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The Professional Bulletin of Army Engineers

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Front cover: A Soldier from the 19th Engineer Battalion prepares for a breaching operation at Fort Knox, Kentucky. (U.S. Army photo by Charles Leffler)

Back cover: U.S. Army photos

DEPARTMENTS

FEATURES

Clear the Way

Colonel Kevin S. Brown
Interim Commandant, U.S. Army Engineer School

"Soldiers are not in *the Army. Soldiers* are *the Army."*

General Creighton Abrams,
26th Chief of Staff of the Army

Fellow engineer leaders: Greetings! Our Soldiers and leaders are at the core of every mission, program, and initiative in the Engineer Regiment. Continually educating and developing young talent is imperative for current mission success and future capability. I want to take this opportunity to share some of our emerging regimental initiatives that inspire personal character and increase engineer competence through two domains in the framework of doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy (DOTMLPF-P)—leadership and education and personnel. Investing in the development of young and seasoned leaders alike will provide substantial returns in the near term and far future of the Engineer Regiment.

The U.S. Army Training and Doctrine Command (TRADOC) addresses complex problems through the DOTMLPF-P framework and develops solutions to these problems. This is a time-consuming and complex process. Normally, an entire problem cannot be solved within a single domain. However, I believe that concentrating on the *L* domain—*leadership and education*—allows leaders to achieve lasting results with their Soldiers in a relatively short amount of time. Army Doctrine Publication (ADP) 6-22, *Army Leadership,* clearly states how Army leaders develop Soldiers from followers to leaders through the continuous process of leader development:

> *"Leader development involves recruiting, accessing, developing, assigning, promoting, broadening, and retaining the best leaders, while challenging them over time with greater responsibility, authority and accountability."*[1]

The first topic that I would like to examine is how we inspire character in Soldiers and leaders through an established framework—the Army Leader Development Strategy. On 28 August 2017, TRADOC published an Army white paper entitled *The Army's Framework for Character Development*.[2] It implements the Army Leader Development Strategy in accordance with the Army ethic. Army Doctrine Reference Publication (ADRP) 1, *The Army Profession,* defines the Army ethic as "the moral principles that guide our decisions and actions as we fulfill our purpose: to support and defend the Constitution and our way of life."[3] The Army ethic builds trust in units and between Soldiers because Army professionals are—

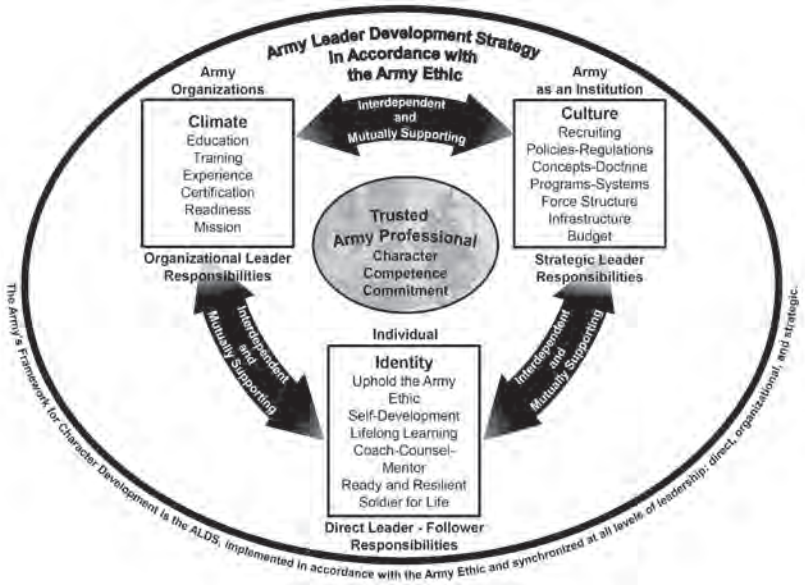
- Honorable servants—professionals of character.
- Army experts—competent professionals.
- Stewards of the Army profession—committed professionals.

The Army's framework of character development allows the Army Leader Development Strategy to be implemented in accordance with the Army ethic.

This white paper serves as the Engineer Regiment's first step in implementing the initiative: to educate the force. I encourage leaders to read this new Army white paper and reread our capstone doctrine in ADP 1 and ADRP 1 as they develop their own character development programs.

The second topic I would like to discuss is the Engineer Regiment initiative to develop engineer competence in all ranks, in all cohorts, and in all components using the *personnel* domain of DOTMLPF-P. We will do this by encouraging engineers to earn technical skill identifiers (SIs) and additional skill identifiers (ASIs), as well as several other acknowledged credentials, certifications, and licenses. The Engineer Regiment strategy is to—

- Incorporate college level education preferences and technical SIs and ASIs in the career development paths for all cohorts.
- Include technical engineer SIs and pending ASIs in modified tables of organization and equipment and in tables of distribution and allowances.
- Revise the current SIs and create new technical ASIs for enlisted Soldiers and warrant officers.



- Establish a test cost reimbursement program for credentials, certificates, and licenses.

As part of the professional development and talent management plan for the Engineer Regiment, the regiment's preferences for education, certification, credentialing, and licensing have been codified in Department of the Army (DA) Pamphlet (Pam) 600-3, *Officer Professional Development and Career Management,* and DA Pam 611-21, *Military Occupational Classification and Structure*.[4, 5]

Engineer technical SIs and pending ASIs are also being added to key positions across the force. This will provide incentives to attract, recruit, develop, and retain talented engineers. As of 10 October 2017, eight technical engineer SIs—W1 through W8—and ASI 6P were updated in DA Pam 611-21, Table 4-3, "Numerical Listing of Skill Identifiers," on milSuite at <https://www.milsuite.mil/book/docs/DOC-226157>. The current engineer technical SIs are—

- W1–facility planner; area of concentration (AOC) 12A.
- W2–geospatial engineer officer; AOC 12A.
- W3-–licensed engineer officer; AOC 12A.
- W4–degreed engineer officer; AOC 12A.
- W5–construction project manager; AOC 12A.
- W6–construction quality assurance officer; AOC 12A.
- W7–energy and environmental officer; AOCs 12A and 74A.
- W8–facilities engineer; AOC 12A.
- ASI 6P–project management; Career Management Field (CMF) 12; SGT–SGM.

We modified the "W" SIs to include the following components:

- Education/training.
- Practical experience, if required.
- Standard test/certification.

For example, SI W4, degreed engineer officer, is no longer awarded simply for having a science, technology, engineering, or mathematics (STEM) degree. Now, officers must have a bachelor's or master's level STEM degree accredited by the Accreditation Board for Engineering and Technology (ABET) in a certain field. Still, no practical experience is required. Finally, the officers must pass the Fundamentals of Engineering (FE) or equivalent standardized test for architects, landscape architects, geologists, or land surveyors.

