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Front cover: 37th Brigade Engineer Battalion paratroopers clear a field landing strip during an airborne assault training exercise at Fort Bragg, North Carolina. Photo by Sergeant First Class Jonathan D. Hornby

Back cover: U.S. Army photos

DEPARTMENTS

FEATURES

Clear the Way

Brigadier General Mark C. Quander
98th Commandant, U.S. Army Engineer School

Hello to all of our engineers across the Regiment from the U.S. Army Engineer School (USAES)! Our Regiment continues to push initiatives across all fronts to ensure that we have the best training and the best equipment to enable our maneuver brothers and sisters throughout the entire range of military operations.

Significant leadership changes and refined focus have taken place within the Army. The U.S. Army Combined Arms Center (CAC), Fort Leavenworth, Kansas, bade farewell to Lieutenant General Michael Lundy, who retired in January 2020. Lieutenant General Lundy was a critical supporter of our efforts to aggressively pursue modernization within our Regiment, and his leadership will be greatly missed. Lieutenant General Lundy relinquished command to Lieutenant General James E. Rainey on 19 December 2019. Lieutenant General Rainey assumed command of CAC and will undoubtedly continue efforts to develop our leaders and modernize our force.

As the USAES Commandant, my priorities remain focused on leader development and modernization efforts. Our team continually assesses the entire Regiment through the lens of doctrine, organization, training, materiel, leadership and education, personnel, facilities, policy, and readiness. Challenges exist; but rest assured, we are constantly seeking innovative ways to overcome them.

It is imperative that we continue to recruit talent through all commissioning sources and develop our officers across our formations into highly technical and tactical leaders through institutional training, operational experience, and continual self-development and assessment. Our efforts in recruiting officers using knowledge, priorities, desired skills, and demonstrated behaviors proved highly successful during the accessions process in fiscal year 2020. Over the last several months, we have refined our institutional courses, incorporating additional rigor and a variety of holistic assessments aimed at comprehensive feedback mechanisms that will assist in further developing our leaders. We are currently looking at ways to develop and incorporate career-long assessments that will identify and define critical skills and competencies necessary for engineer officer career progression. This will help develop a more comprehensive assignment process and ensure that the right leaders are serving in the right positions. The desired end state is characterized by highly technical and tactical engineer officers capable of serving anywhere within the Regiment. This initiative is currently conceptual; we will continue to work with the CAC, the U.S. Army centers of excellence, and other schools to develop this program in the coming year.

Force modernization remains a priority as we focus on winning in large-scale combat operations and work toward solutions to win in a multidomain environment. Engineer leaders are pursuing efforts to implement the combat engineer company (approved 31 December 2019) into our formations, replace outdated M113 armored personnel carriers, and develop robust and capable bridging solutions focused on interoperability with our allies. Terrain-shaping operations are evolving with ever-changing battlefields.

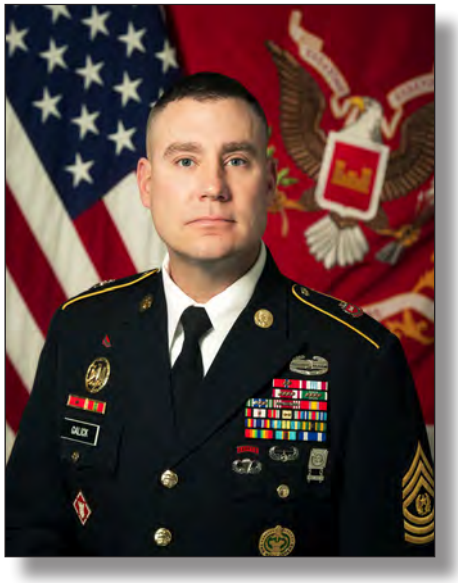
Our current administration recently rescinded the U.S. landmine policy[1] regarding antipersonnel landmines in favor of a new U.S. landmine policy overseen by the Department of Defense (DOD).[2] This change, which provides more options for our forces, states that "The DOD's new policy allows planning for, and use of, antipersonnel landmines in future potential conflicts, including outside the Korean Peninsula, while continuing to prohibit the operational use of any 'persistent' landmines (landmines without a self-destruct/self-deactivation function)."[3]

As we go to publication in April 2020, it seems appropriate to add a few thoughts on the Novel Coronavirus (COVID-19) crisis. Of course, there have been some changes here at USAES and there will certainly be more to come. Much of our military and civilian workforce is teleworking. Right now, we are still conducting training. Some courses, such as one-station unit training, advanced individual training, and the Engineer Basic Officer Leadership Course, are in full swing, while maintaining safety protocols. Most of the professional military education courses have been

(continued on page 15)

Lead the Way

Command Sergeant Major Douglas W. Galick
Regimental Command Sergeant Major



Greetings from the U.S. Army Engineer School (USAES)! As always, the past quarter has been very busy—and even more rewarding. I would like to recognize all the leaders of our Regiment who make us such a competent and successful enterprise. Without the contribution and tireless teamwork of our great Soldiers and civilians, we would not be able to continually reach new levels of excellence. Thank you very much from the entire USAES team!

Transition is a way of life in our business. I would like to bid farewell to Sergeant Major Corey B. Deibel and thank him for his service as the Engineer Professional Development Office Sergeant Major. His efforts cannot be overstated, and his impact will affect the Regiment for many years to come. We wish him and his amazing Family the best of luck as they transition to the 27th Engineer Battalion, Fort Bragg, North Carolina. I would also like to welcome Sergeant Major Eric T. Arredondo, who recently assumed the responsibility of leading the Engineer Professional Development Office. He and his wife came to Fort Leonard Wood from the 864th Engineer Battalion, Joint Base Lewis–McChord, Washington. We look forward to the experience and talent that he brings to USAES.

When I began serving in this position, the Commandant challenged me to integrate our noncommissioned officer (NCO) community into our modernization efforts. From that challenge, the "Modernize the Engineer NCO" effort was born. This effort has been centered on our most valuable resource—our people and, specifically, the backbone of our Regiment, the engineer NCO. The goal was to improve opportunities for individual leader professional development and continuing education for Soldiers willing to accept the challenge. Although we are not yet completely across the finish line, I am proud to say that we have more than tripled the number of NCOs enrolled in credentialing programs. In addition, we have partnered with several academic institutions to lower costs and expand accreditation opportunities for every single military occupational specialty in our Regiment. I would like to thank Master Sergeant Justin R. Payne and Master Sergeant Frank E. Batts Jr. for their hard work in making these things possible. We will continue to push forward and search for other opportunities to modernize our engineer NCOs. A smarter, more adaptive, more competent NCO will strengthen our formations and the Regiment.

After we welcomed the New Year, we started more closely examining our NCO and junior enlisted education programs for modernization opportunities. For example, we looked into incorporating the NCO common core competencies (NCO C3s) into our Senior Leader and Advanced Leader Courses and we added 55 additional hours to the curriculum in January 2020, requiring that students be prepared to train 6 days per week while attending those courses at Fort Leonard Wood, Missouri. These NCO C3s are closely aligned with our modernization efforts and will help establish a foundational base for advanced communication and problem-solving skills.

We are moving forward with an initiative to add rigor to our one-station unit training and advanced individual training. We are reviewing our Military Occupational Specialty 12B–Combat Engineer and 12C–Bridge Crewmember tasks and expect to gather information from the force to better identify what skills our Soldiers need when they arrive at their units. The process will be long and detailed, but we must not be complacent with regard to our entry-level training programs. Enhanced readiness is always the goal, and we ultimately want to improve the fitness, competence, and lethality of all of our engineer warriors.

I am thankful to have such an amazing team here at USAES and to be part of the best Regiment in the Army. The Engineer Regiment and all its wonderful people embody the belief that "winning matters" and that people are always first. I am proud to serve as the USAES Command Sergeant Major, and I look forward to assisting you in building a stronger Regiment in 2020. *Essayons.* We WILL Succeed!

Show the Way

Chief Warrant Officer Five Dean A. Registe
Regimental Chief Warrant Officer

Greetings from the U.S. Army Engineer School (USAES). We have been going through a learning process in the last quarter, and it hasn't stopped yet.

Our engineer warrant officer instructors are back at it again at Fort Leonard Wood, Missouri. USAES established two new engineer warrant officer basic courses and one Military Occupational Specialty (MOS) 120A–Construction Engineering Technician warrant officer advanced course. The great USAES team will continue to train, coach, and mentor our new warrant officers to put the most capable technicians in the field.

We have just implemented Assignment Interactive Module (AIM) 2.0. This is your opportunity to fully utilize AIM 2.0 to identify your unique knowledge, skills, and abilities. As we move forward, talent management will be the cornerstone of desired assignments. Please invest in yourself by providing a fully detailed resume, including job experience and descriptions. Commanders are looking for what sets you apart from other candidates—what you can bring to the table to enhance unit capability. Detailed resumes will result in better utilization of engineer warrant officers in engineer units. Ultimately, we want to create a stronger team to be an essential part of a successful unit.

It is too early to gather full metrics; however, one interesting result from AIM 2.0 is that Fort Leonard Wood was the least-desired assignment for Soldiers in MOSs 120A and 125D–Geospatial Engineering Technician warrant officers. I would like to take this opportunity to enlighten readers about the benefits of being assigned to the Home of the Engineer Regiment and giving back to the Regiment. The Maneuver Support Center of Excellence (MSCoE), Fort Leonard Wood, is where important decisions about the Regiment are made on a weekly basis. Being a part of that decision-making process is extremely satisfying, and understanding the direction of the Regiment is insightful. I also understand that the AIM 2.0 metrics may be misleading because most of the moving population is not eligible for a MSCoE assignment due to present rank/pay grade. If you ever have a chance to serve at USAES, don't pass it up; it is a great opportunity for professional and personal growth and career building.

The U.S. Army Warrant Officer Career College, Fort Rucker, Alabama, in conjunction with the Army University, Fort Leavenworth, Kansas, will redesign Warrant Officer Senior Service Education, addressing current doctrine and operational challenges faced by the Army's most senior warrant officers. This redesign will provide master level professional warrant officers with the perspective and skills required to serve as technical experts, leaders, managers, systems integrators, and advisors throughout the highest Army and joint forces organizational levels as part of unified land operations. The course, which will focus on the senior-level staff officer and leadership skills required to serve in chief warrant officer five positions at strategic levels, will be piloted in 2020; feedback from our engineer warrant officers is strongly encouraged.

There has been a slight uptick in submissions for warrant officer accessions for the Army National Guard and U.S. Army Reserve. This spike is evidence that our recruiting efforts are actually working. This doesn't mean that we are reaching our goals and can stop pushing. Engineer commanders and command sergeants major must look deep into their formations and analyze the talent they have so that they send the warrant officer cohort the best they have to compete in selection for MOSs 120A and 125D.

The most recent warrant officer accession board was unique because the limited-time MOS 120A pilot program began and MOS 12D–Divers and MOS 12C–Bridge Crewmembers were selected for the first time. This was so that we could provide an opportunity for all engineer noncommissioned officers to join the ranks of the warrant officer cohort. Congratulations to the warrant officer selectees for January 2020. This is a positive career change and an exciting time for all of you. The easy part is over; now, you wait for school. And the hard part—doing the job—will come after that. Commanders and their staffs will absolutely require the best from you.

We are the Engineer Regiment of the greatest Army on Earth. *Essayons*!

The Timeless Traits of an Army Engineer

By Colonel Marc F. Hoffmeister

The U.S. Army is currently undergoing the most comprehensive reform of its officer personnel systems since the *Officer Personnel Act of 1947*.[1] The intent of the reform is not just to make the system better, but to create a better system. The belief is that by better understanding the talent of our workforce and the talent needed for unit requirements, the Army can deliver the right officer, to the right assignment, at the right time, over time.

The Army Engineer Regiment has always embraced this philosophy and has always been at the forefront of change for our Army. We recognize the unique demands of technical and tactical talent that make us successful as a branch, and we aggressively recruit talent that covers the breadth of attributes essential to solving the maneuver commander's toughest problems. We also value the lessons of history.

As we move forward to implement the vision of the Chief of Staff of the Army, let's take a moment to reflect on our roots and realize that, despite incredible advances in technology and the anticipated demands of future multi-domain operations, what constitutes a successful military engineer really hasn't changed all that much. Let's take a cathartic look back on an article that first appeared in *The Military Engineer* (February 1943, Vol. 35, No. 208; reprinted with the permission of the Society of American Military Engineers), which was written by Brigadier General Hugh J. Casey.[2] Our current talent model of required knowledge, skills, and behaviors could easily have been authored by Brigadier General Casey back in 1943. So enjoy this "back to the future" look at what it takes to be an engineer, and embrace the timelessness of our mission. Some things—like the pearl of wisdom in the caption of the photograph on page 6—will never change: "Tanks are massive, requiring heavy bridges for their movement"—a challenge with which we continue to struggle today!

Endnotes:

[1]Public Law 381, *Officer Personnel Act of 1947*, Eightieth Congress, Washington, D.C., 1947.

[2]Hugh J. Casey, "Military Engineers in War," *The Military Engineer*, Vol., XXXV, No. 208, February 1943, pp. 57–62.

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The MILITARY ENGINEER

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Tanks are Massive, Requiring Heavy Bridges for Their Movement

Military Engineers in War

HUGH J. CASEY

Brigadier General, United States Army
Chief Engineer, Southwest Pacific Area

OUR Society publication is THE MILITARY ENGINEER. We members are Military Engineers or are interested in promoting the efficiency of the military engineering service. It seems appropriate at this time, in view of the thousands of Military Engineers now engaged in and continually joining our forces, to define and analyze the specifications for a Military Engineer and by critical introspection to X-ray ourselves to determine to what degree we meet these specifications.

As Engineers we accustom ourselves to ensuring and enforcing compliance with specifications and terms of any contract. It is essential, therefore, that we define and know that contract and do all humanly possible to meet its terms.

The characteristics and requirements for a Military Engineer given here are based on recent observations of our military engineering activities in the Philippines and in the Southwest Pacific Area. It is hoped that their enunciation may prove of some value to our Military Engineers already in the Service and the thousands of others who are joining our ranks.

Modern warfare is highly mechanized. It has placed even greater demands than ever on our Engineers. Engineers are required for the design, production, and upkeep of our tanks, planes, ordnance, and numerous other technical requirements of National Defense. Our planes are heavy and fast, requiring extensive airfields through all types of operations areas. Our tanks are massive, requiring heavy bridges for their movement. Our supply requirements run to astronomical totals, placing heavy demands on docks, railroads, roads, and all transportation arteries. A vast quantity of storage for these supplies is also needed. Shelter, water supply, and utilities must be furnished for our men and for hospitalization. Millions of copies of maps of all types must be produced and furnished to our military forces. The job of the Engineer is to provide all of these facilities *on time* with whatever limited forces, plant, and materials are available. To perform that task the Military Engineer must be an animal possessing the following general characteristics.

He must have ENERGY. He should have the ability to carry on continued hard physical effort, oftentimes with lack of sleep, and still remain mentally and physically active. He must have the ability to pick up quickly in relatively short periods of rest after a period of hard exhaustion. This means that our field engineers particularly, must be young, able to climb mountains and tramp through tropical swamp and jungle with heavy equipment, live in wet clothing, without exhaustion and undue lowering of resistance, and still carry on.

He must possess INITIATIVE. A Military Engineer without initiative can not perform his job. It is impossible for higher headquarters to assign to all lower echelons the many engineering tasks which must be performed. The Engineer in the field and on the job must be continually seeking out and executing those tasks essential to advance the whole show.

The Military Engineer should have IMAGINATION. This factor is very important. Our Engineer must have the ability to visualize a situation which has not yet happened, but which may occur, and out-

line plans and measures necessary to meet it. He must be able to put himself in the position of those whom he and his unit are to assist. He must visualize their needs and requirements. He must be able on occasion to detach himself from himself sufficiently to review critically his own operations instructions, plans, and directions in order to ensure that they are what are needed and that they are understandable and clear to those to whom directed. Instructions issued which may initially appear perfectly clear to himself with his full background of information on the particular situation, may not be sufficiently complete and understandable to those to whom issued. He should, therefore, be able to put himself in the position of the other man and critically review his possibly incomplete opus to check if it will be clearly understood by the man to whom directed. He should, in any case, have sufficient imagination to visualize the numerous problems and difficulties which may and will arise, and check that appropriate planning or procurement measures are being taken to meet these contingencies.

Field Engineers Must be Young and Physically Active

He should have INTELLIGENCE. He should be capable of quickly grasping a situation and be alert in his mental processes and reactions to determine promptly a reasonable solution and measures necessary to handle the problem.

Supply Requirements Place Heavy Demands on Transportation Facilities

He should be capable of reducing any problem to its BASIC FUNDAMENTALS. Too often the average individual becomes so enmeshed with the mass of detail pertaining to any problem that he loses sight of the two, three, or four basic fundamentals of that problem. He should exercise great care to determine what these basic fundamentals are and to stick to them.

