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Front cover: A Sapper Leader Course squad detonates a silhouette charge to create an entrance through a wall during urban breaching exercises at Fort Leonard Wood, Missouri. Photo by Stephen Standifird

Back cover: Photos by Mike Curtis

DEPARTMENTS

FEATURES

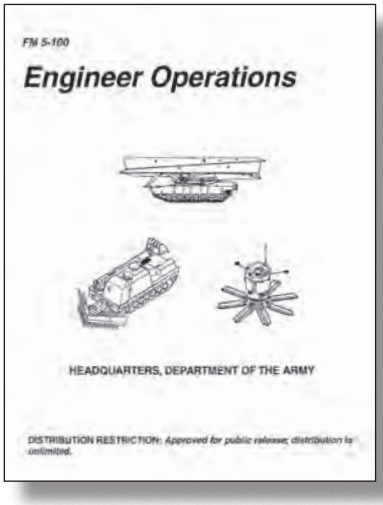
Clear the Way

Brigadier General James H. Raymer
Commandant, U.S. Army Engineer School

In testimony to the House Armed Services Committee on 5 April 2017, General Mark A. Milley, U.S. Army Chief of Staff stated, "The continued recapitalization and modernization of 40- to 50-year-old equipment in the face of overmatch and increasing challenges from our adversaries places our Army at increasing risk on the future battlefield against near-peer threats."[1] The equipment he referred to are items currently authorized in our mechanized engineer formations: the M113 armored personnel carrier, first fielded in 1960, and the armored, vehicle-launched bridge (AVLB), first fielded in 1967. Their sister system, the M728 combat engineer vehicle, first fielded in 1965, was divested from engineer units between 1996 and 2000 without replacement; a major reason for the divestiture was the inability of the M728 to keep pace with the M1 Abrams tank in offensive operations.

Why is the AVLB still in service? Why did the combat engineer vehicle end its service without a replacement (although the assault breacher vehicle did enter Army service in fiscal year [FY] 2010)? Why aren't there new munitions programs for shaping terrain? Historical documents provide clues to the answer.

The 27 February 1996 edition of Field Manual 5-100, *Engineer Operations,* shows pictures of three future engineer systems on the cover—the Grizzly breacher; the Wolverine heavy assault bridge; and the Hornet hand-emplaced, wide area mine.[2] None of these systems entered full production, and only the Wolverine was fielded to operational units. Yet they were important enough in 1996 for the Engineer Branch to place drawings of them on the cover of its capstone doctrinal manual. The Grizzly program was initiated in FY 1992 as a result of lessons learned during Operation Desert Storm, indicating the need for an armored breaching vehicle that could keep up with the M1 Abrams tank and Bradley fighting vehicle. Prototypes were delivered in the last quarter of FY 1995, and the program proceeded through the design maturation phase of engineering and manufacturing development in 1999.



FM 5-100, *Engineer Operations*

The Wolverine program also began in 1992; the prototypes underwent testing under live-fire conditions between 1997 and 1999. However, in December 1999, several Army programs, including Grizzly and Wolverine, were terminated due to changing priorities and the need to fund Army Transformation—specifically the Future Combat System. The Wolverine remained the Army's top unfunded requirement, and Congress directed the Army to obligate FY 2000 procurement funds to build 10 Wolverines. From the original objective of 465 Wolverines, a total of 44 were eventually built. From the original objective of 366 Grizzlies, only two were ever built. The wide area mine, as approved in March 1990, was to include a family of three munitions—a hand-emplaced munition, the Volcano scatterable mine system, and an Army tactical missile system-delivered munition. The hand-emplaced version entered development and gained approval for low-rate initial production in September 1996. However, the Army later chose not to enter into full-rate production. The Army did issue a conditional materiel release for 377 hand-emplaced, wide area mine units in March 2001. A much improved version of the system, the Advanced Hornet, continued in development. An FY 2000 Department of Defense Inspector General report criticized the management of the program. There was also difficulty in demonstrating developmental progress and maintaining program schedules with the Advanced Hornet. The combination of these factors and the attention generated by the inspector general's report resulted in program termination in September 2002. In addition to these program cancellations in 1999 and 2002, the impacts of the 11 September 2001 attacks on the United States and subsequent operations that continue to this day in Afghanistan and Iraq have had a very significant impact on previously envisioned force modernization programs to fight a near-peer adversary.

Senior leaders have noted the consequences of these and other program cancellations that have left the Army using the 40- to 50-year-old equipment noted at the beginning of this column, as well as

the Department of Defense ability to fund new programs to replace that equipment. Retired Lieutenant General Thomas W. Spoehr, a former commandant of the U.S. Army Chemical, Biological, Radiological, and Nuclear School at Fort Leonard Wood, Missouri, stated in November 2016 that "What worries me the most is that there is real potential that we could face an adversary that has better equipment than we do. That's not a position that Americans are used to being in."[3] Major General David G. Bassett, Army Program Executive Officer for Ground Combat Systems, said in October 2016, "I'd love to have replacement programs today for Abrams and Bradley and lay in plans to go do that. But it doesn't fit in this portfolio in this budget environment."[4]

And what about fighting a peer adversary that contests all domains? General Milley has elaborated on the increased risk for American forces. He warns of a far more lethal future battlefield—not the one that a whole generation of officers have become accustomed to in Iraq and Afghanistan, where "enemy firepower has been limited, with virtually no threat from artillery and massed rocket fires, much less precision strikes."[5] He stated in October 2016 that future warfare with a near-peer adversary will "be highly lethal, unlike anything our Army has experienced at least since World War II."[6]

What might near-peer or hybrid conflicts that have occurred since 1945 tell us about fighting when one side encountered a far more capable enemy than expected? The 1973 Yom Kippur War was a reminder that the element of surprise remains a principle of war. The Israeli Defense Forces were surprised by the simultaneous Egyptian assault across the Suez Canal and the Syrian attack against the Golan Heights. The intense fighting nearly resulted in an Israeli defeat. "One of the most common themes in examinations of the October 1973 war strategic warning issue is the absence of dissent against some of the most deeply held truths. One such conventional wisdom was that the 1967 Six-Day War had proven Israeli military superiority and Arab military inferiority to such an extent that the Arabs would avoid war at all costs. Another was that Arabs were tactically and strategically ill-suited for modern warfare and would not be able to fool analysts well enough to launch a surprise attack."[7]

Another conflict in the region, the Second Lebanon War of 2006, showed that combined arms maneuver proficiency is perishable. "When the IDF [Israeli Defense Force] reluctantly moved its ground forces into southern Lebanon, the apparent ineffectiveness of the operation and the stubborn resistance of Hezbollah fighters stunned military observers worldwide. After years of highly successful counterinsurgency operations against the Palestinians, the IDF appeared remarkably inept to conduct a successful conventional ground campaign against Hezbollah. Without question, the Israeli ground campaign revealed an army confused by its new doctrine. Soldiers were deficient in training and equipment, and senior officers seemed woefully unprepared to fight a 'real war.' By the time the United Nations cease-fire went into effect on 14 August 2006, many military analysts were convinced the IDF had suffered a significant defeat."[8]

Finally, consider the war in eastern Ukraine, which has been ongoing since 2014. It demonstrates that the Russian military is not nearly as large as its Soviet predecessor, but it remains a serious and capable force. We should assume the same about other potential adversaries, as opposed to thinking that we can destroy them like the Iraqi army of 1990 or 2003. Dr. Phillip A. Karber wrote, "Against every expectation, the Ukrainian Army conducted the largest mobilization and redeployment of any Western or East European country since World War II and has fought admirably given its two decades of military neglect and inventory of 30-year-old equipment. The surprise is neither that they resisted, nor that they have lost a string of recent battles but that, after 9 months of near continuous combat, the Ukrainian Army is still standing. . . . As of this date, Russia has introduced into the Donbas several thousand pieces of heavy equipment—late model tanks (including T-90s), long-range artillery and rocket systems armed with thermobaric warheads, and a variety of submunitions, modern air defense, and electronic warfare systems (many of which are unique to Russian forces)."[9]

Given those anecdotes, what path do we take in regard to equipment modernization and why is this way forward so important? The armored, multipurpose vehicle will eventually replace the M113 vehicle in brigade combat teams, but we have many mechanized engineer formations at echelons above brigade (especially in the Army National Guard and U.S. Army Reserve) that will remain equipped with the M113 through the next decade. And note that current doctrine clearly requires these echelon-above-brigade formations to provide much of the engineer capability required by the armored brigade combat teams to fight on a high-intensity battlefield. There is no M9 armored combat earthmover replacement currently identified—yet for years to come, we will need the capability that it provides. The joint assault bridge will replace the AVLB in the coming decade, but we have some years left with it and the Wolverine—and the terrain of potential battlefields is not always a wide-open plain without gaps to cross. The family of scatterable mines forms our principal method left to shape terrain to fix, block, turn, and disrupt enemy formations, but the family of scatterable mines is reaching the end of its planned service life and is restricted in use by national policy; any replacement is decades away.

Do we somehow feel protected against the consequences of sending Soldiers into battle against a near-peer adversary using this increasingly obsolete equipment? Do we feel that way because we regard the possibility of such a fight extremely remote? Retired Lieutenant General Daniel P. Bolger wrote, "If it comes down to house-to-house or hole-to-hole combat against a determined enemy, such as the Germans in both world wars, the Japanese in the Pacific, the North Koreans and the Chinese of 1950–1953, or the North Vietnamese . . . American leaders say that such wars will not be waged; but last checked, the enemy side votes in that, too."[10]

It is axiomatic to state that the United States has not often accurately predicted the location or nature of its next conflict, but let's imagine U.S. Army Soldiers fighting in some unexpected crisis in the future that rapidly escalates into high-intensity fighting, even if only for a few days or weeks. This fighting might involve rotational Army units from the

Regular Army and the Reserve Component that see an adversary's training exercise on the border rapidly evolve into an attack across that same border. The war might grow in intensity during this short period until the adversary de-escalates and offers a settlement that cannot be refused given the destruction that occurred during the brief duration of the fighting. Afterwards, would the United States officially study what had happened and why?

Of course it would. For example, examine the Winograd Commission Report after the Second Lebanon War, which concluded, "The overall image of the war was a result of a mixture of flawed conduct of the political and the military echelons and the interface between them; of flawed performance by the IDF, and especially the ground forces; and of deficient Israeli preparedness. Israel did not use its military force well and effectively, despite the fact that it was a limited war initiated by Israel itself."[11]

Think about an American version of that commission following the crisis scenario previously described, as might occur on the Korean Peninsula or on the border of a new North Atlantic Treaty Organization country between the Baltic and Black Seas. Does this cause serious misgivings about the current state of equipment modernization? Senior Army leaders certainly convey some misgivings to the U.S. Congress, such as: "Army can meet wartime requirements in defense planning only at 'high military risk.' Forces forward and civilians will suffer higher casualties because reinforcements 'arrive too late,' delayed by gaps in training and equipment. . . . The Army budget to modernize equipment is $24.8 billion, half what it was in 2009."[12] Clearly, there are difficult issues related to modernizing the Army to the level required to decisively and quickly defeat a near-peer adversary: budget constraints, a complex acquisition process and, since we no longer have the clarity that the Soviet threat provided to our decision makers during the Cold War, the potential adversary on which to focus. Nevertheless, consider some additional advice from the Winograd Commission as we move ahead to tackle modernization in the Engineer Regiment as part of the Army and joint force:

"We would like to caution against dangers which might upset plans and delay required change processes, and thus produce dangerous results:

- Fear of criticism in case of failure may lead to defensive reactions, working by the book, and abstention from making resolute decisions and preferring nonaction. Such behavior is undesirable and also dangerous.
- In a dynamic, complex reality, one should not prepare better for the last war. It is also essential not to limit oneself to superficial action, designed to create an appearance that flaws had been corrected.
- It is also essential not to focus exclusively on coping with dangers, but to combine readiness for threat scenarios with an active seeking of opportunities.
- When speaking of learning, one should take into account that enemies, too, are learning their lessons."[13]

Essayons!

Endnotes:

[1]Mark A. Milley, Chief of Staff of the Army, "Damage to the Military From a Continuing Resolution," testimony before the House Committee on Armed Services, 6 April 2017, <https://armedservices.house.gov/legislation/hearings/damage-military-continuing-resolution>, accessed on 24 May 2017.

[2]Field Manual 5-100, *Engineer Operations,* 27 February 1996. (Superseded by Field Manual 3-34, *Engineer Operations*, 2 April 2014.)

[3]Dan Lamothe, "Conservative Think Tank Breaks With Trump in Describing Russian Threat," *Washington Post*, 15 November 2016, <https://www.washingtonpost.com/news/checkpoint/wp/2016/11/15/conservative-think-tank-breaks-with-trump-in-describing-russian-threat/?utm_term=.29dfa4e7ec0e>, accessed on 23 May 2017.

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[6]Matthew Cox, "Army Chief Issues Stark Warning to Potential Enemies," 5 October 2016, <http://www.military.com/daily-news/2016/10/05/army-chief-issues-stark-warning-to-potential-enemies.html>, accessed on 23 May 2017.

[7]Matthew T. Penney, "Intelligence and the 1973 Arab-Israeli War," CIA Center for the Study of Intelligence, <https://www.cia.gov/library/readingroom/docs/2012-12-10E.pdf>, accessed on 23 May 2017.

[8]Matt M. Matthews, "We Were Caught Unprepared: The 2006 Hezbollah-Israeli War," *The Long War Occasional Paper Series 26,* Combat Institute Studies Press, Fort Leavenworth, Kansas.

[9]Phillip A. Karber, "Russia's New Generation Warfare," National Geospatial-Intelligence Agency, 4 June 2015, <https://www.nga.mil/MediaRoom/News/Pages/Russia's-'New-Generation-Warfare'.aspx>, accessed on 23 May 2017.

[10]Daniel P. Bolger, *Death Ground–Today's American Infantry in Battle,* Ballantine–Presidio Press, New York City, New York, 1999, p. 369.

[11]Eliyahu Winograd, "Winograd Commission: Final Report," 30 January 2008, <http://www.jewishvirtuallibrary.org/winograd-commission-final-report-january-2008>, accessed on 23 May 2017.

[12]Tom Philpott, "Thornberry: Politics Hid Depth of Readiness Crisis Until Now," 11 May 2017, <https://militaryadvantage.military.com/2017/02/thornberry-politics-hid-depth-of-readiness-crisis-until-now/>, accessed on 23 May 2017.

[13]Winograd.

Lead the Way

Command Sergeant Major Trevor C. Walker
U.S. Army Engineer School Command Sergeant Major

Essayons! As I write my first article for *Engineer*, I want to mention what a great privilege and honor it is to serve you as the Command Sergeant Major of the U.S. Army Engineer School (USAES) and Engineer Regiment. My first few weeks at Fort Leonard Wood, Missouri, were exciting, and I am impressed more than ever by all the great things that we do in the Engineer Regiment and by the improvements that we are making. In the near future, I will be attending various in-briefs and the Executive Leader Course to better transition into my daily duties. I am pleased to be serving among the professional Soldiers and Department of the Army civilians of the USAES; and I am awestruck every day by their commitment, knowledge, and contributions to our team. I look forward to serving with all of you over the next few years.

In March, we bid farewell to Command Sergeant Major Bradley J. Houston, who assumed duties as the senior enlisted advisor of the Joint Improvised–Threat Defeat Organization. I want to thank him for all he has done and for what he will continue to do for the Engineer Regiment in his new position. I will continue to improve the Regiment and build upon all the initiatives that Command Sergeant Major Houston started.

Also in March, the 3d Engineer School's top warrant officer, Chief Warrant Officer Five John F. Fobish, retired from the Army after serving the Engineer Regiment for more than 34 years. I want to thank Chief Warrant Officer Five Fobish for his service to the Nation, the Army, and the Engineer Regiment. He will be greatly missed. I also want to welcome Chief Warrant Officer Five Jerome L. Bussey, the new Engineer School Chief Warrant Officer. He came to the Engineer School from the Headquarters, Department of the Army, G-1 at the Pentagon.

Even though I am just a few weeks into my new position as the Engineer School Command Sergeant Major as I write this column, I want to share a few things that we are working on. To bolster the talent pool, we have requested an expansion to the W5 (project management professional) skill identifier for the engineer officer cohort. This addition will complement and assist with the Army Chief of Staff and Sergeant Major of the Army priorities to professionalize the Army with civilian credentials by increasing overall readiness. We are also asking for an equivalent project management professional additional skill identifier (ASI) for the enlisted engineer. This ASI would further incentivize the highly marketable skill set and contribute to the Army's "Soldier for Life" lines of effort. This ASI would be available to all enlisted project management professionals, certified construction managers, certified facility managers, and certified professional constructors with active membership from the appropriate credentialing institute. I encourage readers to go to the Engineer Regiment community pages on the Army Career Tracker (ACT) Web site. They can be accessed at <htttps://actnow.army.mil>.

The Engineer School credentialing program gives every engineer Soldier the opportunity to obtain applicable, high-quality credentials by validating their individual Soldier skills, training, and work experiences. This is a voluntary program; and much like voluntary education, it does not include mandatory military occupational specialty, functional area, or organizational requirements. Credentialing improves military-technical competence, increases Army readiness, and enhances a Soldier's ability to secure meaningful employment upon transitioning from military service. The result is that Soldiers develop an enhanced capability to serve our Nation while in uniform and to increase civilian employment opportunities after their military service. This is something that all enlisted engineers—especially NCOs—should look into.

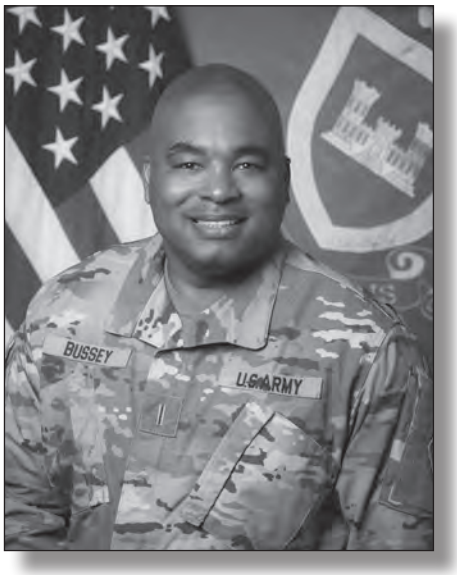
I urge you to frequently visit the ACT enlisted engineer community page to view policy updates and initiatives that the Engineer Regiment is working on. I want this page to be a one-stop shop. It already features many updates, including the approval for enlisted engineers to wear the Engineer Regimental buttons on the Army service dress and mess uniforms, the proper way to wear the DeFleury Medal, upcoming events, a developmental blog, and specific military occupational specialty subcommunities.

Finally, I look forward to visiting our engineer units during my tenure and seeing firsthand the great things that our engineer Soldiers and leaders are doing every day in support of our Army.

Essayons!

Show the Way

Chief Warrant Officer Five Jerome L. Bussey
U.S. Army Engineer School Command Chief Warrant Officer



Greetings to all! First, I would like to congratulate Chief Warrant Officer Five John F. Fobish for serving this great Army, the Engineer Regiment, and the warrant officer cohort selflessly for more than 35 years. I joined the Army on 24 January 1986 and served as the utilities operations and maintenance technician with the 14th Field Hospital, Fort Benning, Georgia, and the 67th Combat Support Hospital, Wuerzburg, Germany; as commander of the 72d Survey and Design Detachment, Fort Knox, Kentucky; as the engineer, military police, and chemical warrant officer assignment officer at the Human Resources Center of Excellence, Fort Knox, as the facility manager at the White House, Washington, D.C.; as the utilities and maintenance technician for the 67th Combat Support Hospital in Iraq; and as the commander of the 72d Survey and Design Detachment in Iraq. I came to Fort Leonard Wood, Missouri, from an assignment as the personnel policy integrator for Regular Army warrant officer promotions at the Pentagon, on 17 March 2017, and became the fourth Engineer School Chief Warrant Officer.

After being briefed by the geospatial engineering and construction engineering technician course managers, I am very excited about the future of our geospatial and construction engineer warrant officers. I will do my part by providing the tools and mentorship needed to continue to move toward Force 2025 and Beyond. The training in our Warrant Officer Basic and Warrant Officer Advanced Courses and Phase 3 of Warrant Officer Intermediate Level Education is cutting-edge education, and it continues to provide junior and senior warrant officers with the tools needed in companies, battalions, brigades, divisions, corps, and Army service component commands.

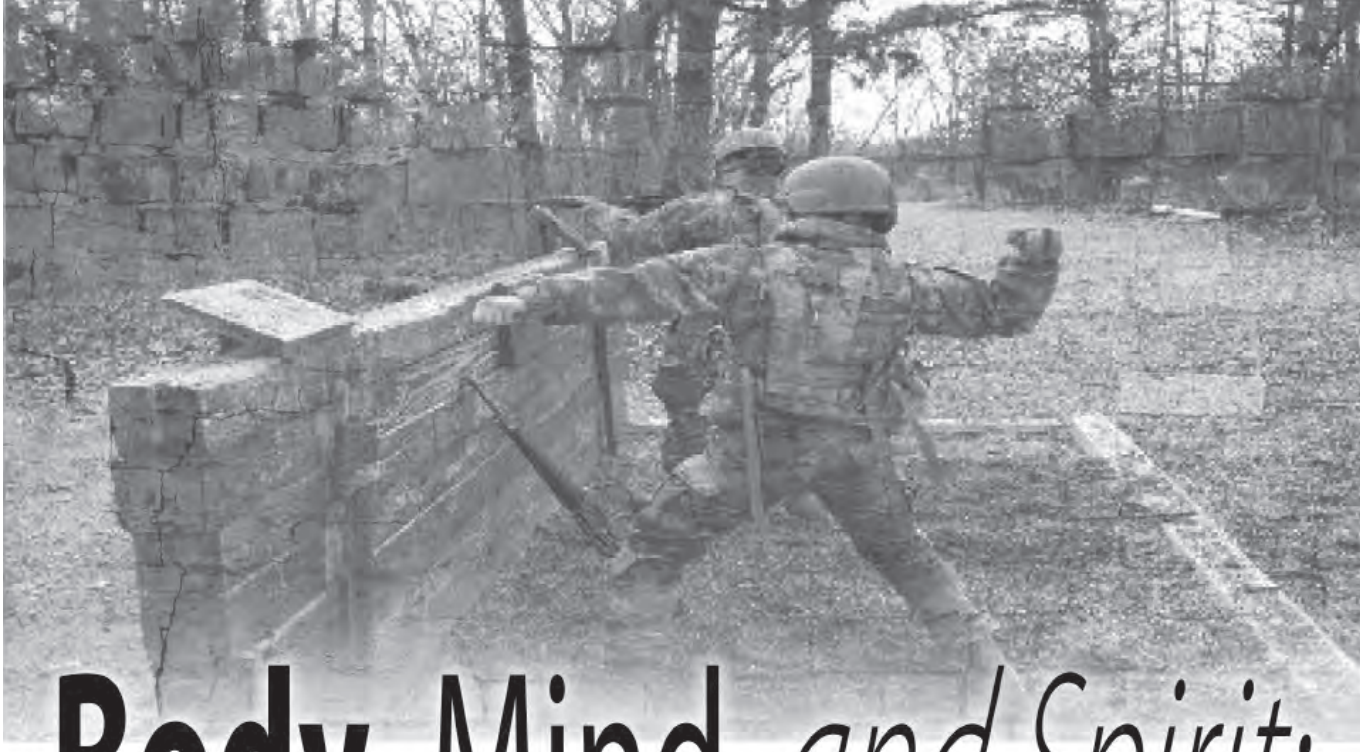
The U.S. Army Engineer School is funding credentialing and certification for programs such as program manager professional, certified assistant project manager, and certified facility manager. A combination of these programs plus our professional military education, work experience, and distance learning will deepen the technical knowledge of engineer warrant officers and enhance their ability to provide commanders with the technical answers needed to win in a complex world. With help from the U.S. Army Human Resources Command, we will predicate certain assignments on having at least one of these certifications.

This is a great time to be an engineer warrant officer, and I am looking for good noncommissioned officers in the Regular Army and Reserve Component to take advantage of this opportunity. Our training will enhance your technical skills and provide you with opportunities to work in places such as the White House, the National Geospatial-Intelligence Agency, and Arlington National Cemetery.

I look forward to serving the Engineer Regiment, and I welcome advice, mentorship, and tough questions from noncommissioned officers, commissioned, and warrant officers, and civilians. Please follow engineer warrant officer sites at <https://www.milsuite.mil/book/groups/senior-engineer-warrant-officer-group> and <https://www.milsuite.mil/book/groups/120A-training-development>.

Essayons!

". . . these programs plus our professional military education, work experience, and distance learning will deepen the technical knowledge of engineer warrant officers and enhance their ability to provide commanders with the technical answers needed to win in a complex world."



Body, Mind, *and Spirit:* Soldier Fitness–The Mind

By Colonel Martin Dale Snider and Lieutenant Colonel Aaron D. Bohrer

(Editor's note: This article continues the discussion of a topic first explored in "Body, Mind, and Spirit: Soldier Fitness—The Beginning," in the January–April 2017 issue of Engineer.*)*

Army initial military training (IMT) programs work well in providing U.S. Army Forces Command with a steady flow of quality Soldiers, but there is room for improvement. As noted in the January–April 2017 issue of *Engineer*,[1] Soldiers begin the Army transformation as willing civilians, the best of America's national treasure—her people. They join for many reasons, but they all join to become more than they are and to serve a greater cause. Their mental transformation begins with an immediate introduction to stress and maximum control by drill sergeants; however, this condition gradually shifts to a more positive coaching environment as trainees begin to adopt the Army's values and display personal responsibility and teamwork. The mental transformation strategy maximizes stress and control up front and reduces them over time.

Early phases of IMT teach trainees discipline, Army values, the Warrior Ethos, individual skills, ways to care for themselves, and methods to become valued members of a team. After many weeks of individual skills training, trainee experience levels have increased enough that there are opportunities for trainers to transfer what they have learned to new situations. There are opportunities to repetitively apply individual and team skills while conducting after action reviews and studying lessons learned with facilitation by seasoned, skilled leaders. Over time, these trainees become disciplined young leaders of themselves and small teams.