As interim commandant, I recently approved the reimbursement of testing of up to $800 annually per Soldier of any rank in all components for several credentials. However, in accordance with TRADOC policy, the U.S. Army Engineer School credential testing reimbursement program is only open to CMF 12 Soldiers. (See Army Directive 2015-12, *Implementation Guidance for Credentialing Program and Career Skills Program*, paragraph 3b[6]). For information about credentialing and test reimbursement, contact Master Sergeant Jason Parlor by e-mail at <jason.a.parlor.mil@mail.mil> or by phone at (573) 596-0013; or see <milSuite.mil/book/groups/engineer-credentialing-forum>.

Finally, I would like to welcome Brigadier General Robert F. Whittle, who became the 97th Commandant of the Engineer School on 19 September 2017.

Endnotes:

[1]Army Doctrine Publication 6-22, *Army Leadership*, 1 August 2012.

[2]Department of the Army, *The Army's Framework for Character Development,* 28 August 2017, <http://cape.army.mil/repository/white-papers/armys-framework-for-character-development-white-paper.pdf, accessed on 3 October 2017.

[3]Army Doctrine Reference Publication 1, *The Army Profession*, 14 June 2015.

[4]DA Pam 600-3, *Commissioned Officer Professional Development and Career Management*, 3 December 2014; <https://www.milsuite.mil /book/groups/smartbook-da-pam-600-3>.

[5]DA Pam 611-21, *Military Occupational Classification and Structure*, 22 January 2007; <https://www.milsuite.mil /book /groups/smartbookdapam611-21>.

[6]Army Directive 2015-12, *Implementation Guidance for Credentialing Program and Career Skills Program,* 11 March 2015.

Lead the Way

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

Essayons! You might have noticed underneath the *Lead the Way* heading that my duty position title has changed from Regimental Command Sergeant Major to U.S. Army Engineer School Command Sergeant Major. This is because the regimental title has been rescinded for the command sergeants major and chief warrant officers of the U.S. Army school system with the rescission of Army Regulation 600-82, *The U.S. Army Regimental System*,[1] and the publication of Army Regulation 870-21 *The U.S. Army Regimental System*.[2] This is the case for all Army schools. Chief Warrant Officer Five Jerome L. Bussey and I still have all the same scope and daily duties. The new regulation does not change the position responsibilities.

We have been up to many things. In June, we celebrated the Engineer Regiment's 242d birthday. The Engineer Regiment is the oldest regiment in the Army—2 days younger than the Army. We bid farewell to Brigadier General James H. Raymer and his wife, Lisa. Brigadier General Raymer is now the chief of staff of the U.S. Army Central Command. The Engineer School will miss him, and we want to thank him for all that he did during the 24 months he was commandant of the school. He truly made the Engineer Regiment better. Before this issue is published, we will be welcoming Brigadier General Robert F. Whittle Jr. as the new Engineer School commandant. Brigadier General Whittle; his wife, Kathleen; and daughter, Avery, are coming from the 1st Cavalry Division, Fort Hood, Texas, where he was the deputy commanding general and home station commander for the 1st Team. In August, we said goodbye to Command Sergeant Major Bradley J. Houston and wished him luck at his new job as the senior enlisted advisor of the Joint Improvised-Threat Defeat Organization. About a month later, Command Sergeant Major Houston was selected to be the top NCO at the U.S. Army Corps of Engineers. I wanted to make sure that everyone knew about this change and how proud we are of him. It will be great having him back working directly with the Engineer Regiment again.

In the last couple months, I have conducted several site visits. I visited Company A, 82d Engineer Battalion, Fort Riley, Kansas, and presented it with the 2016 Itschner Award as the most outstanding U.S. Army engineer company. I also had the opportunity to attend the Joint Engineer Training Conference, which was hosted by the Society of American Military Engineers, the premier professional military engineering association in the United States, where I was able to present the Sturgis Medal to three awesome NCOs—one in the Regular Army, one in the Army National Guard, and one in the U.S. Army Reserves. The Society of American Military Engineers also sponsors and helps members of the Engineer Regiment with credentialing, making it cost-free for Soldiers in the Regiment.

I was also fortunate to attend the 164th Regional Training Institute Annual Training Conference at Camp Grafton, North Dakota, and recently returned from Montgomery, Alabama, where I attended a Senior Enlisted Leader Seminar Workshop, which was hosted by the 926th Engineer Brigade. These were great events put on by great organizations. I am truly amazed by what our brothers and sisters from the Army National Guard and U.S. Army Reserves are doing to help the Army accomplish its missions. The Engineer Regiment could not do what it does without them. In the upcoming months, I will be visiting other great units and can't wait to see what they are doing.

The Engineer Regiment is working on many new initiatives and has completed actions to improve the readiness of the force. Headquarters, Department of the Army, recently approved the expansion of the Sapper Leader Course to Military Occupational Specialties (MOSs) 12C (bridge crewmember) and 12N (horizontal construction engineer). Based on feedback from operational brigade engineer battalion commanders, we identified noticeable gaps in tactical and technical skills within the 12-series MOSs. The revision of the Sapper Leader Course attendance requirements directly addresses the identified skills gaps and will provide increased tactical flexibility to the brigade combat team commander. This change will allow select personnel in the 12C and 12N MOSs to attend the course and will open the school to more grades by allowing promotable Soldiers in grades E-4 and E-5 to attend the course. The effective date

for revision of Additional Skill Identifier S4 (sapper leader) for award to personnel in MOS 12B (combat engineer), 12C, and 12N is 1 October 2017. To complement the expansion of the Sapper Leader Course, the Directorate of Training and Leader Development conducted a critical-task site selection board. The total task inventory was reviewed, and a vote was taken for recommendation to the commandant to update the Sapper Leader Course critical-task list. The highlight of the board was that 12 members from diverse units across the Regular Army, National Guard, and U.S. Army Reserves discussed the sapper leaders of the future and how they are to be implemented in Army Strategy 2025. At the end of voting, 46 critical tasks were approved; four new tasks were derived; and 18 tasks, including the kill class and all of the first aid classes, were entirely deleted from the course. Although first aid is no longer a critical task, it will be critiqued and will affect the evaluation of candidates as they navigate the course.

Headquarters, Department of the Army, approved the 3X Bradley leader skill identifier for the officer cohort. This will allow selected engineer officer commanders and platoon leaders in armored brigade combat teams to attend the Bradley Leader Course. The effective dates for position recoding in Area of Concentration 12A (engineer officer) is 1 October 2019. We are currently working toward approval of the Bradley Leader Course additional skill identifier for the enlisted cohort.