He should be capable of SEEING THE BIG PICTURE. As our Commander-in-Chief has so aptly put it, he should not lose sight of the forest for the trees. His perspective should be such as to ensure a proper balance of effort commensurate with the real importance of each task. On a construction job it is not enough to see that every man is busily engaged. He should constantly review that construction job to determine the bottle-neck which is the control on total output and concentrate his energy on opening up that bottle-neck control for greater production results. When that bottle-neck has been cleared, he should determine the next controlling factor and concentrate on it until it in turn is cleared if maximum production is to be attained.

He should have a proper sense of BALANCE. He should not regard each man, problem, and piece of plant as a routine succession of items for equal consideration and treatment. He should appreciate, for example, that if a D-8 dozer can perform the output of 200 men, the care and nursing of that individual piece of plant merit a degree of consideration comparable to the thought applied to the care and handling of the equivalent 200 individuals, rather than as merely another single item to add to the 200 individual cases. Too often our engineers regard their plant, which, in the final analysis, may be the key to their productive capacity, as an inanimate something unworthy of their

keen personal interest. A marked difference in production results will be noted between those units where balanced consideration is given to the varying importance of the individual problems which constantly prevail.

The Military Engineer must LOOK AFTER HIS MEN. He must defend them against all others. He must look after their wants and requirements. He should give them the praise that is their due. He should exercise special effort to get them such food, comforts, and whatnot as can be procured. He should let them know that they are the best working outfit in the forces, in which case they will strain themselves to merit the confidence placed in them and perform a job of which we shall all be proud. Men will take any degree of driving from their officers and leaders if they in turn know that they and their interests are being taken care of by those in their charge.

Our Engineers, in addition to their normal engineer functions, may also be engaged in COMBAT. They represent a strong potential combat reserve which has been and will be utilized in critical phases of the operations. The situation is always critical when a commander has to pull his Engineers from their normal engineer mission into combat. A Military Engineer must, therefore, ensure that his men have been given a sufficient degree of combat training to give his men a reasonable chance for their lives, wholly aside from the fact that such training may represent the difference between success and defeat or failure.

The Engineer Must Have Ability to Carry on Continued Hard Physical Effort

The Military Engineer must be able to WORK. Just as nothing beats fun, so nothing takes the place of work. I repeat, nothing takes the place of WORK. There is always far more to be done than can be done within the time, with the forces, plant, and materials available. No Military Engineer can say at any time during an all-out war effort that he has nothing to do. He should have plans on tap for the utilization of his men for many jobs ahead. Whenever he and his unit are seen, outside of their limited rest periods, they should be seen actively at work. They should engender the thought in the commands of which they form a part that Engineers and Work are synonymous.

A Military Engineer must have a SENSE OF HUMOR; otherwise he is likely to go mad. Blunders are going to be made, confusion will be met and untold difficulties will be encountered. A major league batter who makes three successful hits out of ten times at bat, not to count the strikes called against him, is considered an excellent performer and big-league caliber. Perfection in any human field is not attainable. Errors will be made. Impossible, unintelligible, and conflicting orders will occasionally be received. Tough situations will be encountered. In such situations, the Military Engineer must not lose his sense of humor. A joke or laugh in a tight spot may save the day. A message to the President: "Please send us a new P-40 as ours is full of holes," relieved the nervous strain and tension in a tight situation. Similarly, a message to the Governor of California from Bataan, when it was learned that an enemy submarine had shelled a small dot on the thousand miles of California coastline, urging them to hold on until the BBB's* could send him aid, gave some hard pressed boys a pickup when they needed it most. A Military Engineer taut with nervous tension under difficulty is unqualified to perform his task. Turn that hang-dog expression in for one of good cheer. It will help both you and your men.

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 fuse 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 row boat. Piers and bridges can be built cut 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.

COOPERATION is another essential characteristic of the Military Engineer. He must be ready in every way to help our troops advance or hold. He should never fail to do any job required merely because it is the responsibility of someone else, if that someone else is not there. If other service elements are not forward at the site, the engineers should take on the job within the relative priority of importance of the various tasks to be performed.

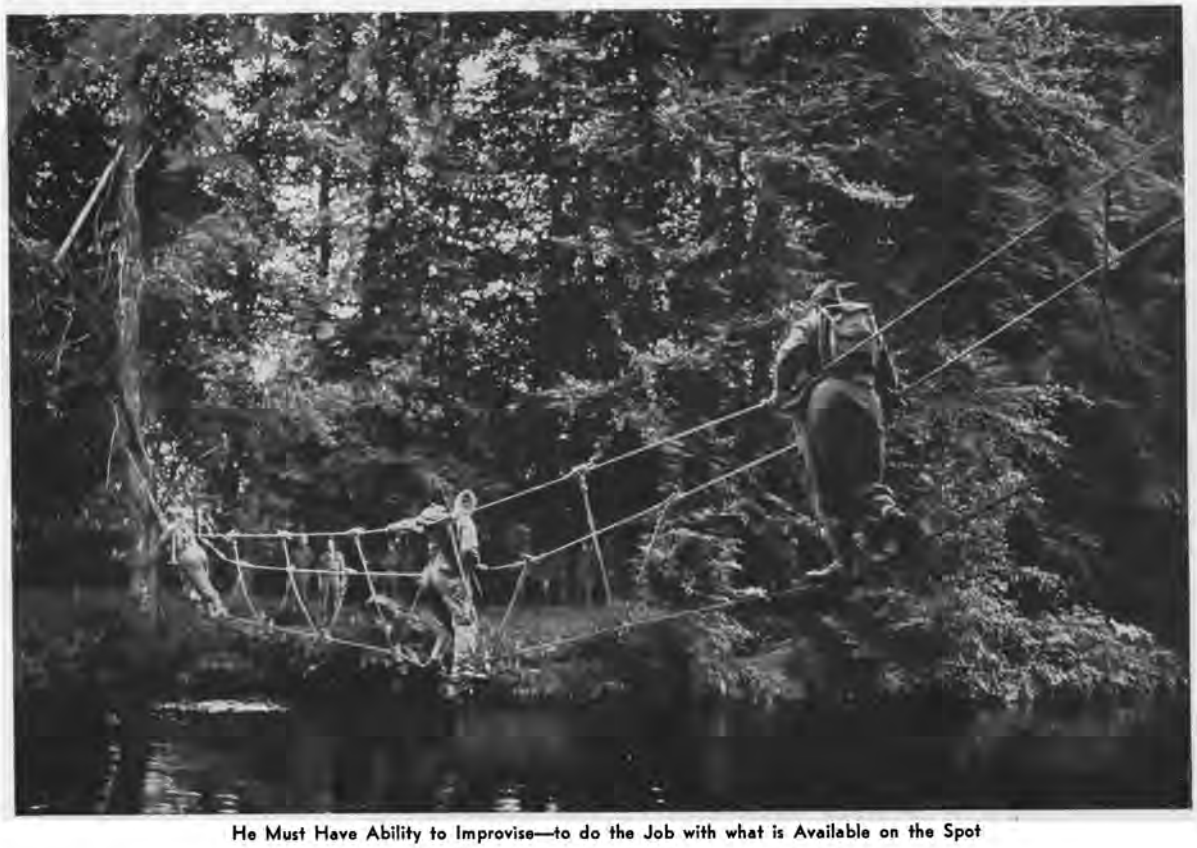
ADVANCE PLANNING is most important. A Mil-

*(Battling Bastards of Bataan.)

itary Engineer should never be caught with his "trousers drooping," (a more elegant expression for "pants down"). He should constantly be visualizing his future problems and requirements and making necessary provision therefor. His tools, plant, men, and materials should be provided or arranged for insofar as possible well in advance to ensure that they will be available at the point where needed, when needed. Relatively little effort expended on advance planning will save much effort and frantic confusion later in trying to procure the means which, if properly planned for in advance, would be already available. If these requirements have generally been adequately provided in advance, additional emergency needs will be relatively few and will actually receive more prompt and complete consideration with greater assurance of their being furnished than if they form part of a vast number being screeched for. The need for careful advance planning can not be overstressed.

The Military Engineer should be possessed of a reasonable degree of PROFESSIONAL OR TECHNICAL KNOWLEDGE. What is even more important, he should be currently and continuously improving himself in learning what he can from the various references and training literature available on the problems he is currently meeting. He should observe and profit not only from his own experience but also from that of others. He should exercise special pains to cull out the basic fundamentals of each subject rather than to overtax his mind with a vast accumulation of detail. He should, for example, with respect to the construction of a landing strip, appreciate that sufficient drainage must be provided around the island strip to prevent water entering the subgrade as well as to afford drainage relief to what water does get through. If, because of lack of drainage the subgrade to a landing strip is soup or mud, a surface layer of 6-inch steel would still sink and be incapable of supporting planes. He must also appreciate that a surface of such lateral strength must be provided as to distribute the 20-ton-per-square-foot impact of heavy bombers over such 10 or 20 square feet of area as would reduce the unit loading to one which the subgrade can support. As a final desirable element, a raincoat or seal coat which would prevent surface water from penetrating into the subgrade will further protect the strip from deterioration. These are the basic essentials which he should keep in mind. It is of course essential that he also know the limitations of slope and crown and degree of variation in longitudinal slope as dictated by the operating characteristics of our planes. In any case he should know where he can get this information in the limited reference texts that form his bible. Technical libraries are just out of reach.

His WORK SHOULD BE PLANNED. In the execution of the job he should make such quick preliminary investigations of soil, sources of materials, distance of haul, possible methods of construction, et cetera, as will ensure that the job will be done satisfactorily with a minimum of expenditure of time, labor, and plant. A source of material on a slope where a chinaman can be provided for quick gravity loading of trucks with material fed to the chinaman by a bulldozer will be far more effective than resorting to power shovel loading. A reasonable amount of effort given to the consideration and evaluation of the



He Must Have Ability to Improvise—to do the Job with what is Available on the Spot

He Must Have Intelligence to Grasp a Situation and Handle it Promptly

Here is shown a method of destroying a bridge against the invader in Bataan. Straw was piled on the bridge and later set on fire.

various possible methods of construction, and determination of the most efficient method, will effect a great savings in time as well as in physical effort on the part of his men and plant. Too often there is a loss of time and effort due to a failure to spend a day on planning the job. A few hours of proper planning may save many days of actual work.

A Military Engineer need not be a reckless hero but should display a moderate degree of COMPOSURE under enemy action. If he himself can not set such a standard, he can not expect his men to perform normally under enemy fire and bombing. In the final analysis, it should be relatively easier for an engineer to conduct himself normally under enemy fire. With an analytical mind and a knowledge of the theory of probability, he is in a better position to gauge the relatively slight chance he is taking and control himself accordingly. It is normal and human for individuals to fear enemy rifle and machine-gun fire and bombing activity. The engineer should appreciate, however, that it is most difficult for a bomber moving several hundred miles per hour at great height to drop its bomb at the exact spot at which the pilot or bombardier is aiming. We should also be aware that a bomber is not going to waste an expensive and important bomb on a single *homo sapiens,* irrespective of the high value and importance which we as individuals attach to ourselves. We should appreciate first, therefore, that that particular bomb is not out to get us individually. It is only the one marked "To Whom It May Concern" that we need worry about. If we assume that we occupy a square yard of space, we should appreciate that there are 3,097,599 other similar areas in the square mile surrounding us. If we buy a ticket for a lottery in which that number of tickets is sold, we assume we have tossed that dollar away, as we know we are not going to win. We should similarly feel that the bomb which is dropped into that area is not pointed in our direction and has an insignificant chance of hitting us. This does not mean, of course, that it is recommended safe practice to place oneself in the middle of an airfield when they are bombing a drome; but we should feel that there is a reasonable degree of security in a fox hole or on the ground, even though in the general proximity of the target area, and by our own composure we should be capable of engendering that same feeling in our men.

We should also appreciate the difficulties the average soldier or new recruit has in putting all of his bullets into a fixed bull's-eye at any moderate range even under conditions when he knows the exact range, the windage, and he is in a secure firing position, is merely shooting holes in paper, and with no one disturbing him other than an over-anxious sergeant or lieutenant. We, as Engineers, should, therefore, be able to evaluate the reduced chances of being hit when we are a moving, indistinct target at an unknown range being fired at by a wheezy, little yellow slant-eyed ..... (censorship prevents). We should also appreciate that only a small percentage of those engaged in any combat actually become casualties and that of that small percentage only a still smaller per-

centage die. In fact if you talk to yourself long enough on these lines, you can feel that war is a relatively safe proposition. But seriously, a full consideration of the probability phases of combat, insofar as fear of our permanent loss to the military establishment is concerned (wholly aside from the natural and selfish instinct for life, family, and the pursuit of happiness and other earthly comforts), can instill in the Military Engineer a degree of composure under fire which others may fail to understand. It will, in any case, be helpful toward adopting that attitude which the Military Engineer must have if his men are to carry on under him under all conditions that will have to be faced.

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 that operations area. He should know the condition of roads, bridges, and 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, plant or supplies are available. Only by continuing reconnaissance will he remain a jump ahead of such problems and contingencies that will be continually arising.

The Military Engineer who is full of "book larnin" but who lacks the personality, vigor, forcefulness, leadership, and driving energy to put that knowledge across will fail.

There is a time and place for everything. In permanent peacetime engineering, the construction of a large bridge, a dam, a power plant, or similar permanent massive structures merits and requires detailed and thorough planning to ensure the most economical and efficient structure. In time of war the relative importance of the various factors entering military construction varies. The most important criterion is to get the job done on time to a degree adequate to meet the requirements of the situation, even though temporarily, irrespective of cost. This does not mean that the cost factor is completely disregarded, as cost is but another measure of materials, plant, and labor which should, of course, be conserved to the greatest degree possible in order to execute a greater extent of work. It is important, however, that the Military Engineer appreciate that high cost or utilization of valuable materials, if such are the only ones available, which must be thrown into a job in order to get it done as and when required, or destruction of valuable installations which might otherwise fall into enemy hands, should at no time bar or handicap his operations. A Military Engineer should be prepared to throw in all of his resources of whatever nature in order to get whatever job is assigned to him done on time. An airfield not available on schedule to meet tactical requirements, or roads, bridges, or trails not provided in time to sustain an attack represent failures of the engineer mission. They must be provided in the face of any obstacle.

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 make-up and characteristics must be adjusted to that tempo if he is to accomplish his job.

He Must Have Professional and Technical Knowledge to Carry Out Large Construction Projects

Reflections on Battalion Command

Lieutenant Colonel Daniel J. Herlihy

This article captures lessons that I have learned from my experience as a brigade engineer battalion (BEB) commander in an airborne infantry brigade combat team (BCT). Some of the lessons are specific to BEBs, while others are not—and much of my thinking is reflective of the thoughts of my BCT and division commanders. Your mileage may vary. My key takeaways are as follows:

- **Understand your role.** For starters, you must understand your role as a BEB commander and know how you fit into the BCT fight. There are doctrinal explanations, of course; but based on my experience, the BEB exists for two key reasons:
  - To enable maneuver battalions to dominate the enemy at the point of decision.
  - To enhance the BCT commander's ability to perform mission command.

  The issue really is that simple. You are not—and probably never will be—the main effort. You exist to help the team win, mostly from down in the trenches and behind the scenes. So be it. Accept that, and find a way to contribute. You play a critically important role; but most of the time, it will not be glamorous.
- **Own your role.** Never point fingers. Never blame the previous commander. You are responsible. Own it from Day 1, and leave things better than you found them.
- **Execute mission command.** My BCT commander issued the following standing guidance to his battalion commanders:
  - Do what is right—legally, morally, and ethically.
  - Do what the BCT commander would want you to do.
  - Do what you want to do.
  - Follow these guidelines in the order presented.

  I provided the same guidance to my company commanders.
- **Command on offense.** Some commanders observe/coach their formations, while others lead. Army Regulation (AR) 600-20, *Army Command Policy*,[1] allows wide latitude to command—use it. Train your Soldiers,

37th BEB paratroopers provide support for the 82d Airborne Division Immediate Response Force mission.

and develop your leaders. Move to the point of friction, and solve problems. Make on-the-spot corrections. It is okay to stop training and immediately fix problems; you don't need to wait until the after action review to do that. If you don't fix things, who will?