This article discusses—

- The Army's needs for adaptable Soldiers and leaders.
- Examples of how adaptability is trained.
- Mental aspects of IMT.
- Immediate changes that can be made.
- What an optimal training environment could look like.

The development strategy focuses on a "leader-centric view of being adaptable, flexible, and able to adapt to the situation on the ground." The future environment is likely to be "complex and asymmetrical" with insurgency, conventional warfare, and a rapid flow of information within and between the populace.[2]

The Need for Adaptive Soldiers

The Army occasionally reconsiders the question of how to develop adaptive Soldiers to fight and win the inevitable conflicts of the future. History informs

us that war and conflicts are a part of human nature and only by great efforts of leadership are security and stability maintained. With this understanding, it is prudent to prepare for conflict. In preparation for conflict, the Army must maximize the resources of time, money, manpower, and mental energies. It must train units and develop leaders with a laser focus on the most effective and efficient methods. To support this pressing need, Army senior leaders have identified a number of priorities. General Raymond T. Odierno, 38th Army Chief of Staff, singled out leadership development as the single most critical Army task. His successor, General Mark A. Milley, has identified Army readiness as his No. 1 priority. That priority includes three elements:

- Equipping the Army.
- Training the Army.
- Providing the Army with the best leadership possible.

As General David G. Perkins, commander of the U.S. Army Training and Doctrine Command (TRADOC) said, "The enemy is unknown, the location is unknown, and the coalition involved is unknown. The problem we are focusing on is how to 'win in a complex world.' "[3]

Engineer students participate in hands-on assessment training.

Army Leader Development Strategy

The stated objective for Army leaders is to be innovative and adaptive. Even very young leaders must be able to use conventional and unconventional solutions in a complex and ever-changing environment. The Army strategy involves achieving this by lifelong exposure to education through training, developmental assignments, and self-development.[4] Great leadership is important because the Army has long identified the need to maintain a competitive edge over adversaries through the development of adaptive leaders. The Army officially states, ". . . leader development processes produce and sustain agile, adaptive, and innovative young leaders who act with boldness and initiative in dynamic, complex situations . . . founded in Army values..."[5]

An improved ribbon bridge construction project over the Big Piney River provides an opportunity for adaptive application of program-of-instruction training.

". . . the Army has made great strides incorporating the science of how adults best learn into advanced individual training (AIT). According to that concept, Soldiers learn best when they can apply previous knowledge and experience to a task."

Army Doctrine Reference Publication 6-22, *Army Leadership,* describes the Army's view of adaptive leadership and describes leader attributes and competencies with the intent to inform trainers across all Army institutions, including the use of those attributes and competencies in joint training environments.[6]

The Army must continue to assess successes and failures so that iterative, positive adjustments can be made. The development of agile and adaptive leaders is currently under review in TRADOC Pamphlet 525-3-1, *The U.S. Army Operating Concept,*[7] which describes how the Army will prevent, shape, and win conflicts. *The U.S. Army Operating Concept* takes a deliberate look at many aspects of how the Army currently operates and attempts to provide a framework for thinking about how the Army should fight in the future. TRADOC has broken this conceptual review into 20 Army Warfighting Challenges. Challenge No. 10 is *Developing Agile and Adaptive Leaders.*

The Training of Adaptability

Since publication of the first version of *The U.S. Army Learning Concept for Training and Education* in 2015,[8] the Army has made great strides incorporating the science of how adults best learn into advanced individual training (AIT). According to that concept, Soldiers learn best when they can apply previous knowledge and experience to a task. AIT is trained somewhat differently across the eight military occupational specialties (MOSs) taught in the 169th Engineer Battalion, 1st Engineer Brigade. This is partly due to the fact that the battalion footprint spans five training locations from Fort Leonard Wood, Missouri, to Panama City, Florida, to San Angelo, Texas. As many as three MOSs are taught at each site. Despite the variance in technical tasks, the learning methodology at these locations adheres to a simple idea—that although young adults learn a little differently, they will learn the material through a systemic teaching method. The instructors hold to a prescribed teaching structure that has been proven to ensure that the maximum amount of information is retained. Training is no longer conducted in a "death by PowerPoint™" classroom environment. Instead, the AIT curriculum has shifted from largely lecture-based training to student-inclusive lectures, hands-on, assessment training. For example, electricians (MOS 12R) and carpenters and masons (MOS 12W) begin each block of instruction with a lecture that is augmented with slides and a concrete experience in the form of a video or live demonstration. This allows students with no existing knowledge of the

Young operators and project managers support a training area deconstruction mission at Fort Leonard Wood.

A dive Soldier unmasks during salvage diving search training.

technical task to gain familiarity with it before moving to a hands-on practical exercise. After the demonstration, students execute a practical exercise in which they put their hands on the tools, manipulate the material, and execute the task under supervision. The instructor and other students offer advice, assistance, and feedback throughout the execution. Once the practical exercise is complete, the students receive feedback from each other and from the instructors on lessons learned, then discuss what they learned from the practical exercise. Finally, the instructor offers context to further application of the task, often setting the conditions for training the next task or applying the task just learned to a collective task. This reinforces the training and improves the retention quality of the information. This method works extremely well for building foundational knowledge with unfamiliar tasks, which can later be applied to larger, more complex tasks.

Company A, 169th Engineer Battalion, uses a similar methodology in its complex, 26-week curriculum at the Naval Dive and Salvage Center, Panama City, Florida. During instruction of salvage diving search, students apply previous knowledge of dive operations and scuba diving in open water to execute a limited-visibility search of the bottom of a body of water. After a lecture and discussion, instructors demonstrate search techniques in a pool. Students observe the instructors perform the search, then practice the search themselves in pairs. During this drill, one of the two trainee divers wears a blacked-out mask to simulate limited-visibility conditions. Instructors observe and critique the students in this controlled environment before moving to the murky-water search exercise. During that training event, divers execute search techniques at the dive school pier, in the mostly controlled environment of Alligator Bayou. There, the water offers little visibility and the bottom is covered with old concrete blocks from previous construction projects, debris from the ocean, silt, and sand. Students apply all they have learned to this exercise to find a weapon on the ocean floor. This hands-on approach using progressively more realistic, rigorous, and complex conditions has a concrete learning effect on all dive students.

Mental Aspects of IMT

One current AIT shortfall is in the area of training critical thinking and problem-solving skills. While plumbers and electricians are tested on their ability to troubleshoot systems, only a systemic checklist is used, eventually leading to a static solution. Students are not challenged to think outside the box and seek unique solutions. In the Army Learning Model (ALM) that is used now, the technique of applying what students have learned to a new set of circumstances, evaluating performance (conducting an after action review), and applying what has just been learned to another iteration of execution is saved for training at the next duty station.

Possible Immediate Changes

Programs of instruction (POIs) are the foundation of institutional training courses in the 1st Engineer Brigade. They establish long-term programmed funding for training and document the requirement for the trainers needed to conduct training. Refreshing POIs every 2–3 years is vital to maintaining current training programs. This long-term planning need is often overlooked when the emphasis is on providing quality training to Soldiers today. In the past year, we have prioritized POI revision, applying personnel and command emphasis to refresh outdated POIs. By the time this article is published, a number of critical POIs will have been updated, but there is much more to be done. Applying lessons learned, successful methods from current training programs, and the ALM, we must double down on the number of assets applied toward POI updates. Before shifting more assets to this effort, however, we must ensure that new POI writers are trained in ALM instructional methods and create POI development teams that include subject matter experts, doctrinal writers, and educational experts in curriculum development. These teams will refresh the curriculum while ensuring that training is grounded in ALM imperatives and lessons learned from successful current training like that described earlier in this article. The result will be a robust curriculum that generates more adaptable Soldiers for the operational force.

Over the next few years, the 1st Engineer Brigade and the U.S. Army Engineer School must refresh and embed the ALM into all POIs so that institutional training is standardized and properly resourced for the long term.

Optimized Training

Adaptability development is transferable from research, to IMT, to the greater Army. The question remains: How does the Army determine which tools develop adaptive leaders? Existing programs that are effective in developing adaptable Soldiers can offer data for collection and analysis, providing both qualitative and quantitative measurements of success for study. Continuous measurement of individuals and units would ensure that necessary large-scale data were available and could be provided for researchers at each command level. This should include data from Army physical fitness tests, weapon qualifications, High Physical Demands Testing, every individual task through company collective task evaluation, and data from evaluations such as the Multi-Source Assessment and Feedback (MSAF). All of these and more should be studied.[9] To successfully evaluate which development tools work, the Army must collect and analyze all measurements of unit performance, including reenlistments, rotational successes at combat training centers, and documentation of Soldier performance and development. Evaluation of training and long-term tracking and testing of individuals and teams are needed to determine if training and developmental tools are successful. This data collection must not add another requirement to already strained manpower resources. The use of exisiting technology must be maximized in data collection and analysis.

To optimize training, high-quality new recruits are in great demand. TRADOC and the Defense Department should consider greater emphasis on incentives to encourage America's youth to voluntarily attend military schools at younger ages. An earlier focus and more developmental time would provide more opportunities to shape young people to meet Army eligibility standards. Young people graduating from these education systems could have the option of enlisting in any of the Army institutional branches or continuing with a Reserve Officer Training Corps Program at an academic establishment. Such a system could provide advantages for other government institutions through consolidated recruiting of candidates for military service and other agencies, including the State Department, Department of Justice, Central Intelligence Agency, Federal Bureau of Investigation, and others. Many could benefit from a high-quality pool of young people from which to recruit.

Conclusion

Developing a corps of adaptive Soldiers is critical to maintaining a decisive cognitive advantage over adversaries. Is our current strategy for leadership development suitable to produce adaptive Soldiers? Given that the U.S. military is *the* global military power and that the center of its military strength is the Army's global dominance of the land domain; it is a significant validation that the Army leader development system works when U.S. allies and partners come to the U.S. Army to copy our doctrine and learn our methods.

The Army has a proven, time-tested professional system that works well at developing adaptive Soldiers. Still, senior leaders must continue to refine leader and leadership development programs and talent management opportunities to ensure the creation of adaptive leaders who are required to excel in the Army Operating Concept and to win in a complex world.

Endnotes:

[1]Martin Dale Snider et al, "Body, Mind, and Spirit: Soldier Fitness—The Beginning," *Engineer*, PB 5-17-1, Vol. 47, January–April 2017, pp. 24–28.

[2]James Sciutto, "Odierno: Leader Development No. 1 Priority," *Army News Service*, 12 February 2014, <http://www.army.mil/article/120024/Odierno_Leader_development_No_1_priority>, accessed on 20 April 2017.

[3]TRADOC Pamphlet 525-3-1, *U.S. Army Operating Concept*, 31 October 2014.

[4]Army Regulation 600-100, *Army Leadership,* 8 March 2007.

[5]Field Manual 6-22, *Leader Development,* 30 June 2015.

[6]Army Doctrine Reference Publication 6-22, *Army Leadership,* 10 September 2012.

[7]TRADOC Pamphlet 525-3-1.

[8]TRADOC Pamphlet 525-8-2, *The U.S. Army Learning Concept for Training and Education*, April 2017.

[9]The MSAF 360 program is designed to enhance leader adaptability and self-awareness and to identify Army leader strengths and developmental needs. Assessments are made by the leader and from those who surround the leader. MSAF login, <http://msaf1.army.mil/Help/FAQ.aspx>, accessed on 2 May 2017.

Colonel Snider is the commander of the 1st Engineer Brigade, Fort Leonard Wood. He holds a bachelor's degree in geography from Texas Tech University, a master's degree in construction management from Texas A&M University, and a master's degree in strategic studies from the U.S. Army War College. He is a graduate of the Engineer Officer Basic Course, the Field Artillery Officer Advanced Course, the U.S. Army Airborne School, the U.S. Army Air Assault School, the U.S. Army Combined Arms and Services Staff School, and the U.S. Army Command and General Staff College.

Lieutenant Colonel Bohrer is the commander of the 169th Engineer Battalion, Fort Leonard Wood. He holds a bachelor's degree in geology from the University of Northern Colorado, a master's degree in public administration from Webster University, and a master of military arts and sciences degree from the School of Advanced Military Studies. He is a graduate of the Engineer Officer Basic Course, the U.S. Army Combined Arms and Services Staff School, the Engineer Captains Career Course, the U.S. Army Airborne School, the U.S. Army Command and General Staff College, and the U.S. Army School of Advanced Military Studies.

101st Airborne Engineers in Operation Inherent Resolve 2016

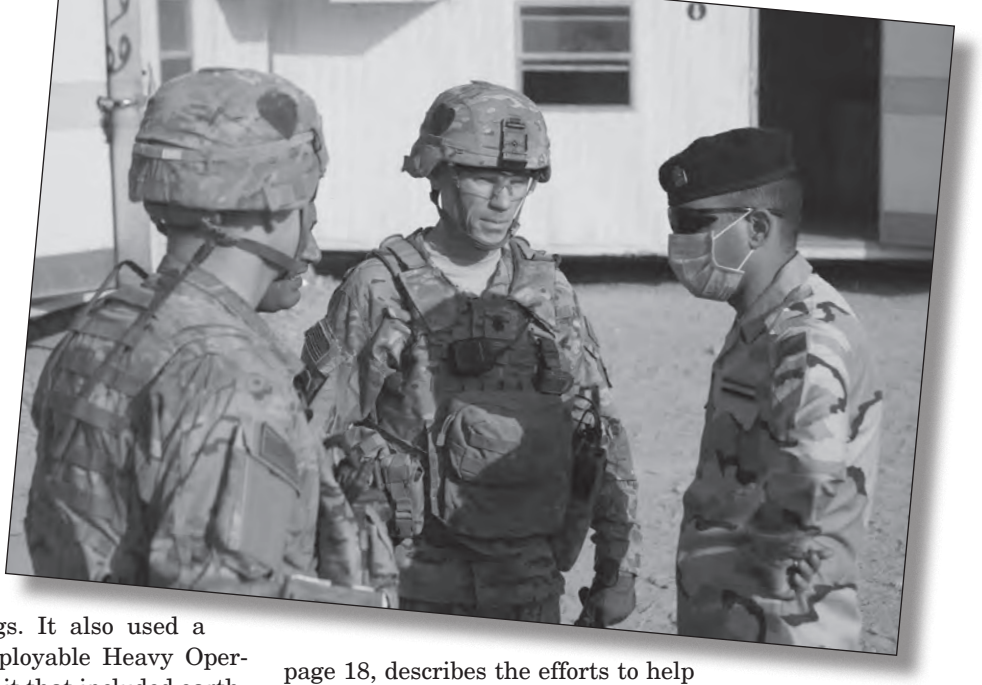
By Lieutenant Colonel Aaron W. Wolf

The 101st Airborne Division (Air Assault) deployed its division headquarters to Iraq in March 2016 for a 9-month mission to support Iraqi security forces (ISF) during Operation Inherent Resolve (OIR). The 101st supplied most of the personnel for the division level element of the Combined Joint Forces Land Component Command (CJFLCC-OIR). The division engineer section provided the staffing and control of all facets of military engineering within Iraq. The focus of engineering was to advise and assist the ISF in defeating the Islamic State in Iraq and the Levant and to repair facilities to build the partnership capability of the ISF. The division engineer section engaged the leaders of the Iraqi Directorate of Engineering to provide communication and advise-and-assist support. Additionally, with a robust construction management capability, the division engineer directly supported 10 base camp locations with construction effects. Great effort was required to rebuild or repair facilities since the departure of U.S. forces several years earlier. This article outlines the general task organization of engineers within CJFLCC-OIR, their mission, and lessons learned.

A Task Force Strike bridging advisor speaks to an Iraqi army captain during an advise-and-assist mission.

Task Organization

The engineer formations supporting CJFLCC-OIR were perhaps not as robust as those in previous campaigns in Iraq, but all the capabilities required for mission accomplishment were present. There were two engineer battalions in the division formation: the 39th Brigade Engineer Battalion and the 863d Engineer Battalion. The 39th Brigade Engineer Battalion is organic to the 2d Brigade Combat Team, 101st Airborne Division (Air Assault), and it continued to directly support the brigade combat team with route clearance and engineer advise-and-assist efforts. The 863d Engineer Battalion is a U.S. Army Reserve unit that provided construction effects with its headquarters company, forward support company, horizontal- and vertical-construction companies, survey and design detachments, and utilities detachment. A forward engineer support team–advance and a bridge training team reported directly to the division, and they were controlled by the division engineer section. The first forward engineer support team–advance was a U.S. Army Reserve engineer detachment from Florida, which was later replaced by another Reserve engineer detachment from Massachusetts. The bridge training team consisted of 15 members from a multirole bridge company, which was critical during maneuver missions and sustainment operations. A new addition to the division engineer team was the civilian engineer response team, which was composed of 17 engineer specialists who provided a robust construction management capability to the division engineer team. For specific missions, the CJFLCC-OIR was augmented



A U.S. commander speaks to a member of the Iraqi security forces about the status of a bridge across the Tigris River during an advising mission in northern Iraq.

with engineer military working dogs. It also used a U.S. Air Force Rapid Engineers Deployable Heavy Operational Repair Squadron Engineer unit that included earthmoving and well-digging capabilities.

Missions

The engineer missions were primarily focused along two lines of effort: to advise and assist ISF with preparing, resourcing, and supporting engineer formations to defeat the Islamic State in Iraq and the Levant and to repair facilities to support the coalition and build Iraqi partnership capability. In providing the first line of effort, the division engineer section communicated daily with the ISF Directorate of Engineering about breaching, building, and bridging requirements. At one of the Iraqi training bases, the 39th Brigade Engineer Battalion provided training on the antipersonnel obstacle breaching system, the mine-clearing line charge, route clearance, and other combat operations. The battalion also directly supported engineer training efforts at forward locations when the ISF conducted operations to retake Mosul. The bridge training team provided direct engagement with the ISF bridge regiment, conducting training on fixed and float bridge systems in addition to maintenance operations on unique bridge systems. The second line of effort focused on construction effects of new builds, repairs, or refurbishments. The 863d Engineer Battalion directly provided these construction effects to the coalition as the division developed several base camps. The battalion provided horizontal- and vertical-construction capabilities and project management in the construction or repair of 10 base camps.

Lessons Learned

Train the basics. The engineers who directly engaged with the ISF talked through basic engineer capabilities and methods. The ISF engineers were smart and displayed ingenuity in finding methods to counter the enemy. Many times, a simple conversation about basic fundamentals of bridging or breaching set the stage for success. That basic foundation allowed the ISF engineers to find methods within their capabilities, resources, and culture to solve problems. "Bridging the Tigris," an article by Major Bobby W. Johnson on page 18, describes the efforts to help Iraqi engineers perfect their bridging skills.

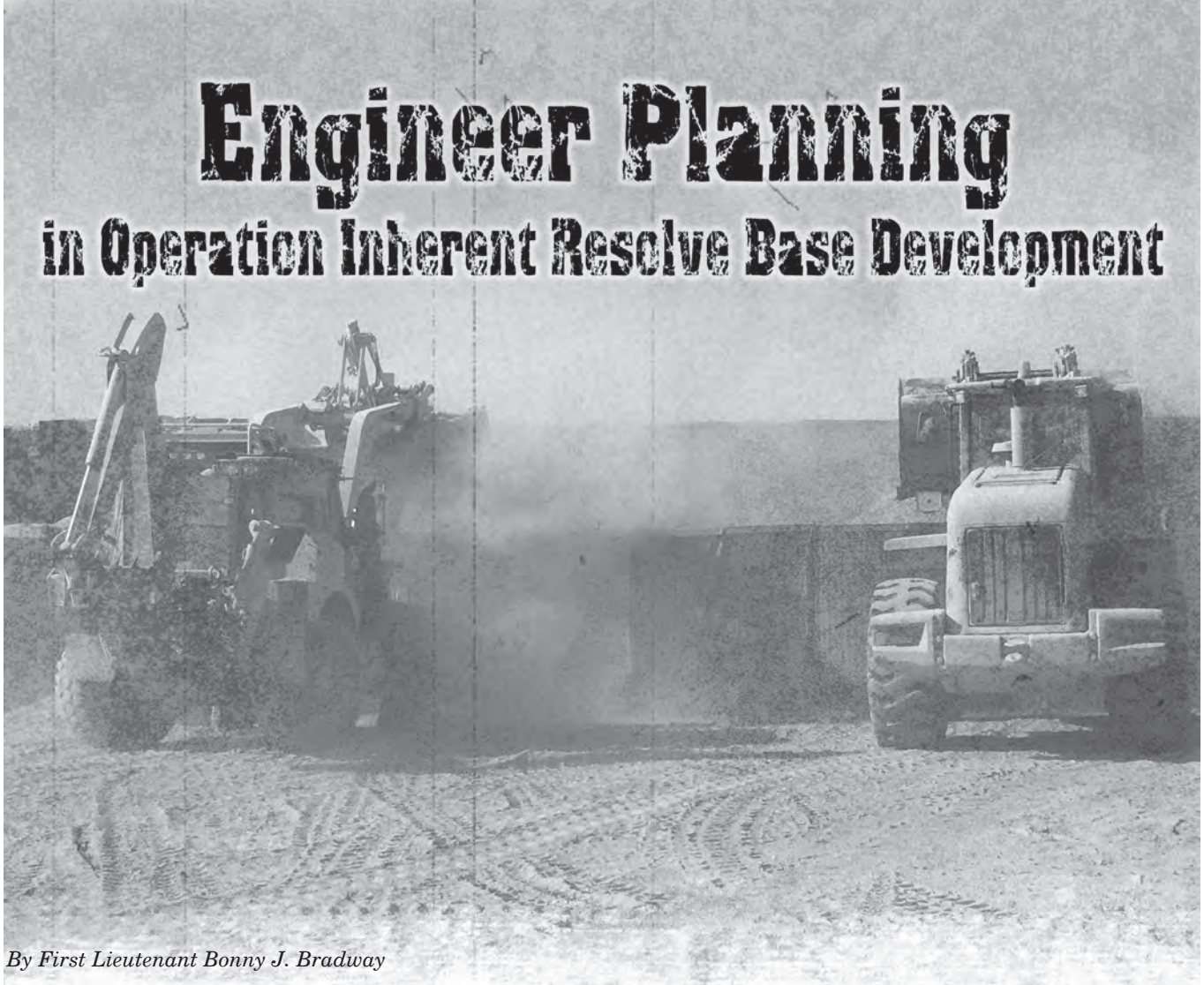
Plan base design early. Once it was determined that Qayyarah Airfield West would be the first base liberated, the division engineer initiated a base master planning working group. This group identified capabilities and requirements early so that a simple building and terrain management plan could be identified and resourced. Captain Paul R. Cusick's article, "The Buildout of Qayyarah Airfield West," on page 20, outlines the best practices and lessons learned during the development and execution of building that crucial base.

Drink chai for partnership. To sustain a partnership with their Iraqi counterparts, it was critical for U.S. engineers to develop an honest relationship with them. Executing continual engagements and learning about Iraqi culture and thought processes led to better understanding and an ability to influence the methods used to accomplish the tasks at hand. "Iraqi Security Forces Partnership During Operation Inherent Resolve," by Major Joseph E. Owens, on page 24, outlines after action concepts.

Gather the right mix of forces. Our engineer force is built to depend on, and work integrally with, many elements of the Regular Army and Reserve Component. The expertise and experience of the civilian engineer response team provided another dimension of the multifaceted U.S. Army Corps of Engineers. The team proved extremely valuable, and it is recommended that its expertise be maintained in specialties ranging from environmental issues to real estate operations to project management of the mission's many mechanical, electrical, and structural requirements.

Lieutenant Colonel Wolf is the division engineer for the 101st Airborne Division (Air Assault) and served as the CJFLCC-OIR engineer during 2016. He has a master's degree in construction management from the University of Missouri–Rolla (now Missouri University of Science and Technology), and a bachelor's degree in cartography from the University of Wisconsin at Stevens Point.

Engineer Planning in Operation Inherent Resolve Base Development



By First Lieutenant Bonny J. Bradway

The engineer mission during Operation Inherent Resolve (OIR) 2016–2017 encompassed the full spectrum of engineer operations and challenged Task Force Strike, 2d Brigade Combat Team, 101st Airborne Division, to plan and coordinate coalition and Iraqi security force (ISF) engineer efforts in northern Iraq. Task Force Strike engineers and attached engineer units provided mobility, survivability, and construction support to coalition forces and mobility, countermobility, survivability, and construction advice and assistance to the ISF. Notable coalition and ISF engineer accomplishments during Task Force Strike's OIR tenure include the remediation of Qayyarah Airfield West, the establishment (and in some cases, closure) of more than nine bases ranging from tactical assembly areas (TAAs) to ISF intermediate staging bases, the assembly of two complete route clearance packages, and the placement of five mission-essential bridges in northern Iraq. Tackling those missions was a constantly evolving effort that posed a unique planning challenge that required maximum flexibility. However, base development was the main focus of engineer planners and the associated complexities provided lessons learned at all stages of planning and execution.

The various bases which housed Task Force Strike Soldiers throughout northern Iraq in 2016–2017 ranged from dusty fields with concertina wire perimeters to coalition air bases accommodating more than 1,000 Soldiers. Through the efforts of multiple headquarters, a comprehensive design was developed for each base, based on several planning factors and execution variables. The requirements identified through mission analysis at battalion, brigade, and Combined Joint Forces Land Component Command–OIR (CJFLCC-OIR) levels drove decisions regarding the location, sustainment, and lifetime of each base. Those planning factors allowed engineer planners to work with logistic and maneuver planners to analyze execution variables that determined appropriate resources, methods of execution, and timelines for engineer efforts in base development.