Counter Explosive Hazards Center personnel have also been busy over the last couple of months. They discontinued the Intermediate Search Course due to little interest and low student numbers, but they started new training on area clearance and M160 robotic mine flail training. The M160 is used for explosive hazard area clearance missions, with multiple accessories including the flail, dozer blade, and rollers used for proofing. The center is currently working with the Robotic Systems Joint Program Office to provide a pilot blended course for a deploying unit. The course consists of 6 days of M160 operation and 4 days of area clearance training. If the pilot program is a success, the center will further refine the course and make it a new course offering. Results should be available by October 2017.

The new Medium Mine-Protected Vehicle Type II, with a vehicle optics sensor system (commonly referred to as a GyroCam), interrogation arm, and the Common Remotely Operated Weapon Station, was scheduled to be fielded to the center in August 2017. Along with Soldiers from the 5th Engineer Battalion, the center instructors will take part in a combined operational new-equipment training exercise that will cover preventive maintenance checks and services and basic operation of the vehicle and hands-on training on the Common Remotely Operated Weapon Station. Once complete, the center will have the newest engineer mine-resistant, ambush-protected vehicle, including all of the enablers, such as the interrogation arm, the Common Remotely Operated Weapon System, and rollers.

In May, the new versions of Army Regulation 670-1, *Wear and Appearance of Army Uniforms and Insignia*,[3] and Department of the Army Pamphlet 670-1, *Guide to the Wear and Appearance of Army Uniforms and Insignia*[4] were released. I urge you all to read this new regulation and pamphlet because there are several changes in them. One of the changes involves the authorization for all members of the Corps of Engineers with an engineer primary MOS to wear *Essayons* buttons on the service, dress, and mess uniforms. This is a great win for the Engineer Regiment. As Soldiers and leaders, we need to stay current on all new regulations and be aware of new military personnel messages and All Army Activities messages so that we can enforce the standards.

If you are not already a member of S1NET, I ask you to join by going to the S1NET home page at <https://www.milsuite.mil/s1net> and signing in with your common access card. (Signing in establishes your milSuite account if you don't already have one.) When you reach the S1NET home page, look for the *Join S1NET* widget on the left, and click it. When new publications or military personnel messages are released, members are directly notified. This is an easy way to stay up to date with what is going on in the Army.

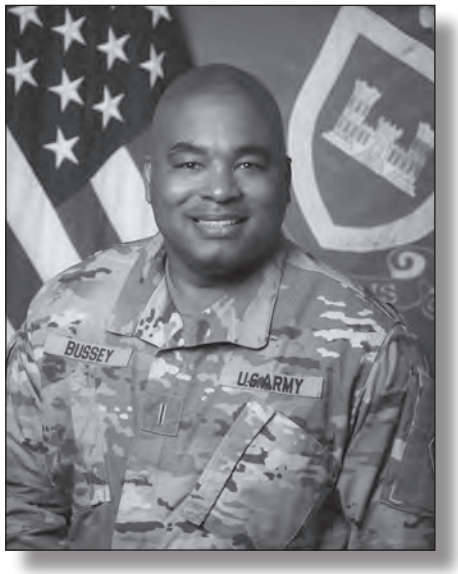
The Army is forming security force assistance brigades to organize, train, advise, and support foreign security forces in coordination with joint, interagency, and multinational forces to improve partner capability and capacity and facilitate achievement of U.S. strategic objectives. These formations are uniquely manned, equipped, organized, and trained to conduct security force assistance within defined authorities to support unified land operations and build partner nation capability and capacity. These units will be minimally manned, lightly equipped, and rank-heavy. Each of these brigades will include an engineer battalion, and some readers of this bulletin will be selected for assignment to them.

I urge you to visit the Army Career Tracker at <https://actnow.army.mil> and to frequently check the enlisted engineer community page to view policy updates and initiatives that the Engineer Regiment is working on. There are approximately 106,000 Soldiers across all three components in the Engineer Regiment, but this community page has only 2,200 members at present. I urge you to become a member. As a member of the community, you will receive messages when there are updates from the Army Career Tracker portal. The Career Management Field 12 community page can help Soldiers stay informed about what is going on within the Engineer Regiment, and the U.S. Army Engineer School can post questions asking members of the Regiment for their opinion on initiatives or possible changes. The Engineer School wants Soldier feedback because the outcomes could affect them in the future. I also want feedback on the community page itself. Does it have everything it should have? If it is missing something that you think is important, please let us know. It is all a part of improving the Engineer Regiment.

(continued on page 44)

Show the Way

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



Team, first and foremost, I would like to thank every Army engineer warrant officer for representing the Engineer Regiment, the warrant officer cohort, and the U.S. Army in a very professional and selfless manner. Keep up the good work. I look forward to meeting and talking to you all. It was a busy summer visiting warrant officers and engineer leaders. A lot of strides were made to help move the engineer warrant officer cohort forward into the future. Although my title has changed from U.S. Army Engineer School Regimental Chief Warrant Officer to U.S. Army Engineer School Command Chief Warrant Officer, I still have the same duties and responsibilities entrusted to me by the commandant.

Our teams at the U.S. Army Engineer School and the U.S. Army Human Resources Command are doing an excellent job of training and managing Army engineer warrant officers. As technology advances, we here at the Engineer School continue to stay abreast of those advances and ensure that our warrant officers are receiving the best training and resources to fight in a multidomain battle. In addition, the U.S. Army Human Resources Command is managing the Engineer Regiment's most valuable resource and weighing every option to accommodate the Soldier, the Engineer Regiment, and the Army when assigning engineer warrant officers.

I had the opportunity to visit the U.S. Army Corps of Engineers, Chicago District, this past summer and was amazed at how engineer warrant officer technical training, skills, knowledge, and experience correlate with positions in the district. There is a construction engineering technician (Military Occupational Specialty 120A) currently working at the district on temporary orders. According to his leaders, he is doing an outstanding job and has proven to be a value added to the organization.

I also spent time at Fort Carson, Colorado, and Fort Bragg, North Carolina. During those visits, I delivered the commandant's priorities and vision to engineer warrant officers and informed them about what the Engineer Regiment is doing for the warrant officer cohort. In addition, I spent time with engineer leaders and advised them on the utilization and capabilities of engineer warrant officers and explained the best way to take advantage of the skills and knowledge that an engineer warrant officer possesses.

More warrant officers are applying for and taking examinations for certifications. Here at Fort Leonard Wood, Missouri, all Engineer School instructors either have the project manager professional certification or are preparing to take the examination. Our goal is for all instructors to have their project manager professional certification so they will be equipped with additional tools to better serve Army engineer warrant officers. In addition, students in the Warrant Officer Basic Course are being trained for, and given the opportunity to take, the associate constructor examination before their graduation.

