored breakthrough seemed appropriate.

The situation on October 1 was shown in Figure 2. On the right the 38th Infantry held, with its first battalion, some 2,000 yards of front which was to be turned over to the 5th ROK Division when Operation TOUCHDOWN began. The remainder of the regiment was in assembly and training areas to the south. The 23rd Infantry in the center was heavily committed on the slopes of Heartbreak Ridge. The 9th Infantry occupied defensive positions on the left, with two battalions in contact with the enemy.

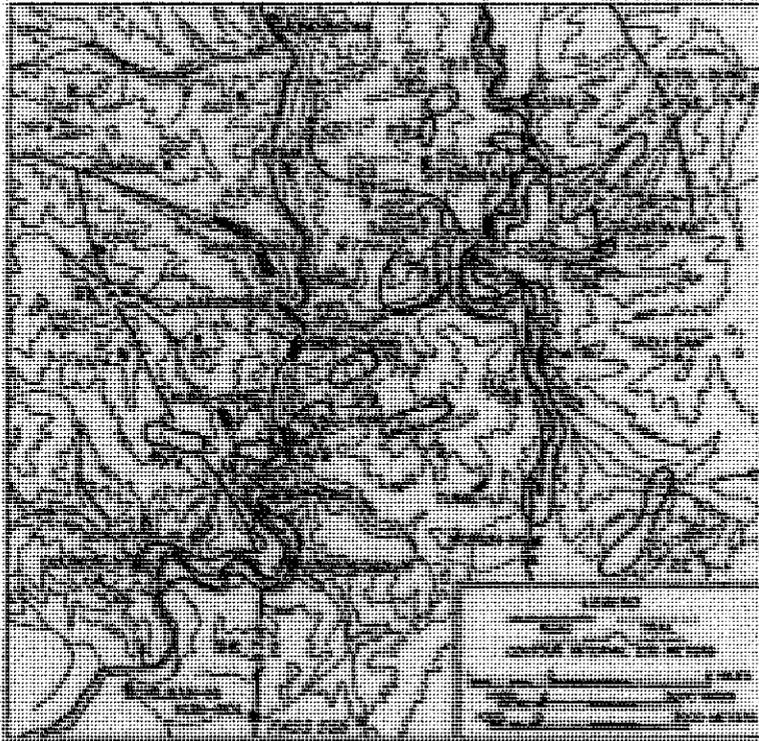
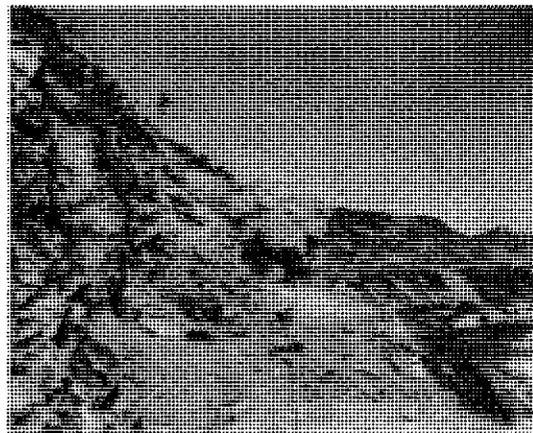


Figure 2. Disposition of units on October 1

The engineer battalion, like the division, had most of its weight to the right. Company B, in direct support of the 23rd Infantry, was repairing the road and clearing mines from it in the Satae-ri valley north of Pia-ri. In addition, it had

started work on the abutments for a double-single Bailey bridge to replace the demolished concrete bridge at Samtae-dong. Company C was engaged in improving a pioneer road that had been pushed along the ridge line from a point northeast of Worun-ni north toward Taeusan (east of Pia-ri) to support the 38th Infantry. Company D was maintaining the eastern MSR from a point near Tumil-li north through Pia-ri to a stream crossing where Company B took over. In addition, a lateral had been pushed east from Santae-dong to the base of Hill 868 on which the positions of the 38th were located. At the end of this road the unit was constructing a 1,000 foot aerial tramway to supply those positions. It was also maintaining three division liaison airstrips, constructing a fourth, and providing demolition teams for the round-the-clock operations of a Corps Engineer unit pushing the new road north over pass 558. Company A, in the western valley, was clearing and rebuilding the road from Chilban-ni north within the Division sector. It had cleared the road of mines as far north as Kong-dong and was working there under intermittent but heavy mortar fire, to by-pass that heavily

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2nd Engineers use demolitions on road construction.

cratered area by tank-dozing a passage up the river bed. In preparation for Operation TOUCHDOWN it was ordered on October 1 to start preparing a hundred bundles of logs and fifty rope-and-log mats to be carried on the tanks to assist their progress over craters or soft ground while operating in the subsequent attack, and to reconnoiter and mark a tank trail north within the zone roughly parallel to the road.