Site Selection

Site selection was a particular challenge in northern Iraq for two primary reasons: Iraqi-Kurdish relations and land use agreement requirements. Advise and assist teams strove to colocate with partnered ISF headquarters to support planning and execution of the Mosul counteroffensive. However, because the Kurdish defensive line separated Iraqi and Kurdish forces from those of the Islamic State in Iraq and the Levant in most of northern Iraq, the Iraqi government was forced to coordinate with the Kurdish Regional Government to establish approved bases for ISF staging and preparations behind the Kurdish

defensive line. Once the ISF TAA sites were selected, Task Force Strike was able to project its own TAA locations according to the combined joint task force requirement to establish a land use agreement for land used explicitly by U.S. forces. The type and complexity of each agreement varied from site to site, but the land use agreement was a precondition for U.S. presence on Iraqi or Kurdish soil. In the case of the TAAs that supported the Mosul counteroffensive, the ISF commander provided written authorization for U.S. forces to establish headquarters locations. Other bases, such as Camp Swift (leased from the city of Makhmur) and Kara Soar Base (leased from a private citizen), required a more complex land use agreement process, which could require monetary compensation.

Sustainment Requirements

Sustainment requirements were another planning factor that weighed heavily in base development mission analysis. While logistic planners determined the appropriate level of sustainment and concept of support for each location, engineer planners determined construction and force protection requirements to support those sustainment functions. Fuel points and supply yards required access control and protection to ensure that resources were not vulnerable. Field kitchens required level, stable ground that could handle constant foot and vehicle traffic and also protect the Soldiers working and dining there. Aid stations required nearby all-weather helicopter landing zones to evacuate Soldiers in addition to standard force protection requirements. Engineer support to sustainment nodes in these examples primarily consisted of site preparation, survivability and protection measures, and facility maintenance, but additional engineer support requirements for base sustainment would be identified through the mission analysis process.

A Soldier measures raw materials for shelving and storage inside a bunker.

Engineers expand a drainage ditch to alleviate flooding after a heavy rainfall.

Soldiers fill HESCO® bastions to improve base force protection.

Base Lifetime

Base lifetime, or the duration of occupation, was also taken into consideration when planning engineer support to base development. Bases that were set to exist for just a few weeks received minimal engineer support so that the limited engineer assets and resources could be allocated to more enduring requirements. For example, TAAs initially received no construction support and minimal materials due to their expected short duration, while Qayyarah Airfield West received extensive support. The base housed multiple engineer headquarters to support the large-scale engineer projects required to support a new coalition air base. Engineers there supported road network construction, entry control point hardening, ammunition holding area construction, morale support facility construction, and other projects that were not necessary for shorter-duration bases. However, engineer planners remained flexible as the advise and assist tactical level mission changed and weather changes shifted some TAAs from shorter to longer duration.

In support of those new requirements, engineer planners forecast and resourced engineer assets and construction materials such as gravel and additional lumber. Base lifetime projections also allowed planners and contracting personnel to prebuild construction and bill of materials contract packets for approval and funding before occupation of a new base. These packets, to be employed once predetermined conditions were met, sped up occupation timelines and enabled faster, more efficient buildout. This was the case at Qayyarah Airfield West, where packets were ready for execution before the ISF seized the base from the Islamic State in Iraq and the Levant.

The key base development planning factors used in mission analysis—location, sustainment, and base lifetime—enabled engineer planners to make decisions in course-of-action development. Planners analyzed and weighed variables associated with execution so that they were able to prioritize and allocate the limited theater engineer assets. The most important variables considered were the resources to be used, the method of execution for each portion of base development, and associated timeline requirements.

Resources were a critical variable in base development because quantities were limited and Iraqi and Kurdish government requirements complicated transport. Funding requirements demanded thorough analysis and accurate estimates to ensure proper justification and timely delivery.

Commonly used materials in base development included concrete barriers, such as T-walls and Jersey barriers; lumber; gravel; sandbags; and HESCO Bastion Concertainers.® Quantities of new materials were limited, so planners used creative solutions to minimize waste and speed up timelines. For example, the process of requesting, approving, and delivering large numbers of T-walls and other concrete structures often took weeks to accomplish. To acquire these items for faster use on TAAs and Qayyarah Airfield West, Task Force Strike reused materials from Kara Soar Base, which was closing at the same time the TAAs were being established. Task Force Strike also regularly conducted T-wall harvest operations with explosive ordnance disposal support on Qayyarah Airfield West to recover T-walls that

were minimally damaged during the destruction of the airfield in early 2016. Another example of creative resourcing in construction was the use of gray water from showers in road construction compaction on the airfield. These resourcing solutions are examples of overcoming resourcing constraints to effectively execute construction and protection projects.

Execution Method

Execution method was another major factor in planning engineer support to base development. Because of force cap restrictions, Task Force Strike brought very limited organic horizontal-construction assets and used them constantly to support construction and route clearance missions. In addition to organic assets, CJFLCC-OIR and Task Force Strike received construction support from the 863d Engineer Battalion for a multitude of construction efforts in northern Iraq. Using troop labor was always the preferred course of action in base development for many reasons (especially operations security) but was not always feasible because of limited personnel and equipment. Contracting support was the other execution method employed by Task Force Strike to fill the organic capability gap. In some cases, contracted execution meant complete project execution by local nationals, including the initial ground preparation and tent construction at Qayyarah Airfield West. An existing bulk purchase agreement allocated funds for the regular rental of 25 different types of construction equipment, including bulldozers, graders, front-end loaders, and cranes. This enabled Soldiers to execute construction projects using local equipment. The equipment was often outdated and poorly maintained, but skilled operators and maintainers worked through those challenges to meet execution timelines. This combination of troop and contracted execution proved to be extremely efficient, allowing the limited armored equipment on hand to be used where risk levels were higher. The options of troop labor with organic equipment, troop labor with contracted equipment, or completely contracted execution gave planners more flexibility to determine the best course of action for each project and phase of base development.

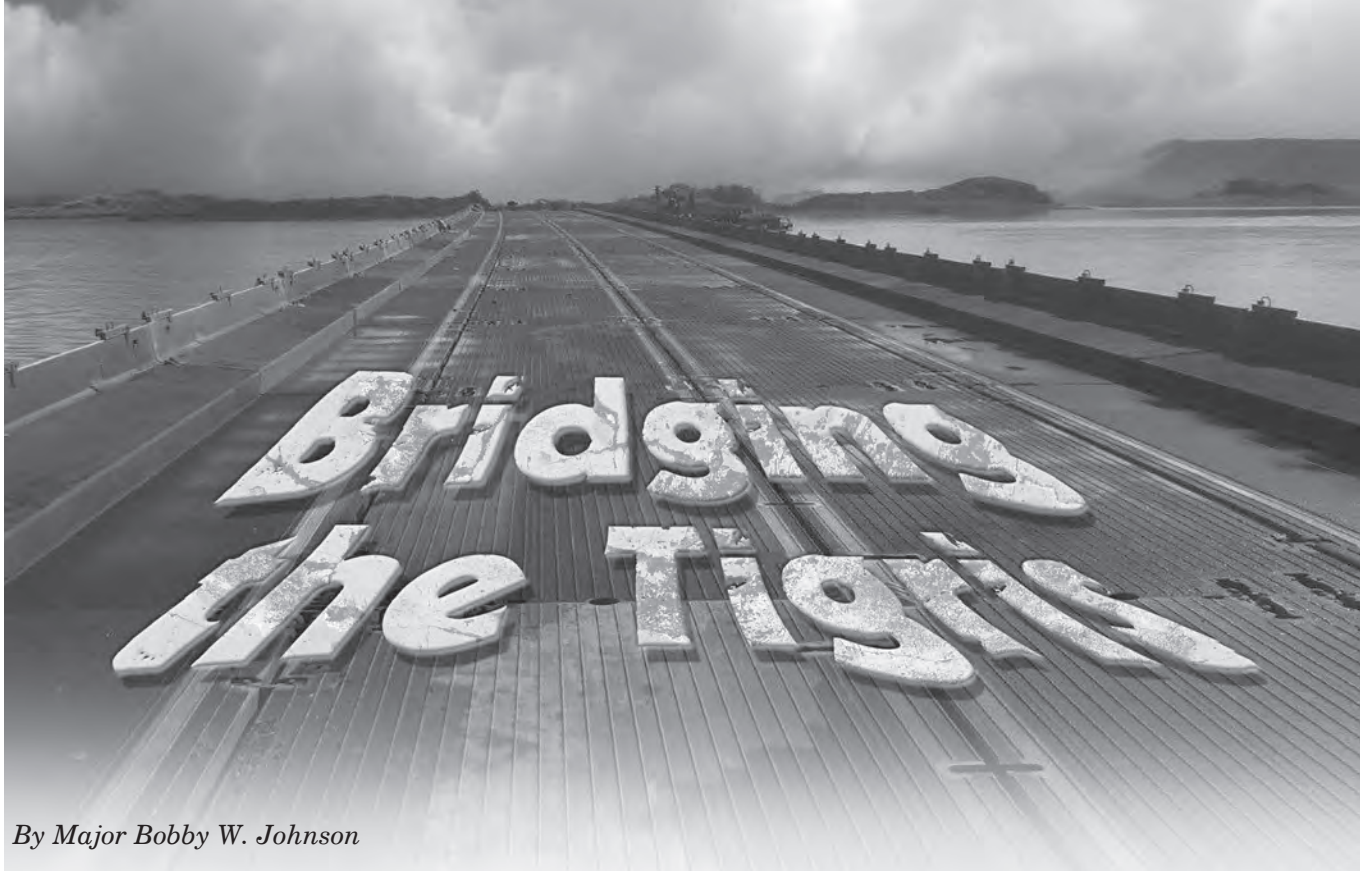
Execution Timeline

The final variable that engineer planners considered in base development planning was execution timeline. Prioritizing projects in base development drove asset allocation and the construction timeline, which ultimately determined the base's capability to support the mission. Task Force Strike described project completion in terms of initial operating capability and fully operational capability. The conditions required to meet these standards were determined based on mission set and projects, or portions of projects, and were prioritized to meet those requirements. Project execution timelines and asset allocations were then derived to form an accurate completion timeline. For example, the combined joint operations center construction at Qayyarah Airfield West was an emerging requirement which needed to be ready for use before the start of the Mosul counteroffensive. When analyzing this requirement for completion of the operations center as part of the entire airfield buildout, the project was moved to the top construction priority, which temporarily reallocated Soldiers from other projects to work on the operations center. By setting a required completion date for the new project, the entire Task Force Strike airfield buildout timeline was adjusted, but the top-priority project was still completed on time. Understanding how long a project would take, especially as part of a large-scale buildout, and when a project was required to be completed were critical in both project planning and management.

". . . effective project management and a flexible, adaptive approach to each project were essential in the buildout of the nine different bases the task force constructed."

Base development was one of the largest engineer planning efforts Task Force Strike executed in OIR during 2016. Understanding the purpose of each individual base and the variables associated with buildout proved to be critical to successful planning and execution. In addition to comprehensive engineer planning from the division through platoon levels, effective project management and a flexible, adaptive approach to each project were essential in the buildout of the nine different bases the task force constructed. Task Force Strike engineer planners learned these lessons, which greatly eased base construction planning at each iteration of base development. While base development was not Task Force Strike's main effort in OIR, comprehensive engineer planning in base development enabled fluid buildout and therefore enabled the task force to best posture advisor teams and support their ISF partners.

First Lieutenant Bradway serves as a platoon leader in Company A, 39th Brigade Engineer Battalion, 2d Brigade Combat Team, 101st Airborne Division (Air Assault), Fort Campbell, Kentucky. She served as an engineer planner and platoon leader while deployed in support of OIR 2016–2017. She holds a bachelor's degree in environmental engineering from the U.S. Military Academy–West Point, New York.



Bridging the Tigris

By Major Bobby W. Johnson

In the fall of 2016, the 101st Airborne Division (Air Assault) deployed and assumed command of the Combined Joint Forces Land Component Command–Operation Inherent Resolve. Upon arrival, the 101st worked with Iraqi security forces (ISF) to retake the cities of Fallujah and Ramadi and started plans to retake Mosul. The first step toward getting the members of the ISF properly positioned for the counterattack on Mosul was to take the former Iraqi Air Force base at Qayyarah Airfield West. However, there are no usable bridges over the Tigris River between Tikrit and Mosul. This led to the requirement to emplace a tactical bridge across a river in combat conditions, an operation that no military has attempted since World War II.

The division engineer who was tasked with finding a fast solution identified the following key issues:

- Provide additional bridging assets to the ISF.
- Repair current ISF assets.
- Train ISF personnel.
- Stage the ISF for the upcoming operation.
- Execute the mission.

The ISF has a bridging regiment, but its equipment and proficiency were lacking. The gap at the proposed crossing site was 230 meters, and the ISF had only 100 meters of fully mission-capable bridge. The majority of the deficiencies could be corrected by simple welding, but the ISF did not have an aluminum-welding capability. To solve this problem, the command had a team of 15 Soldiers from the 502d Multirole Bridge Company pushed into theater. They were assigned the monumental task of advising and assisting the ISF bridging regiment in all bridging skills. The U.S. Soldiers started to repair the disabled equipment, ensuring that they were working hand-in-hand with the Iraqis. Within a month, the Iraqi bridging regiment had 200 meters of fully mission-capable bridge. While the 502d Soldiers were repairing the equipment, the Combined Joint Task

Iraqi soldiers hone bridging skills on a lake created for the training.

Iraqi soldiers deploy a bay for an improved ribbon bridge.

Force Land Component Command worked to locate additional assets that could be sent to Iraq. As a result, the delivery of an additional 200 meters of bridge for the operation was expedited. Within 1 month, the ISF bridging capability increased from 100 meters to 400 meters.

As the repairs were being executed, the division engineer cell attempted to find a suitable location where the ISF could train. Since coalition personnel were not able to leave the base, this task proved to be difficult. It was essential that the 502d MRBC be able to train with the ISF, but a small lake would be needed to facilitate realistic training. With a lot of coordination and some luck, the division engineer cell was able to work with the land owners of the base, who created a drainage pond suitable for training purposes.

With training underway and adequate assets in hand, the question still remained: Would the ISF be successful in emplacing a 230-meter improved ribbon bridge in a combat situation? It was determined that the Iraqi bridging regiment needed to conduct a rehearsal on the Tigris River, allowing armored vehicles to drive across the bridge. After many key leader engagements and extensive coordination, the ISF located a crossing point on the river near Baghdad and successfully executed a flawless rehearsal. The Iraqis were then prepared to execute the mission.

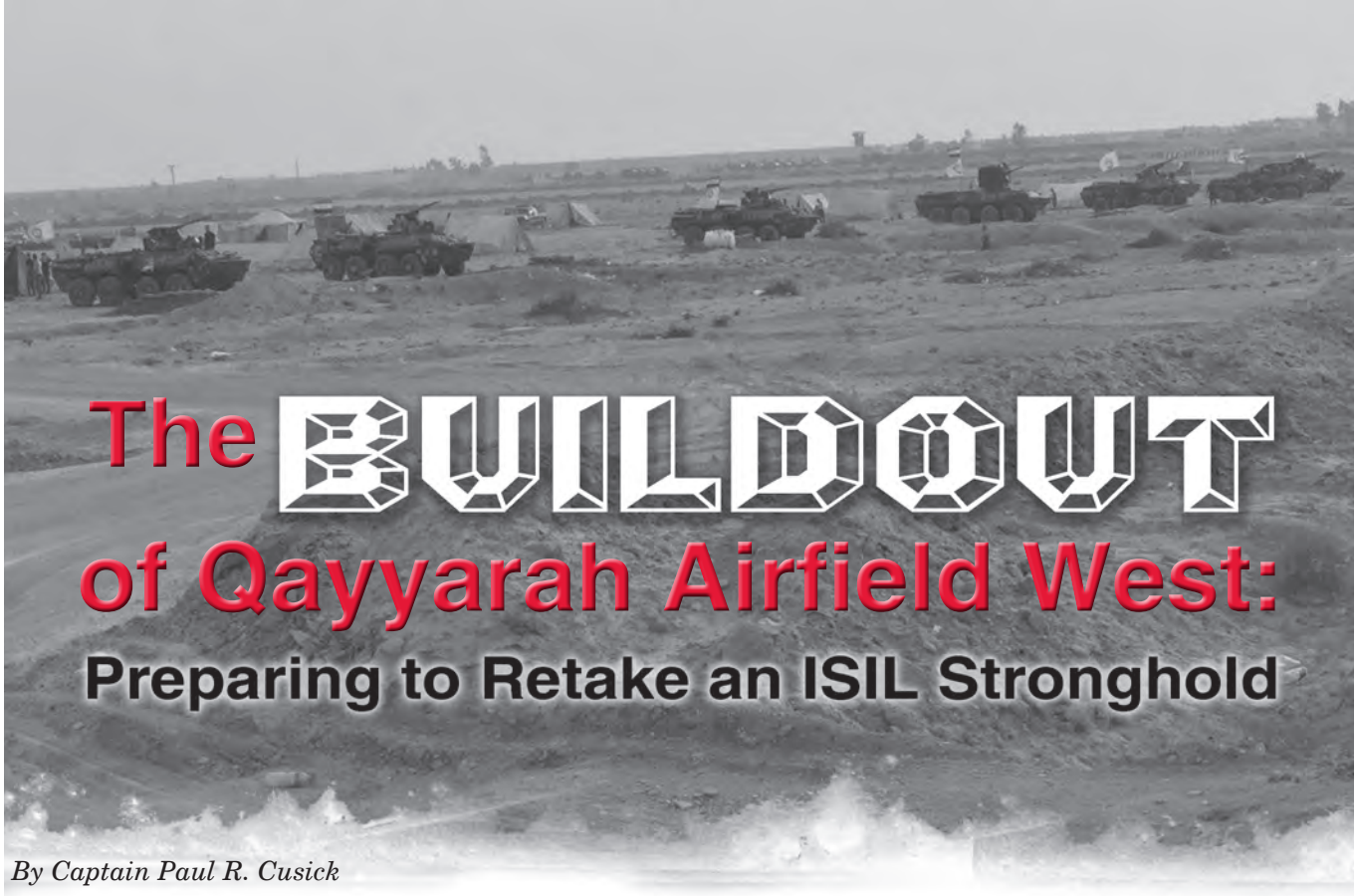
With the operation nearing, the focus quickly shifted from training to mission preparation. The Iraqis loaded all assets, performed preventive maintenance, and staged for movement. To assist with the movement, the coalition provided the haul assets necessary to transport all of the required assets in one move. A combination of ISF motivation and coalition assistance resulted in the successful movement to the staging areas. The ISF were now staged and ready to execute their mission when they were ordered to move.

From the time the ISF personnel and equipment were staged to the time they were called forward, battle drills were rehearsed. Bridge emplacement, medical procedures, and movements were all covered prior to the mission.

Even after all of the equipment fielding, training, and rehearsals, there were doubts about the Iraqi capability to accomplish the mission. However, when the ISF bridgers were ordered to execute, all earlier doubts were quickly dismissed. The ISF successfully emplaced a 228-meter improved ribbon bridge 6 hours faster than anticipated. This bridge emplacement became a symbol of the forward progress that the Iraqi military has made against the Islamic State in Iraq and the Levant.

With forward thinking, thorough planning, and intense motivation, the 101st was able to bring an Iraqi bridging unit from non-mission-capable status to fully mission-capable status in just 60 days. The process was an excellent example of how the coalition partnership with Iraq can succeed. The hard work and coordination between many organizations ended in success for the Iraqi people, and this success continued with the eventual clearance of Mosul.

Major Johnson is the operations officer for the 39th Brigade Engineer Battalion, 2d Brigade Combat Team, 101st Airborne Division. He is a graduate of the Engineer Basic Officer Leader Course, the Engineer Captains Career Course, the Sapper Leader Course, Intermediate Level Education, the U.S. Army Airborne School, the 82d Airborne Division Advanced Airborne School, and the U.S. Army Air Assault School. He holds a bachelor's degree in manufacturing engineering technology from Minnesota State University, Mankota, and a master's degree in engineering management from Missouri University of Science and Technology at Rolla.



The BUILDOUT of Qayyarah Airfield West:

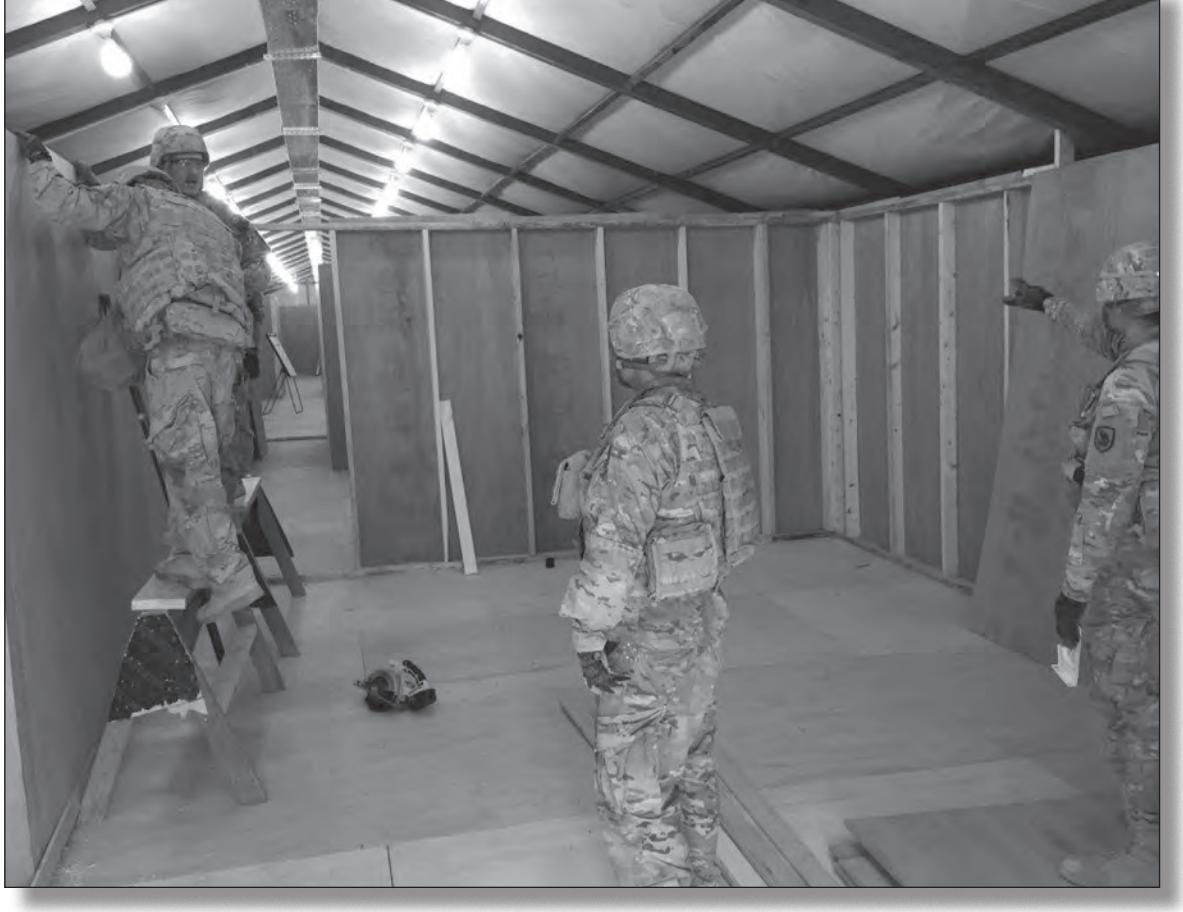
Preparing to Retake an ISIL Stronghold

By Captain Paul R. Cusick

Qayyarah Airfield West was the first contingency base retaken from the Islamic State of Iraq and the Levant (ISIL) and built out to serve Iraqi and coalition forces as a stepping stone for the attack on the city of Mosul. ISIL had leveled hundreds of buildings, toppled thousands of T-walls, removed miles of underground electrical infrastructure, and ruined more than 9,000 meters of runways by digging 2-meter-wide ditches across them. A 30-kilometer pipe that delivered water to the base had been unearthed and removed, and the base water tower had been razed with a plasma cutter. Coalition bombing to dislodge ISIL destroyed more base infrastructure, and the former jewel of Saddam Hussein's air force was reduced to rubble. It was known that ISIL had heavily fortified the airfield with improvised explosive devices (IEDs) and set a defensive network of berms and debris to canalize adversaries. It was also suspected that the base might contain a network of underground tunnels.

Because of the destruction and the perceived IED threat, Combined Joint Forces Land Component Command–

U.S. engineers construct an ammunition holding area.



Engineers from the 176th Engineer Company (Vertical) help the airfield's combined joint operations center take shape.

Operation Inherent Resolve (CJFLCC-OIR), led by the 101st Airborne Division (Air Assault), had prepared plans to occupy land north of the base. The plan was to reduce the need to wait for a clearance operation, which could take up to 2 months to complete. Qayyarah Airfield West was retaken by Iraqi Special Operations Forces on 9 July 2016 with little resistance. Few IEDs were discovered (though they were still considered a significant threat), and no underground tunnels were discovered. The challenge to CJFLCC-OIR was simultaneously reducing the threat from unexploded ordnance, clearing piles of rubble, providing force protection in an advise-and-assist environment, and constructing a base large enough to support thousands of Iraqi and coalition forces in support of the proposed Mosul offensive to take place in 45 days.

Qayyarah Airfield West was a strategic base for the seizure of Mosul and was needed by coalition forces to provide advice and assistance to surging Iraqi forces, for artillery that could reach Mosul, and for a fixed-wing capability to serve Iraqi and coalition forces. It was anticipated that the Iraqi forces for the attack on Mosul would include—

- Tribal forces.
- Iraqi Federal Police Forces.
- Iraqi army personnel.
- Iraqi Counterterrorism Service personnel.

Engineer requirements were difficult to determine because units were not available to provide security, explosive ordnance disposal (EOD), route clearance, mine detection with military working dogs, countermortar fire, or basic primary medical care. Forces were arrayed to support an advise-and-assist mission, and the in-theater logistical footprint was limited. The 39th Brigade Engineer Battalion provided mission command, with engineer support from various vertical and horizontal elements, a route clearance company, a military working dog detachment (for mine detection), and an EOD unit. A U.S. Air Force civil engineer group was slated to repair the runways.