Congratulations to Chief Warrant Officer Three Weaver Prosper, the first engineer warrant officer to graduate from the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas. The experience and knowledge that he gained from the course have been very valuable to his career. He writes, "The curriculum allowed me to fully understand the Army design methodology and, most importantly, the military decision-making process. I can easily articulate to my superiors, peers, and subordinates how the Army runs. From national security strategy, to operational- and tactical-level roles and responsibilities, to force management, and developing capabilities, I have learned the ins and outs of my profession." Chief Warrant Officer Three Prosper now serves with the 1st Armored Division, Fort Bliss, Texas. He is currently stationed in Iraq, using the skills he learned at Fort Leavenworth.

If you are not already a warrant officer, now is a great time to become one. The Engineer Regiment is looking for good noncommissioned officers to become warrant officers. Visit the warrant officer recruiting site at <http://www.usarec.army.mil/hq/warrant/WOgeninfo_mos.shtml> to see if you are qualified.

Essayons.

TRAINING AFGHAN NATIONAL ARMY ENGINEERS

By Colonel Kevin S. Brown, Mr. James R. Rowan, and Dr. Michael A. Dascanio

In response to a U.S. Forces Afghanistan request to U.S. Army Training and Doctrine Command, the U.S. Army Engineer School sent a team to assess the Afghan National Army (ANA) engineer school in March 2017. The Engineer School team members were Colonel Kevin S. Brown, Mr. James R. Rowan, and Dr. Michael A. Dascanio. The team was pleased and impressed with the ANA engineer school and the training it provides to the army.

The ANA engineer school is located at Camp Shaheen, west of the city of Mazar-E-Sharif. This location is a double-edged sword: At the time the assessment team visited, it was considered a relatively peaceful, stable part of the country, but its far northern location makes it a challenge for ANA units to get students to and from the training site. ANA leaders have made great progress since the school became operational in 2010. The facilities are first-rate for the ANA and were constructed through the U.S. Army Corps of Engineers from 2011 to 2014 for €29 million (about $34 million). The school footprint includes headquarters, administrative space, soldier barracks, classrooms, and motor pools. The facilities have mostly been well maintained, and they fully meet the school requirements.

The school trains more than 20 courses in many specialties. There is a clear link between ANA doctrine and the requirements of the courses being taught at the school. There are courses for enlisted soldiers, basic and advanced noncommissioned officer courses, and basic and advanced commissioned officer courses. The ANA engineer school also trains explosive ordnance disposal skills and a follow-on course in improvised explosive device disposal. The training we observed in these counter explosive hazards courses is an appropriate mix of classroom and hands-on instruction using current metal detectors and robotics. A live demolitions range, which is part of the Explosive Ordnance Disposal Course was in use during our visit. Perhaps it isn't surprising that such courses are not the most popular among ANA students due to the hazardous duties they will execute once they return to their units.

ANA engineer school facilities

ANA engineer school improvised explosive device disposal training

A heavy-equipment operator course is also conducted at Camp Shaheen. The equipment is new and modern, consisting of bulldozers, skid steer loaders, hydraulic excavators, compaction equipment, and other equipment. The ANA school has excellent access to ranges and training areas at Camp Shaheen. Its "Million-Dollar Hole" is not as extensive as the one at Fort Leonard Wood, but many of the same skills are taught to junior soldiers. The ANA has identified the need for a heavy-equipment supervisor course, and it was scheduled to begin in April 2017.

U.S. Army Engineer School assessment team

One of the highlights of the ANA engineer school is the facilities maintenance course. The coalition has made a significant investment in facilities for the ANA, which ultimately will be responsible for their maintenance and upkeep. The facilities maintenance course teaches skills that include plumbing; electrical work; welding; carpentry; concrete and masonry; and heating, ventilation, and air conditioning repair. The hands-on training seemed to be effective, and the graduates should have the skills and tools to execute the maintenance work at ANA facilities across the country. The heavy-equipment operator and facilities maintenance courses are very popular with students because of the skills they will have upon graduation.

The ANA engineer school commander, who has been at the school since its inception, spoke to us about the many challenges that ANA leaders still face. One challenge is

ANA engineer school heavy-equipment training

ANA engineer facilities maintenance training

filling courses to capacity. ANA units get quotas for each course but often fail to send students. Reasons vary from units being too busy with combat missions to an inability to get students to the school's remote location. The ANA engineer school also struggles greatly with illiteracy among its students. Some basic literacy training takes place, but it isn't enough to turn the tide. The problem is further complicated by the language and cultural differences among members of the ANA.

The ANA engineer school appears to be well ahead of the other branch schools in Afghanistan, largely due to a robust on-site advisory team from the Combined Advise and Assist Team–North. The team is composed of a lieutenant colonel from the German Army, a captain and noncommissioned officer from the Romanian Land Forces, and a noncommissioned officer from the Latvian National Armed Forces. Each has special skills to effectively advise on different portions of the curriculum. The United States has attached an Army major to this team; the major advises on the facilities maintenance courses.

The sustainability of the ANA engineer school is the most important issue to be addressed. While the school leaders operate fairly well today, they are very dependent on the coalition for advice, curriculum development, and resourcing. There are currently 15 instructors operating under a coalition contract. The coalition also provides virtually all of the supplies, maintenance, and equipment required for the courses. The long-term plan is for the ANA to become self-sufficient, but its leaders acknowledge that this may not be possible for at least several years. In the end, the school will only be successful if it can be transitioned to a facility that is owned and resourced by the ANA, rather than an enterprise that is heavily subsidized by the coalition.

Colonel Brown is the assistant commandant of the U.S. Army Engineer School. He previously served as the Director of Training and Leader Development and commanded the Special Troops Battalion, 1st Brigade Combat Team, 82d Airborne Division.

Mr. Rowan is the deputy commandant at the U.S. Army Engineer School. He has served at the Engineer School headquarters for the past 8 years and previously commanded the 1st Engineer Brigade.

Dr. Dascanio has been the technical director at the U.S. Army Engineer School for more than a decade and is a subject matter expert in training and training development.

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

By Colonel Martin Dale Snider, Major Jeffrey B. Roberson, and Captain Anthony M. Cech

(Editor's note: This is the third and final article in a series that has been featured in the previous two issues of Engineer.*)*

In a 1941 speech entitled "Morale in Modern Warfare," General George C. Marshall declared, "The Soldier's heart, the Soldier's spirit, the Soldier's soul are everything. Unless the Soldier's soul sustains him, he cannot be relied upon and will fail himself, his commander, and his country in the end."[1] The Army recognizes this and continues the dialogue on the spiritual dimension of the Soldier, as evidenced by Army Regulation 350-53, *Comprehensive Soldier and Family Fitness*.[2] This article, the third in the series entitled "Body, Mind and Spirit: Soldier Fitness," examines how we develop the spirit of the Soldier. Specifically, it describes what chaplains do for the brigade and how spiritually grounded Soldiers in the 1st Engineer Brigade are trained.