On October 2, enemy contacts were light and most units of the division were preparing for the shifts in positions and boundaries called for by Operation TOUCHDOWN. Company C of the Engineer Battalion moved from the eastern valley, relieved Company A of approximately half of its road responsibility and started construction of a road from Kobangsan-ni southeast toward pass 558 to meet the Corps Engineer units working from the other side. All other companies continued their previous missions.

Company D completed its tramway and the division artillery airstrip and was ordered to move to the vicinity of Oduwon-ni in the western valley where Companies A and C



2nd Engineers sweep for mines

were then located. Meanwhile, Company A had made a trafficable by-pass around the destroyed ¾-mile of Cliffside Road opposite Kong-dong and had its mine clearing crews working farther up the valley. Company C was sweeping and clearing areas for the 38th Infantry collection station and for its heavy mortar company. Company B continued work on its roads and bridges, cleared ground for an aid station in the 23rd Infantry sector, and furnished two squads, which were, in effect, heavy demolition

teams, to assist tanks of the 23rd Infantry and the 2nd Reconnaissance Company into forward firing positions west of Satae-ri.

The Engineer Plan

The Division Engineer published his plan on October 3, essentially as follows:

a. A forward CP, to operate Companies A, C, and D, was set up at the CP of the 38th Infantry.

b. Company A, reinforced with mine detector and demolition crews from Company C was to carry the burden of opening the MSR as far as the point opposite the junction of the Suip-chon and the So-chon Rivers

c. Company C was to put its primary effort to getting tanks into the valley running northwest from Saegonbae and, as Company A opened the MSR behind them, was to repair and improve the heavily cratered section around Saegonbae and pioneer a road northwest up the valley toward Kongnae.

d. Company D was to maintain and improve the MSR behind Company A until Saegonbae was taken and then sweep, clear, and repair the road north toward Mundung-ni (Objective H, Figure 1) and when it was passable for tanks, mount a platoon to move forward with the 72nd Tank Battalion.

e. Company B working alone in the SataeOri valley was to provide direct support to the 23rd Infantry.

f. Mine detector repair facilities and a forward supply dump were to be established at Company A.

g. Extra Engineer effort available in the early stages of the operation was to be put on expanding and improving the forward ammunition supply point in the western valley and to pushing through the road over pass 558.

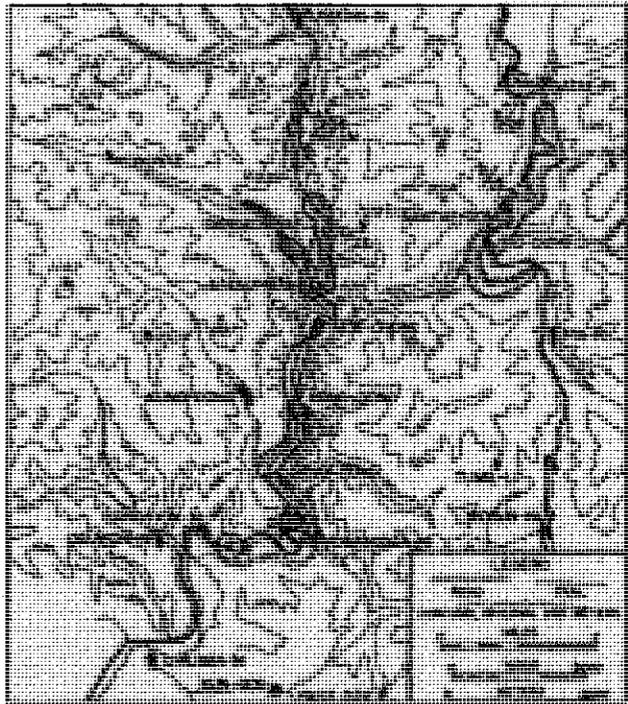


Figure 3. The Engineer Plan

Operations October 4-6

On October 4 Company D closed into the western valley, while company A continued its efforts to repair the shattered road opposite Kong-dong, and the other companies continued their previously assigned work. By 6 p.m. all units of the division were in place for the attack scheduled for the following evening. The tempo of division air and artillery support picked up during the daylight hours as the enemy continued to throw in harassing mortar and artillery fire on friendly positions. Small enemy probing attacks were repulsed during the night.