"Qayyarah Airfield West was a strategic base for the seizure of Mosul and was needed by coalition forces to provide advice and assistance to surging Iraqi forces. . ."

The 425th Forward Engineer Support Team was the unit tasked for design support and development of the master plan. CJFLCC-OIR engineers were the first to begin planning the buildout of Qayyarah Airfield West; stakeholders were reluctant to contribute to this effort. During the design process, CJFLCC-OIR planners struggled to identify requirements in their respective lanes because forces were unavailable and planners were unsure whether a required force capacity uplift would be approved. Once momentum was gathered on the planning process, it immediately became apparent that base master planning could be complicated and that the integration of all subject matter experts was key. The most critical players in base master plan

development are associated with force protection, field artillery, safety, aviation, and logistics. EOD personnel were also key players for this scenario since a reduction of the IED threat was necessary before construction buildout could take place. Route clearance, EOD, and military working dog mine detection teams were mobilized to conduct the buildout.

Artillery and ammunition supply considerations must be identified early in the planning process to determine the space needed for safety purposes. There is a predetermined required standoff distance for each ammunition supply area based on quantity, and there are large clear-space requirements for field artillery. The standard design for an ammunition holding area requires a standoff distance from inhabited buildings of approximately 300 yards on all sides. After accounting for the restrictions required by artillery and ammunition supply, a large footprint must be considered. The footprint at Qayyarah Airfield West was approximately 400 acres after calculating all standoffs.

After the base was recaptured by Iraqi forces, a series of reconnaissance and combined arms clearance operations helped to clarify conditions on the ground. Dismounted engineers, EOD technicians, and Husky vehicle-mounted mine detectors determined IED density in the area planned for the base camp**.** A small, hand-launched drone obtained through the U.S. Army Corps of Engineers provided an additional asset that paid dividends. Imagery obtained from the drone provided rudimentary terrain modeling, which was critical because ground vehicles had limited mobility in uncleared areas. The images provided a clear picture of conditions on the ground, including rows of HESCO Bastion Concertainers®, piles of rubble, and toppled T-walls that could be used later. The imagery also allowed construction units to validate construction estimates. Based on the reconnaissance missions, the decision was made to directly occupy Qayyarah Airfield West rather than the area north of the base, as originally planned. This would lead to cost savings and a compressed construction schedule.

Since the airfield was to serve as a logistical base for Iraqi security forces, Iraqi involvement and planning were needed. The base had a perimeter of 29 kilometers; and since the airstrip only needed restoration to accommodate Iraqi C-130 aircraft, it was determined that only part of the available space was needed. ISIL had destroyed 20 percent of the airfield's berms. A plan was developed with engineers from the Iraqi Ministry of Defense to repair the remaining berms and tie them in with newly constructed berms and a T-wall perimeter. To complete the project, engineers

Rubble clearance operations were a major part of efforts to build out Qayyarah Airfield West.

Engineers from the 282d Engineer Company (Horizontal) build a position for a land-based Phalanx weapon system.

repurposed existing T-walls throughout the base, which included harvesting more than 400 T-walls that had been placed on the airfield by ISIL.

Construction was a collaborative effort. Ministry of Defense engineers started their buildout on 9 August and finished with the berm and T-walls on 4 September. Contractors started to access the base during coalition reconnaissance missions and began their buildout on 19 August. They constructed a compound using T-walls, tents, and base life support facilities for coalition personnel and were finished by 5 October. Coalition engineers from two U.S. Army engineer units under the control of the 39th Brigade Engineer Battalion started their buildout on 26 August. The U.S. Air Force civil engineer group repaired the runways in 21 days, rendering them capable of handling C-130 aircraft.

Lessons Learned

Newly arriving units should come with a strategic communications backbone and tactical communications equipment. This is important from a base master planning perspective because administrative hubs must be supported with strategic communications and not all camp activities can be easily centralized. Examples of noncentralized mission command centers include medical care and airfield operations, which must be located near an airfield, and artillery and early warning systems, which must be located near the perimeter.

The footprint of the base should have capacity to grow. The master plan called for building a 24-cell ammunition holding area, but the space set aside for it was unsecured and needed extensive rubble clearance. This issue was mitigated by adding a six-cell ammunition holding area with the required standoff within the initial footprint. Qayyarah Airfield West was sectioned off into four 600- by 600-meter zones for artillery, administration, logistics, and ammunition storage, much like municipal zoning. The base was scalable, so an additional artillery requirement was accommodated with limited effort.

Conclusion

The buildout of Qayyarah Airfield West was successful because of the collaboration between staff elements at the CJFLCC-OIR and the Combined Joint Task Force–OIR. They were brought to the table early and provided input that ensured a scalable, safe, and lethal base to support Iraqi security forces with airland, field artillery, and logistic capabilities. Collaboration and buy-in from Iraqi forces were critical in the buildout of a logistical base for the offensive action on Mosul. Testament to this effectiveness of this effort is the ongoing success of the assault on the ISIL stronghold of Mosul.

Captain Cusick is a member of the Wisconsin Army National Guard and serves in Detachment 1 of the 101st Airborne Division (Air Assault). He served on the division engineer staff as chief of construction effects for CJFLCC-OIR and provided oversight of the Qayyarah Airfield West construction. He works as the resource manager for the Wisconsin Army National Guard Construction and Facility Management Office. He holds a bachelor's degree in water chemistry from the University of Wisconsin at Stevens Point and a master's degree in soil science from the University of Wisconsin at Madison.

Iraqi Security Forces Partnership During Operation Inherent Resolve

By Major Joseph E. Owens

The success of Operation Inherent Resolve and the achievement of U.S. strategic goals in Iraq depend on building the required capacity within the Iraqi security forces (ISF) to defeat the Islamic State of Iraq and the Levant and protect Iraq from becoming a safe haven for violent extremist organizations in the future.

The goal within the engineer cell of the Combined Joint Forces Land Component Command was to build relationships within the Iraqi Ministry of Engineering that would allow the U.S. Army to influence the planning and execution of engineering priorities and to establish systems in the Iraqi engineer regiment that will endure beyond the presence of coalition forces. This relationship allowed U.S. Army engineers to pursue the following three lines of effort in building Iraqi capacity:

- Training.
- Equipping.
- Maintaining.

Coalition forces offer several training courses for Iraqi engineers and combined arms elements, including—

- Bridge emplacement.
- Combat engineer skills.
- Combined arms obstacle breaching.
- Route clearance patrol skills.

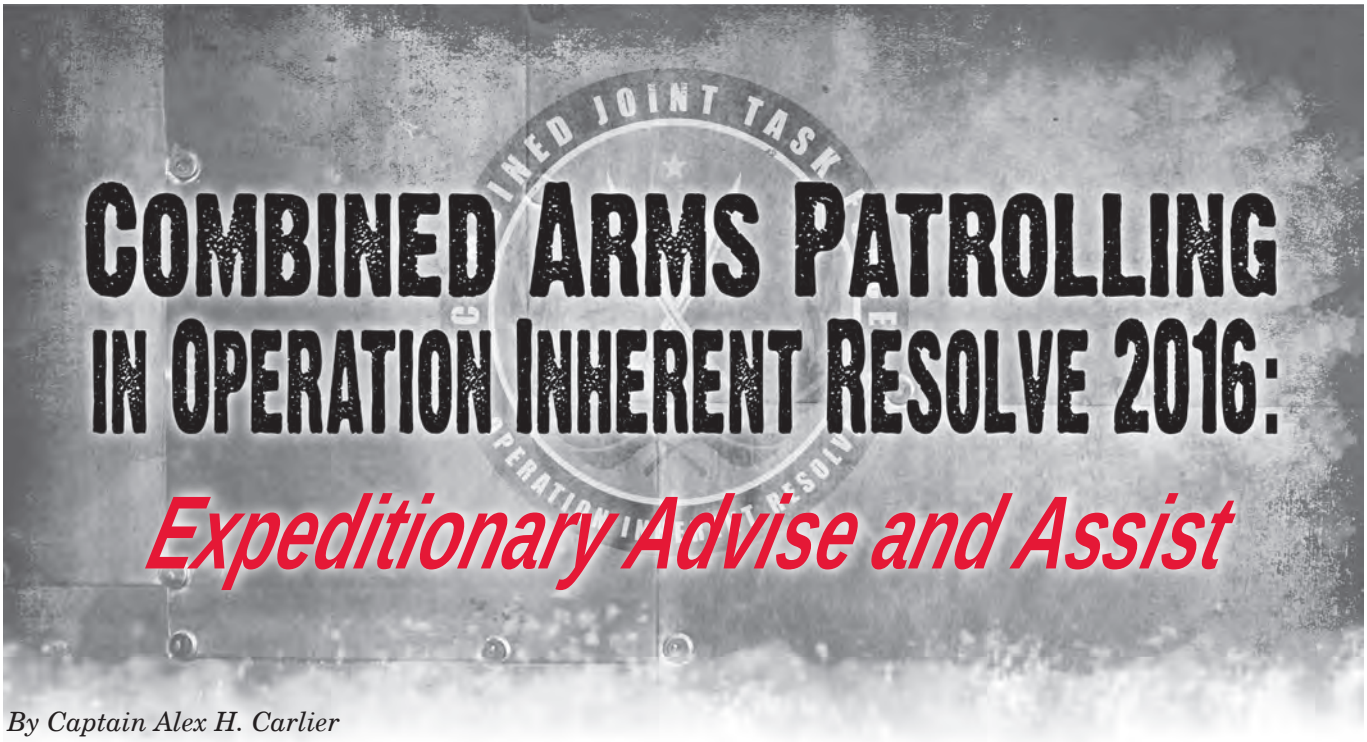
ISF leaders want the coalition to provide training and resourcing for all courses, but negotiations revealed that ISF engineer leaders understand that they must take ownership of their soldier and unit development. The ISF is assuming the planning, resourcing, and execution of the training with minimal coalition advisor presence. It is encouraging that within the ISF ranks, there are competent and capable instructors who clearly worked with coalition forces during Operation Iraqi Freedom and take their job of instructing young Iraqi soldiers very seriously.

A difficult aspect of partnering with the Ministry of Engineering is the continual negotiation for equipment and additional support. Ministry leaders are aware of the limits of coalition divestment programs and realize that many requests for equipment simply cannot be supported. U.S. Service members should remember the cultural acceptance of negotiation in Arab society. Generally speaking, approaching every engagement as a give-and-take conversation alleviates frustration and allows both sides to walk away with some level of satisfaction.

U.S. Army engineer Soldiers speak to an Iraqi army captain during an advise-and-assist mission in northern Iraq.

Maintenance is a continual problem for the ISF as a whole and the Ministry of Engineering specifically. Although the ministry has a very good engineer equipment repair facility with competent mechanics and leaders, it relies heavily on contracted maintenance provided by coalition funds. This creates a nearly certain future shortcoming when those contracts are not renewed or when the coalition leaves Iraq.

Major Owens is the engineer current operations officer for the 101st Airborne Division, Fort Campbell, Kentucky. He holds master's degrees in military operational art and science from the U.S. Air Force Air Command and Staff College and engineering and technology management from Oklahoma State University.



Combined Arms Patrolling in Operation Inherent Resolve 2016:

Expeditionary Advise and Assist

By Captain Alex H. Carlier

Although the U.S. Army has a long history in Iraq, 2016 was a year of many firsts for Operation Inherent Resolve (OIR). The 2d Infantry Brigade Combat Team faced the unique challenges of OIR, which were summed up in a phrase coined during the relief-in-place with the 1st Brigade Combat Team, 10th Mountain Division headquarters—"A 2016 problem set with a 2003 infrastructure and 2007 expectations." It took effort by every echelon for Task Force Strike to see the fruits of reconciling the problem set with the infrastructure and the expectations. One of the OIR milestones reached was the building and operation of a combined arms maneuver package that could conduct expeditionary advise-and-assist operations and enabler delivery beyond the forward line of troops. Conducting Iraq's first combined arms patrols in 2016 offered lessons learned about devising a package of the right size; using enabling assets properly; and adjusting tactics, techniques, and procedures as needed.

The Right Package Size

Company A, 39th Brigade Engineer Battalion, fielded multiple operational needs statements that were submitted based on the route clearance platoon composition in Afghanistan. Different missions have called for packages of different sizes. This article focuses on what was necessary for the requirements in the OIR operational environment.

Company A received two infantry platoons (with mortars) to staff the combined arms route clearance company (CARCO). It is good practice to reevaluate what assets are necessary as the mission or environment changes. The package for a security force operation might include a mortar team, antitank weapon system, casualty evacuation team, and combat medic. A clearance operation might include a Talon® robot for explosive ordnance disposal, ground-penetrating radar equipment, and dismounted sappers with hand-held detectors. A mission command operation could include a joint tactical air controller, a linguist, advise-and-assist teams, and recovery and haul assets.

Use of Enabling Assets

After building the necessary capabilities and deciding which assets to use for a mission, it was time to discuss the employment of assets and enablers. Battalion and brigade level planning meetings were good sources of information because any activity that requires movement by ground beyond the forward line of troops will be assigned to the CARCO as a mission.

It was useful to become familiar with the key enabler or supported unit during mission preparation. For example, any time bridge training team advisors needed to go forward to advise the Iraqis in an operation, the CARCO held classes on the points of performance for bridging operations. This made it possible for all CARCO personnel to collect information on that mission (and future patrols), and it allowed them to maintain continuity with some of the Iraqi units and efforts, even when CARCO personnel were not the primary advisors.

It was also necessary to consider the array of enabling equipment for each type of operation. The CARCO displayed which vehicles had special equipment during the contingency operations and showed the "trip tickets" that were submitted so that the command and staff knew where the

(continued on page 37)

The Engineer Reconnaissance Platoon

Within the Airborne Brigade Engineer Battalion

(The following article describes a proposed allocation of personnel and task organization when the brigade engineer battalion is the only engineer force in support of the brigade combat team. During actual operations, the brigade combat team will likely include significant additional engineer assets from the echelons above brigade.)

By First Lieutenant Kristofer B. Peck and Captain John C. Collier

The 307th Brigade Engineer Battalion (BEB), 3d Brigade Combat Team (BCT), 82d Airborne Division, contains six engineer platoons—three sapper platoons, two light-equipment platoons, and one platoon that can be employed as a route clearance package or an engineer reconnaissance team (ERT). Each platoon has a habitual relationship with a maneuver battalion within the brigade.

The sapper platoons habitually support the infantry battalions, and the light-equipment platoons habitually support the field artillery and brigade support battalions. This leaves the cavalry squadron as the last platoon to be supported. The brigade typically conducts joint forcible-entry and noncombatant evacuation operations. Within an airborne infantry BCT, it seems natural to integrate this last platoon into the cavalry squadron. However, it is difficult to provide support because of two issues—the current engineer platoon modified table of organization and equipment and the overlap between the skill level tasks of combat engineers and cavalry scouts.

A robot interrogates a named area of interest during a route reconnaissance.

The platoon uses advanced optics to detect any improvised explosive devices along its route.

There are several ways this last engineer platoon can be used more effectively within the brigade. One way is to remove the route clearance mission from its mission-essential task list. The route clearance capability of the ERT in an infantry BCT is currently used as an interrogation asset behind the infantry and maneuver elements while opening ground lines of communication. The maneuver elements move to expand the lodgment, open air lines of communication, and provide continuous coverage to ground lines of communication. Echelons-above-brigade route clearance platoons are used because they provide a robust and continuous route clearance capability. Due to the space available on an aircraft and the time that it takes for the echelons-above-brigade route clearance platoons to enter an operation, it is more efficient to use those tasks from the ERT mission-essential task list that are related to engineer reconnaissance.

Current Army doctrine on engineer reconnaissance, Army Techniques Publication 3-34.81, *Engineer Reconnaissance*, outlines three specific task organizations of ERTs:

- Integration as part of brigade information and intelligence collection efforts.
- Assignment of BCT and regimental combat team named areas of interest in a task force area of operations.
- Operation under task force control.[1]

Permitting the platoon to operate under brigade control will enable the brigade to accumulate the most engineer-specific data through the platoon's reconnaissance.

The modified table of organization and equipment for the platoon currently consists of the brigade route clearance package, including a number of vehicles and more than 20 Soldiers. This typically means that the platoon assumes brigade route clearance missions. However, if it receives a route clearance mission, the platoon's ability to conduct engineer reconnaissance missions is hampered for the duration of a brigade operation because of the transportation and storage requirements of the route clearance equipment on the battlefield. Therefore, a change in the modified table of organization and equipment to remove route clearance equipment from an airborne BEB would lead to the maximum utility of this engineer asset.

While the other BEB platoons are at an advantage when it comes to integration and the combined arms route clearance concept, BEB route clearance platoons are at a distinct disadvantage with respect to the time and training needed to complete their full mission set. A platoon with two drastically different mission-essential tasks has inadequate time to master route clearance and engineer reconnaissance. This compels the battalion or company commander to assume risk when deciding at which tasks the platoon will be more proficient. This may leave Soldiers vulnerable due to a lack of training when they are asked to perform one mission over the other.

Due to its limited training time, an ERT is inherently less proficient than a platoon whose sole purpose is to conduct route clearance. Allowing the ERT to focus on reconnaissance and leaving route clearance to echelons-above-brigade engineers is one solution that could alleviate problems associated with the platoon's training focus.

Unlike the issue presented with the modified table of organization and equipment, the similarity of duties between combat engineers and cavalry scouts leads the combat engineer Soldiers to be underutilized when task-organized

Dismounted paratroopers conduct a point reconnaissance in their area.

within the cavalry squadron. They are typically used as the common cavalry scout is used—as observers in observation posts within a screen or within teams in a troop's zone reconnaissance. Because the ERT has up-armored Humvees, members may be underutilized as a primary security detail. This issue could easily be remedied by altering the brigade task organization from operating under task force control to using the other two methods of employment from Army Techniques Publication 3-34.81 for an engineer reconnaissance platoon:

- Assignment of BCT and regimental combat team named areas of interest in a task force area of operations.
- Integration with brigade information and intelligence collection efforts.[2]

For the joint forcible-entry portion of the airborne infantry BCT mission, assigning the ERT to the brigade intelligence section for administrative control with specific priority intelligence requirements on the brigade intelligence synchronization matrix would enhance the ability of the ERT to develop engagement areas. ERT sappers could parachute in with the first chalks of an airborne mission and immediately conduct movement to their assigned engagement areas. The intent for these engineer paratroopers is to provide the infantry task force engineers and the brigade engineer cell with a clear depiction of terrain with respect to type, location, and desired effect of obstacles that the brigade wants to place in each engagement area.

By assigning brigade priority intelligence requirements directly to the ERT under the control of the brigade intelligence section, auxiliary tasks associated with supporting a cavalry squadron are eliminated and ultimately make the ERT a more efficient mission command tool for the brigade commander. Using the ERT as a brigade asset allows the brigade commander the flexibility to use route clearance as the mission requirements change for offensive or stability operations without the risk of overusing the route clearance or ERT assets.

In conclusion, the employment of engineer reconnaissance platoons, especially ERTs, is a new concept to the Engineer Regiment. Over the next few years, there will be continuous revisions to the employment and use of these platoons to produce maximum utility for the brigade that each respective platoon enables. However, with the two changes noted above, the impact that an engineer reconnaissance platoon can make within an infantry BCT scheme of intelligence and information-gathering will greatly enhance a brigade's depiction of the battle space.

Endnotes:

[1]Army Techniques Publication 3-34.81, *Engineer Reconnaissance,* 1 March 2016.

[2]Ibid.

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NURTURING TECHNICAL COMPETENCE AMONG JUNIOR ENGINEER OFFICERS

By First Lieutenant Ian C. Moss

The Technical Engineer Competency Development Program (TEC-DP) has created an opportunity for degreed engineer officers to reinforce their technical knowledge with practical experience in the U.S. Army Corps of Engineers (USACE). The program was developed in response to a backlog of junior captains waiting for space in the Engineer Captains Career Course. That backlog resulted from an increased demand for officers during the 2007–2013 "Grow the Army" initiative and a bottleneck for billets at the course. As that backlog has eased, the program has met an increasing requirement for technically competent officers in the Engineer Regiment and across USACE.

The engineer junior captain assignment officer at the U.S. Army Human Resources Command said the program seeks degreed civil, mechanical, electrical, and environmental engineers and will consider other engineering disciplines on a case-by-case basis. These disciplines most readily align with USACE missions and ensure that the participants provide distinct value to the districts they serve. USACE districts use their congressionally authorized and appropriated operation-and-maintenance budget to fund TEC-DP positions, so participation is at the district commander's discretion, based on district-specific manning requirements.

There are 85 junior captain billets across USACE, and the 41 current TEC-DP participants fill authorizations that would otherwise remain vacant. The Los Angeles and Savannah Districts have the most participants, with five each. TEC-DP officers serve their districts in a variety of positions, based on a regionally aligned mission set that ensures a depth of technical experience and a broad understanding of the task and purpose of USACE.

Engineer officers in the program work under and alongside civilian counterparts to solve the Nation's most complex engineering problems. One operations supervisor in the Walla Walla District who once had a TEC-DP officer assigned to him said that he appreciated the officer's solutions-focused approach to problem solving and his ability to master technical material while learning to collaborate with his peers and supervisors. The district deputy commander said, "[TEC-DP officers] provide a fresh perspective and an energy that is unmatched . . . They know they're only here for a short time, so they can focus on specific projects that provide direct, tangible results."

While TEC-DP officers are unfamiliar with USACE standard operating procedures and the history of their assigned projects, their leadership experience allows them to work with, and rely on, the experience of their peers to quickly triage problems, develop a course of action, and execute to accomplish the mission.

The first TEC-DP officer in the San Francisco District serves as a project engineer in the construction project office at the Military Ocean Terminal Concord, California. His office manages a series of new construction projects while sustaining maintenance at one of the busiest terminals on the West Coast. He said that the transition from the Engineer Regiment to USACE entailed a very steep learning curve and that most of his current duties fall outside the spectrum of his undergraduate curriculum. However, he said that his experience as a vertical-construction platoon leader provides him with the skills necessary to handle the unique challenges that he and his team encounter in the Bay Area.

A TEC-DP officer serving with the Tulsa District echoed his statements. "My undergraduate work definitely prepared me well, but there's an important distinction to be made between academic theory and real-world applications. Luckily, I've received great support throughout the district and been able to ask my peers any questions I've had," he said. As part of the military design section in the Tulsa District, he has been able to incorporate lessons learned from Soldiers at his previous duty station into future barracks designs.

Officers considering the TEC-DP can expect to be placed in positions that allow them to build their technical competence alongside USACE professionals while using leadership and organizational skills they developed in the Regular Army. These positions include project or design managers and project or deputy resident engineers, among many others. Participants serve as liaisons for USACE and as ambassadors for the Regular Army within their districts. In return, those districts facilitate officers' technical and professional development as engineers and Army leaders. Participants can pursue professional engineering certifications and project management professional credentials and take part in leadership and technical conferences across the country. The program, which has been in place for almost 10 years, is refined yearly to ensure that it provides the highest value to the participating officers, the districts they serve, and the Army at large.

First Lieutenant Moss is a project engineer with the Walla Walla District of USACE. He holds a degree in mechanical engineering from the U.S. Military Academy–West Point, New York.

Regimental Awards

Each year, we recognize the best engineer company, platoon leader, warrant officer, noncommissioned officer, enlisted Soldier, and civilian employee in each component for outstanding contributions and service to our Regiment and the Army. Every engineer unit in the Regiment is eligible to submit the name and achievements of its best to compete in these distinguished award competitions. Only the finest engineer companies, Soldiers, and civilians are selected to receive these awards. They will carry, throughout their careers, the distinction and recognition of being the best and brightest of the Engineer Branch. Following are the results of the 2016 selection boards for the Itschner, Outstanding Engineer Platoon Leader (Grizzly), Outstanding Engineer Warrant Officer, Engineer Soldier of the Year (Van Autreve) and Outstanding Civilian of the Year Awards and the Sturgis Medal.

Regular Army

Itschner Award: Alpha Company, 82d Engineer Battalion, 2d Armored Brigade Combat Team, 1st Infantry Division, Fort Riley, Kansas.

Outstanding Engineer Platoon Leader (Grizzly) Award: First First Lieutenant Breawna S. Davis, 523d Engineer Company, 84th Engineer Battalion, Schofield Barracks, Hawaii.

Outstanding Engineer Warrant Officer Award: Chief Warrant Officer Two William S. Test, Headquarters and Headquarters Company, 27th Engineer Battalion, 20th Engineer Brigade, Fort Bragg, North Carolina.

Outstanding Civilian of the Year Award: Mr. Steven K. Kelley, Seattle District, U.S. Army Corps of Engineers.

Sturgis Medal: Staff Sergeant Eric T. Bailey, Alpha Company, 169th Engineer Battalion, 1st Engineer Brigade, Panama City, Florida.

Engineer Soldier of the Year (Van Autreve) Award: Specialist Michael K. Higginbotham, 511th Engineer Dive Detachment, 92d Engineer Battalion, 20th Engineer Brigade, Joint Base Langley-Eustis, Virginia

Army National Guard

Itschner Award: 155th Engineer Company (Vertical), Rapid City, South Dakota.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant Craig C. Miller, 1194th Engineer Company, Columbus, Ohio.

Outstanding Engineer Warrant Officer Award: Chief Warrant Officer Two Wade A. Lein, 155th Engineer Company, 153d Engineer Battalion, Rapid City, South Dakota.

(No packet was submitted for the Army National Guard Outstanding Civilian of the Year Award.)

Sturgis Medal: Sergeant First Class Michael J. Herbert, Headquarters and Headquarters Company, 769th Brigade Engineer Battalion, Baton Rouge, Louisiana.

Engineer Soldier of the Year (Van Autreve) Award: Specialist Lucas A. Scott, 842d Engineer Company (Horizontal), Rapid City, South Dakota.