For a millennium, professional fighting forces have known that spiritually grounded Soldiers are better fighting Soldiers. Soldiers who are rooted in their faith are more resilient to the adversities of war. These Soldiers better deal with stresses, physical toil, and fellow human maladies and better recover from physical and mental challenges. Experienced leaders know that it is wise to ensure that Soldiers are given time and encouragement to pursue a spiritual grounding.

As leaders, it is our duty to provide our Soldiers the time, access, and opportunity to worship. It is also in the best interest of our units to do so. The architecture and beauty of the worship facility are far less important than the time and access that Soldiers have to interact with unit chaplains.

A better fighting force stems from being spiritually grounded, but another important thing stems from having a spiritually grounded force. Our Soldiers, and ultimately our leaders, develop their character muscle through the process of becoming and staying spiritually grounded. How should a Soldier respond to various situations in life? The Army has an answer.

Character development is a part of our formal programs of instruction (POIs). One-station unit training (OSUT) units focus on developing character through the training of Army values and warrior ethos using lectures and role-modeling from leaders and trainers.

A 1st Engineer Brigade chaplain has an informal discussion with Engineer Basic Officer Leader Course students.

OSUT and advanced individual training companies currently conduct about 10 hours of programmed Army Values Training using a combination of instruction, video, scenario, case study, and question-and-answer formats. The materials are produced by the Center for the Army Profession and Ethic (C.A.P.E.)[3], and the training is led by our primary trainers, drill sergeants. Drill sergeants, who spend the most time around the trainees, are able to work one-on-one with them to reinforce the training during their time in the U.S. Army Training and Doctrine Command. The instruction is conducted during the first week of Red Phase training and is then reinforced and revisited throughout the remainder of the 9 weeks of basic training and 14 weeks of OSUT. The expectation is that, over time, the Army's professional values and the Army ethic will replace the values that trainees bring into the Army.

When Soldiers fail to demonstrate character during their basic or advanced individual training and their leaders believe they can be rehabilitated, they can be sent back to the Red Phase, where the Army values and warrior ethos are taught. Character is also taught as part of the POIs for Engineer Basic Officer Leader Course and Engineer Captains Career Course training. The brigade commander emphasizes character and the Army values during his inbriefing to those courses and during the class that he or she teaches to company commanders in the brigade. Deliberate training and command focus are important, but the most effective method of teaching character to the next generation is via role-modeling through daily action.

Although no single Army document encapsulates the essence and importance of a Soldier's character or spirit, a growing awareness of the value of this component of the human condition is evident in numerous publications, such as white papers; POIs; and Army Regulation 600-20, *Army Command Policy*.[4] At present, engineer officers in the Engineer Officer Basic Leader Course or Engineer Captains Career Course are exposed to instruction aimed at developing a robust character that inculcates the Army values and addresses the need for sound decision making with regard to ethical or moral dilemmas. Engineer Basic Officer Leader Course students receive character developmental training during their Ethical Dilemma Resolution block of instruction. The training designed to create an officer of strong character is further reinforced through an understanding of cultural and familial identity, the concept of just war theory, relevant video illustrations, and open discussion. Engineer Captains Career Course students receive a block of ethically oriented instruction known as Lesson Plan U510, or Law of Armed Conflict (LOAC), which identifies the legal and moral implications of conduct in war.

U.S. Army Training and Doctrine Command Pamphlet 600-4, *The Soldier's Blue Book*, states that "Soldiers must cope with adversity, perform well in stressful situations, and learn to thrive in stressful environments."[5] The word *spirit* is almost nonexistent in Army doctrinal publications, but there is a growing dialogue about resiliency, fitness, and the spiritual dimension of the Soldier.

Chaplains of the 1st Engineer Brigade do a number of things to nurture and develop the spirit and character of the Soldiers in their care. The brigade recognizes that it includes many populations: trainees, leaders, cadre, and Families. First and foremost, chaplains serve as a visible and vocal advocate of the spiritual. They remind trainees, leaders, and cadre that we are spiritual beings. They remind commanders of their responsibility for the spiritual well-being of those in their command and assure them that the practice and development of personal faith is acceptable. Doctrinally, chaplains nurture the living, care for the wounded, and honor the dead.[6] They supervise or conduct worship services; provide religious education; ensure religious rites; and advise commanders on the spiritual dimension, religion, or welfare of Soldiers. Chaplains conduct formal classes on ethical decision making and on matters concerning marital relationships. Much of what chaplains provide is resiliency, and this is done through a ministry of presence and one-on-one conversations. The conversations can occur while Soldiers are performing on the rifle range, conducting a field training exercise, navigating the confidence course, or training in any other location. Chaplains meet people at their places of struggle, loss, or failure. Their constant presence with Soldiers provides innumerable opportunities for coaching, encouragement, and promotion of a spiritually healthy life.

A chaplain conducts a suicide prevention class.

During the first week of basic combat training, chaplains provide trainees with coping skills and instruction on how to practice their faith in the Army. Chaplains can provide assistance through informal conversations with leaders and cadre or spiritual fitness moments at leadership meetings. Chaplains regularly conduct pickup prayer breakfasts for cadre members who are preparing to pick up new cycles of trainees. Chaplains reinforce ethical conduct, instill a sense of caring for each other, and reinforce Army values. They build a spirit of trust with trainees who are not performing well and quicken the inner will of Soldiers who may want to quit. Chaplains encourage their souls to persevere in the midst of adversity.

The recognition of a Soldier's spirit as a significant component of character development is increasingly gaining ground in the Army culture in general and in the U.S. Army Training and Doctrine Command environment in particular. Therefore, identifying and adequately defining the essence and complexity of the human spirit is important in the development of a Soldier's *character compass*. As a core competency of the chaplaincy, the art of nurturing Soldiers epitomizes the belief that spiritual well-being is the foundation of sound character development.

According to an Army white paper, "Intrinsically, character is our true nature, including identity, sense of purpose, values, virtues, morals, and conscience."[7] The spiritual nature of a chaplain's counsel, whether to a commander, cadre member, or Soldier, is supportive and edifying and encourages resiliency and developmental transformation. In addition to religious counseling, chaplains also engage in premarital, marital, behavioral, occupational, grief, and family life therapy. In the past 6 months, chaplains have conducted more than 2,900 such sessions. While chaplains may not counsel from an empathetic position in every matter, their "desire to counsel must be fueled by compassion or it will lack a motivating force that cannot be compensated for even with well-learned skills and techniques."[8] The Army ethic stipulates that Soldiers be committed to a continuous development of character.[9] However, the ability to complete this task requires that Soldiers understand that their character and spirit are intricately woven together. At its core, our understanding of one's being, or essence, is inseparable from our world view.