- **Perform as a field grade commander.** Understand the intent of the commanding general and brigade commander, and then command on offense and execute! It's okay to ask for guidance; but if you ask for it, be prepared to receive it. Unless absolutely necessary, avoid asking questions that prompt your boss to make decisions that limit your freedom of action. When in doubt, attack!
- **Own your 1/7th.** Recognize that you are one of seven battalions (give or take) in the BCT. Don't consume more than your 1/7th share of bandwidth with the boss or the BCT staff. Your brigade commander knows that you will have serious incident reports, accidents, and inspector general complaints. Just own your square and command on offense. Your credibility and your diligence in doing routine things well buys freedom of action for you and your team. Don't worry about being "the best"; just work hard and strive for improvement.
- **See the "bigger picture."** Unit pride is great, but not everything is about your battalion. You exist to enable the success of the BCT. Yes, I said enable—it's okay.
- **Be a team player.** The most important intangible thing that you can cultivate throughout your formation is teamwork. Strive to be the ultimate team players across the BCT and other division BEBs. Be a good teammate—not just when it's easy, but especially when it hurts. Never be the source of the phone call that your peers or brigade staff members dread answering. Train your squads and platoons on their unique enabling skills, and then let them go. They should feel just as at home in their maneuver task forces as they do in their organic companies.
- **Use your rank and position for good.** Never underestimate your influence as a field grade commander on local agencies and institutions. A simple call or visit from you or the command sergeant major can often save subordinant leaders an unreasonable amount of time and frustration. Get involved, and engage!
- **Stay focused.** Identify the things that only you can do for your battalion, and focus your energy there first. Ask yourself the same questions that Lieutenant General Harold G. "Hal" Moore (Retired) was known for asking: "What am I doing that I should not be doing? And what am I not doing that I should be doing to influence the situation in my favor?"[2] Prioritize what you must do, and delegate the rest.
- **Incorporate your own style.** Be yourself. Don't overthink things. Our Soldiers tolerate imperfect leaders (news flash—that refers to all of us), but they don't tolerate phoniness. Just be you.
- **Use time wisely.** As a field grade commander, your most scarce resource is your time. Where and how you use your time sends the clearest message about your priorities. Establish a disciplined battle rhythm, and stick to it. You will never regret using time for battlefield circulation, and a leader's reconnaissance is never time wasted. Invest your time; don't spend it.

A sapper squad from Company A, 37th BEB, is poised to breach a wire obstacle.

- **Be present.** "Being there" is important, but only if you are the calm voice on the radio and the steady hand at the rudder. Never overreact to bad news or adversity. When it comes—and it will—your commanders and troops will look to you for reassurance. If you have a temper, find a way to mitigate or manage it. No one wants to work for a leader who can't manage his or her own emotions.
- **Manage talent.** It's difficult to overstate the impact of having the right (or wrong) leadership in your organization. There's no substitute for talent. It's your job to find it and recruit it—to make folks want to be on your team. It's not about poaching all the "good" officers/noncommissioned officers on the installation; it's about building a culture that attracts people.
- **Develop leaders.** I greatly underestimated how much time and effort I would need to personally apply in the area of leader development. After a few months in command, I drastically increased my investment in this arena. You and your command sergeant major are the two most experienced and intuitive tacticians in your formation; it is your job not only to lead, but also to teach.

  The following things should be considered:

  - □ Weekly leadership professional development sessions.
  - □ Professional reading.
  - □ Maintenance leadership professional development sessions.
  - □ Guest speakers.
  - □ *Mungadai*.
  - □ Leader certification.
  - □ Shadow programs.
  - □ Physical training sessions with target groups (platoon leaders, sergeants, senior leaders, officers, and staff).

  Double down on leader development now.
- **Stay ready.** Don't fixate on metrics and data; those things tell only part of the story. If your boss emphasizes metrics, then perform well enough to buy yourself maneuver space but don't compete for the purpose of coming in first. Stay focused on the important aspects, and accept that you will spend some time outside of the "band of excellence" no matter what the measurement.

- **Encourage participation in Soldier and Family readiness groups.** Leverage social media, but don't be lulled into a false sense of community. Social media serves as a great tool, but it is not akin to a readiness group and it will never replace real personal relationships—especially on a Family's toughest day. Make sure that commanders and junior leaders are engaged, and create opportunities to bring Soldiers and Families together. If you don't make Soldier and Family readiness groups a priority, they will suffer significantly.
- **Enforce discipline and standards.** The buck stops with you. If you know that the discussion will be uncomfortable, then the conversation is one that you must have; no one else will.
- **Maintain unit traditions.** Recognize that you and the command sergeant major are the keepers of many of the traditions that make our Army and our engineer culture special. I have been surprised to learn how few officers and noncommissioned officers have participated in a dining in, a prop blast, a spur ride, a right-arm night (an old Army tradition promoting camaraderie and esprit de corps), an engineer muster, skits, or a unit ball. Basic things such as hails and farewells require leader engagement, or they will perish. You must teach and show by doing.
- **Trust your gut.** You and your command sergeant major are the two most experienced leaders in your formation. Trust your instincts, and act on them! I can't think of a time when I regretted doing so, but I do occasionally regret dismissing a gut feeling.
- **Remember to have fun**: This may be the last opportunity that you have to command Soldiers, so enjoy it. Slow down, and savor the experience. Don't take yourself too seriously. Share some laughs and war stories. And remember that leading in our Army is an incredibly personal business; never pass on the opportunity for one-on-one engagement with your Soldiers.

Endnotes:

[1]AR 600-20, *Army Command Policy*, 6 November 2014.

[2]"We Were Soldiers: Lt. General Harold G. (Hal) Moore on Leadership (2007 AVC Conference)," American Veterans Veterans Center, 5 August 2008, <https://www.youtube.com/watch?v=PJo6YZTbPXg>, accessed on 27 February 2020.

Reference:

James Pat Work, *Reflections and Observations on Battalion Command*, 13 August 2013.

Lieutenant Colonel Herlihy serves at the XVIII Airborne Corps Headquarters, Fort Bragg, North Carolina. He commanded the 37th BEB (Eagle Battalion), 2d Brigade Combat Team, 82d Airborne Division, from December 2017 to November 2019. The Eagle Battalion provides airborne, joint forcible-entry engineering; communications; and chemical, biological, radiological, and nuclear capabilities to the 82d Airborne Division Immediate Response Force mission. He holds a master's degree in civil engineering from Missouri University of Science and Technology at Rolla.

("Clear the Way," continued from page 2)

converted to distance learning. The status of functional courses vary—some are being conducted with reduced loads, and some have been cancelled due to travel restrictions. Clearly, this situation will generate a backlog in the future; we are preparing for that challenge. Rest assured that all of the ongoing training is being conducted to standard and that our graduates will be fully trained and qualified.

Due to the current COVID-19 situation, the May–August 2020 issue of the Engineer professional bulletin will not be published this year. We plan to be back on track with the September–December 2020 issue. Articles previously submitted for publication, will be moved to the September–December issue. We are asking that leaders across the Regiment prepare articles that document actions taken by engineer units to support the COVID-19 fight and share lessons learned and best practices.

Please continue to communicate with USAES; send requests for information, share pertinent information, and provide regular situation reports. Best wishes to the entire Regiment as we all balance the execution of essential missions with our efforts to protect the health and readiness of the force.

In closing, I continue to observe our dedicated and loyal military and civilian engineers serving our Regiment with pride and distinction. It is truly incredible to see the efforts of so many professionals, both within the military and throughout the vast functionality of our U.S. Army Corps of Engineers mission—stateside and abroad—as they answer the call of our Nation's requirements. I could not be more proud of what each of you do every day across the globe.

Essayons . . . We will succeed.

Endnotes:

[1]U.S. Landmine Policy, U.S. Department of State Web site, 23 September 2014, <https://2009-2017.state.gov/t/pm/wra/c11735.html>, accessed on 19 March 2020.

[2]Vic Mercado, "Landmine Policy", DOD Web site, 31 January 2020,<https://www.defense.gov/Newsroom/Releases/Release/Article/2071692/landmine-policy/>, accessed on 19 March 2020.

[3]Ibid.

H2F Implementation in an Engineer Battalion

By Captain Steven J. Stanwick and Captain Kyleigh N. Harlow

The Army is heavily investing in people and the promise of lethality by exploring optimal medical practices, revamping the physical fitness evaluation, and transitioning to the Army Combat Fitness Test (ACFT). This sets the framework for a cultural shift in the way in which Soldiers maintain their physical bodies and the level of importance that leaders place on the process. As a result, the U.S. Army Forces Command is piloting the Holistic Health and Fitness Program (H2F), which places medical providers, strength and conditioning coaches, and additional resources in line units to address medical readiness and physical performance issues. This article outlines the embedding of multidisciplinary sports medicine professionals into the largest engineer battalion in the Regular Army and explores the challenges and successes in increasing medical readiness and maximizing physical fitness.

An H2F team consisting of Regular Army physical therapist and a registered dietitian (RD), a contracted athletic trainer, and two contracted strength and conditioning coaches has been embedded in the 19th Engineer (Seahorse) Battalion, Fort Knox, Kentucky. The goal is to improve medical deployability and task-specific physical performance—the Soldiers' physical ability to execute the mission. Upon arrival at the battalion, the H2F team rebranded itself as the Seahorse Performance Enhancement and Readiness (SPEAR) Team to generate unit-specific ownership and buy-in. Unlike with traditional medical models, these providers and coaches operate within the battalion foot-print and service only 19th Engineer Battalion Soldiers. The team conducts clinical work in the battalion area and regularly participates in range operations, training events, and unit functions. This allows the team to assess how Soldiers move, observe the effects of fatigue on body mechanics, determine how Soldiers fuel their bodies in a field environment, and evaluate the risk for injury.

Establishment of the Program

The SPEAR Team obtained office and training space in a company operations facility in the 19th Engineer Battalion. It then established a critical connection between the medical command network and the medical treatment facility, which required a coordinated effort between the battalion communications office, the installation network enterprise center, and the information management department at the medical treatment facility. This connection proved essential for providing consistent access to electronic health records. The team also acquired $60,000 to stock the facility with medical equipment. Performing healthcare functions outside of a traditional medical facility requires that safety and medical care standards meet those of a non-Category 500 building.[1] To meet these clinical requirements, the team developed a standard operating procedure addressing fire prevention, medical waste removal, and infection control.

Soldiers perform a sandbag push press during a SPEAR Team foundation class.

The integration of contract personnel into the SPEAR Team requires direct oversight by government personnel; therefore, the battalion appointed and trained a contract monitor, who ensures that the contractors are fulfilling their duties and sending monthly performance reports to a U.S. Army Forces Command contract officer's representative. Contractors are encouraged to attend and participate in unit training so that they can further understand the physical demands of their unit and to build rapport. However, they cannot deploy with the unit or stay overnight in the field.

Team Approach

A multidisciplinary approach is fundamental to the delivery of nonclinical services. Foundation classes comprise a series of progressed instruction on the fundamental skills, knowledge, and movements required for success in mission-essential tasks and the ACFT. The physical therapist begins the classes by leading Soldiers in mobility and stability drills during warm-ups tailored to support the workout. The strength and conditioning coaches lead most of the movement instruction phase, which is followed by a movement-related workout. Instruction on the deliberate execution of the power stance is followed by a progression of spinal-loading exercises such as the squat, deadlift, and press. This is followed by a cool-down period led by the physical therapist, who focuses on regional mobility. An RD concludes the class with instruction on basic nutritional principles and offers Soldiers practical recommendations for use at dining facilities, in the barracks, or at home with their Families.

Physical Fitness

The multidisciplinary approach is integral to the SPEAR concept due to the symbiotic nature of physical fitness, injury control, and performance nutrition. However, the SPEAR Team also offers individualized services outside of the multidisciplinary effort. The strength and conditioning coaches counsel unit fitness and senior company leaders on physical training (PT) programs. The coaches provide advice on ways to train the multiple components of fitness required for success with the ACFT and discourage training methodologies that focus solely on muscular endurance and aerobic endurance, which were commonly used in preparation for the previous Army Physical Fitness Test. The counseling provided is tailored to the unit's training resources and the physical requirements of the mission-essential tasks.

The strength coaches rotate through companies, spending a week leading PT sessions. During this time, company Soldiers train in less-emphasized areas of fitness, such as speed, agility, anaerobic endurance, muscular strength, and power. Soldiers can then follow a progression period of PT sessions on the Train Heroic® smartphone application. This application allows users to participate as a unit or perform personalized workouts designed to meet their individual fitness goals. The application, which is customized based

Soldiers load a civilian strength and conditioning coach onto a litter as part of a simulated casualty evacuation drill.

on the equipment available in company training areas, is designed to be followed until the company's next week with the coaches. It addresses areas of improvement for specific components of fitness.

The coaches also offer optional open-gymnasium time during lunch periods, when Soldiers can complete predesigned workouts utilizing the ACFT equipment in the battalion gymnasium. They familiarize themselves with the testing equipment, receive additional tips from the coaches, and work on problem areas. Through these initiatives, Soldiers increase their confidence and ability in weight lifting, conditioning, completing the ACFT, and meeting the physical requirements of their mission-essential tasks.

Some challenges in the implementation of the strength and conditioning program have been encountered. The 19th Engineer Battalion is made up of more than 1,000 Soldiers in seven companies—one of which is geographically separated and is located at Fort Campbell, Kentucky. In spite of the weekly company rotations through the coach-led PT sessions, it is still 6–8 weeks before any particular company cycles through again. One strategy that has been used to mitigate the low coach-to-Soldier ratio is the training of Soldiers to become tactical strength and conditioning facilitators, who are certified through the National Strength and Conditioning Association® and can act as extenders of the SPEAR Team, leading their formations in all aspects of physical fitness, performance nutrition, and injury control in the absence of core SPEAR Team members.

Injury Control

Injury control of the H2F Team personnel include the physical therapist and the athletic trainer. Their work is divided into clinical and non-clinical encounters. Clinical work consists of the evaluation and treatment of musculoskeletal injuries. With the traditional medical model, Soldiers see their primary care manager before being referred to physical therapy—a process that can take 3–4 weeks, depending on appointment availability at the medical treatment facility. But having providers within the battalion means that Soldiers can see the physical therapist without a referral and wait time is decreased to less than 1 week. That decrease in time often results in a better medical outcome and a quicker return to duty.

Nonclinical encounters with the physical therapist or athletic trainer are focused on injury prevention. These personnel teach various classes that include mobility drills, recovery basics, and load carriage principles. The athletic trainer performs an injury screening and movement analysis for all incoming Soldiers in order to identify individuals who are at risk for musculoskeletal injuries and to initiate interventions to mitigate that risk. Soldiers complete a questionnaire and then participate in a movement assessment. Those with movement deficiencies are taught how to perform corrective exercises. Similarly, those with a history of unrecovered injuries or who experience pain during movement are referred to the physical therapist for a more thorough evaluation.

Injury control personnel are also heavily involved in profile management and review. The current profile system is being updated to reflect a Soldier's ability to participate in the ACFT. The physical therapist completes updates to reflect the physical restrictions that limit Soldiers during ACFT testing. All battalion medical providers are also involved in monthly profile review boards and communicate with command teams on a regular basis to update them on their Soldiers' physical capabilities.

Direct-access medical care in the battalion footprint and regular participation in the strength and conditioning PT sessions have been critical to the success of injury control. While the coaches lead conditioning, the physical therapist can further analyze movement patterns of fatigued Soldiers and offer on-the-spot corrections during training as well as injury mitigation strategies after training.

One challenge has been the integration of a clinical schedule into the unit's pre-existing battle rhythm. In order to remain flexible in spite of training and mission demands, the clinic schedule is maintained on a rolling 1–2-week availability. Additionally, acquisition of the equipment necessary to furnish the rehabilitation clinic proved time-consuming and challenging. Equipment was ordered through a coordinated effort between the battalion S-4 (logistics), the brigade S-8 (finance), the medical treatment facility, and the U.S. Army Mission and Installation Contracting Command.

Performance Nutrition

An RD is an expert in both healthcare and sports performance nutrition. Unlike nutritionists, RDs are required to pass a national registration examination and meet specific academic and supervised practice requirements.

As with injury control providers, RDs' time is split into clinical and nonclinical encounters. Clinical encounters include providing one-on-one medical nutrition therapy to Soldiers with chronic diet-related diseases or eating disorders. Maintaining a clinic schedule with a 1–2-week rolling availability, Soldiers can receive direct care within the battalion footprint. Nonclinical RD encounters include tactical/sports performance nutrition counseling and weight management counseling in individual and group settings. The RD prepares Soldiers for austere food environments, teaches ration optimization for field training and school situations, caffeine dosing for sustained operations, and safe and effective dietary supplement use. Many Soldiers compete in recreational- to professional-level sports, and RDs can assist in tailoring their intensive sports nutrition prescriptions to the often less-than-ideal environments of the Army. For example, they may balance the increased caloric requirement of a marathon training program with an upcoming field exercise.

The SPEAR Team RD altered the battalion Army Body Composition Program (ABCP) to focus on prevention. Soldiers flagged as ABCP failures and those within 3 percent of failing the tape test are required to attend an ABCP class on nutrition basics such as calorie balance, macro- and micronutrients, and hormone regulation. The RD measures a Soldier's body composition at a resting metabolic rate via research-grade bioelectrical impedance analysis to formulate a nutrition prescription and behavior change plan. Soldiers meet with the RD on a weekly basis for assistance with meal plans and help in adjusting for upcoming events that will affect their food environment, such as training exercises, holidays, or leave time. Soldiers are required to continue in the program until removed from ABCP but may opt to continue beyond program removal until all wellness goals are met.