U.S. Army Reserve

Itschner Award: Headquarters and Headquarters Company 368th Engineer Battalion, Londonderry, New Hampshire.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant Nicholas J. Severtson, 461st Engineer Company, 372d Engineer Brigade, Saint Joseph, Minnesota.

Outstanding Engineer Warrant Officer Award: Chief Warrant Officer Two Shiloh L. Becher, 461st Engineer Company, 367th Engineer Battalion, 372d Engineer Brigade, Saint Joseph, Minnesota.

(No packet was submitted for the U.S. Army Reserve Outstanding Civilian of the Year Award.)

Sturgis Medal: Staff Sergeant Will Davis, 461st Engineer Company, 367th Engineer Battalion, 372d Engineer Brigade, Saint Joseph, Minnesota.

Engineer Soldier of the Year (Van Autreve) Award: Specialist Gatlin Lamb, 461st Engineer Company, 367th Engineer Battalion, 372d Engineer Brigade, Saint Joseph, Minnesota.

Engineer Regimental Week

Major General Kent D. Savre's address to the Regiment

Lieutenant General Todd Semonite, Chief of Engineers

Fallen Sapper wreath-laying ceremony

Engineer Regimental Ball

2017

Best Sappers celebrate their win

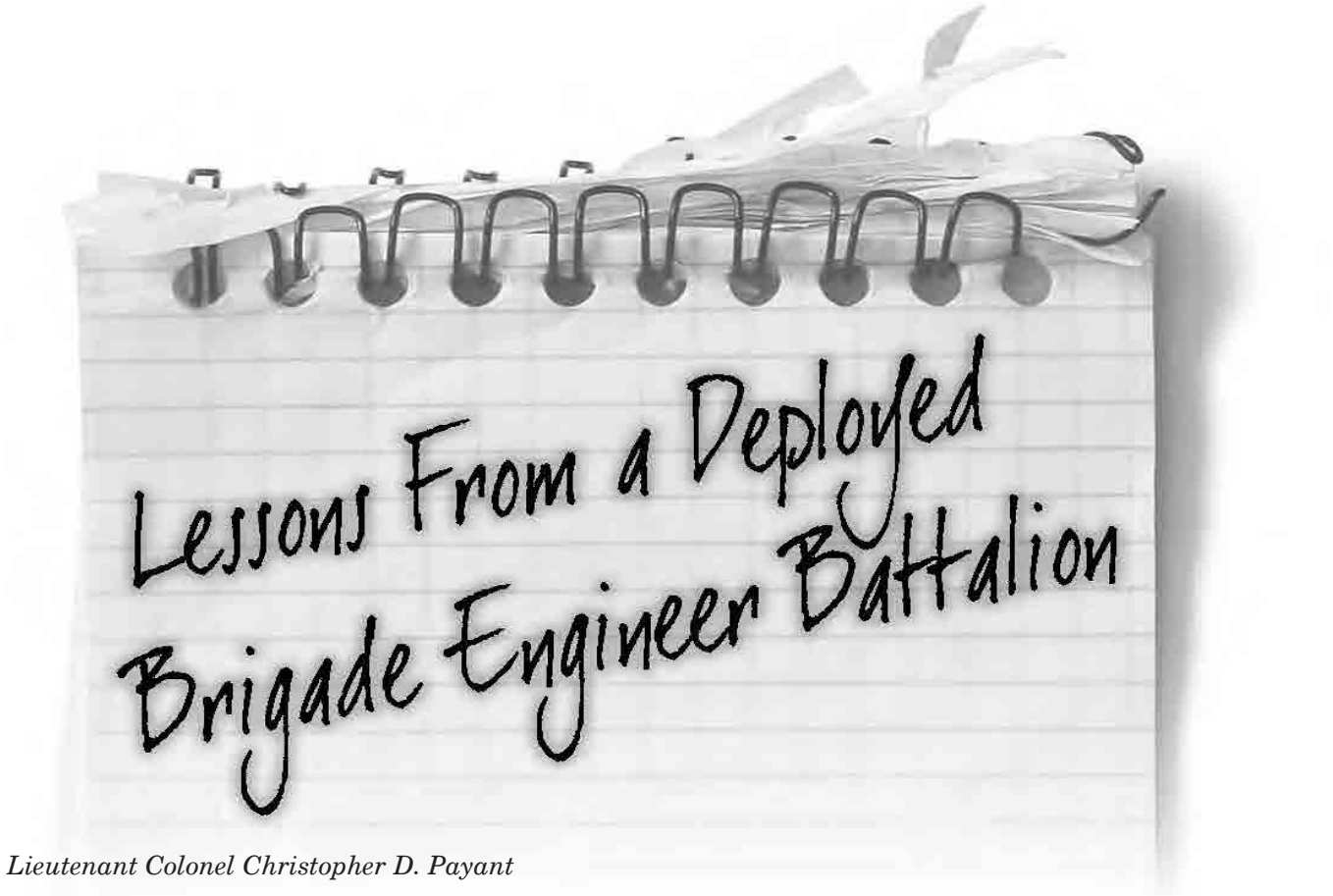
Engineer Regimental run

Brigadier General James H. Raymer

Engineer castle

10th anniversary of Medal of Honor presentation to Sergeant First Class Paul R. Smith

Photos by Fort Leonard Wood Visual Information Center



By Lieutenant Colonel Christopher D. Payant

U.S. Army engineers played a vital role when Operation Iraqi Freedom began 14 years ago, from the first breach of Iraqi defenses in 2003 to the very end when critical security infrastructure was transitioned to the Iraqi government as part of Operation New Dawn in 2011. Army engineers are back in Iraq today in support of Operation Inherent Resolve (OIR), again providing substantial contributions as a coalition of nations advises and assists the Iraqi army in its fight to defeat the Islamic State of Iraq and the Levant.

Field Manual 3-34, *Engineer Operations*, describes how Army engineers assure mobility, enhance protection, enable force projection, and build partner capacity.[1] Most recently, the 39th Brigade Engineer Battalion (BEB), 2d Brigade Combat Team (Strike), 101st Airborne Division (Air Assault), supported the Combined Joint Forces Land Component Command (CJFLCC) in OIR. The 39th BEB engaged in all of the engineer efforts identified in the field manual and learned key lessons along the way. This article offers division and brigade level engineer leaders points to consider as they develop home station training strategies, review and apply current engineer doctrine, and prepare for future deployments.

The Engineer Technical Chain: Building the Network

Engineers seem to be a frequent target of criticism for taking too long to complete projects. In some respects, this is legitimate criticism, as many engineer missions do take time—whether they involve breaching a complex obstacle or constructing a base camp. It is incumbent on engineer leaders and staffs to mitigate these delays as much as possible. One mechanism for doing so is to take full advantage of the engineer technical chain of support, which exists between higher and lower headquarters.

The engineer community is small, and professional relationships among engineers are an important means by which coordination and planning occur. In preparation for deployment to OIR, 2d BCT engineers opened communications within the OIR engineer technical chain. The BCT deployed under its organic division headquarters, which was helpful because a relationship already existed between the BCT engineer and the division engineer. Broadening the technical chain to the Combined Joint Task Force–OIR, U.S. Army Central, sister Service engineers, and U.S. Central Command engineer cells enabled the rapid sharing of information up and down the engineer chain. Informal planning and coordination through the engineer technical chain provided the means by which conditions could be set to ensure the least amount of friction during the formal planning processes that encompassed the warfighting functions.

It may frequently be unclear to a higher headquarters staff why a subordinate headquarters staff requests a certain action, such as funding a specific project or task-organizing a certain way. Communicating requirements through the technical chain often allows information to be shared rapidly, generating more opportunities for mutual understanding. Creating this understanding within the engineer technical chain allows the higher headquarters engineers to be advocates for the lower headquarters when it comes time to formally staff an action and increases the likelihood that proposals will be accepted and approved quickly.

The engineer technical chain from the 39th BEB up to the combined joint task force engineer cell anticipated the mission to secure, clear, and build out a life-support area at Qayyarah Airfield West. The units worked together closely, encouraging the transparent sharing of information to set conditions for the operation, regardless of when the execution order was given. Project funding packages were processed early and placed "on the shelf" for ready execution, master planning was synchronized with resource delivery, construction equipment was prioritized for ground movement to allow work to begin immediately, task-organization adjustments were precoordinated to ensure that units and capabilities were properly positioned, and requests for forces were processed early in anticipation of requirements. As a result, a mission that was expected to take 6 months was completed in 2 months.

The previous example focused on construction of a base camp; but the approach can be applied in any situation, whether fielding engineer-specific equipment, coordinating for engineer resources, or advising host nation security forces. No one wants to be the cause of a mission coming to a grinding halt. The key is to initiate and sustain communications within the technical engineer chain.

Maximizing the Effectiveness of the Engineer Staff

Much discussion surrounds the employment of the BEB headquarters. There are questions about where it should be located and for what missions it should be responsible. Recent OIR history reveals that the headquarters is capable of nearly any mission. Previous BEB headquarters in support of OIR focused on advising at the strategic level with the Ministry of Peshmerga Affairs and the Baghdad Operations Center. Upon arrival in Iraq, the 39th BEB conducted a relief-in-place with a cavalry squadron and assumed a security force mission. As conditions within the CJFLCC changed, the focus of the mission of the 39th BEB transitioned to a more traditional one of mobility, survivability, and general engineering. The battalion seized on the opportunity to align more closely with a mission set that allowed the exploitation of the BEB capabilities.

When serving as a functional area headquarters within the BCT, the BEB headquarters can align some of the key staff against discrete problem sets. One example relates to the employment of the battalion intelligence (S-2) personnel. Understanding the routes within the area of operations is a critical information requirement for the BEB. Identification of the enemy threat along the route and the trafficability of the route are essential to ensuring the freedom of movement of forces within the area of operations. This is not a remarkable statement since engineers are expected to be familiar with the route status. How the BEB staff gains this understanding is worthy of discussion.

A primary 39th BEB S-2 task during OIR was the management of the route status tracker for the BCT. The battalion produced a daily update that was reviewed and submitted through the assistant brigade engineer (ABE). Route tracking is traditionally a responsibility of the ABE, who should remain abreast of the status of the routes within the AO but often does not have the time to fully conduct the analysis. Outsourcing route analysis to the BEB S-2 removed a time-intensive—but absolutely necessary—effort from the full plate of the ABE, provided the BEB S-2 with a focused problem set that did not duplicate other intelligence efforts, and allowed the BEB to remain fully integrated in discussions regarding routes.

Narrowing the focus of the BEB S-2 to very specific intelligence analysis requirements contributed to more precise and informative products for the command. Also, relieving the ABE of a time-intensive task allowed the ABE to focus on other commander priorities. During OIR, that meant the priority of force protection.

During the 39th BEB deployment to OIR, the protection commander's update brief was one of the critical brigade battle rhythm events executed. The format was deliberately constructed so that it would not become focused only on tracking the status of protection assets within the brigade. While asset tracking was important, it was not important enough on its own to assemble all the brigade key leaders twice a month. With force protection the No. 1 priority for every CJFLCC commander, the protection commander's update served as the forum that the BCT commander used to communicate force protection guidance. The meetings alternated between a staff working group facilitated by the ABE and a commander's update briefing attended by all battalion command teams.

Protection was one of the primary brigade lines of effort, with the brigade engineer serving as its proponent. Aligned against the phases of the operation, objectives were identified and metrics created to ensure progress toward the end state. Protection efforts were not focused only on equipment status. The protection commander's update briefings included—

- Special topics for discussion.
- Updates from command teams on recent successes, upcoming efforts, and ongoing force protection initiatives.
- Reviews of brigade protection priorities and progress toward meeting line-of-effort objectives.

Special topics were selected to coincide with ongoing operations or recent challenges and included topics such as reviews of—

- Preventative medicine measures on drinking water and air quality.
- Recent safety trends.
- Patrol procedures related to operating tactical and nontactical vehicles.
- Behavioral health resources.
- Unit standards and discipline.
- Electronic warfare updates.

The outcome from these protection forums included a common understanding of priorities, better-informed leaders regarding force protection, and shared lessons learned throughout the brigade.

The BEB headquarters offers significant reachback capacity for the ABE and brigade headquarters. Thoughtfully identifying specific areas where the BEB staff can augment the brigade and carefully articulating those capabilities benefit the brigade and ensure that the brigade engineer is appropriately advising the brigade commander and staff.

Assuring Mobility–Bridging

The U.S. Army built many bridges across the Tigris and Euphrates Rivers during Operation Iraqi Freedom. To support OIR in 2016, the Army tapped into some of the experience of multirole bridge companies to form a bridge training team. A specially selected team of bridge builders and maintainers deployed to Iraq to train Iraqi bridgers on the improved ribbon bridge. Within a few months, Iraqi boats were in the Tigris River, assembling a 180-meter bridge to allow the projection of Iraqi army combat power into enemy-held territory. Iraqi bridgers constructed the bridge rapidly, just as they had been trained. Advisors watched the operation unfold via video feeds. As with any complex operation, there were challenges. The proper installation of the anchor system and sustained bridge maintenance were particular challenges. However, these were overcome with persistent, aggressive advising by the bridge training team and the advising task force.

The most difficult challenge, and one unique to the operational environment, was the mitigation of the waterborne improvised explosive device threat to the bridge. Reaching back to Training Circular 5-210, *Military Float Bridging Equipment,* dated 1988 for guidance, bridge training team members proposed a bridge protection device made of 55-gallon drums, cable, and lumber.[2] Together with the Iraqis, the team prefabricated the device and packaged it for movement to the crossing site, where the Iraqis emplaced it on the river. Ensuring the protection of the bridge once the device was emplaced was the most difficult part of the operation.

The key lesson learned from this experience is that mobility and countermobility go hand in hand. The establishment of the bridge allowed mobility for Iraqi and coalition forces, but the bridge did not ensure mobility until it was protected. The employment of a bridge protection system as a countermobility obstacle was essential. Recognizing the significance of a protection system and allocating the proper resourcing, transportation, and installation assets are critical components to the planning of engineer wet-gap crossings.

Assuring Mobility–Route Clearance

Route clearance has been such a frequent mission for Army engineers over the past 13 years that the Army created units for that purpose. Clearance techniques have been adjusted, and the equipment employed has evolved; but the approach taken is usually the same—put the clearance assets up front, insert a mission command element, and provide a security force.

Conditions that were much different from those of the past 13 years made it necessary for 39th BEB leaders to rethink their approach to route clearance during participation in OIR. An environment where U.S. forces were not in the lead meant that the traditional employment of route clearance capabilities required modification. The engineer company, composed of two infantry platoons, a route clearance platoon, and multiple additional enabler capabilities, was not used for route clearance alone. This combined arms maneuver force was capable of much more. Subsequent missions included serving as the CJFLCC ground reaction force, logistics patrol escort, advisor escort, and static security force. The package was easily tailorable to specific mission requirements and influenced by host nation participation, route, movement distance, and tactical task.

"Conditions that were much different from those of the past 13 years made it necessary for 39th BEB leaders to rethink their approach to route clearance during participation in OIR."

In an advise-and-assist environment with the host nation in the lead, it is essential to stay linked in with the host nation ground-holding unit. The most important factor driving the success of each patrol was probably the accompaniment of Iraqi army solders. Not only were the soldiers familiar with the routes to be used, but they were also in communication with other Iraqi forces in the area. When the enemy may be able to blend in with the local populace (or even with the local security force), knowledge of the friendly forces in the area of operations is essential. Incorporating Iraqi army troops into any combat patrol was possibly the most significant force protection measure taken.

Building Partner Capacity

While Field Manual 3-34 refers to building partner capacity (BPC) in terms of infrastructure and essential services, BPC occurs at the tactical level as well. The 39th BEB provided a team of personnel to support the combat engineer train-the-trainer course at the Iraqi bomb disposal school. The course trained Iraqi soldiers on basic breaching techniques, applying the principles of suppress, obscure, secure, reduce, and assault. The goal for any unit with a BPC mission is to work itself out of a job. Creating the capacity within the host nation force to plan, resource, and execute its own training is the desired end state for any BPC mission. This mission was no different, and the team ultimately worked itself out of a job with the successful handoff of the course to the Iraqi army.

For the reader, the lesson is not how to conduct BPC, but to understand the opportunities a BPC mission gives a unit that has been identified to support this type of mission. There were two significant takeaways worth highlighting during the 39th BEB BPC experience—learning from the cultural exposure and reaping the training benefits. Young Soldiers who had not previously deployed were assigned the bomb disposal school BPC mission. The Soldiers were exposed to Iraqi culture, customs, and language. This proved to be an invaluable experience for continued engagements in the near term and for long-term development. Additionally, they integrated with engineers from coalition partners and learned about their armies and cultures. Often limited by the availability of resources at their home station, many sappers never get the opportunity to fire live mine-clearing line charges or antipersonnel obstacle breaching systems. Likewise, home station demolition ranges may not offer the time necessary for multiple repetitions of live-explosive breaching using bangalore torpedoes and field-expedient methods. The BPC environment often provides these opportunities.

Conclusion

It is frequently suggested within the Engineer Regiment that engineers are versatile, agile, and responsive to any mission. Engineers from the 39th BEB proved their versatility during OIR and, along the way, learned some lessons that may prove useful to others who are preparing for their next mission.

Endnotes:

[1]Field Manual 3-34, *Engineer Operations*, 2 April 2014.

[2]Training Circular 5-210, *Military Float Bridging Equipment,* 27 December 1988.

Lieutenant Colonel Payant was the commander of the 39th BEB, 2d BCT, 101st Airborne Division (Air Assault). He holds a bachelor's degree in civil engineering from Virginia Polytechnic Institute and State University and a master's degree in engineering management from Missouri University of Science and Technology at Rolla. He is a registered professional engineer.

("Combined Arms Patrolling," continued from page 25)

capabilities were being employed. If only a select number of vehicles were going on a mission, then the element ensured that the package included all the necessary enabling payloads for the patrol, such as—

- Tactical intelligence, surveillance, and reconnaissance assets.
- Tactical signals intelligence collection assets.
- Antitank weapon systems.
- Counter-unmanned aircraft systems.

Field support representatives for every piece of enabling equipment can provide training for operators and leaders and offer critical maintenance support.

OIR-Specific TTP

Iraq CARCO operations in 2016 were much more risk-averse than in the past. There was zero tolerance for U.S. casualties in this fight, which meant two things: U.S. forces had more assets available to protect the force while on patrol, and they were more restricted in what they were allowed to do. For the ground force commander, this meant that well-defined and rehearsed rules of engagement and escalation of force were required. Soldiers can get bored with a lack of contact, so leaders need a plan for conducting training between operations. Examples may include—

- Expert Infantry Badge train-up.
- Sapper train-up.
- Engineer–infantry cross-training.

There is a healthy competitiveness that exists between sappers and infantrymen that can be used to promote physical training events and build camaraderie.

Combined arms patrols do not always require deliberate route clearance, so the convoy order of march can be adapted to meet specific mission requirements. A modular formation provided the capability to emplace security rapidly, split off a smaller element for a specific reconnaissance priority, and conduct mission command.

Conclusion

Building flexibility into the training plan to allow for crew-served weapon training, antitank weapon training, driver training, or operator training for enabling equipment will pay off in a restricted environment that is constantly changing. I extend an open invitation to continue dialogue about the use of a CARCO for an advise-and-assist campaign. Please feel free to contact me at (614) 580-4240.

Captain Carlier is the commander of Company A, 39th Brigade Engineer Battalion, Fort Campbell, Kentucky. He holds a bachelor's degree in agriculture (construction systems management) from The Ohio State University and a master's degree in engineering management from Missouri University of Science and Technology at Rolla.

Engineer Doctrine Update

U.S. Army Maneuver Support Center of Excellence
Capabilities Development and Integration Directorate
Concepts, Organizations, and Doctrine Development Division

Publications Currently Under Revision

Publication Number	Title	Description	Proposed Publication Date
Army Technical Publication (ATP) 3-37.34	*Survivability Operations*	This publication will include updated survivability data for the various tables.	4th quarter, fiscal year (FY) 2017
Field Manual (FM) 3-34	*Engineer Operations*	This publication will update brigade engineer battalion (BEB) information and includes updates from Army Doctrine Reference Publication 3-0, *Unified Land Operations,* and FM 3-0, *Operations*.	4th quarter, FY 17
ATP 3-34.22	*Engineer Operations Brigade Combat Team (BCT) and Below*	This update will include discussion on the roles and responsibilities of the task force engineer; clarify roles and responsibilities of the BEB commander, operations officer, and assistant brigade engineer; and include discussion of additional BEB missions and responsibilities within the BCT.	4th quarter, FY 17
ATP 3-34.45	*Power Generation and Distribution*	This new publication will cover the power spectrum from low- to medium-voltage systems.	1st quarter, FY 18

How can you provide feedback to doctrinal publication reviews?

Soldiers and civilians can provide feedback to our doctrinal publications as well as those staffed across the Army. For existing publications, please e-mail us directly with feedback. For doctrinal publications under assessment or revision, the doctrinal publication staffing process includes a 45-day period for comments. Comments are accepted regardless of rank or position. However, there are requirements associated with the *level* of comment. Below are the notes associated with *critical*, *major*, *substantive*, and *administrative* comments. We have added additional notes annotating the rank equivalent associated with the level of comment.

C—**Critical.** Contentious issue that will cause nonconcurrence with publication; requires general officer level backing.

M—**Major.** Incorrect material that may cause nonconcurrence with publication; requires colonel level or above backing.

S—**Substantive.** Factually incorrect material.

A—**Administrative.** Grammar, punctuation, and style.

Regardless of level of comment, we welcome the feedback to ensure that the information we are capturing for the Regiment is current, relevant, and useful for the force.

Engineer Doctrine Update

U.S. Army Maneuver Support Center of Excellence
Capabilities Development and Integration Directorate
Concepts, Organizations, and Doctrine Development Division

New Engineer Publication Highlights

ATP 3-37.10, *Base Camps*, published on 27 January 2017. This manual—

- Updates the base camp life cycle activities (command and control versus mission command; operation and maintenance versus operations only). The base camp life cycle consists of four activities: planning and design, construction, operations and maintenance, and transfer or closure. Command and control is the driving force throughout the base camp life cycle.
- Updates the operations chapter to include operations and maintenance.
- Changes the base camp sizes to be aligned with named echelons versus generic sizes. Base camp sizes are now—
  - Platoon: 50 personnel
  - Company: 300 personnel
  - Battalion: 1,000 personnel
  - Brigade: 3,000 personnel
  - Support Area: 6,000 personnel or more
- Expands the discussion on base camp land use planning with the addition of an appendix.
- Consolidates planning and design into one chapter and contains a subsequent appendix that discusses facility and infrastructure design.

ATP 3-34.80, *Geospatial Engineering*, published on 22 February 2017. This manual includes—

- Updates information on the establishment of the Standard and Shareable Geospatial Foundation (SSGF). SSGF is a set of geospatial data that provides a common framework for visualizing an area of interest to enable mission command and the planning and execution of operational goals. It consists of four data types (elevation, map background, georeferenced imagery, and geographic feature data) presented in standard digital and paper formats.
- Covers migration of the Digital Topographic Support System into the Distributed Common Ground System–Army family of systems and the establishment of other peripheral systems and software to the geospatial realm.
- Discusses the evolution of the geospatial intelligence concept consisting of imagery, imagery intelligence, and geospatial information.
- Updates the loss of the topographic companies.
- Internalizes the memorandum of agreement between the U.S. Army Engineer School and the U.S. Army Intelligence Center of Excellence as a collaborative effort to further the interdisciplinary abilities of geospatial intelligence.

Please contact us if you have any questions or recommendations concerning doctrine:
Lieutenant Colonel Matt McCulley, Telephone: (573) 563-2717; e-mail: matthew.y.mcculley.mil@mail.mil
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Engineer Doctrine Team, e-mail: <usarmy.leonardwood.mscoe.mbx.cdidcodddengdoc@mail.mil>.

CERTIFY YOUR TOOL KIT

By Sergeant First Class Corey D. Wilkens

For many years now, successful combat engineer leaders have attended training such as the Sapper Leader Course, the U.S. Army Ranger School, the Urban Master Breacher Course, the Route Reconnaissance and Clearance Sapper and Operator's Courses, and many others to broaden and develop their technical and tactical skills. These skills play an important role in building a tool kit that can be used to accomplish many of the missions that are asked of combat engineers. In recent years, Engineer Regiment leaders have strongly encouraged certifications to sharpen engineering skills and link military engineers with the civilian sector. Certification as project management professionals (PMPs) can be beneficial for combat engineer leaders. The time has come for combat engineer leaders to certify their tool kits.

Army engineers are aware that many people who are not engineers do not know or understand the different types of capabilities associated with each Army engineer specialty. For instance, when things need to be built, the call goes out for engineers, regardless of their specialty. This can often result in a combat engineer filling the role of project manager, especially in contingency environments. There were many examples of this during Operation Enduring Freedom and Operation Iraqi Freedom, when combat engineers managed a wide variety of projects. The combat engineers doubtless responded with a resounding *Let Us Try,* but most of them lacked knowledge of project management processes, tools, and techniques. While that did not stop many of them from being successful, there were often high costs associated with such a learning curve: schedule overruns, scope creep, cost increases, and poor plans for quality control and quality assurance. Earning a PMP certification provides a knowledge base, resource bank, and network of project managers to reduce the learning curve and provide a supported task force with a critical capability in contingency environments.

Combat engineers have continued to manage projects during Operation Inherent Resolve, but a capability gap existed during the early stages of the operation. Combat engineers make up the majority of engineers in brigade combat teams, which have limited horizontal-construction capabilities but essentially no organic vertical-construction capabilities. With most vertical-engineer units in the U.S. Army Reserves, the majority of the early Operation Inherent Resolve base camp development projects were performed by U.S. and local contractors. While these contractors can fill gaps in vertical-construction capability until reservists can be mobilized, a member of the military must still provide project oversight and act as the customer's project manager (often taking the form of a contracting officer representative). In the early stages of Operation Inherent Resolve, the brigade combat team was spread across many locations and construction requirements quickly outpaced the capacity of the construction management cell of a brigade engineer battalion. This is where a properly trained combat engineer leader, already organic to the brigade combat team and probably already attached to the maneuver battalions, could fill the gap. Most combat engineers would need support on the technical aspects of the construction, but the gaps could easily be bridged by the U.S. Army Corps of Engineers Reachback Operations Center, a forward engineer support team–advanced, a forward engineer support team–main, or the joint task force headquarters engineer cell.