One fortunate break occurred during the early hours of October 4 when a patrol from Company F of the 38th Infantry found Hill 485 unoccupied. The remaining elements of Company F moved onto the hill, securing it and thus taking one of their intermediate objectives before the main assault had begun.

Taking of this ground also permitted detailed reconnaissance of the road opposite. Similar to the road opposite Kong-dong, in that it was a shelf cut in the cliff high above the river, it was even more thoroughly blown away for a length of over half a mile. It could not be by-passed easily through the streambed because huge boulders and ledge rock blocked it at the bend just south of Saegonbae. Patrols from Company C, which now became the engineer spearhead, working closely with the patrols of the 38th Infantry, found a route which might be opened as a by-pass by going into the stream at Imok-chong, following it 200 yards, cutting a ramp up the opposite bank, then down into the

stream again. A second possibility for getting tanks into the valley running northwest from Saegonbae, where they could fire on the reverse slopes of Hill 867, was a trail running up and over the point on the west side of the road between Imok-chong and Saegonbae. This was the most direct route, but there was considerable doubt that tanks could be gotten out again once they were in the valley, because of the steepness of the northern slopes. It was decided to develop both routes: the one on the west to get the tanks in rapidly, and the one on the east for resupply and evacuation, using the tankdozers of the engineer assault platoon, under Company A on the east, and tankdozers from the 9th and 38th Infantry, under Company C on the west.

On October 5 the Corps Engineer relieved the battalion of responsibility for the roads south of Kobangsan-ni, permitting concentration on the routes of advance northward. All day Company A worked under sporadic sniper and machine-gun fire clearing and improving the road north from the Kong-gong defile. Company D improved the previously swept road south of that point and put the remainder of its effort on the new road southeast over pass 558. Company C, in the lead, hacked at its tank trails with tankdozers and explosives.

At 9 p.m. all regiments moved out on Operation TOUCHDOWN. The 1st and 3rd Battalions of the 9th Infantry, moved up the steep slopes of Hill 867, hampered more by the terrain than by enemy activity, while a platoon of Company A of the engineers pioneered a supply road up the valley behind them northeast from near Sayap-yong. In the sector of the 38th Infantry the 1st Battalion, less Company B, which remained on hill 778, moved out toward Hill 728 overlooking the west MSR. Only light opposition was encountered and the objective was taken with little trouble. Company A then extended north and east and tied in with elements of the 23rd Infantry on the ridge line west of hill 894. The 2nd Battalion of the 23rd moved north from 894 in a fierce assault on Hill 931 while the French closed on that peak from the north and east. By 6 a.m., October 6, the hill was secure as a result of the outstandingly successful night, but it was not until 2 p.m. that all remnants of the stubborn defenders of Hill 931 were disposed of. At daylight on the same day, Task Force STURMAN, the tank-infantry force in the eastern valley, with a platoon of Company B to clear the way, struck toward Satae-ri engaging a battalion of the enemy, drawing a heavy concentration of artillery, mortar, and antitank fire, and so materially diverting opposition against the attacks on 931. Thirty-five bunkers were destroyed before the task force withdrew at 3:40 that afternoon.

Meanwhile, engineer work in the western valley proceeded day and night. Although the high ground west of the river and north of Saegonbae had not been taken, engineer patrols pushed north up the gorge. Their reports were most discouraging. It was the only possible route for the tanks to advance north to Mundung-ni, and the Red engineers fully appreciated the fact. The road was the most heavily mined and cratered the division had ever encountered. In the 1 ½-mile length of the defile only about 50 per cent of the road was intact, and in vital spots the ledge was blown away sheer to the stream far below. Enormous boulders blocked the stream bed and at one point midway in the defile and at two points near the north end, the stream fell over ledges 10, 14, and 20 feet high. Enemy automatic weapons fire still covered most of the valley and all of it could be

reached by enemy mortar fire. On October 6 and 7 only small demolition teams could work in the gorge, and Company D, which was to be the new engineer spearhead, puts its efforts to assisting the 38th Field Artillery forward through the defiles to the south. Companies A and C continued their clearing, repairing and by-passing work, relying heavily on explosives to detonate enemy mines, procure rock for filling craters, and cut by-pass ramps in the sheer rock river banks.



Engineers confront road cut by Communist demolitions.