Finally, the RD maintains a presence on installation working groups related to the nutrition environment. The SPEAR Team RD has recently been working with the installation Logistics Readiness Center and the food program manager to implement menu standards at the dining facility that services the 19th Engineer Battalion Soldiers in order to serve higher-quality foods and more-nutritionally balanced meals. By improving nutrition, Soldiers are better fueled for both physical and mental performance, more quickly able to return to duty following injuries, and better equipped with the tools to maintain a Soldierly appearance throughout their military careers.

Conclusion

After 1 year, results of the H2F pilot have been promising, with a 45 percent reduction in nondeployable Soldiers due to musculoskeletal injuries, a 26 percent reduction in ABCP enrollment, and nearly a 20 percent increase in ACFT pass rates. Synchronization with all battalions and buy-in from command teams at company and battalion levels are critical to program success. The H2F Program has been proposed to be fielded to brigades across the U.S. Army Forces Command and the U.S. Army Training and Doctrine Command to improve the health and fitness culture and readiness of the Army over the next several years.

Endnote:

[1]*Brigade Physical Therapy Guide,* Appendix K, U.S. Army Medical Command, January 2016.

Captain Stanwick is a SPEAR Team physical therapist for the 19th Engineer Battalion. He holds a bachelor's degree in kinesiology from Michigan State University, East Lansing; a doctorate degree in physical therapy from the Army–Baylor Doctoral of Physical Therapy Program, Joint Base San Antonio, Texas. He is a board-certified clinical specialist in orthopedic physical therapy and a certified strength and conditioning specialist.

Captain Harlow is a performance dietitian and SPEAR Team coordinator for the 19th Engineer Battalion. She holds a bachelor's degree in dietetics from Kansas State University, Manhattan, and a master's degree in nutrition sciences from Baylor University, Waco, Texas.

Engineers in the Maneuver Support, Sustainment, and Protection Integration Experiment

By Mr. Dennis G. Hutchinson and Mr. Curtis R. Ratliff Jr.

From 23 April through 9 May 2019, Fort Leonard Wood, Missouri, hosted Maneuver Support, Sustainment, and Protection Integration Experiment (MSSPIX) 19, which was a collaborative effort between the Maneuver Support Battle Laboratory, Fort Leonard Wood, and the Sustainment Battle Laboratory, Fort Lee, Virginia. For 2 weeks, a team of Soldiers, Army civilians, and contractors subjected technologies from Army laboratories and private-sector organizations to a series of trials in an operationally relevant environment and collected data to assess operational utility. While MSSPIX 19 included technologies addressing maneuver support, sustainment, and protection, this article concentrates on technologies employed by engineer Soldiers.

Activities for MSSPIX 19 started with a call for technologies in November 2017. This call went out through Army distribution channels and on what was then known as the *Federal Business Opportunities* Web site.[1] The call identified capabilities desired for inclusion in the experiment and prescribed the proposal process. After the closing date for proposals passed, the focus shifted to technology selection. In order to be selected, a technology needed a sponsor from the Maneuver Support Battle Laboratory or Sustainment Center of Excellence. To be a sponsor, an organizational representative was required to show interest in the technology, identify what was to be learned, and specify how the learning would be applied.

The planning phase was next. During this phase—

- Vignettes to execute the technologies were developed.
- Required clearances were obtained.
- Experiment and analysis plans were created.
- Soldier support was requested.

Following the planning, the experiment was executed in April 2019.

A squad of engineer Soldiers from the 5th Engineer Battalion, 36th Engineer Brigade, Fort Leonard Wood, wore physiological status monitors (PSMs) while employing two breaching systems. The PSM, which is worn much like a watch on the wrist of the Soldier, monitors the location, heart rate, and body temperature of the Soldier. The information gathered was digitally transmitted to the PSM leaderboard in the tactical operations center, where leaders could monitor the physiological status of the Soldiers. The PSMs and PSM leaderboard were provided by the U.S. Army Combat Capabilities Development Command Soldier Center, Natick, Massachusetts, with the intent of supplying input for modernization efforts at the Soldier Support Institute, Fort Jackson, South Carolina. The same squad also employed a Bandolier© provided by Critical Solutions International Inc. The Bandolier is a modular explosive breaching system with numerous employment capabilities including wire obstacle reduction, cache reduction, wood/timber cutting, and more. Prior to use, all Soldiers received training on the Bandolier. Upon displaying proficiency with the technology, squad members transitioned to the

A Soldier performs final checks of the Bandolier.

Soldiers use the D7R-II bulldozer to conduct earthmoving operations

demolition range, where they ran through breaching vignettes using the Bandolier to breach a simulated minefield and triple-standard concertina wire obstacle. Finally, the squad also employed a thermal erosion cutting torch provided by Combined Systems, Inc. The thermal erosion cutting torch is a lightweight, self-contained, handheld tool designed for use by Soldiers for expedient breaching under any conditions. The cartridges contain a unique thermite formulation, resulting in maximum temperature and velocity for optimized cutting performance. The cutting jet burns at temperatures greater than 4,000° F. The cartridges are designed to safely contain the thermal energy and intense pressure within inches of the operator's hand. After being trained on the technology, the Soldiers spent a day cutting through various targets including steel plates, locks, and chains, which were included in the vignettes.

Another squad from the 5th Engineer Battalion employed two route clearance technologies. The Combat Capabilities Development Command Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance, and Reconnaissance Center Night Vision and Electronic Sensors Directorate provided a Slash, which is a vehicle- or mine-roller-mounted improvised explosive device (IED) detection system used to clear vulnerable points in all types of weather conditions. The system, which mounts to a vehicle or mine roller using a universal mounting bracket, detects IED components associated with victim-operated and command-initiated IEDs. The system enables the rapid clearing of vulnerable points or danger areas, as described in Army Techniques Publication (ATP) 3-21.8, *Infantry Platoon and Squad*.[2] Training routes—complete with theater-specific IED training aids—were set up in Training Area 190. After 4 hours of training on the Slash, the Soldiers negotiated the training lanes and achieved a significant detection rate with minimal assistance or guidance from the instructor. The second route clearance technology employed was a Xap® (pronounced "zap"), which was provided by Critical Solutions International Inc. Xap is a counter-IED vehicle payload that employs controlled electrostatic discharge to enable explosive clearance and remediation teams to reliably mitigate electrically initiated IED systems, disrupt remote triggers, and even neutralize threats through blasting cap neutralization or controlled detonation. When configured with the vehicle standoff platform, Xap acts as a mitigation system that targets entire threat systems—unlike a pressure-based mitigation system that targets threat triggers and can easily be undermined by offsetting the explosive charge. After training on the technology, the squad employed Xap on the

The Slash system mounted on a tactical vehicle

Soldiers using the Skorpion

same training routes on which the Slash had been emplaced and achieved an impressive location/rendered-safe rate.

A team of vertical-construction engineers was tasked with the remote operation of a D7R-II bulldozer provided by Caterpillar® Defense. This bulldozer was a modified with an electrohydraulic retrofit kit and the AutoCarry™ semi-autonomous *blasé* control, which allowed the bulldozer to be remotely operated by a Soldier. The team spent 2 weeks learning how to operate the D7R-II before putting it through a series of trials. With the assistance of a senior noncommissioned officer who was on a Training With Industry assignment with Caterpillar Defense, the vertical-construction team conducted multiple bulldozer tasks including minefield breaching, tank-ditch reduction, rubble removal, and various digging tasks.

Engineer Soldiers also employed the MV-4D Skorpion, which was provided by Critical Solutions International Inc. The MV-4D is a remotely operated tracked platform with front and rear multirole tool attachments and is capable of performing a full range of assured mobility functions. The resistance of the system to small arms and blast effects allows for remote employment in high-threat environments. Digging and lifting power offer detection of deeply buried IEDs, as well as rapid obstacle emplacement and reduction. The MV-4D is well-suited for rapid deployment to areas where traditional, single-role engineering systems are restricted.

A final technology employed by engineer Soldiers was the modular protective system overhead cover provided by the U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. The protective system overhead cover is part of a family of lightweight modular systems with portable components that can be constructed without special tools or equipment. The protective system overhead cover is designed to protect critical structures from indirect fire.

Figure 1 portrays the annual rhythm for the planning and execution of MSSPIX. Planning for MSSPIX 20 is currently underway. Due to a directed change, the execution window for MSSPIX 20 has shifted from April 2020 to September 2020. Maneuver support and protection capabilities will be assessed at Fort Leonard Wood; sustainment

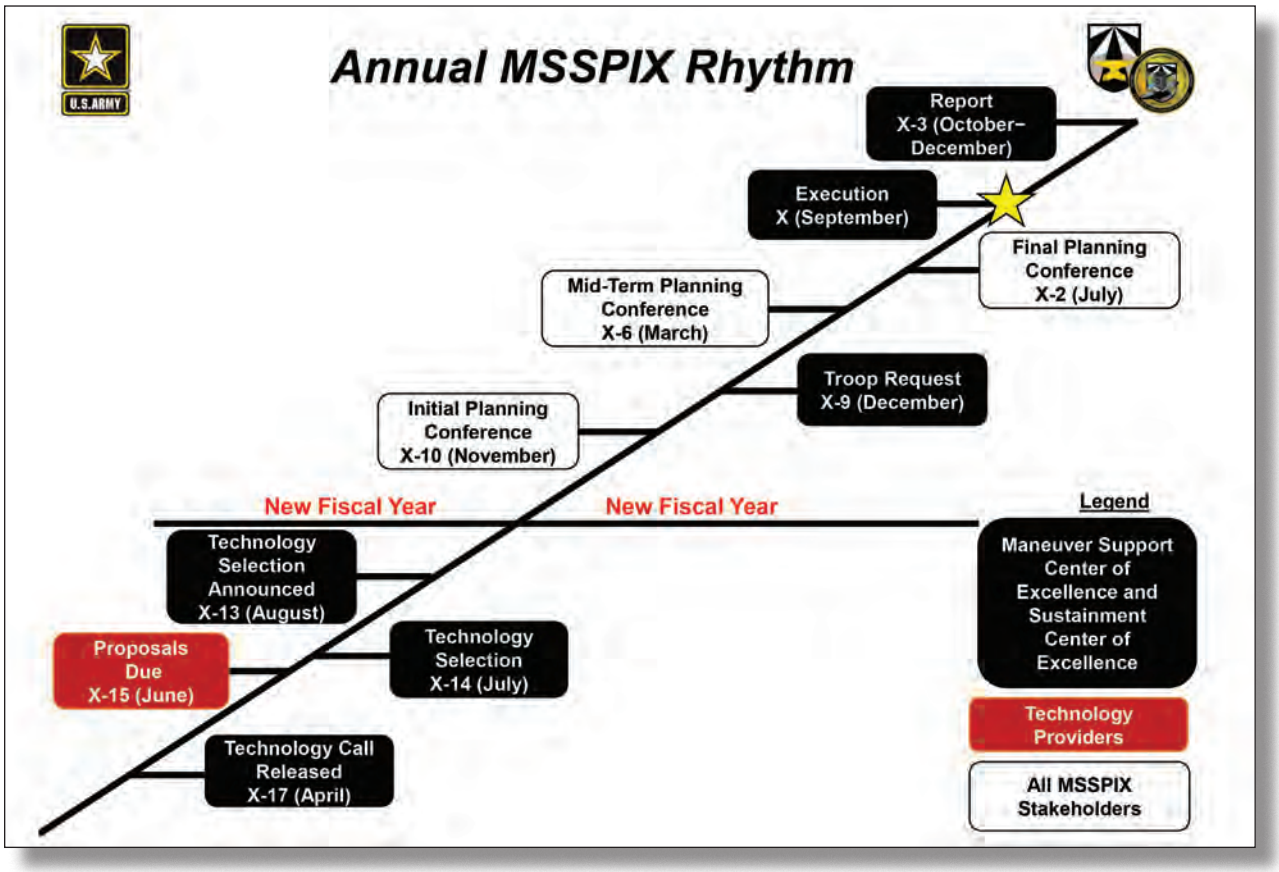


Figure 1. Annual MSSPIX rhythm

Left: The Skorpion towing the MICLIC into position

Below: The Xap clearing a training lane

capabilities will be concurrently assessed at Fort Lee, Virginia. There are 20 technologies currently scheduled for assessment in MSSPIX 20. To the greatest extent possible, the Maneuver Support Battle Laboratory and the Sustainment Battle Laboratory will continue to strive to accept late proposals for MSSPIX 20; however, perhaps the greatest constraint is ensuring that sufficient numbers of Soldiers with the correct ranks and military occupation specialties have been requested. If you know of a technology that you believe might be advantageous to our Soldiers but isn't currently fielded, please contact the MSSPIX team at <usarmy .leonardwood.mscoe.mbx.msspix@mail.mil>.

The technology call for MSSPIX 21 is scheduled to be posted to the Contract Opportunities Web site at <https://beta.sam.gov/> February–May 2020. If you are a Department of Defense employee and would like a copy of the MSSPIX 19 report, please submit a request to <usarmy.leonardwood.mscoe.mbx.msspix@mail.mil>.

Endnotes:

[1]The *Federal Business Opportunities* Web site, which was available in November 2017, is now known as "Contract Opportunities" and is available at <https://beta.sam.gov/>, accessed on 11 December 2019.

[2]ATP 3-21.8, *Infantry Platoon and Squad*, 12 April 2016.

Mr. Hutchinson is a capability development experimentation analyst for the Maneuver Support Battle Laboratory, Fort Leonard Wood. He holds a bachelor's degree in business administration from Columbia College, Missouri; a master's of business administration degree from Webster University; and a master's degree in project management from Western Carolina University, Cullowhee, North Carolina.

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By Captain Adam J. Leemans

As I looked forward to transitioning from the Regular Army, I desired a position in which I could hone my technical skills before entering the civilian job market. I found an incredible opportunity with the U.S. Army Corps of Engineers (USACE), working in the Army Career Skills Program and serving as the project engineer on a $400-million section of the new border barrier in Arizona. In just a few months, I helped establish a new resident office and guided the project from inception through completion of the first few miles of new barrier. It was a once-in-a-lifetime opportunity.

Setting up the resident office proved much less ceremonial than I had imagined. As the first USACE employee on-site, I met with the contracted quality control manager, who showed me our trailer and provided me with a key. As I hung an engineer castle above my desk and sent in the first daily report, the Douglas Resident Office was established. It was another week before I really figured out we how would operate the office, when we should meet with the contractor, what the roles and responsibilities of those involved were, and how we should manage the contract.

From the start, the office employed a resident engineer, a construction representative, and me. However, the resident engineer was tasked to oversee another section of the border, leaving the construction representative and me to represent the federal government on the megaproject.

The pace of work was slow at first; contractors were still mobilizing, bringing in equipment and personnel from across the country. First, they set up a concrete batch plant and began bringing in the fabrication equipment. They were setting up what would be a factory next to the border. This factory would take in steel tubes, rebar, and plates and churn out 30-foot-long steel barrier panels. As I reviewed the shop drawings with the construction representative, two things became abundantly clear: After 7 years in the Army, I would need to brush up on how to read technical drawings and teach the construction representative how to read shop drawings.

The construction representative had joined USACE a year earlier, after having served as a U.S. Marine combat engineer. He had never received formal engineering schooling; however, he was extremely bright and eager to learn. Showing him how to interpret welding symbols reminded me of when I instructed the Engineer Basic Officer Leadership Course at Fort Leonard Wood, Missouri.

Much of what I needed to know, I had not learned while obtaining my undergraduate degree. I needed to learn the intricacies of concrete mix designs and how to mitigate the

effects of high-alkali silica reactivity in aggregate. I also needed to learn how to check the consolidation of grout and how to perform compressive tests on grout cubes. Finally, I needed to learn about confined aquifers and how drawing from a well in one part of a valley could impact other wells. While I might not have learned these things while studying mechanical engineering at college, the same fundamental engineering logic and methodologies applied.

While I was brushing up on the American Society for Testing and Materials International© manuals and teaching the construction representative, I was being mentored by the resident engineer. Even though he was hundreds of miles away, he educated me about how USACE operated. It quickly became apparent that environmental concerns would be a major risk factor for the section of the barrier that I was overseeing. We were building in an area that crosses a national memorial, a national conservation area, two national wildlife refuges, and a major flowing river. My first real challenge was aiding in deconflicting the construction of a temporary bypass across a stream near the international boundary. The bypass was needed because the existing bridge could not support the weight of the construction equipment. The stream, which exited a national wildlife refuge, was identified as a critical habitat for several endangered species. U.S. Fish and Wildlife Service representatives were concerned that the temporary structure would negatively impact the water quality, aquatic habitat, and endangered species. The resident engineer coached me on interacting with the numerous stakeholders through the USACE project delivery team. I needed to work with the USACE project delivery team environmental technical specialist and U.S. Customs and Border Protection to coordinate with resource agencies and manage their expectations while completing the project. Ultimately, Customs and Border Protection contracted for a team of qualified biologists to conduct species surveys, place exclusionary netting, and relocate species from the construction site to areas identified by the biologists and the U.S. Fish and Wildlife Service. Following the coordination effort, building the actual barrier seemed like a breeze.