> ***". . . Engineer Regiment leaders have strongly encouraged certifications to sharpen engineering skills and link military engineers with the civilian sector."***

While the PMP certification is well known by engineer officers, few enlisted engineers have heard of it and even fewer understand what it is or how they or their units could benefit from it. In general, the certification requires experience in managing projects and the ability to pass an examination. Many enlisted engineers—especially combat engineers—mistakenly disqualify themselves due to a supposed lack of experience in managing projects. The Project Management Institute® defines a project as "a temporary endeavor undertaken to create a unique product, service, or result."[1] Based on this definition, Army noncommissioned officers (NCOs) routinely manage projects throughout their careers and can easily qualify to take the PMP examination.

(continued on page 43)

An Engineer's Farewell to the Army Evaluation Task Force

By Lieutenant Colonel David W. Noble

Army Warfighting Assessment (AWA) 17.1 marked the end of an era for the 40th Brigade Engineer Battalion (Battering Rams) and the 2d Brigade (Iron Brigade), 1st Armored Division. The brigade was tasked to execute the U.S. Army Training and Doctrine Command Army Evaluation Task Force Mission in support of Army modernization efforts. This included both being a critical component for mission command development and helping to develop interim solutions to the Army warfighting challenges. The Battering Rams battalion concluded this 5-year journey with the successful execution of the inaugural AWA.

The Army operating concept provides the intellectual foundation and framework for learning and presents

Engineers demonstrate manned-unmanned teaming engineer equipment candidate systems.

techniques for applying that learning to force development under Force 2025 and Beyond, which is the comprehensive strategy to deliver Army forces to meet the Army operating concept challenges. Force 2025 Maneuvers are exercises designed to experiment with, incorporate, evaluate, and validate Force 2025 and Beyond ideas. Since 2011, the Army has been conducting network integration evaluation (NIE) exercises twice a year to build, test, and field the Army's tactical network. NIEs are Soldier-led evaluations designed to further integrate and rapidly improve the Army's tactical communications network, which is a top Army modernization priority. NIEs deliver an agile, adaptable, networked Army. Through the NIE process, the Army has integrated, validated, and refined network capability sets to provide improved mission command capabilities and network connectivity from the command post, to vehicles on the move, and to the dismounted Soldier. The Army-wide commitment to NIEs has enabled the Army to simultaneously obtain insights from multiple organizations and stakeholders, thus yielding better information to decision makers to meet the needs of the Army within budget constraints. Nowhere in the Army is there a larger operational exercise that tests and evaluates systems and capabilities; it is the Army's critical modernization effort.

An M1 Abrams tank crosses a Wolverine bridge.

Analysis of Doctrine, Organizational Design

Then came the AWA. Transforming an annual NIE into an AWA was no small feat. A component of Force 2025 Maneuvers intellectual and physical events, the AWA assesses interim solutions to the Army warfighting challenges. The AWA leverages the unique and innovative training environment of the Fort Bliss, Texas, range complex. It also takes advantage of being colocated with, and using, the ground and airspace of White Sands Missile Range and Holloman Air Force Base, New Mexico. Organizational design changes can be assessed using live, virtual, and constructive techniques, while limited system tests, experiments, and demonstrations can be conducted across the operational environment with units and Soldiers using prototypes or surrogate capabilities. These will not simply be assessments of material interim solutions but also analyses of emerging doctrine and organizational designs in response to Force 2025 Maneuvers learning demands for future force maturation and risk reduction.

The AWA final proof of concept occurred in October 2015 as part of NIE 16.1. It included integrating 80 concepts, capabilities, and innovations into maneuver formations that included an armored brigade combat team; 14 partner nations with airpower; communication across a coalition network that did not exist; and the execution of live, virtual, and constructive operations as part of a combined joint task force.

"Nowhere in the Army is there a larger operational exercise that tests and evaluates systems and capabilities . . ."

Some of the units taking part in the assessment were—

- I Corps, Joint Base Lewis–McChord, Washington.
- 1st Armored Division, Fort Bliss.
- 82d Airborne Division, Fort Bragg, North Carolina.
- 20th Chemical, Biological, Radiological, Nuclear, and Explosives Command, Aberdeen Proving Ground, Maryland.
- U.S. Army Special Operations Command, Fort Bragg.
- 32d Army Air and Missile Defense Command, Fort Bliss.
- 12th Armoured Infantry Brigade, United Kingdom.
- Folgore Parachute Brigade, Italy.

More than 10,000 U.S. Army, joint, and multinational troops were on the ground for this 3-week exercise because the AWA is the capstone event for the Force 2025 Maneuvers. The Army is provided with a venue to achieve triple payoff objectives, which include—

- Training readiness.
- Future force development.
- Joint and multinational interoperability in a resource-constrained environment.

Engineer Operations During the AWA

Engineers were active in the AWA as they integrated into several formations and improved engineer effort across the force. Engineer capabilities, to include obstacle breaching and the use of earthmoving equipment, were integrated into light infantry companies as part of a manned–unmanned teaming initiative in which robotics enabled the dismounted force. The 40th Brigade Engineer Battalion executed a hasty defense within the armored BCT mobility corridor using the Volcano mine system, which is currently not part of the armored BCT equipment allocation. A year later, the official inaugural AWA kicked off. The Battering Rams battalion executed several high-intensity operations during the exercise. The 40th was designated as the breach force commander in a deliberate brigade level combined arms breach. The battalion integrated into the engagement area development as part of a comprehensive defense against the Fort Bliss opposing force, providing rear area security across 900 square kilometers of complex desert terrain by leveraging military police, route clearance, explosive ordnance, and civil affairs enablers to achieve success. Capitalizing on the expansive training opportunities and resources available, the battalion accomplished four live-fire mine-clearing line charge exercises; validated engineer capabilities; and ensured successful mission command efforts across a dynamic, complex, decisive-action training environment.

The 40th Brigade Engineer Battalion, along with the rest of the Iron Brigade, may have concluded its tenure in the Army evaluation task force business, but modernization continues across the Army. Since AWA 17.1, the annual event has evolved into a joint warfighting assessment, with the 18.1 exercise programmed to take place in Europe. It is highly likely that the Engineer Regiment will continue to be decisively engaged, assuring mobility and shaping the operational environment to remain relevant and tactically sound.

Lieutenant Colonel Noble serves as the commander of the 40th Brigade Engineer Battalion. He holds a bachelor's degree in communications from the University of Tampa and a master's degree in business administration from the University of Phoenix.

("Certify Your Toolkit," continued from page 40)

Those who take the examination must learn the Project Management Institute process for managing projects, which is derived from international best practices. In the end, getting a PMP certification will help translate military experience into civilian terms, teach leaders effective ways to manage based on international best practices, and provide a highly sought-after civilian certification.

Successful junior enlisted Soldiers and junior NCOs perfect the tactical and technical skills of their trade. However, many of these skills become much less important to Soldiers who attain senior NCO ranks. Badges and tabs do not matter so much to senior NCOs; the ability to calculate time fuses, to emplace a water impulse charge, or to operate a Husky vehicle-mounted mine detector will not make an NCO a successful operations sergeant, first sergeant, or command sergeant major. A senior NCO must understand the Army at the tactical, operational, and strategic levels and be able to establish and manage the systems and processes that drive results. There are many avenues available to become a more proficient manager, but few are as rewarding and relevant as earning a PMP certification.

The Engineer Regiment has been dedicating manpower and resources to the credentialing program for years now, but many enlisted engineers (especially combat engineers) have failed to seize the opportunity. The best combat engineers are jacks-of-all-trades, capable of filling all the engineering needs of a maneuver element. Just as engineers have adjusted to the assured mobility needs of the Army over the past 10 to 15 years with route clearance knowledge and skills, they must now adapt to future requirements. As promotions become more competitive, the most capable engineers who have shown the potential to manage at senior levels will rise to the top. An NCO with a PMP certification provides increased capabilities to commanders, demonstrates a strong understanding of managing systems and processes, and has an internationally recognized certification that will directly translate to a higher-paying job after transitioning from the Service.

Get on board, put in the work, and certify your tool kit!

Endnote:

[1]Project Management Institute, "What is Project Management?" <https://www.pmi.org/about/learn-about-pmi/what-is-project-management>, accessed on 21 March 2017.

Sergeant First Class Wilkens is a combat engineer serving as the operations sergeant for the 307th Airborne Engineer Battalion, 3d Brigade Combat Team, 82d Airborne Division, Fort Bragg, North Carolina. He is a graduate of the U.S. Army Ranger School, the Sapper Leader Course, the U.S. Army Jumpmaster School, the U.S. Army Pathfinder School, the Army Reconnaissance and Surveillance Leader Course, and the Battle Staff NCO Course. He holds a PMP certification from the Project Management Institute.

NTC Corner

Prerequisites for Live-Fire Operations at the National Training Center

By Major Andrew A. Thueme

This article addresses some confusion about live-fire exercise (LFX) qualification standards at the National Training Center (NTC), Fort Irwin, California. To participate in brigade combat team LFXs at NTC, engineer platoons must have completed a Table XII (platoon LFX) within the previous 9 months (or 12 months for Army National Guard and U.S. Army Reserve units).

Leaders of engineer units often believe that they must conduct a "maneuver" Table XII and an engineer qualification table (EQT) XII to meet the qualification standards for the NTC LFX. This confusion comes from a misunderstanding of gunnery training standards as defined in Field Manual 3-20.21, *Heavy Brigade Combat Team Gunnery*,[1] and Training Circular 3-20.31, *Training and Qualification, Crew*.[2] The Combat Engineer Integrated Training Strategy, presented in Table 12-5 in the field manual, shows *Collective Gunnery Training Tables VII–XII* and *EQT IX–XII*. This is misleading since the requirement for engineer platoons is EQT, as stated in Appendix E (Engineer Squad Qualification Tables): "During the advanced phase of gunnery, engineer platoons will conduct EQTs IX through XII."[3] EQT XII is the standard for engineer platoon gunnery qualification. By following the engineer gated training strategy, units meet the qualification requirements for the NTC LFX.

Field Manual 3-20.21 is now used as the only source for EQTs. In 2010, the heavy brigade combat team gunnery manual was changed so that it became a single-source manual for gunnery training. The EQTs from Training Circular 5-150, *Engineer Qualification Tables,*[4] were incorporated into Field Manual 3-20.21 and are no longer in a standalone training circular. Field Manual 3-22.3, *Stryker Gunnery*,[5] follows a pattern similar to the heavy brigade combat team manual—it does not include training strategies for antitank guided missile platoons or platoons that are not infantry. There is no gunnery manual for echelon-above-brigade companies.

The following qualification standards apply for participation in LFXs at the NTC:

- **Engineer platoon**—Platoon must have completed EQT Table XII within the previous 9 months (or the previous 12 months for Army National Guard and U.S. Army Reserve units).
- **Bradley fighting vehicle**—Bradley commander/gunner must have completed Table VI in the previous 9 months (or the previous 12 months for Army National Guard and U.S. Army Reserve units).
- **Stryker fighting vehicle/M113 armored personnel carrier**—Vehicle commander/gunner must have completed crew qualification in the previous 9 months (or the previous 12 months for Army National Guard and U.S. Army Reserve units).
- **Assault breacher vehicle/Mine-clearing line charge crew**—Crew must have fired a live rocket and inert charge within the previous 12 months.
- **Demolitions**—All demolitions training must have been completed within the previous 12 months.
- **Crew-served weapons**—Standards are in accordance with the most recent field manual for the weapon.
- **Individual weapons**—Standards are in accordance with Department of the Army Pamphlet 350-38, *Standards in Weapons Training (Standards in Training Commission).*[6]

Units that do not meet these standards can participate in LFX training in a nonfiring status or request a waiver through the brigade combat team commander, subject to approval by the commander of the NTC Operations Group.

Endnotes:

[1]Field Manual 3-20.21, *Heavy Brigade Combat Team Gunnery,* 3 September 2009.

[2]Training Circular 3-20.31, *Training and Qualification, Crew,* 17 March 2015.

[3]Field Manual 3-20.21.

[4]Training Circular 5-150, *Engineer Qualification Tables*, 16 June 1998.

[5]Field Manual 3-22.3, *Stryker Gunnery,* 9 March 2006.

[6]Department of the Army Pamphlet 350-38, *Standards in Weapons Training (Standards in Training Commission),* 22 November 2016.

Major Thueme serves as the current Sidewinder 03, the brigade engineer battalion trainer at NTC. He holds a bachelor's degree in industrial technology management from Central Michigan University and a master's degree in engineering management from Missouri University of Science and Technology at Rolla.

Preparing the Brigade Engineer Battalion for the Joint Readiness Training Center

By Lieutenant Colonel Michael R. Biankowski, Jr.

During each Leader Training Program at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana, Task Force 5 briefs the brigade engineer battalion (BEB), focusing on battle command and staff planning, coordination, integration, synchronization, and execution of BEB-specific combat operations in the decisive-action training environment. Since the training usually occurs 1 to 3 months before a unit's JRTC rotation, it is usually too late to affect common training shortfalls and trend observations.

As BEBs prepare to deploy to the JRTC, the following points must be emphasized to ensure that the whole organization is properly prepared to operate in the decisive-action training environment:

- **Operationalize reception, staging, onward movement, and integration** *(RSOI).* Ensure that the BEB process is nested within the brigade combat team concept of the operation.
  - Define and develop reporting requirements and standards.
  - Integrate external units and enablers, ensuring that their capabilities are understood and that subject matter expertise is incorporated into the BEB planning process.
  - Define, establish, and maintain a common operational picture, allowing the BEB commander to understand, visualize, and describe the building of combat power over time and to identify friction points during RSOI.
  - Assign ownership of key portions of RSOI, such as validation of mission command systems; installation of multiple, integrated laser engagement system equipment; and weapon zeroing.
  - Establish a battle rhythm that enables shared understanding and helps the BEB commander make adjustment decisions and provide further guidance.

At the JRTC, it is often said that units cannot win the rotation during RSOI. However, they can definitely lose it if RSOI is not properly executed.

- **Delineate the BEB fight.** Establish a shared understanding of duties and responsibilities across the organization between the brigade and battalion staffs, liaison officers, company headquarters, and task force engineers. This topic is especially important since many BEB enablers directly support the brigade combat team staff or maneuver task forces and are dependent on established command or support relationships.
- **Focus on transitions from RSOI, to forced-entry operations, to follow-on missions.** The BEB must be sure to maintain mission command, battle rhythm events, and planning horizons during these critical transition periods. To enable collaborative and parallel planning, determine whether the brigade will conduct its planning horizons in the tactical command post or in the main command post. The staff should be nested accordingly when assets are allocated to the BEB tactical command post. Trainers have often observed unorganized forced-entry operations and little or no detailed planning conducted during transitions because the BEB tactical command post or the main command post were not properly manned or equipped to execute mission command and effectively conduct planning for follow-on missions.
- **When not attacking, defend!** Due to its many functional and nonfunctional roles, this principle is especially true for the BEB.[1] The BEB should approach its JRTC force-on-force rotation as 14-day tactical defense. Beginning with the initial occupation of its tactical assembly area, the BEB has a vested interest

in aggressive, competent efforts to continually improve its defensive posture, to include the construction of protective obstacles and survivability positions and the emplacement of fighting positions and tactical obstacles. Some critical implied training tasks include—

- Conduct crew-served weapons qualification to enable 24-hour combat operations.
- Conduct antiarmor weapon and munition certifications and qualifications for Javelin and AT-4 antitank weapons and Selectable Lightweight Attack Munitions.
- Conduct munition certifications on M18A1 Claymore mines and M7 Spider networked munitions.
- Conduct certification on the use of equipment such as night-vision goggles and infrared lights for night-time operations.
- License operators on special equipment, such as chainsaws, to increase BEB countermobility capability.

Units are strongly encouraged to begin their interaction with Task Force 5 well before their scheduled Leader Training Program. Following are methods available to leaders to help their units understand the employment of the BEB echelon-above-brigade engineer elements during CTC rotations:

- Send key leaders and/or staff to JRTC as guest observer-coach trainers.
- Request a short ride-along with the Task Force 5 team to gain firsthand experience during an actual rotation.
- Visit the Center for Army Lessons Learned for numerous publications that address common JRTC trends.

Task Force 5 is postured to assist organizations and improve their Soldier readiness. Call (337) 353-8287 or (337) 208-3441 to coordinate a visit or request additional information.

Endnote:

[1]Michael R. Biankowski, Jr., "The Brigade Engineer Battalion Role at the Joint Readiness Training Center," *Engineer Professional Bulletin*, Vol. 47, January–April 2017, p. 39.

Lieutenant Colonel Biankowski is the Task Force 5 (BEB) senior observer-coach trainer at the JRTC. He recently commanded the 9th BEB, 2d Infantry Brigade Combat Team, 3d Infantry Division, Fort Stewart, Georgia.

We Need Your Photographs!

Engineer **is always looking for good-quality, action photographs (no "grip and grins," please) to use on the outside covers. If you have photographs of Soldiers who are in the proper, current uniform and are participating in training events or operations or photographs of current, branch-related equipment that is being used during training or operations, please send them to us at <usarmy.leonardwood.mscoe.mbx.engineer@mail.mil>.**

Ensure that photographs depict proper safety and security procedures, and do not send copyrighted photographs. All photographs must be high-resolution; most photographs obtained from the Internet, made smaller for e-mailing, or saved from an electronic file such as a Microsoft® PowerPoint or Word document cannot be used for print. In addition, please include a caption that describes the photograph and identifies the subject(s) and photographer (if known). Please see our photograph guide at <http://www.wood.army.mil/engrmag/Photograph%20Illustration%20Guide.htm> for more detailed information.

THE MOBILE COMPANY COMMAND POST

By Captain Justine M. Meberg

Senior Army leaders caution that future conventional warfare will require extreme mobility in an environment where troops will not be able to remain in place for more than 2 or 3 hours without risking enemy targeting. However, Army mission command nodes, generally in the form of a tactical operations center, take hours to set up and tear down. Ideally, the Army would meet this challenge by adapting existing technologies mounted on mobile transport, similar to the expansible vans often used by mobile command groups. Such technologies might involve wireless secure Internet protocol router access, the use of the Combat Service Support Automated Information Systems Interface, and improved Joint Capabilities Release access and could exist in decentralized clusters rather than the large and easy-to-find configuration of a typical brigade tactical operations center. Yet these changes would take many years to implement. For the present, we should address the question of how to make ourselves more mobile and expeditionary with the resources that we have. This article discusses one such on-the-ground solution, in the form of a mobile company level command post (CP).

Headquarters and Headquarters Company, 16th Brigade Engineer Battalion, 1st Stryker Brigade Combat Team, 1st Armored Division, Fort Bliss, Texas, uses a Humvee adapted to serve as a CP. It requires less than 5 minutes to emplace and displace. Soldiers use standard blocking and bracing materials to construct a desk on the back of the vehicle bed, bridging the vehicle's two bench seats. A Joint Capabilities Release screen mount is installed on the desk. Once the vehicle is in place, the screen that is normally mounted in the front of the vehicle can be moved to the rear. The vehicle has two full radio mounts, with two radios with speakers in the cab and another two radios with speakers in the rear. Changing from front to rear radios then becomes a simple matter of moving a cable. Resting on one side of the vehicle, mounted on top of the bench seat and secured with paracord, is a CP board. After analysis of CP operations, battle tracking, and reporting requirements, spaces for numerous products are assigned to the board. Lists of required items, such as communications cards, operation orders, and the locations of company elements, are posted so that anyone can tell at a glance what products the CP needs.

Since the unit is a headquarters company, the center of the CP board is dedicated to base defense. The brigade geospatial intelligence cell provides imagery printouts of the brigade base cluster area, and a company sector sketch is included on the board. There is a dedicated place for printouts of company and battalion tactical standard operating procedures and copies of Department of the Army Forms 1594 to maintain a log.[1] The storage plan includes a combat lifesaver bag under the desk, along with vehicle basic issue items. A map board that includes a complete set of the latest operational graphics is also posted, with special focus on matters most relevant to the unit mission. In the case of a brigade engineer battalion headquarters company, that includes potential decontamination sites that the company chemical, biological, radiological, and nuclear platoon will reconnoiter and the medical treatment locations that will be useful to company medics.

The guiding concept that the company strives to adhere to specifies that the CP will have everything that is needed and nothing that is not. Only a small table with chairs for use as additional meeting or planning space are stored in the vehicle during movement. These items are easily removed when stopped and allow set-up and tear-down times to be kept to a minimum. After many experiments using generators for power, we found that problems with available loads for different generators, the extra maintenance requirements, and the lost trailer space were liabilities. The CP now simply uses vehicle electrical power and carries extra fuel cans in the vehicle trailer. The CP can run continuously for much more than the standard 72 hours on the fuel available.

This quite simple concept is not a new idea. Many previous generations of Soldiers have devised simple ways to turn a vehicle into a mobile CP. However, this approach merits study, as it is increasingly relevant in a time when we must look to the future. In a military environment that prizes direct-action training, our current field setups reflect the more stationary mentality of forward operating bases, which are reminiscent of our recent organizational history in Iraq and Afghanistan. Army tactical operations centers are semipermanent and cannot be moved in a timely fashion when threatened. They are also nearly impossible to camouflage. If operated alone or in a small cluster, the vehicle and trailer that comprise the mobile CP can be easily camouflaged with a single camouflage net.

The purpose of this article is twofold: To share an easily adaptable template born of many lessons learned and to demonstrate that, although the supermobile force of the future may be a long way off, leaders at all levels can move toward that goal in their own units, a little at a time.

Endnote:

Department of the Army Form 1594, *Daily Staff Journal or Duty Officer's Log,* 1 November 1962.

Captain Meberg is the commander of Headquarters and Headquarters Company, 16th Brigade Engineer Battalion, 1st Stryker Brigade Combat Team, 1st Armored Division. She previously served as the commander of the military intelligence company for the same brigade. She is a graduate of the Military Intelligence Basic Officer Leader and Captain's Career Courses. She holds a bachelor's degree with majors in economics and comparative politics from the U.S. Military Academy–West Point, New York.

557th Engineer Construction Company Activates and Shares Lessons Learned

By Captain Mark D. Garrison and First Lieutenant Johnny C. Jung

Late in 2016, almost 2 years to the day after its last inactivation, the 557th Engineer Construction Company was reactivated at Joint Base Lewis–McChord, Washington. It was the fifth activation in the unit's 72-year history. The 557th consists of two heavy horizontal-construction platoons, a vertical-construction platoon, and associated support elements. Unlike some other engineer construction companies in the Army that converted from established horizontal-construction companies, the 557th started from scratch. The company began its activation in November 2015 with just a company executive officer, who began coordinating, organizing, and executing lateral transfers, storage locations, and initial company tracking systems. The company first sergeant joined in February 2016 and, with the battalion personnel section and command sergeant major, focused on coordinating personnel growth. The commander and a supply clerk arrived in April 2016, and the company began to grow exponentially. By October, the company had grown to 80 percent strength, with the majority of its organizational property on hand.

However, the activation did not occur without struggles and challenges. This article provides an overview of some of the major challenges of the activation and the associated lessons learned from each.

Challenge: Soldiers Arriving With Limited Leadership

Lessons Learned: When a personnel requisition is submitted, Soldiers arrive from advanced individual training in large numbers. It is imperative that leadership at all levels be well established before the new Soldiers arrive in order to avoid a high Soldier-to-leader ratio. Platoon leaders, platoon sergeants, and especially squad leaders should be present once Soldiers arrive because they play such a critical role in developing and shaping first-term Soldiers. The company leadership should consist of a good mix of experienced leaders and new leaders with potential. The commander and first sergeant should take time to sit down with all new Soldiers, get to know them, define the company vision, discuss command philosophy, and identify any problems the Soldiers are having. The Commander's Risk Reduction Dashboard should be used to screen for risk indicators that may require additional chain-of-command involvement or monitoring.

Challenge: Sponsoring New Personnel

Lessons Learned: Leaders should understand the Total Army Sponsorship Program and how to effectively use the tool to sponsor personnel. When done correctly, sponsorship allows first-line supervisors to help their Soldiers transition to a new duty station. The first sergeant should monitor and track sponsorship by individual.

Challenge: Reporting Unit Status

Lesson Learned: Activating units cannot brief unit status reporting until activation is accomplished. However, higher echelons can still provide comments in the notes section to highlight problems on behalf of an activating

The 864th Engineer Battalion commander and the 557th Engineer Construction Company commander unveil the guidon during the activation ceremony.

unit. Additionally, in-progress reviews that include command and staff members are useful tools to ensure that situational awareness is maintained at all levels.

Challenge: Handling Equipment Shortages

Lessons Learned: Despite having most of its modified table of organization and equipment property, the company still lacked many of its construction vehicles. Common items such as radio mounts and night vision goggles are easy to source and acquire, but they are not significant contributions toward conducting mission-essential task list training. Equipment requisitions should be prioritized according to pacing items and equipment that is required for mission-essential task list training. Equipment should be tracked by the categories of *shoot*, *move*, and *communicate* to paint a clear picture about the property situation to higher echelons. Leaders should coordinate with force management personnel for available new-equipment fielding dates as early as possible.

Soldiers from the 557th Engineer Construction Company use D7R bulldozers to rough grade the airstrip for a tactical unmanned aerial surveillance launch and recovery site at the Yakima Training Center in eastern Washington.

Challenge: Determining Which Systems to Build First

Lesson Learned: First, areas in which the unit's higher echelons are not willing to assume risk should be determined. The 557th determined (in no special order) that the following systems were critical during activation:

- Arms room, arms, ammunition, and explosives.
- Master driver and licensing program.
- Command supply discipline program.
- Command maintenance discipline program.
- Sponsorship program.
- Digital Training Management System.

