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Brigadier General (Ret.)
Hugh J. Casey

ENGINEER INGENUITY

A FADING ART?

by COL Don W. Barber

Any student of military history understands that war places great demands on the military engineer. In wars from antiquity to the 20th century, there are countless examples of engineer ingenuity turning the tide of battle.

Peacetime training, however, places little emphasis on engineer ingenuity and its precursor, reconnaissance. We must rekindle interest in ingenuity during training because the ability to improvise will certainly be a key factor on the next battlefield.

Ingenuity is more than mere technical expertise. It is the engineer leader's ability to assimilate data *and to use it creatively!* The scarcity of resources in combat has frequently driven engineers to ingenious solutions. Moreover, innovative use of locally available materials was the paramount factor in most engineer successes on past battlefields.

Such ingenuity, based on personal reconnaissance, was demonstrated during World War II by then-Colonel Emerson C. Itschner, engineer of the Advanced Section (ADSEC), Communications Zone, Europe.

On Aug. 12, 1944, Itschner took a mission of great importance and difficulty. General Patton, who had broken through the German lines and was racing towards Paris, needed fuel for his tanks and trucks. Itschner had to rebuild the railroad to LeMans in three days.

He faced an immense job. The rail line extended 137 miles, seven bridges were down, and three rail yards were heavily bombed. Few watering and coaling facilities remained. He had 75 hours to do a job requiring several months.

ADSEC's 10,500 engineer troops were scattered throughout Normandy. Itschner had to notify them, assign tasks, and deploy them between Folligny and LeMans.

But first came personal reconnaissance. Itschner flew over the rail net to select lines that could be quickly repaired. He ruled out the most

Captured German equipment is used by engineers of D Co., 332d Engineer Reg., to repair a railroad near Aldenhoven, Germany, during World War II.

direct route because bridges at Pontaubault and Laval were too damaged for quick repair. He decided to use the double-track between LaChapelle Athenaise and LeMans.

The bridge over the Selune River at St. Hilaire-du-Harcourt presented the worst obstacle. The Germans had blown the south end off its abutment. The 347th Engineer General Service (GS) Regiment cut off the damaged end, jacked up the bridge, and rested it on a crib. Men went without sleep so they could complete this task in three days.

When Major General Cecil R. Moore, chief engineer, ETO, flew over the bridge with Itschner six hours before deadline, he saw spelled out in white cement, "Will finish at 2000." And it was.

The first trainload of gasoline left Folligny Aug. 15 and reached LeMans two days later. Thirty trains carrying fuel for Patton followed at 30-minute intervals.

Meanwhile, another general service regiment began repairing bridges at Pontaubault and Laval. When completed by the end of August, they allowed opening a better line to LeMans. Itschner's troops helped speed along the gasoline required for Patton's armor to thrust across Northern France and shorten the European war.

While the LeMans railroad illustrates personal reconnaissance, it doesn't tell all about engineer ingenuity.

The American forces were critically short of bridge materials. In earlier reconnaissances, ADSEC engineers spotted quantities of German-produced meter beams. In an interview conducted by the Office of the Chief of Engineers, Itschner recalled how they were put to use:

All through Europe we found these big meter beams . . . We found other sized beams, too, but the meter beams were the mainstay of the Germans and they were all stamped with the name of a single steelmill—Hadir—located at Differdange, Luxembourg. So we determined right from the start if we ever got into Luxembourg, and we thought we would, we'd head right away for Differdange. And as soon as it was captured we had our people there, and lo and behold, the steelmill was intact. They were badly in need of rubber belts, and of course we didn't have any of them, but we found some others and replaced them, cannibalized and replaced them. But above all they needed manganese to mix with the ore. It was a steelmill located right at an iron mine and near sources of coke. So you had everything right there. We had our scouts out all over and fortunately they reported there was a large pile of manganese right on the west bank of the Rhine, at the time the Germans were on the east bank. So we sent our trucks up there at night and with some cover from our own forces we got the manganese that was needed and hauled it back.

Resources located through personal reconnaissance and used creatively compensated for critical material shortages. Fifty thousand tons of meter beams were produced after the United States took over production at Hadir, and over 90 percent of all railroad bridges built by engineers used them. Engineers throughout Europe used these meter beams to build bridges which permitted tactical operations that would have been impossible or delayed.