Once the contractors started constructing the barrier, the pace of work quickly increased. Luckily, there was an addition to my team. While this addition was officially a field assistant, I would transform him into another construction representative. He worked for USACE as an intern, inspecting field work during the day, and was working on completing an online degree in construction management at night. First, he performed quality assurance inspections on clearing and grub work (root removal), ensuring that the contractors stayed within the Roosevelt Reservation—a 60-foot-wide easement along the border of Mexico—and did not damage any protected plants.[1] Next, he oversaw the removal of

Old barrier section

First new fence section

existing vehicle barriers. In some places, the barriers consisted of old railroad tracks welded together and, in other places, of steel posts with concrete footers. Regardless of the makeup, the barriers could stop only vehicles; pedestrians could pass over them with little or no effort.

The next step was creating the foundation for the new barrier. Contractors dug a trench, with the depth being set by the soil conditions and the need to prevent tunneling under the system. The newly converted construction representative made certain that the trench was deep enough and wide enough and ensured that rebar was correctly placed. Finally, he observed the placement of the 10,000-pound barrier panels. There was a tight tolerance in the spacing of the panels, as they were set and encased in concrete. With every panel set, the project was 8 feet closer to completion. Once the contractors found their rhythm, the job was extremely repetitive—until it wasn't.

We knew that the location of the barrier construction along the border could impact the productivity of the crews; however, safety takes precedence over construction operations. Customs and Border Protection responses to drug-smuggling activity, human trafficking, or illegal attempts to cross the border could potentially impact our crews on any given day. Bad weather could also be expected to cause delays. While the American Southwest is known for its sun, we lost more than a few days of production due to rain. Precipitation turned the dirt roads into mud traps. Lightning was an even more dangerous factor; it was difficult to tell who was more afraid of it—the welders fabricating the steel panels or the workers installing the 30-foot-high panels on the border. Safety was taken seriously; safety concerns quickly stopped work.

I was somewhat surprised at the importance with which the contractors viewed safety and quality. Representing a multibillion-dollar company, the contractors fully understood the value of safety. Safety briefings were presented to every crew member every day, and workers were the ones who led the discussions. As a team, they discussed safety issues and talked about how to improve their work areas. This mentality was carried throughout the company. I attended a partnering event that included the president

". . . I helped stand up a new resident office and guided the project from inception through completion of the first few miles of new barrier. It was a once-in-a-lifetime opportunity."

of the contracting firm and senior USACE leadership; the day began with a safety discussion and the ambitious goal of breaking their own record of number of work hours without losing work time. What impressed me the most about this company was its size, depth, and expertise. To assess panel production, the company brought in a subsidiary team with decades of experience in welding. The team identified overlooked safety and quality issues and corrected them. A concrete team determined final concrete mixtures to mitigate concrete issues while maintaining low water requirements. The concrete team members had more than 100 years of combined experience. Interacting daily with these veterans of construction taught me much more about the industry than I could have ever learned in any classroom.

I realized that, while the field work progressed, no matter where I went, I could not escape the inevitability of

Inspecting welds on a fence panel

office work. The project was a design-build project, with the contracting company submitting the designs to USACE for approval. As the only government engineer who was physically on-site, it was my responsibility to make sure that what looked good on paper matched the real-world situation. I was also required to work through progress payments. I negotiated with the contractor regarding the percentage of a particular activity to be paid. While 1 percent one way or another may not seem significant, 1 percent can make a big difference on payments of tens of millions of dollars. The work reported in the construction representative's daily quality assurance reports guided the payment negotiations. I reviewed those reports to make sure that they contained sufficient detail to justify the percentage awarded in a payment. I also used the reports as a developmental tool, directing the construction representatives to record the concrete mixtures used, which led to a discussion about why knowing the mixtures used is important for the project records. I gave the construction representatives homework assignments to read particular American Society for Testing and Materials International documents so that they would understand why and how to do particular tests. I was truly amazed at how quickly they picked up on topics as diverse as rebar scheduling (placement), exothermic weld standards, and grout mixtures.

Ultimately, this project influenced my life more than I influenced it. Initially, I thought that working for USACE would entail sitting in an office, looking at equations and drawings all day. But I quickly realized that the vast majority of my day was spent interacting with people. Whether it was talking to a foreman, the site superintendent, or the project manager back in Phoenix, Arizona, the value that I added to the project came from my work with others. The ability to build and manage relationships was just as important as the ability to read drawings. My ability to communicate ideas and intent was the difference between project success and failure.

I couldn't imagine a better developmental opportunity than working on this project. I was certainly pushed to my limits at times, which only made me a better engineer and leader. I encourage all Soldiers transitioning from the Engineer Regiment to consider volunteering for the Army Career Skills Program with USACE. USACE has offices across America, where personnel are working on every type of engineering project that you can imagine. Many USACE personnel have deep ties to the military and will do everything in their power to help you grow while you are at USACE. Even if you ultimately do not want to work in government service, the experiences that you gain and the relationships that you build will be valuable in any field you enter.

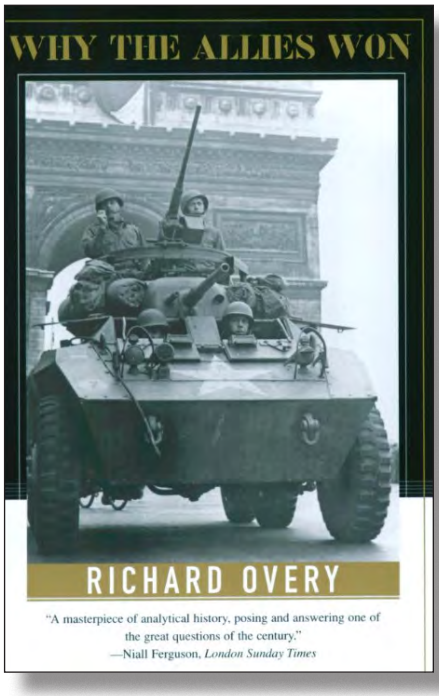
Endnote:

[1]Theodore Roosevelt, *Presidential Proclamation 758*, 27 May 1907, <https://www.govinfo.gov/content/pkg/FR-2019-09-24/html/2019-20718.htm>, accessed on 10 February 2020.

Captain Leemans is the chief of general engineering for the Engineer Basic Officer Leadership Course, Fort Leonard Wood. He holds a bachelor's degree in mechanical engineering from the U.S. Military Academy–West Point, New York. He is a licensed professional engineer and a project management professional.

Book Review

Book reviews are a feature in each issue of *Engineer*. Authors of book reviews summarize the contents of books of interest and point out the key lessons to be learned from them. Readers who wish to submit book reviews may forward them to <usarmy .leonardwood.mscoe.mbx.engineer@mail.mil>.



Why the Allies Won, by Richard Overy, W. W. Norton & Company, 1997, ISBN: 0-393-31619-x.

Reviewed by Mr. James E. Mc Carthy

Why the Allies Won, by Richard Overy, takes a hard look at a topic that might seem self-evident. This work is not an operational history. While Overy looks at the broad themes of campaigns of World War II, he focuses more on the abstract factors that contributed to the Allied victory, such as relative economic power, the pursuit and use of technologies, and leadership. Overy concludes that an Allied victory was not inevitable and that the issue hung in doubt from 1942 to 1944—far longer than popular thought gives credence. Aspiring strategists and policy makers might do well to note the role that friction, surprise, and luck play in war—even World War II.

Few nations embark on a war that is certain to result in defeat; the Axis powers were no different. Overy argues that Germany was the central "decider" of Axis strategy, given its initiation of hostilities and delays in Italian and Japanese forces entering the fray. While Germany certainly did not intend to start a world war, it began the war without a clear-cut strategy for defeating the Western Allies if they actually honored their pledge to defend Poland (which was not a certainty, given the abandonment of Czechoslovakia by the West a year earlier). Hitler viewed hostilities with the West as an unfortunate preliminary obstacle to be overcome prior to the main event of war with Russia. Certainly, Hitler's vacillation and inconsistent dalliance with Operation Sea Lion—the amphibious invasion of England—demonstrated a lack of seriousness about the conflict, as did the woefully inadequate number of submarines for a campaign against British merchant shipping. Given the lack of thought about the means required for British defeat, Overy observes that Germany did not seek to take advantage of other potential means of injuring Britain beyond repair, such as striking through Spain to seize Gibraltar or assaulting Malta to break the British grip on the Mediterranean and to secure lines of communication with the Afrika Korps in Libya as it marched along the Suez Canal. Overy does, however, correctly assesses Germany as the most lethal of the Axis powers—the Axis center of gravity—and, therefore, the force that the Allies needed to defeat; but he points out that neither England nor France had a plan to defeat Germany or save Poland, except by sea blockade.

Overy examines the relative economic strength of the Axis and Allied powers and discounts the modern trap of determinism that would lead some to believe that the Allies crushed Germany under the sheer weight of military production; Overy observes that "Statistics do not speak for themselves; they require interpretation" and then correctly points out that material superiority has certainly been no predictor of success in conflicts since 1945. Regardless of disparities in any given commodity, Overy argues that technological differences, locations of production centers, and tactical skill in the employment of the armaments produced combined to substantially reduce the margin of Allied economic superiority to something much less than a guarantor of inevitable victory. Nonetheless, it did not help their cause that, after 1941, the Germans were at war with the three largest world economies outside of Europe and had no viable means of decisively striking them.

Technology was also an interesting facet of the conflict. Overy notes that, with the first effective use of tanks, jets,

missiles, carrier aviation, and paratroopers, the Axis powers are often perceived to have been far ahead of the Allied powers in military technology; however, Axis powers could not afford to produce potentially war-winning technologies quickly enough. Germany employed 3,350 tanks (with perhaps a third of those being captured, foreign-made, or otherwise not fit for front line service) and 650,000 horses when invading Russia in 1941; by 1945, operational reverses and lack of fuel virtually immobilized the few hundred remaining armored fighting vehicles. Furthermore, short-range German jets lost their shock value as swarms of Allied piston-driven fighters loitered over airfields and destroyed them as they sought to land when short of fuel. And despite the terror factor, missiles were not a cost-effective delivery means for high explosives. Carrier-borne airpower succumbed to attrition in the Pacific, as well as to the better tactics of the Allied powers. The six operational German *Fallschirmjäger* (paratrooper) divisions became merely expensive infantry assets when air superiority was lost. At best, Axis technological excellence created a tactical advantage, whereas the Allied powers had technological superiority in radar, and fast carrier task forces. Ultimately atomic power were strategic determinants of victory.

On leadership, Overy rates the Allies as having a decisive advantage. While British Prime Minister Winston Churchill, General Secretary of the Russian Communist Party Joseph Stalin, and President Franklin Delano Roosevelt each had flaws as leaders, each was able to provide political focus to his nation while allowing the military to exercise professional judgment. By contrast, Adolf Hitler's approach to operational leadership—and even tactical direction in the last stages of the war—was that of an extreme micromanager. That not only stifled subordinates' military initiative, but also took Hitler's time away from the diplomatic, informational, and economic aspects of the conflict. Even though he had the talent necessary to master multiple disciplines, Hitler was simply spread too thin to exercise due diligence on the myriad of issues over which the German political system required him to preside. Among the Allies, only Stalin was an absolute ruler—and even he needed Western aid. Because they needed to forge the means of cooperation, Allied leaders gained an uneasy mastery of coalition warfare, whereas the Axis kingpins of Hitler and Emperor Michinomiya Hirohito of Japan merely dictated to increasingly unhappy, reluctant, and sometimes recalcitrant client states.

As old things become new again, perhaps it is time to revisit history at a level deeper than that presented in the vignettes of a seldom-read field manual. Allied victory in World War II, the deadliest conflict in human history, was not a foregone conclusion. The Allies did not simply drown the Axis powers in a flood of planes and tanks. Skill, the careful utilization of available strengths and resources, determination, and luck all played a role in the outcome. Even in a conflict as industrialized as World War II, intangibles were the eventual determinants of victory—so much so that Prime Minister Churchill viewed the victory as providential. Overy concludes that military professionals would do well to review the details of the World War II conflict—not out of a spirit of triumphalism, but out of a need to "be precise about the explanations that matter, and may matter once again, in the century to come."

Mr. Mc Carthy is a retired infantry officer and avid history buff. He serves as the U.S. Army Forces Command engineer analyst at the Maneuver Support Center of Excellence, Fort Leonard Wood, Missouri.

The Engineer Amphibious Support Brigade:

A Concept for Future Operations, Rooted in the Past

By Captain Robert F. Gold

In recent years, as combat operations have taken place in Iraq, Syria, and Afghanistan, the United States has been forced to pay attention to increasing competition from both Russia and China. While the Nation's focus has been on the Middle East and central Asia, these two countries have developed increasing antiaccess/area denial capabilities to diminish U.S. military advantages. As a result of this growing competition from Russia and China, the U.S. Army has refocused its efforts from conducting primarily counterinsurgency operations to preparing for high-intensity conflict with a peer-state military. However, war against another nation-state will be difficult due to the complex antiaccess/area denial challenges that the Army must overcome in order to close with and destroy the Nation's enemies. Access to seaports and airfields that the Army plans to use will likely be challenged. This is a dilemma that the Army has not had to face in recent memory.

It is plausible that the Army will find itself with the need to maneuver and fight in the littoral zone in a future operational environment because it does not have unhindered access to seaports to sustain large-scale conflict. The ability to operate in the littorals would allow the Army to surprise an adversary by rapidly deploying a multidomain task force that is capable of delivering multiple, synchronized effects across a shoreline. However, to do this, the Army must redevelop its ability to conduct amphibious operations—something that it has not practiced on a large scale in more than 50 years.[1] Today, the Army maintains a small watercraft fleet (manned by the Transportation Corps) which provides an important capability that enables the operational movement and maneuver of Soldiers and equipment over the shore. However, getting to the fight is only part of the problem. Once there, the Army needs the ability to support ground forces engaged in multidomain battle. This will require the establishment of logistical nodes, base camps, and survivability positions for command posts and weapon systems engaged against an opponent.

To help restore amphibious capability in the Army, the Engineer Regiment, and the Transportation Corps should partner to create a multifunctional brigade of engineers

Landing Craft, Mechanized 8 (Modification 1)

"Discussions of amphibious operations typically cause individuals to think of the U.S. Marine Corps."

and logisticians. This brigade would be capable of moving a landing force and equipment to shore and conducting construction and combat engineering operations to sustain and support the task force once it is ashore. This formation would support all types of amphibious and logistics over-the-shore operations on sea and land.

Historical Precedent

The idea of a formation that conducts ship-to-shore or shore-to-shore transfer of Soldiers and cargo is not a new concept for the U.S. Army. In the early years of World War II, engineer amphibian brigades (later designated engineer special brigades) executed this mission. These engineer formations filled a crucial role for the Army and provided commanders with operational maneuver capability and the ability to sustain land campaigns, especially in the Pacific theater of operations. There were three engineer special brigades, each consisting of an engineer boat and shore regiment.[2] This formation was effective because of its integrated capabilities and because it allowed for easier command and control in the planning and execution of operations. The engineer boat and shore regiments were capable of supporting regimental-size landing forces, and engineer special brigades were capable of landing a division.[3]

These formations proved to be highly successful throughout the war. In March 1945, General Douglas MacArthur wrote to General George C. Marshall, the Army Chief of Staff, stating, "In the succession of amphibious operations up the coast of New Guinea to Morotai, thence to the Philippines, the performance of the 2d, 3d, and 4th Engineer Special Brigades has been outstanding. The soundness of the decision in 1942 to form organizations of this type has been borne out in all action in which they have participated. These units have contributed much to the rapid and successful prosecution of the war in the Southwest Pacific Area."[4]

Discussions of amphibious operations typically cause individuals to think of the U.S. Marine Corps. However, during World War II, the Army participated in the assault or support phases of 58 of 61 amphibious operations.[5] Along with the U.S. Navy and U.S. Marine Corps, the Army also took part in six major assault operations and supported seven others.[6]

Amphibious engineer units also proved their worth from 1950 to 1953, during the Korean War. However, in the mid-1950s, these units transferred their watercraft to the Transportation Corps. By the mid-1960s, the last amphibious engineer units were deactivated as the Army focused on intensified fighting against large Soviet tank formations in Europe and Vietnam.[7] In the intervening years, the capability of the Army to conduct amphibious operations has continued to decline. This role has been taken on primarily by the Marine Corps and the Navy. These type of amphibious operations are not meant to sustain large-scale land warfare.