Mine Clearing Technique

A use of explosives that would be considered prodigal in ordinary operations marked the whole advance. A substantial portion was used in clearing out enemy mines by induced detonation. The enemy had not followed any set pattern in his placement of mines, scattering them indiscriminately along all roads—in road beds and shoulders and turnouts—and in all valley areas that might be used as artillery positions. The battalion had a few mine detectors, but they were found to be inadequate. Not only were many of the mines deeply buried, but also most were wooden box mines with plastic detonators, containing practically no metal. With widely scattered shell fragments giving innumerable false alarms, rapid clearing by standard detector and probe teams was impossible.

Tests were conducted by the Battalion to determine effective spacing and amounts of explosives required to detonate enemy mines at various depths and in different types of soil. The tests indicated that a spacing of standard chain block M-1 of 6 feet on centers would detonate all mines buried to a depth of 24 inches between interior rows of chain and all mines 3 feet outside the exterior rows; hence, two chains laid down a road would clear a 12-foot width, which would cover most of the roads in Korea.

Turnouts were provided by fresh cuts or by blowing suitable but suspect areas after the road had been cleared for the advance of equipment. Although this method of clearing cuts furrows in the road surface it does not damage it sufficiently to make it useless, and it does destroy all the mines.

No other method would have permitted the rapid advance that was essential to this operation, and neither personnel nor equipment were lost to mines in any area cleared by detonation. Some equipment was destroyed or damaged, however, by mines in areas which had been searched by other means during the operation. The apparent expense was more than justified by the saving of lives and equipment. A staff study made after the operation by the X Corps Engineer, recognized the value of this method and recommended its employment in similar situations. It did, however, place a severe burden on the supply agencies. Over 40 tons of various explosives were used.

Operations October 7-10

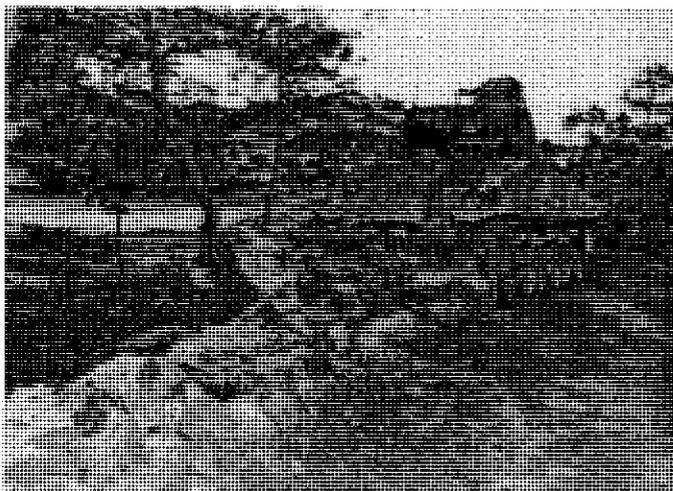
The 38th Infantry was given three new objectives on October 7. They were Hills 905, 974, and 841 comprising the next ridge line north of that under attack by the 9th Infantry. A fourth hill, 605, on the left of the MSR about 1,800 meters southwest of Mundung-ni was also assigned to the 38th.

South of these new objectives, the 3rd Battalion of the 9th Infantry moved onto Hill 867, and continued its advance up the ridge toward Hill 1005. The 2nd Battalion swung up from the valley on the left flank, cut the ridge and joined the 3rd Battalion in its assault on 1005. Resistance increased with every move upward but the advance continued through October 7 and 8, and on the morning of October 9 the 2nd Battalion was near its goal but held up by a North Korean death-stand. Bayonets were used to dig the enemy, one by one, from their caves and by late afternoon the hill was secure. On October 10, the 1st Battalion, which had taken Hill 666 northeast of 867 two days before, passed through the 2nd Battalion on Hill 1005 and inched up the next peak, securing it by 4:10 p.m., October 10.

With this important ridge in the hands of the 9th Infantry, the 38th launched its attack on the new objectives. Hill 636, which was the gateway to the ridge objectives of the 38th and which dominated the gorge in which the engineers were working, was stubbornly defended. The initial attempt by the 2nd Battalion failed. Another attempt was made immediately and the crest was occupied by nightfall on October 9 but man-to-man battles continued into the night. The following morning the 2nd Battalion headed for 905 and the high ground to the northwest, gaining it on the evening of October 11, despite stubborn resistance and desperate counterattacks. The 3rd Battalion and the Netherlands Battalion drove north to take Hill 605 on October 10. On the east the 23rd Infantry continued its bitter battle for Hill 851, aided by the daily slashes of Task Force STURMAN at Satae-ri. The heights held out, but by October 10 the ridge line running west of 851 to knob 520 was in the hands of the 23rd Infantry, and, with both sides of the valley secure, the stage was set for the armored thrust which the engineers had been working to make possible.