In *The Military Engineer*, Feb. 1943, Brigadier General Hugh J. Casey, listed the following attributes of a successful military engineer:

- initiative
- intelligence
- ability to reduce problems to fundamentals
- ability to see the big picture
- proper sense of balance
- commitment to the welfare of subordinates
- a sense of humor
- ability to improvise
- cooperation
- a reasonable degree of professional or technical knowledge
- composure
- continuous exercise of active reconnaissance

The following excerpts from Casey's article represent his experience as chief engineer, General Headquarters, Southwest Pacific Area. Casey knew the meaning of ingenuity:

A Military Engineer must have the ability to improvise. He will have to do his job with what is available on the spot. There is no corner hardware shop to get the supplies, or industrial establishment to turn out the tools that he needs for the job immediately ahead. He must do it with what is on hand. If hand grenades are not available, a cookie (most appetizing to serve) can be made from a piece of bamboo, a stick of

dynamite, some nails, mud, a cap and fuze with cellophane-wrapped match attached. A larger cookie with a piece of automobile spring for a catapult or with a bow and arrow arrangement made of discarded inner tubes may make a workable, even though less capable, substitute for lacking mortars. In the absence of tank mines, a tiny wooden coffin with ten pounds of dynamite, an electric cap, a flashlight battery with contacts operated by crushing in the top, secured by only sufficient brads to sustain a 400-pound load, will give reasonably satisfactory results. At least the tanks don't like it. The use of boiler plate properly emplaced will make a small cruiser out of a large-size rowboat. Piers and bridges can be built out of discarded gasoline drums. The job, no matter what it is, must be done with whatever is available. The Military Engineer will never say he can't do the job because he lacks the means.

The Military Engineer must continuously exercise Active Reconnaissance. He must reconnoiter the area in which he is engaged, evaluate the difficulties which may be encountered, and determine and know the engineering resources that are available in the operations area. He should know the condition of roads, bridges, railroads, and their potential sources of trouble. He should devise plans beforehand as to what he must, can, and will do to handle those problems. He should know where sources of timber, gravel, water, barbed wire fences, stocks of engineer tools, plants or supplies are available. Only by continuous reconnaissance will he remain a jump ahead of such problems and contingencies that will be continually arising.

The engineers are among the first ones in and the last ones out. The Military Engineer in time of war is rough, tough, and fast. His whole mental makeup and characteristics must be adjusted to that tempo if he is to accomplish his job.

All engineer leaders must be concerned about battlefield ingenuity. The ingredients are reconnaissance, assimilation of data, and improvisation. We train our soldiers in part of the ingenuity equation, but fall short in solving the whole problem.

For example, units in field training exercises frequently receive reconnaissance missions. But what happens to the data? Usually the reconnaissance form is evaluated and filed, not used for accomplishing a battlefield task. Locally available materials spotted during reconnaissance aren't used in a mission. In other words, we aren't fostering battlefield ingenuity.

There are many obstacles to creating a proper training environment—restraints on using locally available materials, prohibitions against cutting trees, training areas without usable materials, and environmental objections.

Many leaders also argue you can't teach ingenuity. That mentality is hogwash. It better be, because we'll need all our ingenuity in the next war.

Engineer leaders should be fostering an innovative spirit. If you have suggestions for improving officer or NCO training or if you tried something in your unit that may improve our curriculum, tell us. Write to USAES, DTAD, Fort Belvoir, Va. 22060. The Engineer School is incorporating the topic of ingenuity into instruction programs.

With military history as a beacon, we can foster a creative spirit by meeting challenges with enthusiasm and imagination. Between those of us at the Engineer School and each of you in the field, we can work together to bring ingenuity back to the forefront in combat engineering.

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ENGINEER SOLUTION

1. 5/Z/?/4.1/(OB)

   5-Minimum width encountered was 5 meters.

   Z-Route is type Z anytime a ford or ferry is encountered along a route.

   ?-Lowest Military Load Classification-No bridge along the route and the load classification along the worst section of the route is undetermined.

   4.1-Lowest overhead clearance was encountered at the railroad crossing, 4.1 meters.

   (OB)-Used if any obstructions were encountered, i.e., sharp curves, ferry ford, overhead clearance 4.3 meters, and traveled-way width of underpass.

2. Vehicle/Pedestrian
3. Difficult
4. 15 meters
5. Difficult
6. 6 meters
7. 1:12,500
8. No seasonal limitations
9. 11%
10. 30 minutes
11. Yes-overhead clearance is 4.3 meters
12. Tracked vehicle turn-off with coniferous concealment