The Army and Expeditionary Warfare

While the Marine Corps and Navy are undoubtedly proficient at conducting amphibious operations, joint doctrine does not prohibit the Army from conducting amphibious operations. Joint Publication (JP) 3-02, *Amphibious Operations*, describes a landing force as being comprised of either Marine Corps or Army units.[8] The doctrine goes on to state, "Amphibious operations, no matter their makeup or application, are complex and inherently joint or multi-Service."[9] The bottom line is that returning amphibious operations to the Army capability set will provide additional options for joint force commanders, giving them operational flexibility in a contested environment.

The Army's primary method of executing forcible entry into enemy-held territory is currently through airborne or air assault operations. However, while airborne operations represent an important forcible-entry capability, there are limitations due to anticipated complexities of the operational environment. In the early stages of a high-intensity war, it is conceivable that the United States would not have gained air superiority or sufficiently suppressed enemy air defenses, thereby leaving relatively slow formations of Boeing™ C-17 transport aircraft vulnerable to the enemy integrated air defense network. Also, air drops are capable of delivering only a small number of Soldiers and a limited amount of heavy equipment. The capture of an airfield is required in order to land additional troops and supplies and to expand the lodgment. Air assault operations are even more limited than air drops due to the range and capacity of rotary-wing aircraft.

However, compared to airborne or air assault operations, Army watercraft are capable of delivering a relatively large number of troops and materiel. A logistics support vessel, for instance, is capable of transporting 24 M1A2 Abrams tanks or up to 48 double-stacked, 20-foot containers.[10] The payload capacity of one logistics support vessel is 4 million pounds—the equivalent of 40 C-17 aircraft.[11] Smaller Army watercraft, such as the Landing Craft, Mechanized 8 (Modification 1), are capable of delivering the payload of one C-17.[12] Utilizing the payload capacities of these watercraft not only frees up C-17 aircraft, but also extends the operational reach of the Army, allowing the capability to endure at sea with support from the U.S. Navy Military Sealift Command, Norfolk, Virginia. As the Army considers the anticipated operational environment and trains for high-intensity conflict, it should create a force structure and train for conducting amphibious operations to better project the force.

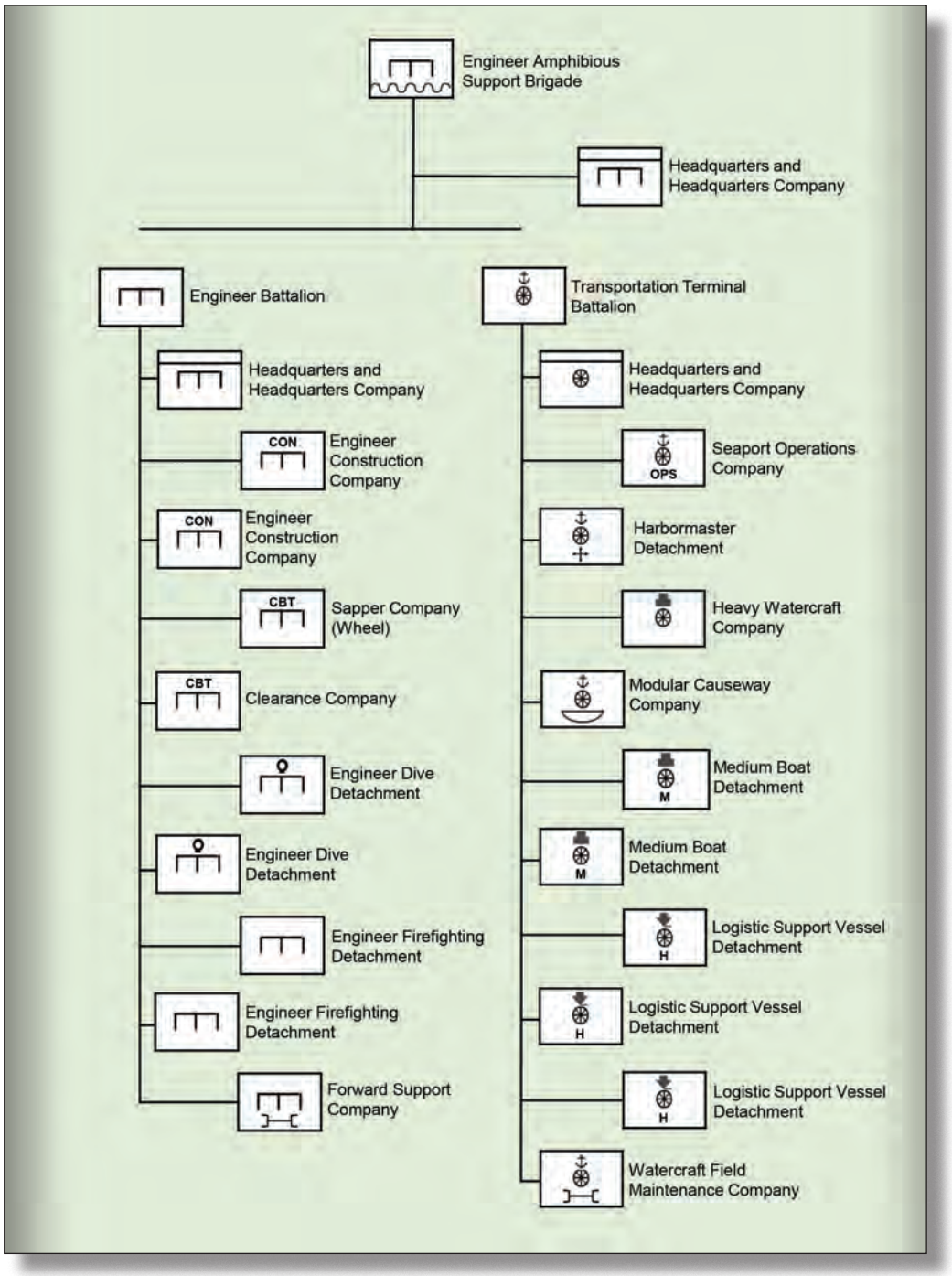


Figure 1. Proposed EASB task organization

The EASB

To better project the force, the Engineer Regiment and Transportation Corps should form a multifunctional brigade that pairs engineers with logisticians—the EASB. Figure 1 shows an example of a proposed EASB task organization. The purpose of the brigade would be to provide operational- and tactical-level maneuver support to Army, joint, and multinational forces operating from the company to division level in a littoral environment. This would allow the maneuvering of troops and equipment from ship to shore or shore to shore in order to place the enemy in a position of disadvantage, permit ground forces to maintain tempo, and quickly mass effects at the decisive point. The EASB would provide mission command of two battalions—an engineer battalion and a transportation battalion (terminal). This formation would allow unity of command by placing diverse capability sets under one responsible commander. This would streamline the planning and execution of inherently complex operations. Additionally, it would allow more opportunities for Soldiers and leaders to train together on complex tasks.

Utilizing this type of organization would facilitate the creation of standard operating procedures for Army-specific amphibious operations and reintroduce institutional knowledge of amphibious operations back into the force.

The proposed EASB would consist of current existing formations and, therefore, would not need to be built from scratch. The terminal battalion would be capable of providing mission command of terminal operations or watercraft companies and could simultaneously unload two ships at a logistics over-the-shore site.[13] These are critical capabilities for establishing and expanding a lodgment in a forcible-entry operation. Subordinate units to the battalion would include a heavy watercraft company, two medium boat detachments, three logistics support vessel detachments, a modular causeway company, a seaport operations company, a harbormaster detachment, and a watercraft field maintenance company.

The engineer battalion would provide mission command for engineer companies and detachments needed to establish and expand the lodgment. The battalion would include two engineer construction companies, a sapper company (wheel), a clearance company, two engineer dive detachments, two engineer firefighting detachments, and a forward support company. In addition to providing firefighting support for base camps, the primary mission of this battalion would include constructing—

- Depots.
- Piers.
- Combat roads.
- Petroleum, oil, and lubricant distribution systems.
- Base camps.
- Forward area rearming and refueling points.
- Survivability positions.

However, this battalion would also need to be able to provide limited combat engineering augmentation to a landing force in the event of an amphibious assault. Additionally, combat engineers in the sapper and clearance companies could provide general labor support to construction operations.

The formation of such an organization would just be one step. Training and education (both institutional and unit) would be required to fully restore the (mostly lost) capability. The Army should seek involvement from U.S. Marine Corps engineers and U.S. Navy Seabees and conduct joint training and exercises. This would allow the sharing of lessons learned, build the institutional knowledge of Soldiers and leaders, and streamline the integration of EASB into future joint operations. The Army should also pursue opportunities to send officers and noncommissioned officers from EASB to Marine Corps and Navy courses such as the Marine Corps Intermediate Amphibious Operations Course and the Navy Amphibious Warfare Staff Planning Course. This would provide Army personnel with formal education on amphibious operations and further enhance the integration of EASB into joint amphibious operations.

Conclusion

It is impossible to know for certain what the next war will look like. However, adversaries are devoting resources to antiaccess/area denial capabilities and strategies that aim to prevent the United States from influencing certain areas of the world. To counter this, the United States needs to maintain forward forces in contested spaces. While the Marine Corps prides itself on its expeditionary capability, it does not have the capability to sustain large-scale ground combat through amphibious operations. Additionally, the Marine Corps should not be required to shoulder the burden of forward presence alone. The Army needs to be flexible and willing to adapt to these future challenges.

The proposed EASB would provide the necessary flexibility through both organization and capability. It would offer operational reach for joint force commanders, options for operational and tactical maneuver, and options for commanders to support and conduct the deployment of U.S. forces. The organization, which could help maintain the operational tempo in difficult terrain and under difficult conditions, could serve as a historical precedent. After several decades, it is time that we revive our amphibious capability to prepare for the future.

Endnotes:

[1]Donald W. Boose Jr., *Over the Beach: U.S. Army Amphibious Operations in the Korean War,* Combat Studies Institute Press, 2008, p. 338.

[2]Ibid, p. 38.

[3]Ibid.

[4]John T. Greenwood, "The U.S. Army and Amphibious Warfare During World War II," *Army History*, 1993, p. 8.

[5]Ibid.

[6]Ibid.

[7]Boose, pp. 327–338.

[8]JP 3-02, *Amphibious Operations*, 4 January 2019, p. xiii.

[9]Ibid, p. I-1.

[10]Army Techniques Publication (ATP) 4-15, *Army Watercraft Operations*, April 2015, pp. 2–3.

[11]Ibid.

[12]Ibid, pp. 2–5.

[13]ATP 4-13, *Army Expeditionary Intermodal Operations*, 16 April 2014, p. 4-2.

Captain Gold is an advisor team leader with the 5th Battalion, 2d Security Force Assistance Brigade, Fort Bragg, North Carolina. He holds a bachelor's degree in business management from Widener University, Chester, Pennsylvania, and is pursuing a master's degree in international relations from Troy University, Alabama.

Engineer Doctrine Update

U.S. Army Maneuver Support Center of Excellence
G-3/Directorate of Training and Doctrine (DOTD)

Publications Currently Under Revision

Publication Number	Title	Description	Tentative Publication Date
ATP 3-34.22	*Engineer Operations–Brigade Combat Team and Below*	This update, while incorporating the Field Manual (FM) 3-0 focus on large-scale ground combat operations, will include task force engineer tasks, enabler integration, and updates to brigade engineer battalion and echelon above brigade unit capabilities.	3d quarter, fiscal year (FY) 2020
TM 3-34.85/ MCRP 3-17A	*Engineer Field Data*	This multi-Service publication will be updated with new information on networked munitions emplacement, U.S. mine policy considerations, threats, and demolitions.	3d quarter, FY 20
ATP 3-90.8/ MCWP 3-17.5	*Combined Arms Countermobility Operations*	This multi-Service publication will be updated with, and will follow, current U.S. mine policy restricting persistent row mining.	4th quarter, FY 20
ATP 3-90.4/ MCWP 3-34A	*Combined Arms Mobility*	This multi-Service publication will be updated with a revised chapter on deliberate gap crossing and will be focused on division/corps synchronization of effort across warfighting functions and domains.	4th quarter, FY 20
ATP 3-90.40/ MCWP 3-17.7	*General Engineering*	This multi-Service publication will be updated based on comments from across the force and will include information on updated equipment, construction authorities, and environmental considerations.	4th quarter, FY 20

New Engineer Publication Highlights

Training Circular (TC) 3-34.85, *Sapper Leader Course Handbook,* was published to the Army Publishing Directorate Web site at <https://armypubs.army.mil/> on 21 November 2019. This TC provides clear and concise guidelines on how sappers support a task force commander and complete the sapper mission. The principal audience for TC 3-34.85 includes U.S. Army sappers and combat arms units. There are new chapters on urban breaching, threat ordnance, and air operations. Units are encouraged to order these books for their home station sapper training.

Engineer Doctrine Update

U.S. Army Maneuver Support Center of Excellence

G-3/Directorate of Training and Doctrine (DOTD)

A few video and animation products are being produced to facilitate unit support and teach and describe gap-crossing operations. The first video focuses on Third Army historical river crossings near Nancy, France, in 1944. The doctrine team and Mr. Florian L. Waitl, U.S. Army Engineer School (USAES) historian, supported an Army University Press (AUP) effort with doctrine advice and historical research. *Essayons!*

Click this link to watch the video entitled: *France '44: The Wet Gap Crossings at Nancy*: <https://www.youtube.com/watch?v=aR_axsdh_j4>

Please contact us if you have any questions or recommendations concerning engineer doctrine: Lieutenant Colonel Carl D. Dick, Telephone: (573) 563-2717; Mr. Douglas K. Merrill, Telephone: (573) 563-0003; Engineer Doctrine Team, e-mail: <usarmy.leonardwood.mscoe.mbx.engdoc@mail.mil>.

"Doctrine is indispensable to an army. Doctrine provides a military organization with a common philosophy, a common language, a common purpose, and a unity of effort."

—General George H. Decker,
U.S. Army Chief of Staff, 1960–1962

Russian Engineer Reconnaissance in Icy River-Crossing Conditions

By Dr. Lester W. Grau

Rivers dominate the geography of Russia and are, therefore, a major factor in military mobility and sustainment. Rivers can be either allies or foes. Rivers are not constant; they flood, dry up, and freeze over. Crossing a river begins with engineer reconnaissance.

Determining the Suitability of a Crossing Site

The Russian military possesses extensive data on the hydrology of the Eurasian continent; however, on-site engineer reconnaissance for river-crossing operations is still vital. One of the first determinations that must be made involves the gradients at the entry and exit points since steep banks (such as those of canals) could defeat a crossing before it ever gets started. Engineer reconnaissance also includes the selection and demarcation of the trace of the main, reserve, and dummy crossing sites; routes and alternate routes to main and reserve crossing sites; embarkation points for tracked vehicles; refined assembly areas; routes for tracked vehicles from the assembly areas in alignment with their crossings; and sites for the pontoon park and ferrying of vehicles. In addition, engineer reconnaissance teams access the water obstacle, determine the measures necessary to ensure its crossing, and locate traffic control and equipment and casualty evacuation points. They also further examine any on-site or captured river-crossing structures and equipment to determine viability.[1]

Russians classify water obstacles as narrow (up to 100 meters in width), medium (100–250 meters in width), wide (250–600 meters in width), and very wide (more than 600 meters in width). Water obstacles are further classified as shallow (up to 1.5 meters in depth), deep (1.5–5 meters in depth), and very deep (more than 5 meters in depth). Other characteristics of rivers as obstacles are the condition of the approach to the banks, entrance bank, exit bank, and terrain on the opposite side of the crossing. The steepness of the bank can vary from gently sloping (up to 15 degrees) to steep (15–25 degrees) to precipitous (more than 25 degrees). Combat vehicles have no difficulty exiting the water along a gentle slope; tanks can overcome steep-bank obstacles.[2]

Crossing Ice

Rivers, marshes, lakes, and parts of adjacent seas in Russia freeze over in the winter. Ice formation is a function of the prevailing low temperatures, and ice composition varies. Ice formation relevant to water crossings normally follows a cycle in which there is a fall freeze with weak ice; then thick, sturdy ice; then a weakening of the sturdy ice; and finally, spring ice.