According to the Army Ethic White Paper, "The origins and foundation for the Army Ethic include a philosophical heritage, based upon the writings of prominent Greeks and Romans; a theological heritage, based largely upon Judeo-Christian writings and teachings; and a cultural and historical heritage—for example, our tradition of the Citizen-Soldier and the All-Volunteer Army."[10] It is this birthright that promotes our particular fighting spirit and the altruistic mindset that shapes our interpretation of law, morality, ethics, stewardship, and sacrifice.

The issue of maintaining resiliency, while most commonly associated with Soldiers, is no less essential to command and staff members and members of the cadre. Resiliency is not only a matter of maintaining physical health. It also encompasses a need for strength of heart, mind, and will. Within the high-operational-tempo training environment of Fort Leonard Wood, Missouri, engineer chaplains encourage leaders to develop coping mechanisms that reduce stress and to engage in restorative activities that strengthen their spirit. Restorative activities such as Family trips, group sports, or shared hobbies are often more complex than individual activities and can involve a sizable amount of time. However, the rewards are greater and characteristically involve a sense of pride and accomplishment. In addition to their ministerial competencies, chaplains are proactive in speaking with and supporting leaders at all echelons of authority and have a detailed knowledge of the day-to-day operational activities within their sphere of influence. While immediate religious support may take the form of delivering an invocation at a graduation ceremony, visiting a hospital, or participating in a helocast with sappers, "religious support planning is continuous, time-sensitive, detailed, and systematic."[11] Therefore, timely, authentic, and personal chaplain investment regarding the development of leadership resiliency plays an essential part in sustaining confidence and trust. It thereby fosters a command climate in which teamwork is a core component.

The two programmatic roles of perform and provide allow chaplains to remain true to their specific denominational and religious creeds while serving the needs of all. Army Regulation 600-20, *Army Command Policy*, stipulates that "The Army places a high value on the rights of its Soldiers to observe tenets of their respective religions or to observe no religion at all."[12] Religious liberty and the free exercise thereof are protected under the 1st Amendment of the U.S.

Members of a congregation bow their heads during Sunday services.

Constitution. Chaplains uphold the law by performing religious services, ceremonies, marriages, baptisms, dedications, funerals, and numerous other sacramental observances in line with their specific doctrine, precepts, and faith traditions. Likewise, they provide for the needs of those in low-density faith groups by securing (in some cases) specific religious leaders and procuring a suitable location for the rite, ritual, or service. For example, the 1st Engineer Brigade now makes worship opportunities available for Catholic, Protestant, Jewish, Sikh, Muslim, and Buddhist Soldiers and Soldiers who prefer no religion. Outside this formulaic approach, most chaplains minister to the spirit of Soldiers in an ad hoc manner typified by walking through the motor pool, visiting ranges, or sitting down with Soldiers and cadre members for lunch in a dining facility.

When considering what could be done—and any possible improvements involving the spiritual grounding and character development of Soldiers—one must remember that the human spirit and individual character constitute the very core of a Soldier's being. One way to improve the spiritual grounding of Soldiers is the inclusion of vignettes into the POIs and position descriptions. Having a person of skill lead a group through a vignette and letting the group wrestle with the possible solutions and outcomes has proven to be a way to develop an *inner eye* for character. Another method to develop that inner eye is to provide Soldiers with role models of the utmost character and spiritual grounding. Giving Soldiers time to observe, question, and gain feedback from these role models is of vital importance. These leaders of character must spend time with the next generation.

In conclusion, spiritual grounding and character are not acquired at birth; they are gained with the passage of imperfect practice, led by imperfect role-modeling, shaped by planned instruction, and honed by the successes and failures of experience.

Endnotes:

[1]John W. Brinsfield and Peter Baktis, "The Human, Spiritual and Ethical Dimensions of Leadership in Preparation for Combat," *Army Chaplaincy Professional Bulletin of the Unit Ministry Team,* Summer–Fall 2009.

[2]Army Regulation 350-53, *Comprehensive Soldier and Family Fitness*, 19 June 2014.

[3]C.A.P.E., <http://cape.army.mil/Army%20Values/>, accessed on 23 August 2017.

[4]Army Regulation 600-20, *Army Command Policy*, 6 November 2014.

[5]U.S. Army Training and Doctrine Command Pamphlet 600-4, *The Soldier's Blue Book*: *The Guide for Initial Entry Training Soldiers,* 23 July 2017.

[6]Army Doctrine Reference Publication 4-0, *Sustainment*, 31 July 2012.

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[8]Timothy Clinton, *Competent Christian Counseling, Volume One: Foundations and Practice of Compassionate Soul Care*, WaterBrook Press, Colorado Springs, Colorado, 16 April 2002.

[9]"The Army Ethic White Paper," 11 July 2014, <http://cape.army.mil/repository/white-papers/Army-Ethic-White-Paper.pdf>, accessed on 23 August 2017.

[10]Ibid., pp. 6–7.

[11]Field Manual 1-05, *Religious Support*, 5 October 2012.

[12]Army Regulation 600-20, *Army Command Policy*, 6 November 2014.

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Humanitarian Mine Action in Morocco: Combat Tasks for a Peacetime Engagement

By Lieutenant Colonel Richard R. Shuck

Army Chief of Staff General Mark A. Milley said in August 2015, "Readiness for ground combat is and will remain the U.S. Army's No. 1 priority."[1] General Milley's message resonated throughout the ranks and remains the Army's cornerstone of training focus today. However, with reduced deployments and more emphasis on peacetime engagements, how can combat engineers remain proficient in their combat tasks? In 2015, engineers from the Utah Army National Guard (UTARNG) received just such an opportunity by engaging in the humanitarian mine action (HMA) program in the Kingdom of Morocco.

HMA is a critical Department of Defense peacetime engagement effort, executed in concert with the U.S. Department of State, to support ". . . U.S. strategic objectives to advance sustainable development and global interests by providing a humanitarian response to the harmful social and economic effects generated by land mines and unexploded ordnance and to advance peace and security by promoting regional stability through the use of mine action as a confidence-building measure."[2] The HMA mission accomplishes this objective by eliminating hazardous land mines, returning dangerous or unusable land and infrastructure to a hygienic state, restoring the confidence of the local populace, and allowing the host nation to develop and conduct its own sustainable program. The authority to administer HMA programs in foreign

A U.S. Army engineer teaches Moroccan soldiers how to identify unexploded ordnance at Kenitra, Morocco.

A classroom takes shape at the HMA training area constructed at Kenitra.

nations stems from Title 10, Section 401, U.S. Code, which gives U.S. forces the authority to conduct humanitarian demining operations.[3, 4]

Land Mine Removal Expertise

Land mine operations have always been an integral part of the combat engineer kit bag, which makes employing combat engineers to remove land mines a logical choice. Combat engineers from the UTARNG have been collaborating with the Kingdom of Morocco as a part of the Department of Defense state partnership program (SPP), administered through the National Guard Bureau.