It is also critical to establish a solid company in-processing system.

Challenge: Maintaining Minimum Equipment Standards

Lessons Learned: Skilled mechanics should be assigned early to conduct thorough technical inspections of all transferred equipment and to maintain the equipment once it has been signed for. Losing units should be held responsible for the condition codes required in all directives through Military Interdepartmental Purchase Requests. The potential risks and costs associated with accepting equipment that does not meet the minimum required condition standards should be understood.

Challenge: Coordinating and Executing Lateral Transfers

Lesson Learned: A skilled supply sergeant and supply clerk should be among the first individuals assigned to the company to help the executive officer coordinate and receive lateral transfers, build the property book, and resolve supply shortages.

Challenge: Conducting Training During Activation

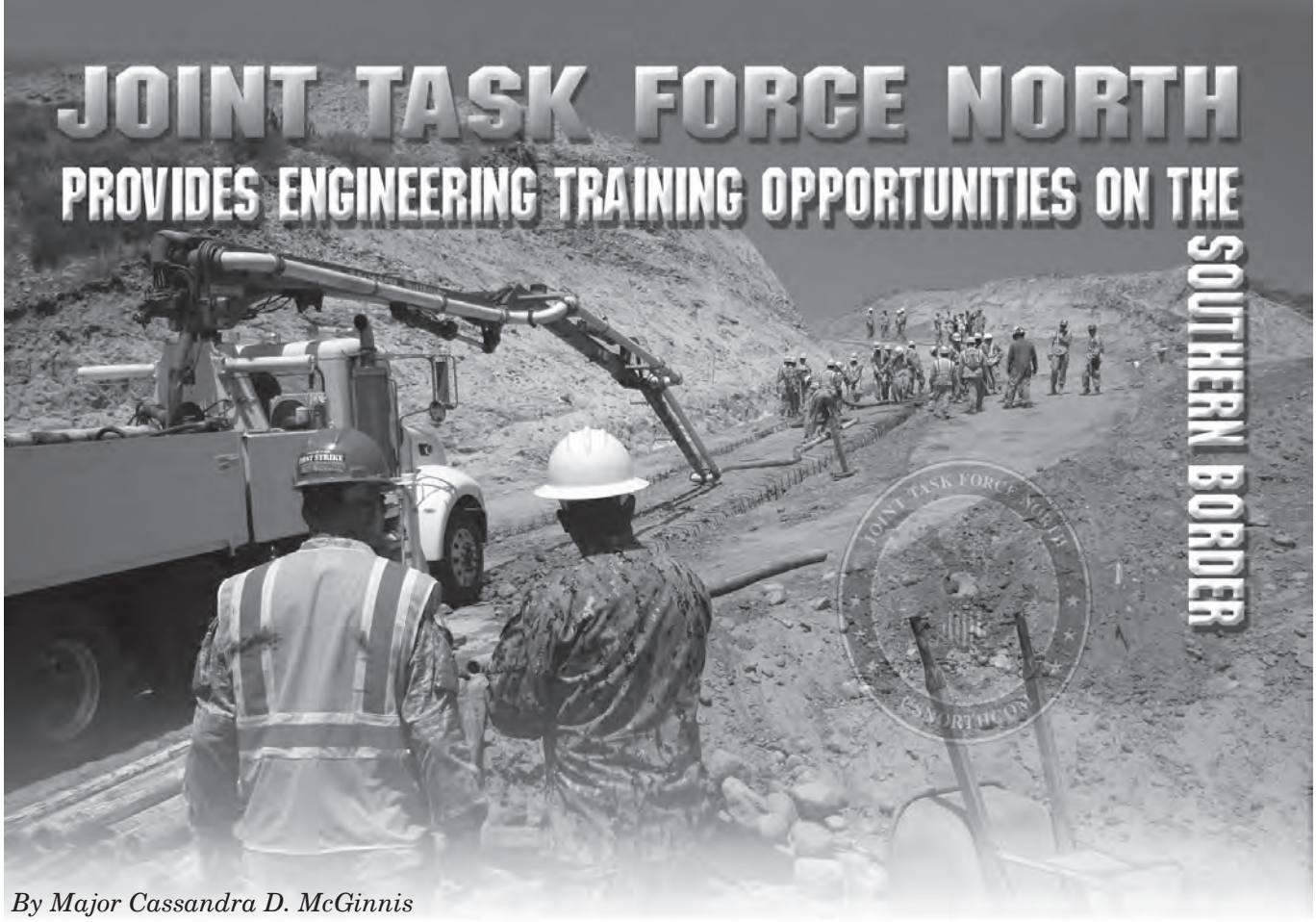
Lesson Learned: Opportunity training was a phenomenal way to allow junior leaders to learn how to train and execute many individual training requirements despite limited access to resources. Even before activation, the company was able to participate in weapons ranges, equipment training, construction projects, and mandatory training by training with other companies. Leader certification and training in the form of professional development events can also help build the foundation for better future individual and collective training.

Despite the challenges it faced, the 557th Engineer Construction Company is activated and moving full steam ahead into its annual training plan. Fellow engineers should be on the lookout for the Soldiers of the 557th Engineer Construction Company.

Captain Garrison is the commander of the 557th Engineer Construction Company, 864th Engineer Battalion, Joint Base Lewis–McChord. He holds a bachelor's degree in civil engineering from the U.S. Military Academy–West Point, New York, and a master's degree in engineering management from Missouri University of Science and Technology in Rolla.

First Lieutenant Jung is the executive officer of the 557th Engineer Construction Company. He holds a bachelor's degree in operations research from the U.S. Military Academy–West Point, New York.

JOINT TASK FORCE NORTH PROVIDES ENGINEERING TRAINING OPPORTUNITIES ON THE SOUTHERN BORDER



By Major Cassandra D. McGinnis

Engineer units face unique training challenges. Construction units can rarely exercise complete mission-essential tasks from survey, to design, to construction.

At the same time, the U.S. Border Patrol is challenged by a lack of mobility along the Nation's southwest border. In many cases, the patrol can only access large areas on foot or by horseback. The need for military construction unit training combined with the need for the mobility of the Border Patrol provides the opportunity for a unique benefit partnership.

Military engineering support from Joint Task Force North (JTFN) directly increases the effectiveness of Border Patrol efforts to deter and prevent drug trafficking and associated transnational threats from entering the United States by constructing all-weather roads while providing Service members with enhanced training opportunities.

Soldiers from the 103d Engineer Company, 94th Engineer Battalion, construct a one-mile stretch of road along the border.

JTFN, based on Fort Bliss, Texas, is the Regular Army Defense Department command tasked to support the U.S. federal law enforcement agencies conducting operations against drug smuggling and transnational criminal organization activities taking place

Engineers from the 232d Engineer Company, 94th Engineer Battalion, construct a road in support of the U.S. Department of Homeland Security and the U.S. Border Patrol.

within and along the Nation's southwest border and at entry points to the United States.

Mobility support missions are executed primarily in parts of California, Texas, and Arizona. The focus and priority of these areas are in direct relation to an operational analysis done by JTFN, the U.S. Border Patrol Tactical Infrastructure Directorate, and the U.S. Customs and Border Protection Facilities Management and Engineering Directorate.

JTFN mobility support missions enhance Border Patrol agent response times to conduct interdiction operations; in many cases, agent response times can be reduced by 75 percent. These missions also allow agents to better patrol the rough terrain and afford access to areas to emplace and maintain persistent sensor platforms. Permanent roads, built with drainage culverts to keep them from washing out, help agents more quickly respond to drug-trafficking activity in the area and more quickly provide aid to undocumented aliens in distress. Local residents and businesses also benefit from the improved conditions.

Military Training Opportunities

Since fiscal year 2011, JTFN mobility support missions have constructed 62 miles of all-weather road while executing 49 engineer missions and deploying 1,658 military personnel from 49 units (34 from the Army, 12 from the Marines, and three from the Navy) at 20 military installations in 14 states for a total of 95 months.

Engineer units from all three Services have executed a variety of mobility missions along the southwest border, to include road construction and improvement, border perimeter lighting installation, border fence construction, and vehicle barrier construction. JTFN mobility missions present military engineer units with unique training opportunities to exercise multiple skill level tasks in military construction. These missions are challenging and provide the unit leaders with some of the best real-world construction training opportunities within the continental United States.

Volunteer units typically train on 90 percent of their wartime mission tasks. Volunteer units and individuals have repeatedly remarked that JTFN missions have provided them with the best training they have ever received, emulating terrain similar to that seen during combat operations, as indicated in multiple after action reports.

"This project provides a phenomenal opportunity for us to train every echelon of the brigade, from individual operator all the way through battalion and brigade mission command," said one U.S. Army engineer brigade commander. "Candidly, we normally don't have an operations and maintenance budget sufficient to allow us to take on a project of this scale, so we're thankful to be able to do it on someone else's dime. At the same time, I have to believe that executing with troop construction lowers the net cost of the project for JTFN, so this truly is the elusive 'win-win' we all search for," he added.

For more information on JTFN, its engineering projects, or its trainings opportunities, contact the command at (915) 313-7777 or visit <www.jtfn.northcom.mil>.

Major McGinnis serves as an engineering plans officer at Fort Bliss, overseeing the development and execution of mobility projects along the southwest border of the United States for JTFN. She holds a bachelor's degree in business administration from Wayland University and a master's degree in geological engineering from Missouri University of Science and Technology at Rolla.

By Captain Casey A. Tuggle and Second Lieutenant Colby C. Stitt

On 10 November 1942, 2 days after the landing of multinational forces in Africa, General George C. Marshall gave a speech at the Academy of Military Science in New York City. "In the past two days we have had a most impressive example of the practicable application of [unity of command] . . . Officers of the British Army and Navy senior to General Eisenhower, men of great distinction and long experience, have, with complete loyalty, subordinated themselves to his leadership. I go into detail because this should not be a secret. It will be most depressing news to our enemies. It is the declaration of their doom," he said.[1]

General Marshall recognized the importance of multinational cooperation, interoperability, and unity of command early in World War II. He worked tirelessly to incorporate these ideas into the framework for Allied operations during the war. Today, his ideas still apply to the way we conduct operations across the globe. The operating environment in the European Theater thrives on multinational operations. During the European Corps (Eurocorps) Engineer Training Exercise 2016 (EURETEX16) in France in September 2016, this is exactly what participants experienced—an operating environment composed of seven nations training toward a common goal of interoperability.

The Multinational Environment

Eurocorps is a multinational corps headquarters for the European Union. It can assume operational control of combat units. Member nations include—

- Spain.
- France.
- Belgium.
- Italy.
- Luxembourg.
- Germany.
- Poland.
- Romania.
- Turkey.
- Greece.

EURETEX is a Eurocorps training event that is conducted every 2 years in a different host nation. Eurocorps member nations train at the squad and platoon levels on the most up-to-date combat engineer tactics, techniques, and procedures (TTP). Eurocorps invited the U.S. Army to participate last year for the first time since the exercise's inception in 1992. EURETEX16 required junior leaders and

Soldiers to work together as multinational units, better preparing all involved for a future where multinational operations are the key to success on the battlefield.

Conducting operations in a multinational environment requires a positive attitude, interpersonal skills, and an eagerness to learn. These are the best qualities to adopt when working with allied nations. Leaders and Soldiers need to be effective communicators. European culture thrives on conversation over meals, coffee, or drinks. Relationships are forged during such social events and positively transposed to training. For example, EURETEX16 commenced with a cohesion rally that culminated in a mixer, where Soldiers and leaders mingled and formed relationships. It was there that the lines of communication opened for the training exercise; without this and other social outings, the planned training would not generally have been as effective as it was. At the first mixer, U.S. leaders met with company commanders from the German 4th Panzer Division and the French Foreign Legion. Members of the various armies discussed their military histories and their enthusiasm for the training to follow. Breaking down barriers between allies helped U.S. leaders secure training events with each nation—demolitions training with the Germans and search-and-seizure operations with the French. Building upon these relationships allowed the allies to plan urban breaching, room clearing, route clearance, and military search training in which each squad had soldiers from multiple nations.

A U.S. Soldier uses the interrogation arm of a Buffalo mine-resistant, ambush-protected vehicle to examine a potential hazard.

A positive attitude and an eagerness to learn, which increased the flow of information and cohesion among nations, were equally important. At times, the Europeans looked to the Americans for TTP, while at other times, the Europeans wanted to showcase their own TTP. Remaining open-minded to the experiences and methods of allies allowed the U.S. troops to improve themselves and become more effective. A Spanish route clearance platoon leader taught one U.S. platoon a course on Spanish TTP. Much of the information the Spanish officer shared was already in U.S. doctrine, but the American Soldiers adopted a number of TTP for marking and investigating improvised explosive devices. These small differences allowed the U.S. participants to learn and further develop themselves. Often, the Soldiers learned TTP from allied nations and shared them during platoon after action reviews. Forging and investing in relationships led directly to U.S. Soldier success during EURETEX16. Learning how to subordinate American Soldiers to the direction and leadership of allied officers allowed them to receive TTP and training from a new perspective.

A U.S. engineer learns proper handling of electronic demolitions from the commander of the French Foreign Legionnaires.

Interoperability

On the first day of EURETEX16, the officers in charge explained that the ultimate aim of the exercise was to achieve interoperability among the participating nations. Interoperability is the ability of a system to work with, or use the parts or equipment of, another system. It is fitting that interoperability was the basis of every operation during EURETEX16. One way it was achieved was by replacing

U.S. components, systems, Soldiers, and equipment with those of allied armies to create an interoperable multinational route clearance platoon. U.S. mounted units were augmented with a French dismounted team, a Belgian dog team, a German explosive ordnance disposal section, and gun trucks from all three nations. No single unit could have accomplished the mission alone; it was through combined efforts and common experiences that the multinational platoon successfully cleared an improvised explosive device situational training lane.

An American Soldier gets hands-on training on abatis charges with French troops.

Many of the U.S. Soldiers had not experienced interoperability at the platoon level, so practicing it during a training exercise was enlightening. The officers in charge sometimes assumed responsibility for the planning and training efforts of other nations' platoons and devised the plans that were executed daily during the exercise. All participants were working toward the practicable application of unity of command, as General Marshall had stated. Placing key leaders in the command vehicles of other nations permitted unity of command and the ability to overcome language barriers. Witnessing U.S. Soldiers as they realized the importance of interoperability was a rewarding feeling, especially when pondering the need for multinational operations during wartime.

Mission Command

EURETEX16 gave junior leaders the opportunity to shape and hone a leadership style in a way that many leaders may not experience. It gave them the opportunity to operate among more-senior leaders from foreign nations and share their guidance and perspective as part of the decision-making process. Those senior leaders also subordinated themselves to junior American leaders, which demonstrated the criticality of forging relationships. Building the foundation of trust between American and allied officers allowed them to function as a single unit.

Conclusion

In a future where the population is growing, technology is rapidly advancing, and the world is shrinking, everyone becomes closer and more interconnected. In order to fight and win future wars, we must embrace the skills necessary to be successful in multinational operations and those encompassed in interoperability. Lieutenant General Frederick Benjamin Hodges, commander of U.S. Army Europe, cites the ability to work with allies and partners, present a dynamic presence, work with regionally allocated forces, integrate with the Army National Guard and U.S. Army Reserve, and empower junior leaders as the pillars of a Strong Europe. These five pillars are the tangible foundation of interoperability.

At his Senate confirmation hearing in July 2015, Army Chief of Staff General Mark A. Milley said that "If 3 or 4 years go by and you lack training, you lack money, you lack equipment, you lack spare parts, and most importantly, you lack a competent, capable, committed leadership, then you can certainly understand why units fell apart."[2] To remain relevant, we must continue to train and adapt to an ever-changing environment. Over the course of 72 years, from General Marshall to General Milley, it is clear that preparation for the wars of tomorrow requires multinational operations across the globe, interoperability, relationship building, and mission command.

Endnotes:

[1]Mark Perry, *Partners in Command: George Marshall and Dwight Eisenhower in War and Peace,* Penguin Books, New York, New York, 10 May 2007.

[2]Mark A. Milley, "Army Chief of Staff Confirmation Hearing," 21 July 2015, <https://www.c-span.org/video/?c4545445/hearing>, accessed on 12 April 2017.

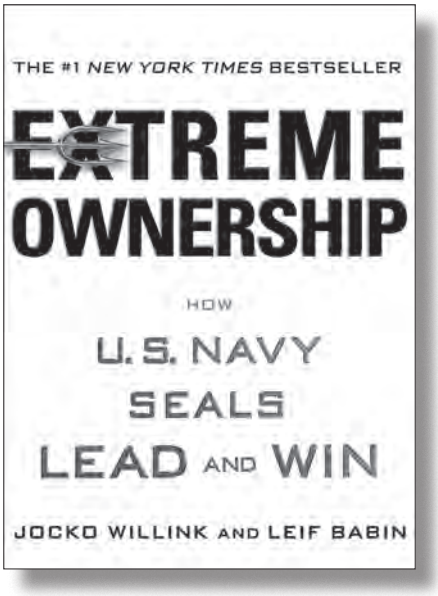
Captain Tuggle is the plans officer for the Regimental Engineer Squadron, 2d Cavalry Regiment, Tower Barracks, Germany. He is a graduate of the Engineer Basic Officer Leader Course and Engineer Captains Career Course. He holds a bachelor's degree in systems engineering from the U.S. Military Academy–West Point, New York, and a master's degree in engineering management from Missouri University of Science and Technology at Rolla.

Second Lieutenant Stitt is the route clearance platoon leader, Troop B, Regimental Engineer Squadron, 2d Cavalry Regiment. He is a graduate of the Engineer Basic Officer Leader Course. He holds a bachelor's degree in biological sciences from Louisiana State University.

Book Reviews

Self-development is a major pillar in the growth of Army leaders. One tool to aid in this is the "Engineer Commandant's Reading List" at <https://www.milsuite.mil/book/groups/usaes-commandant-resource-menu>. It includes a variety of books on history, politics, and culture that are appropriate for Soldiers and civilians in the Engineer Regiment. The list is not all-inclusive and will be updated over time.

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>. Books for review do not need to be selected from the reading list.



Extreme Ownership: How U.S. Navy SEALs Lead and Win, by Jocko Willink and Leif Babin, St. Martin's Press, 20 October 2015, ISBN-13: 9781250067050

Reviewed by Captain Jared Baldwin

Extreme Ownership: How U.S. Navy SEALs Lead and Win is a detailed account of the experiences of Jocko Willink and Leif Babin as U.S. Navy SEALs. The authors open the book by demonstrating how one leader can make or break an organization. Their unit, Task Unit Bruiser, executed a mission during the 2006 Anbar Awakening in the al Qaida stronghold of Ramadi, Iraq, that went terribly wrong. After that mission, senior SEAL leaders required a briefing on mission fail points and on future control measures that the team would emplace. Willink, commander of Task Unit Bruiser, gathered his team and asked who was to blame. The room immediately broke out with discussions deflecting blame. After a few minutes, Willink silenced the room and announced that he himself was to blame for the team's failure. The SEALs looked at him with a mixture of confusion and disappointment. The truth was that everyone had failed at some point during the mission, but it was the leader who assumed the overall mission failure. Willink states, "When a leader sets such an example and expects this from junior leaders within the team, the mind-set develops into the team's culture at every level."

No Bad Teams—Only Bad Leaders

Readers see examples of this when reading about Basic Underwater Demolition/SEAL training, where Willink assumed the role of SEAL instructor after the Ramadi battle. Boat Crew 2 had been dominating all other boat crews during Hell Week, while Boat Crew 6 consistently finished last, so instructors swapped the leaders of the two crews. During subsequent competitions, Boat Crew 6 won every event. Boat Crew 2, the earlier champion, struggled to find itself. How was it possible that switching a single individual—the leader—could completely turn around the performance of an entire group? The answer is that leadership is the single greatest factor in any team's performance. Good leadership is infectious.

Belief

The biggest question a leader must answer is: Why? The Soldiers of an Army unit conduct training based on a mission-essential task list. They may train on every aspect of that list and still fall short of accomplishing the unit purpose and intent. To succeed, Soldiers need to know and understand the purpose of their training and how it relates to the mission of their higher echelon. More importantly, Soldiers need to believe in the mission. While fighting in Ramadi, Willink's team became increasingly frustrated at the slow progress of the Iraqi soldiers with whom it was working. The SEALs wanted to assume ownership of all the missions and let the Iraqi soldiers take a subordinate role. Frustration led to anger and disdain for the Iraqi army. Willink had to make his team understand the *why* of their training mission, explaining that it was important for the SEALs to be able to hand off their combat missions to the Iraqis and create a self-sustaining nation. He asked, "If the Iraqi military

can't handle the security in the country, who is going to do it?" After hearing his message, the team better understood the purpose of its mission and how the team fit into the overall Iraqi campaign.

Shared Burdens

Egos and favoritism create an imbalance in a professional environment and are counterproductive. Leaders have a tendency to think that they are better than their subordinates, and this is a slippery slope considering the ill effects that inflated egos have on an organization. Just as crushing to an organization are staff favorites. It is common for leaders to develop personal bonds with some of their subordinates, which can lead to favoritism. This can lead to personnel who are separate from the group as a whole. The authors write that "The most important tactical advantage we had was working together as a team, always supporting each other." Leaders must set their egos aside and lean toward a team concept. They must resist the temptation to think of themselves as entitled people who can create the rules as they go. Leaders must share in the burdens of their subordinates and be wary of situations that could place them outside the team's circle of trust. Teamwork is the best tactical advantage.

Priorities and Adaptation

When everything is a priority, nothing is a priority. Leaders face an array of tasks to execute in garrison and in conflict. They often stack tasks in numerical order without distinguishing the important actions from urgent actions, which risks failing all actions. Leaders must be able to prioritize actions, communicate their intent to subordinates, execute, supervise, and refine their intent between objectives. Junior leaders must be careful to avoid fixating on a single problem set. They must be able to quickly rearrange their priorities and adapt to an ever-changing conflict. Given clear priorities and structure, junior leaders must be able to execute the unit mission as the fog of war sets in.

Decentralized Command

This concept is arguably the most important piece of extreme ownership that centers around training and leader development. Leaders cannot micromanage their organizations without risking professional exhaustion. They must groom, train, and develop junior leaders to lead and execute within their echelons. Leaders must set high expectations by putting subordinate teams through realistic training that tests the physical and mental stability of junior leaders. Junior leaders must be developed to identify, analyze, and act in critical situations within the parameters of the commander's guidance. The mind-set of junior leaders must shift from "What do I do?" to "This is what I am going to do." Overall, senior leaders must trust their junior leaders to make the best decisions by taking prudent risks to accomplish the mission. The authors write that leaders at each echelon "must understand what is within decision-making authority, recommend decisions to senior leaders, and pass critical information up the chain of command." Confident in the ability of their junior leaders to execute a mission task, senior leaders can step back and observe different aspects of the battle that would otherwise go unnoticed.

Planning and Execution

Military planning begins with mission analysis and ends with Soldier execution. Developing a plan with clear and precise instructions, while also explaining the plan's strategic impact, can be a daunting task for some leaders. A simple, clear, and concise plan is what Soldiers desire. Too much irrelevant information can lead to information overload and disinterest from the Soldier. Many junior leaders fail to skip the detailed aspects of mission planning. They focus on the execution aspect and overlook vital aspects of the warfighting functions such as protection and logistics. One of the authors writes that "Early in my career as a SEAL officer, there was a time when I felt that military mission planning was needless and burdensome. But I was wrong. Establishing an effective and repeatable planning process is critical to the success of any team." Effective senior leaders must allow junior leaders to own their piece of the plan. Given the importance of decentralized command, leaders at every echelon must own their mission task and purpose with Soldier buy-in and personalized refinement.

Conclusion

Implementation of extreme ownership within an organization does not occur without disruption. Leaders who are satisfied with a mediocre status quo will never accept the concept of extreme ownership. When pushed to accept responsibility for their units' failures, mediocre leaders try to deflect blame onto their subordinates instead of accepting responsibility as true leaders should. Leaders must meet such resistance with a continued push to create an organization built on accountability, responsibility, and extreme ownership of the organizational outcome. There is no substitute for a competent, mature, and disciplined team.

I thoroughly enjoyed reading *Extreme Ownership* and used its leadership lessons to help shape my leadership philosophy before taking command of my company. This was the perfect reference guide for changing the culture in my company. I incorporated the reading of *Extreme Ownership* in my junior officer developmental strategy and have seen truly remarkable results. The leadership vignettes that the authors teach can be implemented in military and civilian organizations.

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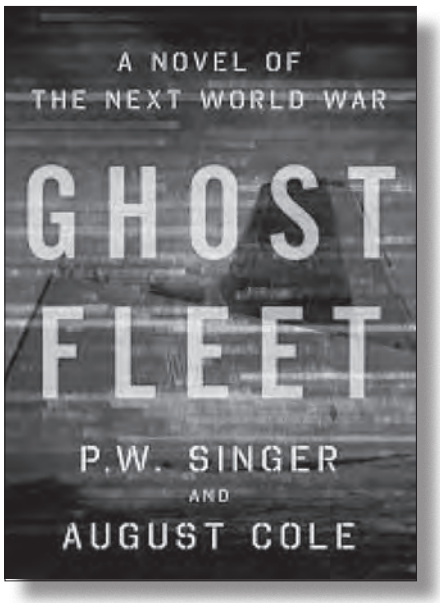
Captains Career Course, and the Joint Engineer Operations Course. He holds a bachelor's degree in criminal justice from Stephen F. Austin State University, Nacogdoches, Texas, and a master's degree in geological engineering from Missouri University of Science and Technology at Rolla.