Weak ice, which is not stable, forms in layers as the wind cools the surface of the water in the fall. As the water temperature drops below 0° C, a layer of slush, sludge (a collection of ice crystals), and/or snow is formed. Weak ice formed on rivers and reservoirs in the fall is not strong enough to support crossing.[3]

Ice density determines what, if any, crossing means can be used. Ice density is determined by dividing the total area of ice within a particular section of the river by the total area of that section. Complete ice coverage would be considered a density of 1, while water with no ice would have an ice density of 0. Vehicle-launched bridges may be employed when the ice density is less than 0.20; pontoon bridges may be employed when the ice density is less than 0.30; and infantry fighting vehicles, personnel carriers, and amphibious ferries may be employed when the ice density is less than 0.40.[4]

Sturdy ice formation begins with the development of an actual ice covering as the ice accumulates and thickens on top of the body of water. This thick, sturdy ice does not have a uniform structure. Figure 1 shows the structure of fully formed winter ice with layers of sludge and snow on top. It is possible for a vehicle to be driven across this type of ice; however, the strength of the ice depends on the air temperature, speed of the current, thickness of the snow cover, and wind speed. The carrying capacity of ice is defined as the total weight of the heaviest cargo that can be supported by the ice under the given conditions. Therefore, determining the carrying capacity of the ice also depends on the mass and quantity of the equipment crossing the ice.[5] Table 1 shows the carrying capacity of ice. When calculating the carrying capacity of the ice, it is important to consider that dirty

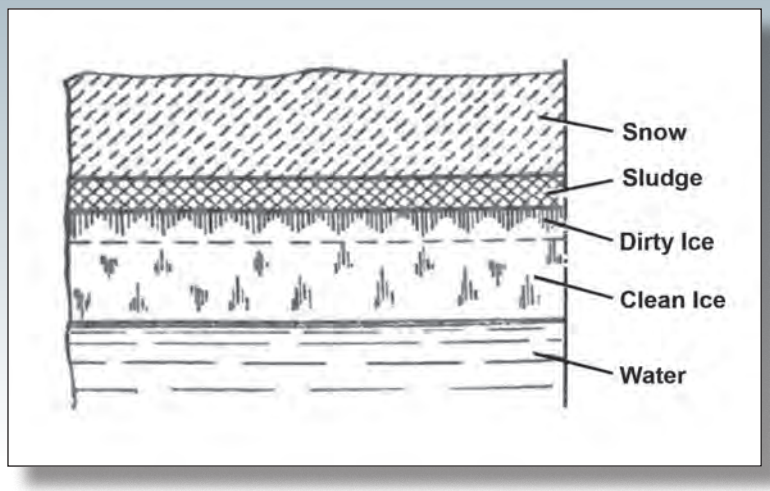


Figure 1. Winter ice structure

Carrying capacity of ice for tracked and wheeled vehicles

Weight of a vehicle in tons	Thickness of ice in centimeters that will support vehiclular traffic		Meters between vehicles
	Crossing single vehicles	Crossing a column of over 15 vehicles of similar (or less) weight	
2	11	16	15
4	16	22	15
6	20	27	15
8	23	31	20
10	25	35	20
15	31	43	25
20	36	49	30
25	40	55	35
30	44	60	35
35	47	65	40
40	51	70	40
45	54	74	45
50	57	78	45
60	62	85	50
70	67	92	50
80	72	98	50
90	76	104	70
100	80	110	80

Table 1. Carrying capacity of ice

ice is 1.5–2 times weaker than clean ice.[6] Furthermore, in the event that the ice is rough and wrinkled, rather than smooth, the values should be reduced by 40 percent.[7]

With thick, sturdy ice, the establishment of roads across rivers and lakes is possible. Ice roads must be laid out straight across frozen rivers. They should be no wider than 20 meters, and neighboring roads should be at least 100 meters apart.[8] The entrance and exit points should not be located on a slope exceeding 6 degrees.

Spring brings about an increased flow of water in rivers. The ice expands, creating cracks and fissures, which allow the water to flow onto the ice. During the spring rise in water level, the ice cover breaks into individual blocks of ice, which then move with the current.[9] Under these circumstances, special measures are required to protect crossing sites from moving ice masses.

Conclusion

Engineer reconnaissance is a vital part of Russian water-crossing preparations. The seasons and weather play a major role in determining whether and where to cross a water obstacle and what equipment will be needed to support the crossing.

Endnotes:

[1]Dimitri V. Shunyakov et al., *Water Crossing: Student Textbook*, Ural University Press, Yekaterinburg, 2017, pp. 102–103.

[2]Ibid, p. 12.

[3]Ibid, p. 15.

[4]Ibid, p. 17.

[5]E. S. Koliberiov, *Handbook for Officers of the Engineering Force*, Voyenizdat, Moscow, 1989, p. 136.

[6]Shunyakov, p. 16.

[7]Koliberiov, p. 137.

[8]Koliberiov, p. 130.

[9]Shunyakov, p. 16.

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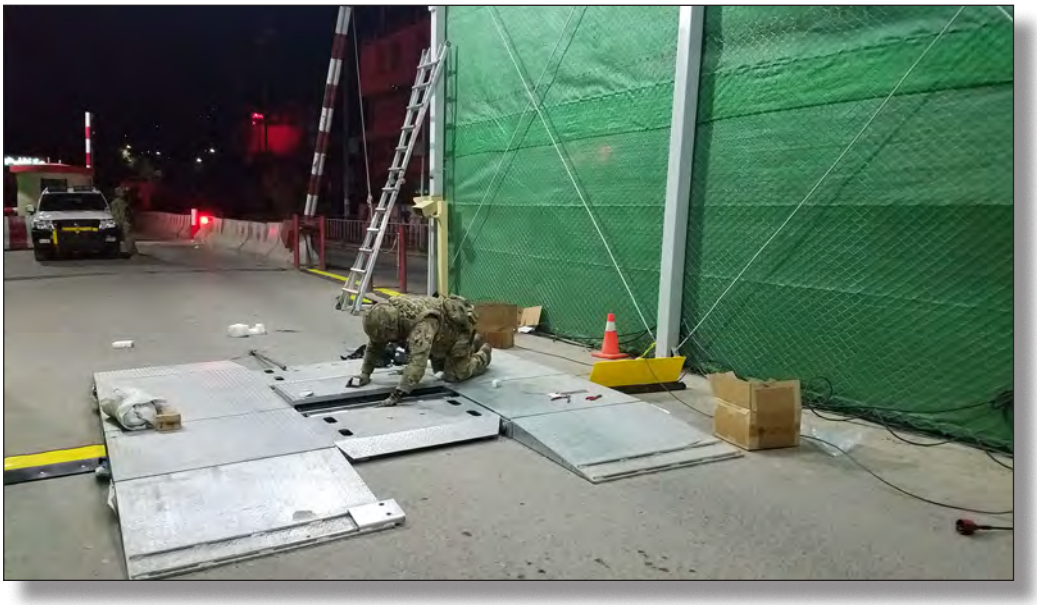
Joint Engineering Advising in Kabul

By Captain Ryan M. O'Connor

Our team mission as part of 5th Battalion, 2d Security Forces Assistance Brigade, Fort Bragg, North Carolina, was ambiguous as we began to prepare for deployment. As the deployment neared, we came to understand that we would be working directly with security forces arrayed throughout Kabul, Afghanistan. Upon our arrival in-theater, we immediately started to gain an understanding of what our mission would entail as the deployment progressed; and as our situational awareness grew, so did our mission set. This article illustrates the importance of flexibility and showcases the interoperability of various entities throughout a 9-month deployment.

The author with British infantry and engineer officers prior to conducting a joint mission

The initial mission set that was laid out before us directed us to advise a police brigade responsible for the protection of the International Zone of Kabul. We knew that we would be working under the British-led Kabul Security Force (KSF). However, due to a slight gap between the departure of the 1st Security Force Assistance Brigade, Fort Benning, Georgia, and our arrival, we were unsure of the extent of the mission. We realized the importance of meeting all entities on the new Kabul compound to form a better understanding of what to expect in Kabul. We attended KSF meetings and conveyed the information gathered to our partner forces. It was imperative that we keep the police units with which we worked abreast of Royal Engineer Cell, KSF–planned security upgrades around the city so that we could get feedback and input from the Afghan police units and, if needed, their assistance.



A British engineer installs technology at an Afghan police checkpoint in Kabul.

Combined joint engineering was at the center of the security upgrades around the city, including checkpoint upgrades. In almost all of the cases, the checkpoints had been sited on a map without feedback from the Afghan units that were familiar with the areas. As we visited various checkpoints and began

The author (center) discusses security upgrades with members of the international community.

to work with our partners, design and stakeholder issues became apparent. The need to get combined joint engineering assets, various contractors, and KSF on the ground so that they could see the sites and fully understand the issues also became apparent. Tight bonds began to form between two British engineer captains, a U.S. Air Force technical engineer, technical contractors, and our team. Our team identified gaps and friction in the checkpoint design. We learned what problems the police saw with the design and then facilitated local stakeholder engagement with neighborhood elders and linked them with involved organizations. My background in design and engineering from my Marine Engineering and Naval Architecture coursework at the U.S. Merchant Marine Academy was very helpful. In addition, our linguists proved to be an important link between the Afghan security forces and our team. We pleased the local populace by taking its input into account when making the necessary changes to the plans. This directly impacted the security of the area.

At the midpoint of our deployment, we began to facilitate the KSF plan to harden the International Zone through checkpoint enhancements. This provided an opportunity for team members to work together to complete the enhancements. Afghan security forces helped with outer cordons; sharing the work with our counterparts allowed us to build rapport and gave us time to focus on identified shortfalls. Combined joint engineering personnel contracted with local truck drivers to enter the base, and the Military Occupational Specialty 12N–Horizontal Engineer team member assisted by using a front loader to load the checkpoint enhancement components onto vehicles. KSF joined us on the ground to monitor how the checkpoint enhancements were progressing and even help with generator issues, with the Royal Engineer staff sergeant putting his background in generator maintenance to good use. This highlighted the importance of recognizing and implementing the strengths and capabilities of individuals. We worked side by side with the contractors who were installing the components of the checkpoint enhancements and creating video links for cameras installed as part of those enhancements, advising them, transporting them to the work site, and providing them with local security.

As time went on, we worked with engineering and contracting personnel from the United Nations Office for Project Services to cover any checkpoint upgrade design shortfalls that could not be previously addressed due to time constraints. We relayed any issues identified by the Afghan security forces to KSF and the combined joint engineering personnel. We worked with embassies and other entities to make sure that they were abreast of the upgraded protection being installed. We attended joint meetings to discuss what help, if any, the Afghan security forces had requested for the repair of damage in a timely manner. KSF then assembled work packages to perform post-installation clean up. We established rapport with various Afghan security forces, which made us a conduit for relaying information back and forth with the international community and United Nations Office for Project Services, allowing for smoother operations, better situational understanding, and increased overall security for everyone.

In conclusion, different countries, different military branches, various contractors, and various entities—all with a common background in engineering—came together to leave a lasting mark on Kabul and to create a more secure city for everyone.

Captain O'Connor is the team leader for Team 2521, 5th Battalion, 2d Security Forces Assistance Brigade. He holds a bachelor's degree in marine engineering from the U.S. Merchant Marine Academy, Kings Point, New York.

The Robotic Complex Breach: A New Development Aims to Save Soldiers' Lives

By Captain Nichole L. Rotte

If there is an opportunity to improve technology to preserve combat power and Soldiers' lives, the area of engineering planning is it. Improved engineering planning can help save lives of Soldiers and reduce the amount of equipment lost during a breach.

In the spring of 2019, Company B, 23d Brigade Engineer Battalion, Joint Base Lewis–McChord, Washington, tested that concept. As part of the 2d Battalion, 3d Infantry Regiment, Task Force Patriots, Company B, 23d Brigade Engineer Battalion, participated as the breach company in Joint Warfighting Assessment 19—a combined joint task force, brigade level certification training exercise conducted at Joint Base Lewis–McChord and Yakima Training Center, Washington, from 8 April to 10 May 2019. The purpose of

Marines defeat an antivehicle ditch with a remotely controlled vehicle.

A HUMVEE equipped with a remote weapon system provided security for the breach.

this exercise was to develop the future force, assess joint interoperability, and improve joint combat readiness. As part of the Army's Force 2025 maneuver capstone event, Company B demonstrated future force and robotic complex breach concepts.

The robotic complex breach concept is still in the development stage. The Joint Warfighting Assesment 19 exercise tested the effectiveness of the concept using many surrogate systems to showcase future capabilities. The information gathered allowed the field service representative (FSR) and equipment program managers to guide the project. If preliminary development is successful, the Army can continue research and development.

Task Force Patriot incorporated the robotic complex breach concept into the military decision-making process. AeroVironment's™ PUMA-All-Environment™ tactical unmanned aircraft enhanced the intelligence-gathering effort to assess whether obstacles were present at named areas of interest and to determine the consistency of any obstacles. This allowed other intelligence-gathering assets to move forward on the battlefield. Obstacles discovered during the mission consisted of a near side minefield, concertina wire, an antivehicle ditch, and a far side minefield. Only robotic equipment was task-organized to the breach force, meaning that engineer platoons were part of follow-on objectives, saving an average of 50 percent loss of life and equipment during the breach.

Company B augmented the execution of the breach with an off-road vehicle fitted with a screening module and used the fundamentals of suppress, obscure, secure, reduce, and assault. The vehicle was operated by the infantry support-by-fire company via a remote-controlled unit. With consideration for the wind, coupled with scout reconnaissance to identify the route, the off-road vehicle and screening module (which is a safer alternative to the M5 hexachloroethane smoke pots) obscured the battlefield between the obstacle and the opposing force. The ability to direct a maneuvered smoke element on the battlefield played a significant role in keeping Soldiers out of direct enemy fire. Fire missions were reallocated with high-explosive rounds, increasing the time available to suppress the enemy with indirect fire. It has been a challenge to secure indirect-fire smoke effects for training exercises; consequently, experiencing an actual obscured battlefield was significant for the task force.

Marines from the Mobility Assault Company, 2d Combat Engineer Battalion, Camp Lejeune, North Carolina, showed support for the test by providing an assault breacher vehicle (ABV) platoon, making this test—and the breach—a joint effort. FSRs added remote-controlled technology, which allowed the ABVs to be remotely operated. The breach force consisted of eight vehicles. Two weaponized robotic vehicles were armed with remote weapon systems with their own control vehicles. These vehicles provided local near and far security. The complex breach was conducted with two remotely operated ABVs with one control vehicle. A Stryker infantry carrier vehicle was the breach command element used. The company commander communicated with Task Force Patriots and controlled the breach elements.

The breach force, with vehicles manned and driven by operators, moved from the tactical assembly area. The transition to robotics and final inspections occurred at the assault position. Vehicles that were manned by personnel

A remotely controlled off-road vehicle provides smoke across the battlefield.

stayed behind the last cover with positions concealed, and unmanned vehicles moved to the breach area. The ABVs were paired with quadcopters, which allowed the ABVs to move ahead 2 kilometers while the control vehicle remained behind cover. The vehicles with remote weapon systems were not equipped with beyond-line-of-sight technology, therefore, the control vehicles needed to be moved out of cover and toward the breach area in order to get the vehicles to the near side security positions. The ABVs moved forward and conducted the breach, demonstrating their full breaching capacity.

Defeating the antivehicle ditch was a concern. The control vehicle was equipped with a speaker so that in addition to utilizing the video feeds, the operator could hear the engine revolutions. After a couple weeks of integrating this technology, the Marines were able to breach the ditch with the ABVs. As a surrogate vehicle for other potential engineer breaching vehicles, the ABV demonstrated the potential for Soldiers to physically avoid the most dangerous part of the fight—the breach. The engineer element was attached to the infantry assault element and was able to preserve its combat power for mobility, countermobility, or survivability needs later in the battle. The need for speed was an important lesson learned during this phase; the amount of time needed to complete the breach impacts the intelligence, surveillance and reconnaissance, fire, and obscuration resources and, ultimately, the entire mission.

The robotic complex breach concept was presented to the Soldiers and Marines in the early stages of development, which benefited both the FSRs and Service members. The concept was simple enough that individuals at any level could quickly learn to successfully execute a breach. Soldiers and Marines provided significant feedback to FSRs to refine the concept and improve the next-level generation.

Recommendations for improvement included the addition of beyond-line-of-sight capability for all systems, increased speed in conducting the breach, and more time integrated for the development and rehearsal of new tactics, techniques, and procedures prior to execution. Incorporating these recommendations at the battalion task force level provided organizational and planning feedback since the battalion was required to adjust for new equipment and build new tactics, techniques, and procedures.

This agile development method for Army equipment is becoming more common, and we are seeing significant positive impacts on Soldiers and FSRs. These systems and future concepts allow Soldiers to see what the future Army has to offer and energizes them to be part of the military and partnered organization effort to make the Army an even better fighting force.

At the completion of the exercise, the training audience concluded that robotized equipment has the potential to increase lethality and preserve combat power by keeping Soldiers out of the breach. The Engineer Regiment should support this concept through continual integration between FSRs and Soldiers throughout the development process.

There are many technological developments available to the Army, but robotic technology still has a long way to go. Research and development of this new tool can benefit the Army and prevent the need for technological compromise. There is also a big decision to be made concerning the degree to which Soldiers will remain integrated with this technology; will we transition to completely unmanned systems?

Captain Rotte is an engineer operations officer for I Corps, Joint Base Lewis–McChord. She holds a bachelor of science degree in psychology from the U.S. Military Academy–West Point, New York.