The HMA efforts are being conducted in partnership with U.S. Africa Command and U.S. Marine Corps Forces Africa. Both organizations recognized the strengths of the SPP programs throughout Africa, which prompted them to offer the UTARNG the opportunity to administer HMA in Morocco. Not all countries in the U.S. Africa Command area of operations have been able to create and sustain an HMA mission, but Morocco is a remarkable exception. One Special Forces officer who served at the U.S. embassy in Morocco attributes the success in Morocco to the following:

- Emphasis on SPP and HMA by Utah's adjutant general.
- Cooperation and endorsement of the geographic combatant commander.
- Continued warm reception by the host country and its indigenous army engineers.[5]

Through persistent military-to-military engagements, Soldiers and key leaders from the Utah National Guard (UTNG) have built firm relationships with their Moroccan counterparts. The UTNG (including Army and U.S. Air Force personnel) participates in as many as 26 engagements each year in Morocco, leaving an indelible mark on the security cooperation goals of the geographic combatant commander and the Kingdom of Morocco.

Keys to Success

Combat engineers from the UTARNG have succeeded with HMA in Morocco when others have struggled to make headway in the U.S. Africa Command area of operations because they come from a legacy of combat excellence and have an intimate, firsthand understanding of current mine warfare. The 1457th Engineer Battalion deployed to Iraq in 2003 and became subordinate to the 1st Armored Division. During their enormously successful deployment, the battalion combat engineers engaged in daily combat operations, supporting the division by supplementing its combat power and providing sapper support in the Bagdad area. The 1457th was essentially a sapper battalion that concentrated heavily on combat-related tasks. Its corps wheeled configuration also gave the battalion the built-in flexibility required to provide general engineering support as needed.

In 2008, the battalion went through a transformation and took on three new line companies, each of which deployed to Afghanistan between 2010 and 2016. One of those line companies was the 118th Sapper Company, which deployed to Afghanistan in 2010 to conduct route clearance operations for the 204th Maneuver Enhancement Brigade. During their 12 months in country, the 118th Sappers participated in more than 20 named operations, completing 475 successful combat missions. They cleared more than 26,000 kilometers of roadway, defeated 109 improvised explosive devices, and suffered 19 improvised explosive device strikes. The sappers received more than 50 Combat Action Badges and 28 Purple Hearts. The combat engineers from the 1457th Engineer Battalion and the 118th Sapper Company are the current instructors of the HMA mission in Morocco today.

A Soldier from the 116th Engineer Company observes progress in the Kenitra classroom construction.

Combat Multipliers for Combat Engineers

In addition to the proven combat experience of UTARNG combat engineers, other unique factors add to the success of the HMA mission in Morocco. Officials at the Humanitarian Demining Training Center at Fort Leonard Wood, Missouri, determined that an understanding of foreign internal defense (FID) and the ability to read the diplomatic landscape in a foreign country were key skills needed to successfully execute the HMA mission. Before the War on Terrorism, U.S. Army Special Forces Soldiers were the only Soldiers who practiced FID. The combat engineers have trained and deployed with UTARNG's 19th Special Forces Group (Airborne) on several recent occasions. Many of the combat engineers have also deployed as members of embedded training teams to fight alongside the Afghan National Army, making them experts in FID.

Another combat multiplier that is unique to the UTARNG is the language capability of the 300th Military Intelligence (MI) Brigade. With more than 1,400 deployable linguists (with nearly 600 in Utah alone), the brigade represents the largest collection of military linguists in the U.S. military and is the only MI brigade configured exclusively for operational linguists. Collectively, the linguists speak 26 assigned languages and many other unassigned languages. French and Arabic linguists from the 300th MI have regularly acted as interpreters for the HMA mission in Morocco.

Royal Moroccan Army engineers practice their skills with a metal detector.

UTARNG Special Forces and MI Soldiers have cross-trained over the years with combat engineers from the 204th Maneuver Enhancement Brigade and the 1457th Engineer Battalion. This mixing of skill sets brings highly complex language skills and expertise in FID and international engagement to the HMA mission in Morocco. The combination of nontraditional skill sets and

hardened combat experience makes the UTARNG combat engineers a solid success with HMA in Morocco.

HMA Progress in Morocco

Currently, the proponent for Morocco's HMA mission is the Royal Moroccan Armed Forces Engineers. The Moroccan Army assigned the mission to its former 5th Engineer Battalion, which is now a domestic all-hazards response team called *Unite de Secours et Sauvetage* (USS) and is composed primarily of engineers. The USS battalion has participated in more SPP engagements with the UTARNG in the past decade than any other unit in the Moroccan military and has proven to be an agile and adaptive group of professionals. Due to the SPP program, the USS battalion has become Morocco's expert in HMA as well as the country's premier disaster preparedness operations authority.

The overall objective of the HMA mission in Morocco is to establish a regional HMA training center of excellence that is capable of providing instruction to the Moroccan military and some of its allies. Such a lofty goal requires a great deal of resources, manpower, and time. However, the USS battalion has expended an enormous amount of effort to accomplish this goal and has surpassed all milestones.

The breaching of the first obstacle required the establishment and construction of a suitable training area. With the USS battalion stationed in the northern city of Kenitra, existing facilities made the home base the most logical and suitable place to build. In December 2015, U.S. Army engineers from the 115th Engineer Facilities Detachment identified a 2-acre plot of land that was ideally suited for an HMA training area inside the Moroccan Army base at Kenitra. The 115th Engineers helped design two mine detection pits to mimic the Humanitarian Demining Training Facility structures. U.S. Army engineers also designed a new classroom at the request of the Moroccan military, and ground was broken on the training area in December 2016.

HMA Curriculum

Since military-to-military engagements began in June 2015, there have been six HMA engagements in Morocco. Classroom instruction began with explosive ordnance disposal (EOD) Level 1 training in February 2016. The HMA curriculum for Morocco consists of seven topics taught in three blocks of instruction over a 5-year period. The seven topics are—

- Land mine clearance/battle area clearance.
- EOD operations.
- Explosive remnants of war operations.
- Physical security and stockpile management.
- Small-arms and light-weapons accountability and disposal.
- Conventional-weapons destruction.
- Improvised explosive device awareness.

Although Humanitarian Demining Training Center courses provide instructors with the basic knowledge required to teach the HMA curriculum, advanced knowledge is preferred for technical topics such as EOD operations. EOD-qualified members of the U.S. Marine Corps Forces Africa and the Air Force 151st EOD Flight, Utah Air National Guard, assisted the UTARNG combat engineers.