The progress of the engineers, under direct observation and fire, was slow on October 8, but Company A managed to push a by-pass around to the east into Saegonbae, while Company C blasted and dozed a way for the tanks of the 9th and 38th Infantry over the point southwest of Saegonbae. Their fire materially assisted the advances of the infantry

up the ridges—both the 9th on the south and the 38th on the north. Company D doggedly pushed its way up the gorge north toward Mundung-ni. Every demolition shot that was set off to blast a boulder or ledge out of the way brought in an answering barrage of mortar fire. Although a few casualties were suffered, the platoon continued to work.



2nd ID tank dozer clears a road of rubble.

Bulldozers and compressors were moved forward the night of October 8 and the work continued around the clock. By noon of the next day the first cataract had been reduced but the obstacles ahead in the river bed were still so formidable that a breakthrough in time to be decisive seemed doubtful. The mine clearing crews on the road above, however, had completed their task to a point just south of the next waterfall ledge, a very rough passage might still be made along the cratered, but not

completely destroyed, shelf road north. The first tractor to attempt the climb threw a track but finally one went up successfully. By nightfall a passable ramp was carved out, and the Division Commander was notified that a way would be clear for the tanks by morning.

Only after nightfall were the engineers allowed to work beyond the last turn of the road from the valley entrance, both because of the aimed fire which could still be received there, and the desire not to disclose that a breakthrough of the trail was about to be made. During the night the last mine clearing charges were detonated and as many as possible of the resulting craters were filled.

At dawn of October 10, when the tanks were lined up ready to roll, a tankdozer rounded the last corner, completed filling the last craters, and the long-planned tank spearhead burst into the valley, carrying the previously prepared log bundles and mats and a platoon of Company D to overcome whatever obstacles might be encountered in the open valley, and with Company L of the 38th infantry aboard to give added weight to the thrust.

The armored fist burst through the enemy positions and deep into the valley that served as his supply route. Mundung-ni was entered and by-passed, lead elements of the tank force advancing 1,200 meters north of the town to place fire on the hills. Another element turned west into the valley behind Hill 841 and was able to strike at the reverse slopes of the enemy hills.

Eastward in the Satae-ri valley, Task Force STURMAN made another surge north and wrought similar havoc on the disorganized enemy. The two tank assault groups forging up the twin valleys found the enemy unprepared and hundreds of casualties were inflicted before the communist troops could find cover.

Work of October 10-15

With the breaking loose of the 72nd Tank Battalion the most spectacular part of the engineer task in Operation TOUCHDOWN was completed. The work of the next six days was, however, quite as important.

On October 10 tanks were in Mundung-ni and Satae-ri, but the supply routes behind them and behind the infantry on the high ridges were only trails. While the Tank Battalion and Task Force STURMAN loosed daily blows to the north, the 38th Infantry and the Dutch advanced northwest up the ridge from Hill 636 to Hills 905 and 974 and finally to 1220, the 9th Infantry took Hill 1005 (Objective B), and the 23rd Infantry and the French clawed their way up 851, the last peak of Heartbreak Ridge. During this time the 2nd Engineers were still working hard in support, filling craters, widening roads, building bridges, removing mines, pioneering new access roads and trails behind the infantry in the lateral valleys, preparing emplacements for the artillery, and supplying water and engineer materials for the division at large.