ENGINEER WRITER'S GUIDE

Engineer is a Department of the Army-authenticated publication that contains instructions, guidance, and other materials to continuously improve the professional development of Army engineers. It also provides a forum for exchanging information and ideas within the Army engineer community. *Engineer* includes articles by and about commissioned officers, warrant officers, enlisted Soldiers, Department of the Army civilians, and others. Writers may discuss training, current operations and exercises, doctrine, equipment, history, personal viewpoints, or other areas of general interest to engineers. Articles may share good ideas and lessons learned or explore better ways of doing things. Shorter, after action type articles and reviews of books on engineer topics are also welcome.

Articles should be concise, straightforward, and in the active voice. Avoid using acronyms when possible. When used, acronyms must be spelled out and identified at the first use. Avoid the use of bureaucratic jargon and military buzzwords. Text length should not exceed 2,000 words (about eight double-spaced pages).

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Team Dig Versus Organic Task Organization:

Observations From an OTC at the NTC

By Captain Gregory M. Shepard

There has been a shift from counterinsurgency to an open-phased, decisive-action training environment concept at the National Training Center (NTC), Fort Irwin, California, over the past several years. Brigade combat teams (BCTs) and brigade engineer battalions (BEBs) regularly task-organize all dig assets under one company command, forming what is known as a "team dig." Despite the continuous struggles that BEBs face in using team digs, they maintain the assets because of potential increases in convenience and efficiency. However, an expansive BCT area of operations—combined with unit failure to plan—usually results in decreased efficiency and the underutilization of dig assets. Unit failure to properly plan for upcoming missions results in rapid and repeated changes in task organization. The real-world complexities associated with these task organization changes lead to valuable time consumed by administrative functions and physical linkup with the gaining unit, including time spent on troop leading procedures and convoy planning and movement. In an open-phased fight, where transitions are immediate, units must be able to maximize available assets and dig time (commonly referred to as blade time) to quickly support the BCT main effort. BEBs can achieve better results across the expansive BCT area of operations by maintaining organic dig assets within engineer companies, while executing mission command of the echelon-above-brigade engineer units to employ

M870 trailer high-centered on a hill in restrictive terrain

Damage to an M870 trailer during movement

dig assets as required to maximize mobility, survivability, and countermobility efforts.

The team dig concept is administratively convenient because all available dig assets are placed under one chain of command, usually the echelon above a brigade engineer construction company or an engineer support company. Dig assets can then be reallocated across the BCT area of operations as required. Team dig can also be convenient from a tactical perspective because it protects critical assets that are easily identified as engineer assets by enemy reconnaissance. Team dig is generally one of the last elements to leave the rotational unit bivouac area. Although team dig is conceptually convenient, the assumed efficiency gained is never actually realized. Units fail to plan for the timely and relevant triggers necessary to conduct immediate task organization changes during the mission and for the real-world time required to move the equipment across the battlespace, resulting in the loss of valuable dig time.

Significant time is consumed with the administrative approval process necessary for last-minute task organization changes. Due to failure to properly identify necessary enablers for mission execution, the gaining task force instead identifies the need for additional dig assets. The task force then requests the additional assets (with proper justification) from the BCT. The BCT tactical operations center (TOC) receives and analyzes the request; assesses the risk of asset reallocation; and, following approval from the brigade commander, issues new guidance to subordinate units. The BEB receives the updated task organization, processes and analyzes the information, and issues guidance to team dig—at which point, the process is repeated. The company commander receives the updated task organization guidance and begins the troop leading procedures necessary to move the dig assets to the gaining task force. If all personnel at every level were diligently standing by their joint capabilities release or FM radio waiting to receive guidance and if the BCT and BEB TOCs were free to prioritize the request and make the last-minute task organization changes, this process could be completed in just a few hours. The process could be completed even faster if the engineer company commander supporting the task force made a parallel request directly to the BEB to prompt team dig to begin the necessary troop leading procedures before an official task organization change were made. However, in reality, personnel do not diligently stand guard over their joint capabilities release or FM radio and the process is not streamlined. The flow of information is further degraded by the complexities and challenges (jamming, hardware issues, terrain, distance) that units face with their communication infrastructure. Ultimately, the administrative approval time seems to take much longer than expected.

After the lengthy approval process of the task organization change, valuable time continues to be consumed via the physical linkup with the task force. Units fail to properly plan and account for the time necessary to conduct the physical linkup and to maneuver across the restrictive terrain, which results in maintenance issues and time wasted. Team dig usually establishes the tactical assembly area about 10–20 kilometers to the rear. Any asset that is pushed forward must travel about 10–15 kilometers on main roads and then about 5 kilometers on trails or across the countryside to get to the actual linkup point, which is typically the task force TOC or the supporting engineer company command post (CP). Task force TOCs are often established in locations that are tucked away, where the terrain can be used to conceal their location and limit the effects of enemy indirect fire. Most supporting engineer companies establish their CP within 1 kilometer of the task force TOC that they support. However, the challenging terrain locations that favor TOCs and CPs make movement difficult, if not impossible, for wheeled, heavy, expanded-mobility tactical trucks (M983s) with fully loaded, 40-ton M870 trailers. The

"In an open-phased fight, where transitions are immediate, units must be able to maximize available assets and dig time (commonly referred to as blade time) to quickly support the BCT main effort."

risks associated with maneuvering an M870 trailer fully loaded with a D7 bulldozer over rocky terrain are not always fully understood. Driving off-road over the challenging terrain at NTC frequently results in multiple maintenance issues (popped trailer tires, broken axels, broken wheel hubs) or stuck vehicles that require recovery assets for dislodgement—both situations that lead to wasted time. Rather than a simple convoy traveling 20 kilometers (as planned), what actually occurs is a slow-moving convoy navigating difficult, restrictive terrain and narrow trails using a joint capabilities release or a map with the scale of 1:100,000—neither of which show the microterrain that can be devastating to a fully loaded M870 trailer. The supposedly simple movement to conduct the physical linkup is further aggravated during conditions of limited visibility. Under those conditions, the unit travels at a slower rate of speed and is at higher risk of experiencing a maintenance issue. During daylight, when visibility is several hundred meters, the driver can best attempt to maneuver the vehicle to the optimal trail. However, during hours of limited visibility, when the driver may only be able to see one vehicle length ahead, locating the optimal trail is more difficult. Under those conditions, the unit must navigate through unfamiliar terrain with steep wadis and draws, wreaking havoc on the equipment because of the inability to see the optimal trail 200–500 meters away.

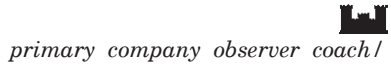
Keeping engineer companies with their organic dig assets removes all of the time requirements associated with the administrative aspects of the task organization change as well as the time requirements associated with the physical linkup. It provides the task force supported by each company with the necessary assets to almost immediately start any kind of survivability or countermobility tasks. This could result in an increase in actual dig time of 6–12 hours or, in more substantial numbers, one to two platoons of vehicles in hull fighting positions. Then, additional dig assets from echelon-above-brigade engineer companies can be tasked as needed to augment the dig assets for the BCT main effort.

The task force needs dig assets just as much for mobility operations as it does for survivability and countermobility operations, and the mobility of the task force is also vastly improved when the organic dig assets are kept with engineer companies. The gap-crossing capability of BEB engineer companies is limited to the impractical rapidly emplaced bridge system or the unreliable armored vehicle-launched bridge, Wolverine, or armored combat earthmover. Nearly every breach operation through an antivehicular ditch at NTC lists a bulldozer as the redundant asset. Without bulldozers, the task force is unlikely to successfully breach an antivehicular ditch, and NTC contains numerous complex obstacles with antivehicular ditches.

Keeping the organic dig assets within engineer companies also aids the task force in forecasting sustainment requirements. Instead of reacting to a task organization change that occurs after the operation has begun, the task force supply officer can create a sustainment plan to ensure the availability of fuel quantities and a viable fuel (Class III) resupply plan before the dig assets move to the front line to begin digging operations. Moreover, engineer company commanders are better able to serve as task force engineers or aid the task force engineer in taking proactive steps toward the protection warfighting function. When their organic dig assets are under their control for the entire operation, engineer company commanders can recommend survivability efforts for areas within the task force that might otherwise be overlooked.

The tactical risk of sending valuable dig assets with the engineer company supporting the task force can easily be mitigated through the proper placement of dig assets respective to the front line. One approach is to collocate the assets with the combat trains command post. Then, if needed, those assets can be sent forward based on a preplanned trigger or be called forward by the commander. With this approach, the unit is still required to plan timely and relevant triggers to initiate movement. Another approach is to consolidate the assets with the engineer company CP at a location that is compatible with the equipment maneuverability, yet still within range of the task force TOC in order to remain integrated. This approach requires that the engineer company deliberately select the CP site and plan routes for relocating the CP.

BEBs can better enable the BCT in the areas of survivability, countermobility, and mobility by allowing engineer companies to retain their organic dig assets. Team dig is conceptually convenient and may be an appropriate option at times, but observations consistently show that team dig rarely results in increased efficiency at NTC. Units generally fail to plan timely and relevant triggers and usually fail to account for the real-world time requirements for moving dig equipment across the battlespace. These failures result in last-minute task organization changes that consume valuable time that could be used for dig operations. BEBs need to avoid the easy task organization solution that team dig provides and keep organic dig assets within engineer companies.



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The Leadership of Lewis and Clark:
An Army Expedition Unlike Any Other

By First Lieutenant Ander J. Thompson

In today's conflicts with other nations, the United States military often looks back to its experiences on the beaches of Normandy or in the jungles of Vietnam to better understand the decisions and actions of leaders in major times of war. Whether it was General Dwight D. Eisenhower's ability to coordinate a joint, multinational invasion or Lieutenant General Harold G. (Hal) Moore's discipline to lead in the most austere conditions, the officers of the past century have shaped the standard to which we hold officers today. But what caliber of military leaders did Eisenhower and Moore admire?

As the author Stephen E. Ambrose describes in *Undaunted Courage: Meriwether Lewis, Thomas Jefferson, and the Opening of the American West,* in 1804, President Thomas Jefferson entrusted two Army officers, Captain Meriwether Lewis and Captain William Clark, to lead the Corps of Discovery, a 33-man element, through the newly purchased Louisiana territory to find a navigable trading route by water and establish a working relationship with Indian tribes, among many other objectives.[1] Although often overlooked in the midst of U.S. efforts to establish a foothold on the world stage in the early 19th century, Lewis and Clark's use of mission command—specifically, their ability to take calculated risks and form unwavering trust with their men during their journey through uncharted territory in the western United States—demonstrates leadership principles that officers are expected to emulate.[2]

In the face of aggressive Indian tribes, unyielding terrain, and endless winters, the ability of Captain Lewis and

Captain Lewis (left) and Captain Clark (right)[3]

Keelboat on the Missouri River[7]

Captain Clark to take calculated risks was essential to their successful exploration and documentation of a region as daunting as the unmapped Louisiana Purchase. There is some degree of uncertainty when making command decisions in all military operations. Therefore, commanders must "determine risks, analyze and minimize as many hazards as possible, and then take prudent risks to exploit opportunities."[4]

To gain as much information as possible during their journey west, Lewis and Clark inherently assumed such risk in dealing with unknown conditions. During their return trip to St. Louis, Missouri, they were audacious in acquiring as much geographical data on the Missouri River floodplain as possible; rather than following the same route that they took going west, Lewis and Clark decided to divide their command and search party. They explored three different passageways because they envisioned "the expedition to be as successful as possible, to bring back as much information as possible, to make every conceivable effort to broker a peace among tribes, and to begin the process of creating the American trade empire."[5] In order to meet the high expectations of President Jefferson and maximize the effectiveness of the Corps of Discovery, Lewis needed to trust his men and assume the risks involved with breaking up the unit for the first time in the expedition. This approach was worthwhile; and, after mapping an area that spanned from the modern-day reaches of northern Montana to the border of southern Wyoming, the Corps of Discovery reunited to the east of the junction of the Missouri and Yellowstone Rivers without having suffered any losses.

In addition to the calculated risks taken during the return trip, in the winter of 1804, the leaders of the expedition were faced with the difficult decision of whether to make a camp in the heart of Indian territory. Hundreds of miles from St. Louis, and a long way to the Pacific coast, the captains decided to create a winter fort near the Mandan Tribe in present-day North Dakota to prepare personnel and equipment for the large push to the ocean the following spring. Despite an extremely cold winter, Lewis and Clark ensured that their men remained occupied "both because there was lots of real work that had to be done and because they were good officers who knew for a certainty that an idle Soldier is a bored Soldier heading for trouble."[6] They balanced the risk of being raided and potentially killed by Indians with staying dormant for the winter and managed to devise a plan that allowed for successful preparation for the following spring. They established a working relationship and trade network with tribe leaders, which helped them prepare for the harsh winter months and the upcoming spring expedition. Lewis and Clark demonstrated how proper planning and preparation, combined with a clear understanding of orders, afford leaders the chance to take calculated, prudent risks—something that is necessary in order for any element to overcome seemingly unsurmountable challenges.

Additionally, soon after the expedition was underway, Lewis and Clark fostered a climate of discipline and order—a critical step in establishing trust and a positive working relationship with their men. Trust—often considered the bedrock of the Army profession—is a value that comes from "shared experiences and training, deliberately developed by commanders or through the conduct of operations."[8] From the moment the expedition got underway, the two officers essentially operated without oversight, during which time the closest form to another military official was thousands of miles away. President Jefferson essentially entrusted the captains to make their mark in history, using their own judgement and abilities, while operating in "an independent command such as the U.S. Army had not previously seen and never would again."[9] In essence, this meant that two lone officers were expected to command a platoon size element in raw, unforeseen circumstances.

The loyalty of the group to its leaders was utterly necessary and quickly established, in part through Captain Lewis's ability to act as the expedition doctor, as he oversaw the care of the men and ensured that they were in prime shape for the arduous requirements of traveling west.[10] The men quickly bought into the mission as soon as they recognized the competence, expertise, and professionalism that Lewis demonstrated as the leader of the party.

Captains Lewis and Clark navigating uncharted territory[11]

Lewis and Clark further earned the trust of their men when faced with the difficult decision of determining which branch of the Missouri River to navigate while searching for a transcontinental trade route. Rather than making the decision in the privacy of their own tent, they asked for input from the men of the Corps of Discovery. Although not all of the men believed that the fork that was ultimately selected was the one most likely to lead to the headwaters of the Columbia River, they appreciated having a say in the decision-making process. The faith that Lewis and Clark had in their men was reciprocated; their simple act of consideration caused the members of the Corps of Discovery to develop full faith in their leaders, and they readily agreed to follow Lewis and Clark anywhere, illustrating that trust goes both ways and must flow throughout the chain of command. Ultimately, the men understood that they were part of a once-in-a-lifetime opportunity, linked by an uncommon experience, and that every single one of them was dependent on the skill sets of the others in order to make it through the treacherous challenges of traveling west. Today's military leaders are expected to match the dedication that Lewis and Clark had for caring for their men and incorporating their ideas into major decisions to build the trust needed to effectively work together.

During a period of history in which Lewis and Clark faced unknown challenges of the western United States, their ability to utilize the basic principles of mission command allowed them to overcome the grueling winters, navigate unmapped rivers, and forge relationships with Indian tribes. The captains' decisions to take warranted risks and their understanding of how to earn the full faith and allegiance of their men allowed them to lead one of the most daunting missions the Army has undertaken to date. Although more than 200 years separate the members of the Corps of Discovery and modern Army officers, there is much to learn from the expedition of Captain Lewis and Captain Clark. According to Ambrose, "How [Lewis] led is no mystery. His techniques were time-honored. He knew his men. He saw to it that they had dry socks, enough food, sufficient clothing. He pushed them to but never beyond the breaking point. He got out of them more than they knew they had to give. His concern for them was that of a father for his son."[12] The autonomous leadership and persistent courage of Lewis and Clark established a precedent for the expectations of U.S. Army officers—a precedent that leaders such as General Eisenhower, Lieutenant General Moore and, perhaps, the leaders of today could aspire to match.

Endnotes:

[1]Stephen E. Ambrose, *Undaunted Courage: Meriwether Lewis, Thomas Jefferson, and the Opening of the American West*, Simon and Schuster, 2013.

[2]Ibid.

[3]"Wikimedia Commons," <https://commons.wikimedia.org/wiki/File:Lewis_and_Clark.jpg>, accessed on 19 February 2020.

[4]Army Doctrine Publication (ADP) 6-0, *Mission Command: Command and Control of Army Forces*, 31 July 2019, p. 1-14.

[5]Ambrose, p. 376.

[6]Ibid, p. 192.

[7]"Lewis-Clark.org," <http://www.lewis-clark.org/article/18040609>,accessed on 19 February 2020.

[8]ADP 6-0, p. 1-8.

[9]Ambrose, p. 139.

[10]Ibid, p. 245.

[11]"Wikimedia Commons," <https://commons.wikimedia.org/wiki/File:Detail_Lewis_%26_Clark_at_Three_Forks.jpg>, accessed on 19 February 2020.

[12]Ambrose, p. 482.

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