Ghost Fleet, by P. W. Singer and August Cole, Eamon Dolan/Houghton Mifflin Harcourt, 30 June 2015, ISBN 0544142845

Reviewed by Lieutenant Colonel Geoff Van Epps

Ghost Fleet is a worthy read for any follower of the *Engineer* professional bulletin. Thought-provoking for everyone from the casual consumer of fiction to the strategist, the novel's imaginative depiction of war between the United States and a Russian–Chinese alliance in the not-too-distant future succeeds as both a page-turning beach book and as a generator of vigorous professional debate.

On the surface, *Ghost Fleet* is a contemporary tale of World War III, an updated version of Sir John Hackett's *The Third World War*,[1] Harold Coyle's *Team Yankee*,[2] or Tom Clancy's *Red Storm Rising*.[3] Indeed, Singer and Cole, both technology experts at Washington, D.C.-area think tanks, profess to have drawn their original inspiration from a shared love of Clancy's classic tale of 1980s combat between the forces of the North Atlantic Treaty Organization and the Soviet Union. Just as *Red Storm Rising* introduced the public to then-new technologies like precision-guided munitions and stealth warplanes in a fictional war against the Soviet Union, *Ghost Fleet* incorporates emerging technologies such as advanced unmanned systems, 3D printing, and neurotechnology into a fast-paced narrative that defies conventional thinking about how war against near-peer adversaries might unfold.

In doing so, *Ghost Fleet* supports the challenge posed by U.S. Army Engineer School Commandant Brigadier General James H. Raymer in the January–April 2017 issue of this bulletin for "each of us as professionals to continue to study and challenge each other in the debate about the nature of future war."[4] The book depicts conflict across all five of the operational domains—on land; at sea; and in the air, space, and cyberspace. It considers how the U.S. military would fight without the air supremacy and sea control that we have come to take for granted over the past 70 years and how we might need to adapt to the loss of secure communications, global positioning, and other technologies that have become more recent staples of our operations. Most importantly, *Ghost Fleet* brings alive a capable and uncooperative adversary who neutralizes presumed U.S. technological advantages, seizes the initiative, and shatters the American aura of invincibility early in the war.

Since the scenario involves war in the Pacific, the action is heavy on naval and air combat and relatively light on the use of landpower. Nonetheless, the broader story illustrates the contribution of each of the Services, including the Army, in conducting joint warfare in an unforgiving, nonpermissive environment. In the process, it highlights many of the conditions and concepts described in the Army's emerging multidomain battle doctrine. Engineers earn a brief mention for rapid runway repair as part of an airfield seizure mission, and those serving in brigade engineer battalions should find the elaborate teaming of manned and unmanned combat aircraft an interesting contrast to the much more limited capabilities of the Shadow® unmanned aerial vehicle currently in use.

Although hampered in places by clunky twists in the storyline and shallow character development, the power of the authors' ideas heavily outweighs any deficiencies in their writing. The compelling plot moves at a rapid pace, and the intriguing uses of innovative technologies capture the imagination. In this achievement, *Ghost Fleet* provides valuable material for the ongoing discussion about how the Army will have to fight in future conflicts—and what adjustments we should consider now to ready ourselves for those fights.

Endnotes:

[1]Sir John Hackett, *The Third World War: The Untold Story*, Sidgwick & Jackson, London, 1982.

[2]Harold Coyle, *Team Yankee,* Ballantine Books, New York City, New York, August 1987.

[3]Tom Clancy, *Red Storm Rising,* G. P. Putnam's Sons, New York City, New York, August 1986.

[4] James H. Raymer, "Clear the Way," *Engineer*, PB 5-17-1, Vol. 47, January–April 2017, pp. 2–3.

Lieutenant Colonel Van Epps is an engineer officer studying at the U.S. Naval War College.

Training the Millennial Sapper:

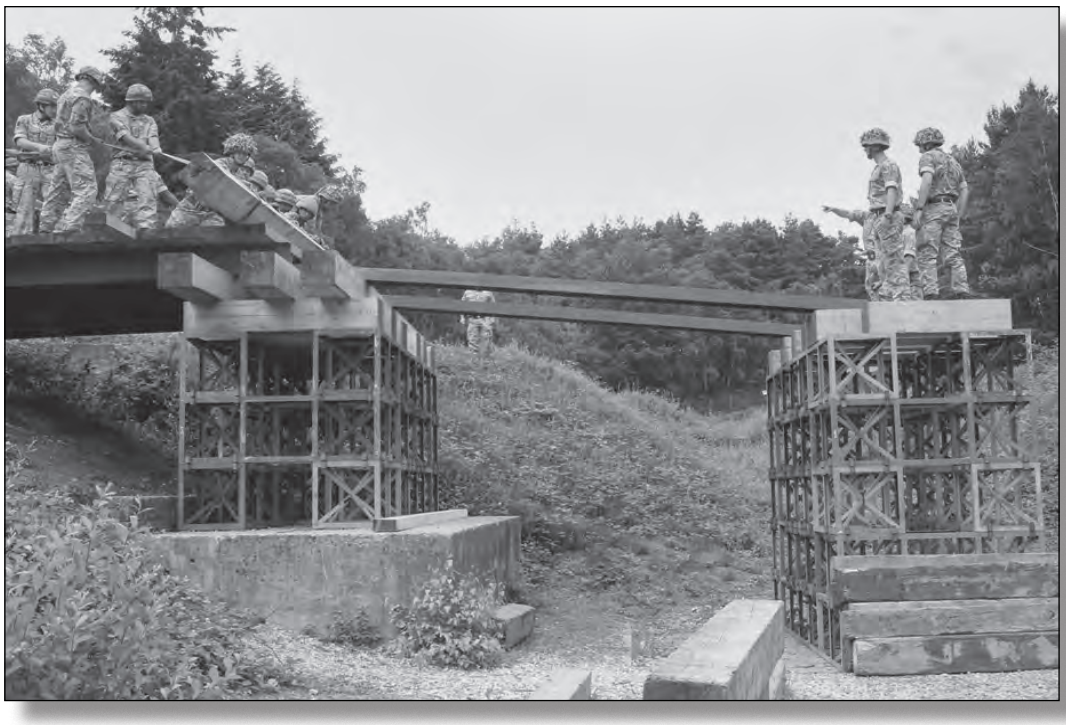
Training Transformation at the Royal School of Military Engineering

By Major Stewart U. Gast

Today's junior Soldiers and officers have grown up as members of the Millennial Generation, inundated with various forms of technology and connectivity. Just as civilian education institutions have embraced technology, the British Army Royal School of Military Engineering Group (RSME Gp) Chatham, Kent, is at the forefront of change within the Army Recruiting and Training Division (ARTD), which is attempting to modernize British Army training through the introduction of blended learning methods. For this article, *blended learning* is defined as the use of traditional means of instruction (such as face-to-face classroom instruction) and the use of modern learning technologies (either centralized or distributed).[1] This learning model taps into the networked culture and applies critical thinking skills gained through experience and reflection using information technology (IT), collaboration, and trainee ownership of learning. This article provides insight into the training transformation within the British Army and how the Royal Engineers have adapted this approach to better train the millennial sapper.

Training Transformation in the British Army

The British Ministry of Defence (MOD) developed the Defence Systems Approach to Training (DSAT) to deliver appropriate, effective, efficient, accountable, safe, and risk-focused training to trainees. DSAT is used to develop training practices through analysis, design, delivery, and assurance of training across MOD. The DSAT process identifies the requirement for new or amended training based on changes in doctrine, organization, materiel, or policy.[2] For example, the MOD identified the need for a training change when Royal Engineer electricians required an additional week of training to conform with new United Kingdom Institution of Engineering and Technology wiring regulations. Under the legacy training system of the classic brick and mortar institution, it would have taken more



Trainees construct a nonstandard bridge under the watchful eye of a trainer.

than 18 months to train all the Royal Engineer electricians. The MOD Defence Centre for Training Support developed a course hosted on the Defence Learning Portal, which delivered the training required to updated electricians. This online training module saved the MOD and the Royal Engineers £1 million (or about $1.2 million) and countless man-hours.[3]

Through the DSAT process, the ARTD (the British equivalent of the U.S. Army Training and Doctrine Command) was interested in using blended learning to make military training across all British Army branches and phases of training as immersive as possible. To facilitate this change, the ARTD developed the Defence Train-the-Trainer–Version 2 Course, which is mandatory for all ARTD trainers. The course teaches trainers how to modernize course delivery from a directive (objectivist) to an interactive (constructivist) approach. The course advises that 30 percent or less of instruction should consist of presentation; 60 percent should consist of application through practical exercises; and 10 percent should consist of review of the material.

Training Transformation in the RSME Gp

The RSME Gp has reaped the benefits of training transformation by more efficiently fulfilling training requirements with time and resources, providing cost savings, and producing a better product. The RSME Gp, in conjunction with a public-private partnership contractor, developed a training plan to make selected RSME Gp courses DSAT-compliant in a blended learning environment. The RSME Gp assessed current courses for the feasibility and suitability of training transformation. To date, 14 courses have been transformed and another 14 are being designed. The three basic principles of training transformation within the RSME Gp are—

- Integration of IT as an education platform.
- Increases in collaborative learning.
- Instillation of trainee ownership and trainer assistance in the learning process.

Key to training transformation was the development of the blended learning environment with an increased emphasis on IT-based learning. The public-private partnership contract has enabled course design and the maintenance of the digital training material on the Enhanced Learning Environment (ELE), an online course management system based on Moodle (a free, open-source software learning management system). To enable the ELE, software programs were required to—

- Support interactive training modules.
- Meet MOD security accreditation parameters up to the *Official* level.
- Be readily accessible to trainees and trainers.

The following hardware requirements were also identified for training modernization:

- Computer systems to assist programmers in course development.

A trainee installs bridge demolitions.

- Equipment such as tablets selected for portability, memory for e-publications, and Internet connectivity for ELE access to interactive lessons and confirmatory learning via online testing for trainer and trainee use.
- Modernized facilities to ease access to video recordings, media projection, and Internet connectivity.
- Upgraded, untethered wireless connectivity with 1 gigabyte capacity and a 200-megabyte bandwidth across the training bases.

Examples of the application of the blended learning environment include the following:

- Trainees use interactive courseware through the ELE to review lessons, conduct exercises, and complete theory testing before hands-on application.
- A trainer uses a coaching video application to compare a trainee's welding technique to a demonstration video on ELE during a fabricator-welder course.
- Trainers access trainee records through ELE to confirm the completion of required pretraining, verify pretest scores, and determine the length of time and number of attempts it took trainees to complete assigned tasks.

A trainer conducts an after action review on charge placement with a section of sapper trainees.

- Modularization of course content allows sharing of training modules between courses.
- ELE provides operational British Army sappers with access to online material to refresh skills or obtain training updates through login credentials.

Students historically changed trainers based on the subject being taught. To promote a collaborative learning environment, trainers now mentor trainees and train as a section for peer-to-peer learning. For instance, trainees undergoing combat engineer training are now divided into 10-person sections and assigned a corporal trainer (equivalent to a U.S. Army sergeant) as a section commander for the duration of the course. This new model allows trainers to follow their sections for the entire course to provide more effective coaching and mentoring. Trainees develop a subordinate-superior relationship similar to that which they will encounter in the operational army. This model also allows trainees to learn individual and collective tasks collaboratively through their peers, again reinforcing a unit experience. Trainers identify trainees who struggle to grasp the material during the pretraining or application phases. Once identified, struggling trainees receive additional attention from their trainers. The model also provides trainers with a broader knowledge base.

Training transformation requires that trainees take responsibility for their training in order to be successful. They use the principles of mission command and apply active learning to think through problems. Active learning, combined with scenario-based training, allows trainees to learn by task accomplishment in a real-world environment. Trainees receive a scenario and mission or training objective through a task order. They then conduct pretraining through ELE online modules. The pretraining is followed by application training under the supervision of the trainer. Lastly, the trainee is evaluated using a task card, similar to U.S. Army training and evaluation outlines.

Trainers provide assistance during the pretraining and application phases and an after action review following the testing. These changes to combat engineer training—all part of Project Combat Sapper—allow trainers to supervise trainees throughout the course in order to better understand the trainees and provide more substantive feedback. The passive approach by trainers develops trainee problem-solving skills through self-awareness. This allows the trainer to *push* and the trainee to *pull* course material to facilitate individual programming for trainees. As best seen in trade training, a fixed mastery–variable time approach (commonly known as self-paced instruction) allows trainees to progress to a specified standard (fixed mastery) at their own pace (variable time).

Royal Engineer Training

The Royal Engineer sapper is trained to be proficient as a soldier, a sapper, and a tradesman. The British Army trains these skills similarly to the U.S. Army initial military training model:

- Basic training–soldier skills.
- Initial training A–combat engineering.
- Initial training B–tradesmen.

Basic training is managed and executed by ARTD. All initial training is conducted by the RSME Gp, which is the

British equivalent to the U.S. Army Engineer School. Initial training A (combat engineer) is conducted at 3 RSME Regiment, Minley Station, Blackwater. Initial training B (tradesmen), is conducted at 3 RSME Regiment, Chatham. Officer basic training is conducted at the Royal Military Academy Sandhurst, while officer initial training is conducted at 1 RSME Regiment, Chatham, for technical engineering and 3 RSME Regiment, Minley Station, Blackwater, for combat engineer training.[4]

The redesign of combat engineering instruction, known as Project Combat Sapper, uses a blended learning environment in scenario-based training. Through the principles of mission command, Project Combat Sapper allows trainees to learn combat engineer tasks by replicating the way the task is accomplished in the operational army. Combat engineering training requires trainees to learn individual and collective tasks. For example, during the mobility phase of training, trainees learn the fundamentals of breaching, explosive breaching, and mechanical breaching techniques. During training application, trainees are assigned a section mission to provide mobility along a training lane with multiple obstacles. Trainees may execute multiple iterations of the mission, which allows them to change duties and/or techniques as required. Project Combat Sapper applies critical and creative thinking to enable trainees to actively learn engineering tasks.

Trademen training was the first training within the RSME Gp to undergo transformation to a blended learning environment. Unlike combat engineering training, tradesmen training provides individual specialty skills such as plumbing, electrical, welding, and other skills. Tradesmen training has proven to be better suited for fixed mastery-variable timing courses, and trainees have shortened or lengthened their training courses based on individual proficiency at a skill. Since the tradesmen pilot courses presented in 2012, first-time pass rates have increased from 90 percent to greater than 93 percent and failure rates have been reduced from 10 percent to 6 percent. Training transformation, in partnership with industry, has enabled 92 percent of trainees to complete recognized civilian qualifications.

RSME Gp Findings

Since the implementation of training modernization, the RSME Gp has collected several lessons learned:

- Blended learning is most effective for training individual skills, but it also remains effective for collective skills.
- Investing in IT systems is not a single upfront cost, but requires maintenance and lifecycle considerations.
- Blended learning requires heavy reliance on IT support to develop and maintain courseware.
- Development of trainers for the role of mentors is critical since a lack of understanding negates the benefits of blended learning.

The RSME Gp also identified elements of training that must remain directive in nature. It was determined that blended learning shortens the learning timeline for tasks that do not require repetition. Repetition was an identified requirement for certain tasks such as basic marksmanship, physical training, and drill and ceremony. The RSME Gp distinguished which initial trade training and advanced occupational training would benefit from blended learning and which still required a directive approach. Similarly, the ARTD and Sandhurst Group maintain a directive training approach for soldier basic training and junior officer training programs, respectively.

"The redesign of combat engineering instruction . . . uses a blended learning environment in scenario-based training."

The RSME Gp annually trains more than 9,000 soldiers through 256 course types. The requirement for trainee throughput while also providing quality training to the field army convinced leaders of the RSME Gp to look for ways to increase efficiency. The ARTD and the MOD training modernization programs facilitated the RSME Gp training transformation to a blended learning environment. The RSME Gp has recouped more than 26,000 training days since the inception of the program in 2012. The length of residential courses has been reduced by an average of 23 percent, while quality output has been maintained with near 100 percent training pass rates. The RSME Gp estimates that it will complete initial transformation of applicable courses by 2019.[5] While training transformation is still in the early stages within the RSME Gp, initial analysis indicates that training transformation has reduced costs, shortened the training pipeline, and provided a better product in the millennial sapper.

Endnotes:

[1]Royal School of Military Engineering Group Publication, *Training Policy–Version 22*, September 2016.

[2]Joint Service Publication 822, *Defence Systems Approach to Training–Direction and Guidance for Individual and Collective Training,* 1 June 2016.

[3]Globalservices.bt.com (2017), *MOD Defence Learning Portal: Transforming Ministry of Defence training*, <http://globalservices.bt.com/uk/en/casestudy/mod_defense_learning_portal>, accessed on 3 April 2017.

[4]Includes project management and basic structures training.

[5]Garry Applin and Kevin Hall, "Training Transformation within the RSME," personal interview, 23 November 2016.

Major Gast is assigned to the U.S. Army Engineer School, Fort Leonard Wood, Missouri, while serving in the Military Personnel Exchange Program in the United Kingdom as a trainer with the Royal School of Military Engineering. He holds a bachelor's degree in biology from Louisiana State University and a master's degree in international relations from Webster University.

864th Engineer Battalion

Setting the Pace in Excellence

By Captain John A. Goodwin and Captain Justin P. Martirosian

Over the past year, the 864th Engineer Battalion *Pacemakers* at Joint Base Lewis–McChord, Washington, lived up to their nickname while also striving for excellence across the battalion's four primary lines of effort: lead, train, maintain, and care. Despite the inherent challenges of a modular formation composed of sappers, construction engineers, and route clearance specialists simultaneously training to their own missions, the 864th succeeded in fielding two Army performance enhancement pilot programs, leading the way in tactical readiness, building an outstanding maintenance program, and serving the installation through troop construction while operating during a field training exercise.

The 864th Engineer Battalion is classified as an echelon-above-brigade battalion. Its mission is to support the 1st Corps with mobility, countermobility, survivability, and general engineering. This translates to supporting the 7th Infantry Division with wide area security, breach lane improvement, obstacle construction, vertical and horizontal construction, and route clearance. The 864th is a modular unit, allowing each individual company to deploy in support of independent missions. This modularity provides 7th Infantry Division and 1st Corps with flexible engineer capabilities that can be adapted to the changing battlefield.

Throughout 2016, the 864th participated in pilots for the U.S. Army Performance Triad and Comprehensive Soldier and Family Fitness Programs. The Performance Triad Program educates Soldiers and their Family members on developing sleep, nutrition, and activity habits that are proven to enhance performance. The program empowers Soldiers to make small changes in their lives to maximize performance and optimize unit readiness, while also increasing overall quality of life among Soldiers, their Families, and their communities. The program reduced tobacco use among Soldiers and increased demand for healthy vending options in the barracks. Through the Comprehensive Soldier and Family Fitness Program, Soldiers received 96 hours of instruction to build confidence and enhance resilience. Skills developed in the classroom were then put to the tactical test.

The battalion has seen many successes this year, from squad competitions to inspections. The 571st Sapper Company command team was selected as the "Best Company Command Team" on Joint Base Lewis–McChord, and the 571st has proved itself multiple times as one of the premier sapper companies on post. The company first sergeant placed third in the command team competition, while most of the competitors dropped out before completing the many physical and mental challenges. Soldiers from the 864th Engineer Battalion comprised two of the sapper teams that represented Joint Base Lewis–McChord at the annual Best Sapper competition at Fort Leonard Wood, Missouri, where one team placed in the top six. The Headquarters and Headquarters Company and the 610th Engineer Support Company were awarded for having the best chemical, biological, radiological, and

Soldiers from the 557th Engineer Construction Company work on a renovation and construction project for the Directorate of Public Works.

nuclear rooms in 1st Corps. Leaders credit much of the battalion success to its participation in the Performance Triad trial and the Comprehensive Soldier and Family Fitness Program.

In April 2016, the 864th Engineer Battalion tested leadership and tactical skills with the Sapper Athlete Warrior Challenge. The challenge operationalized the skills learned in the Performance Triad and Comprehensive Soldier and Family Fitness Programs and warrior training through a grueling, 6-mile, 6-hour, 15-Soldier-per-squad competition that consisted of 13 events testing mental and physical readiness. A favorite event was *Stuck in the Mud*, in which squads carried a 200-pound mannequin on a stretcher for 2.5 miles, then crossed an 8-foot wall bisecting a 50-yard trench filled with 4 feet of water. Teams had to negotiate the wall in the fastest time possible, without talking and without submerging the mannequin in water. The Sapper Athlete Warrior Challenge presented Soldiers with a practical test of their physical and mental readiness, while sharpening their tactical edge.

Members of the 571st Sapper Company practice squad battle drills.

To complement individual tactical competencies, the 864th Engineer Battalion continued to set the technical pace by winning the Army Award for Maintenance Excellence, Large Category, at the U.S. Army Forces Command level for the second year in a row. The battalion's maintenance program is its No. 1 priority since it is the foundation to successful training and overall readiness. The 864th recently reactivated the 557th Engineer Construction Company, just 2 years after its deactivation. After transferring more than $43,000,000 worth of equipment, the battalion received back more than $4,600,000 worth of equipment.

In August 2016, the 864th tested the organization by simultaneously executing several troop construction projects while operating in a field environment. Complete with opposition forces in a tactical scenario, the battalion operated as if it were conducting stability operations in a semipermissive environment. In revitalizing the unit troop construction program, the 864th completed projects worth millions of dollars to support tenant units on the installation. Highlights included—

- Tree felling and stump removal.
- Interior building renovations.
- Motor pool parking lot maintenance.
- Construction of a large gravel range control parking lot.
- Construction of 56 state and territory flag poles and a Stryker vehicle display pad for the 7th Infantry Division headquarters.
- Projects for the 75th Ranger Regiment, including two mock Blackhawk helicopter structures, an Afghan village, a running trail, a door-breaching complex, and a large trench and bunker complex.

Since the unit had not performed troop construction for some time, there were growing pains. But the process developed new leaders, refined project management, honed technical skills, exercised logistical support plans, and evaluated the overall battalion capacity to execute construction. This has resulted in a demand for more high-profile work across the installation, to include a banner display for 1st Corps and an urban search-and-rescue training complex.

The battalion succeeded by focusing on lines of effort that were applicable to all elements of the modular formation. In doing so, the battalion built a strong foundation upon which companies can improve, according to their specific missions. Battalion leaders recognized the value of building relationships with adjacent engineer units on the installation through friendly competition and of providing troop construction capabilities to the installation and its tenant units. Most importantly, the 864th established itself as the premier engineering asset in the Army's 1st Corps.

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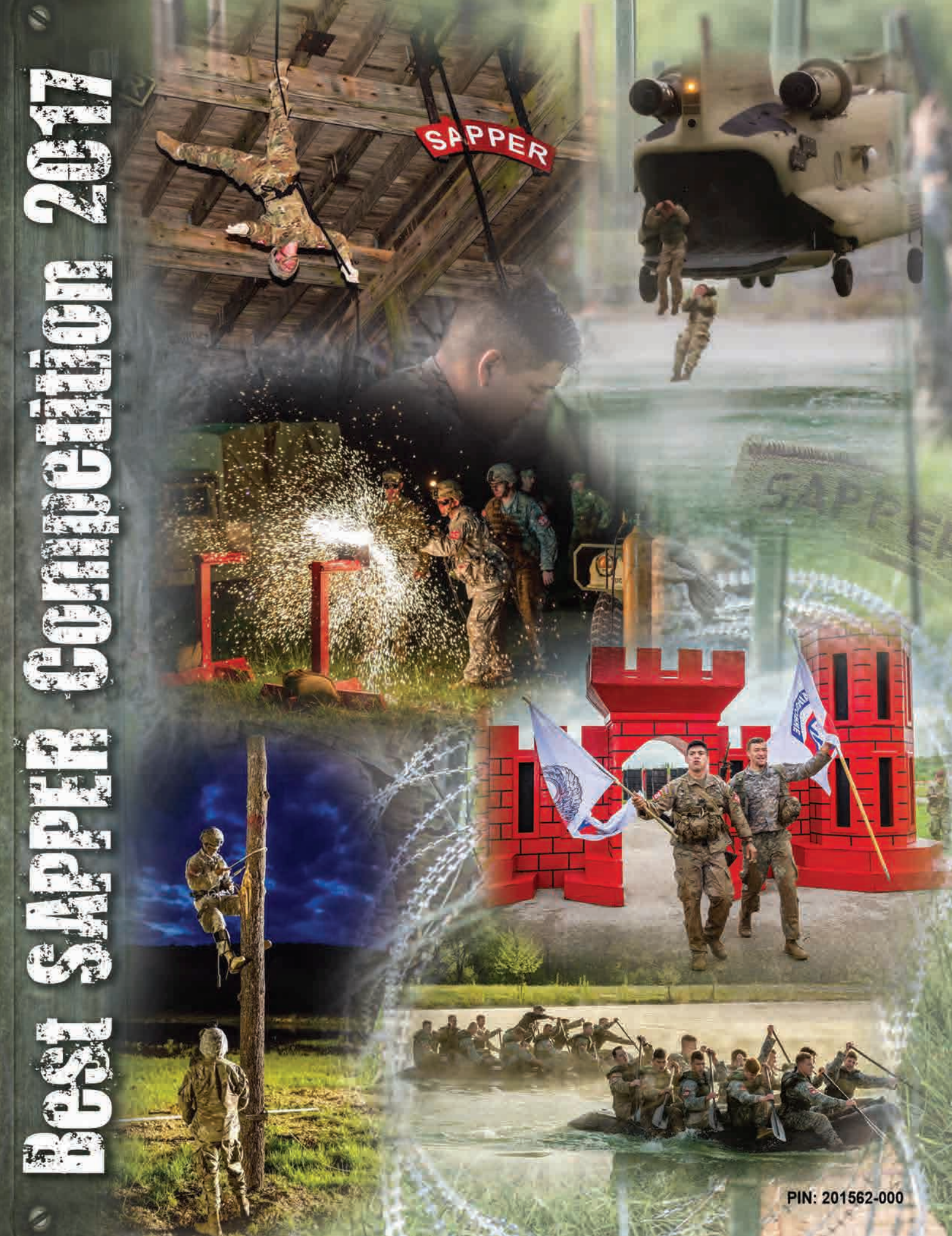

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