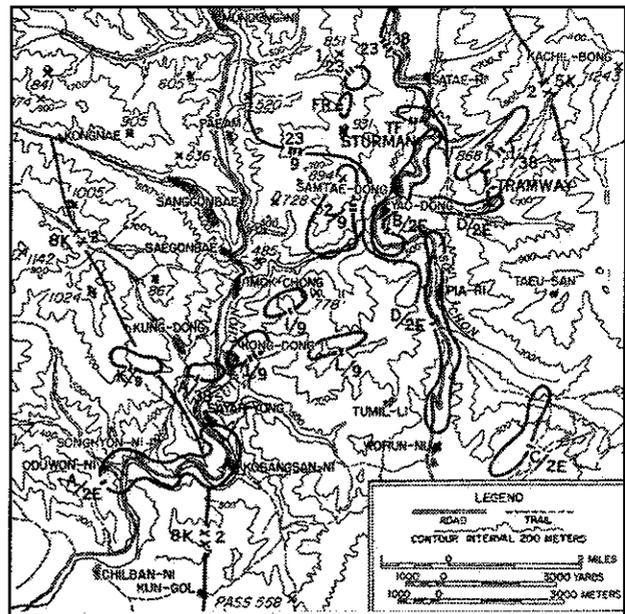


Figure 4: Disposition of 2nd ID forces on October 10

By October 15, when the line was again relatively quiet, Companies A, C, and D had moved up into the valley north of Kong-dong. A mine-free, two-way road (except for the narrowest defiles) had been completed to Paecam and up the valley, running northwest from Saegonbae, as far as Kongnae, including two 90-foot double-single Bailey bridges. In the eastern valley the road was in good shape up as far as Satae-ri and a start had been made on a lateral road along the So-chon connecting the two valleys. Work done in this period, besides the roads and bridges, included the following: 120 mines removed or blown in place; 35 culverts installed; the areas of the 23rd Infantry clearing station, 12th and 15th Field Artillery bivouac and positions, 9th Infantry service trains, and six positions of the 503rd Antiaircraft swept and cleared; one cableway to serve the 23rd Infantry completed and three laid out to serve the 38th Infantry positions on ridge 636—905—974 (later built by the 13th Engineers, 7th Division); the Division artillery airstrip extended

450 feet; a waterpoint established and operated, and wire and anti-personnel mines laid in the 2nd Reconnaissance Company and 23rd Infantry Tank company areas.

Shortly after the division's objectives in Operation TOUCHDOWN had been taken, secured, and consolidated, the 2nd Division was relieved by the 7th Division. The operation was the last all-out offensive before the resumption of the truce talks in 1951. It is felt by all units of the division that their excellent team play did score a touchdown, and that the defeat of the enemy in this sector was of great weight in influencing him to seek his successes by words rather than by arms.

Summary

Operation TOUCHDOWN was by no means typical even of the fighting in Korea. It offers a dramatic example, however, of division teamwork and of the varied tasks the engineers perform in the attack, in carrying out their primary mission of overcoming enemy obstacles and expediting the advance of all elements of the division. In this operation the engineers accomplished the following work:

- (1) Located and removed or destroyed enemy antitank and antipersonnel mines.
- (2) Reduced natural and manmade obstacles.
- (3) Constructed, repaired, maintained, and marked roads and trails.
- (4) Constructed fords, fixed bridges, and culverts.
- (5) Constructed and assisted in the improvement of command posts, artillery positions, and other installations.
- (6) Prepared and maintained landing strips.
- (7) Established and operated waterpoints
- (8) Provided engineer supply services.
- (9) Procured and distributed maps.
- (10) Collected and disseminated engineer intelligence.
- (11) Prepared and executed the engineer plan for the operation.

Among the salient features of the engineer part of the operation, some deserve special emphasis:

Prior planning is essential. Reconnaissance by every means must be pushed vigorously. Aerial photographs and flights are extremely valuable in preliminary planning and save much time and effort by guiding subsequent ground reconnaissance.

Proper allocation and utilization of the engineer effort available depends upon, and must be varied with, the enemy situation, terrain, and objective of the operation as a whole. There is never an excess of engineer effort available and the Division Engineer must insure that each element of the division receives the support it needs. In this operation most of the battalion was operated in general support, but both direct support and attachment were used in the places where they were appropriate. All the ability and experience of the battalion staff was utilized not only in the planning stage but also

throughout the operation, and specialized skills and equipment from all companies were concentrated where most needed.

Centralized, direct, and on-the-spot control in the western valley maintained steady and concentrated effort at the critical points, gave flexibility and the ability to take advantage quickly of unforeseen circumstances. The leap-frogging of Companies A, C, and D as successive spearheads of the engineer effort boosted morale by providing fresh troops at the fore and equalizing labor, sacrifice, and opportunity for achievement.

Liberal use of explosives in mine clearance was the only method, which would permit so rapid an advance, and the expense was fully justified by the elimination of personnel and equipment casualties.

Careful concealment of the progress made by the engineers in the final preparation for the breakthrough contributed to achieving surprise in the armored thrust on Mundung-ni.

Source: *Military Engineer*, Volume XLVI, no. 313, pp. 325-331. Reprinted by permission of the Society of American Military Engineers. Photographs have been replaced for clarity.