Conclusion

As UTARNG combat engineers learn, prepare for, and instruct the HMA curriculum, they also sharpen their combat skills. This provides combat focus during a peacetime engagement. The exceptional UTNG SPP program opened the door for the combat engineers, but the success of the HMA mission in Morocco comes from the following contributing factors:

- The UTARNG combat engineer legacy of combat excellence.
- Constant cross-training of engineers with Special Forces, embedded training teams, and UTARNG linguists.
- The high priority and support of all parties involved.

These factors make the UTARNG combat engineers a perfect fit for the HMA mission in Morocco. This alone does not meet the full intent of General Milley's guidance, but in a resource-constrained environment, the HMA program has proven to be a tremendous vehicle for successfully maintaining combat skills for combat engineers through a peacetime engagement.

Endnotes:

[1]Michelle Tan, "Milley: Readiness for Ground Combat is No. 1 Priority," *Army Times*, 28 August 2015, <https://www.army-times.com/story/military/pentagon/2015/08/28/milley-readiness-ground-combat-no-1-priority/71284206/>, accessed on 5 July 2017.

[2]U.S. Department of State, "Overview of the U.S. Humanitarian Mine Action Program," Bureau of Political-Military Affairs, August 2004, <https://www.state.gov/t/pm/rls/rpt/walkearth/2004/37224.htm>, accessed on 5 July 2017.

[3]Ibid.

[4]Title 10, Section 401, U.S. Code, *Humanitarian and Civic Assistance Provided in Conjunction with Military Operations*, 7 January 2011, <https://www.gpo.gov/fdsys/granule /USCODE-2010-title10/USCODE-2010-title10-subtitleA-partI-chap20-sec401/content-detail.html>, accessed on 10 July 2017.

[5]Tyler Jensen, UTARNG, interview by author, 30 January 2017.

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GROWING SUCCESS:

The Brigade Engineer Battalion Commander in Decisive-Action Training

By Lieutenant Colonel Robert A. Hilliard

Brigade engineer battalions (BEBs) demonstrate varying levels of success in the decisive-action training environment, and BEBs have often proven integral to the overall success of brigade combat teams (BCTs). Success in decisive action begins with the commander's ability to set proper conditions for subordinate units. Successful BEB commanders share the following traits:

- Clearly understand the BCT commander's vision for using the BEB.
- Lead up and across.
- Issue detailed commander's guidance to drive the BEB operations process.

Army Techniques Publication 3-34.22, *Engineer Operations–Brigade Combat Team and Below*, provides broad guidance on command team and section responsibilities, such as provision of administrative and logistical support, integration of attached units, supervision of training and mission preparation, and sharing of insight during BCT planning.[1] Doctrine is intentionally light on BEB essential tasks in decisive action, relationships, and examples of effective commander guidance since all BEB command teams and BCTs are different. Commander concentration on the three shared traits before and during combined arms training is essential to the overall success of BEBs in decisive-action training.

Trait No. 1: Clearly understand the BCT commander's vision for using the BEB. Every BEB faces tough questions, such as—

- How does the BEB enable the BCT fight?
- Are habitual relationships between task forces and engineer companies essential to the BCT commander?
- Does the BEB manage protection for the BCT?
- Will the BEB be involved in the BCT area security mission and in what capacity?

Open, honest dialogue that produces an understanding of the BCT commander's vision for using the BEB is essential. BEB commanders should start this conversation early, either immediately upon taking command or at the beginning of a training cycle in preparation for a deployment or combat training center rotation. They should enter the dialogue with options for the BCT commander's consideration and develop an overall concept of how the BEB enables the BCT. These concepts are not wholly different from one BEB to another. In decisive-action training, BEBs generally fight along the following four lines of effort:

- Engineer synchronization.
- Enabler management.
- Area security.
- Key leader engagements.

Every BCT is unique, so lines of effort may differ. However, understanding the BCT commander's vision for the BEB is the first step in developing an overall concept for BEB operations.

As an example, the 70th BEB "Kodiaks" use an overarching concept supporting 1st Stryker Brigade Combat Team, 25th Infantry Division, from a protection standpoint, focusing on mission command, wide-area security, and combined arms maneuver. Kodiak lines of effort in support of the BCT are clear:

- Plan and synchronize mobility, countermobility, and survivability efforts in support of maneuver.
- Secure high-value assets.
- Maintain lines of communication in the rear area.
- Provide mission command of critical enablers.

The 70th BEB develops playbooks for specific missions such as offensive and defensive operations; area security; internally displaced persons; and detainee collection, from which it can deviate, based on the tactical situation. A clear understanding of the BCT commander's vision for the BEB facilitates effective home station training for subordinate companies and platoons while providing focus for the BEB staff in the development of systems and command post configuration.

Trait No. 2: Lead Up and Across. Successful BEB commanders are involved and engaged with the BCT commander, the BCT staff, and fellow battalion commanders. As brigade engineers, successful BEB commanders are present during key brigade level planning events. They understand key touch points and provide relevant feedback to the BCT commander and staff during the transition from brigade level mission analysis to course-of-action development. The ability to shape task organization and scheme of maneuver early is critical to effective integration of engineer forces and other enabling BCT assets. Involvement in the brigade plans process also builds trust with the commander

and staff on the proper use of key enablers and empowers the assistant brigade engineer ahead of course-of-action development. Late linkups, missed task force orders, and a lack of combined rehearsals are systemic issues for engineer companies, human and signal intelligence units, and retransmission teams. A key benefit of early involvement in the BCT planning process is the recognition of mission requirements that can be translated into effective warning orders, leading to on-time linkup for subordinate units.

Leading across with fellow battalion commanders pays enormous dividends for BEB subordinate units. From engineer utilization to the sustainment of retransmission teams to the integration of intelligence elements, lateral relationships facilitate "ownership" within the supported task forces. Handshake support relationships don't work in decisive action, where a determined enemy, unforgiving terrain, and lack of time create unparalleled pressure. Clearly, appropriate command and support relationships are required from the brigade level, but the ability to quickly work through friction at the command level with a simple face-to-face meeting or radio call is critical. Effective BEB commanders build capital in these relationships before training.

Trait No. 3: Issue detailed commander's guidance. Successful BEB commanders in decisive action drive the operations process. Understanding the BCT commander's vision of how the BEB fits into the BCT fight provides a conceptual framework for operations, but execution requires detailed guidance to subordinate units in the form of mission orders. Army Doctrine Reference Publication 5-0, *The Operations Process*, states, "Commanders drive the operations process through understanding, visualizing, describing, directing, leading, and assessing operations."[2] The BCT commander's vision for the BEB helps the BEB commander's understanding of "situational context" and facilitates "visualizing a desired end state and potential solutions to solve the problem," while "assignment of a mission (derived from the BCT commander's vision) provides the focus for developing the commander's visualization that, in turn, provides the basis for developing plans and orders."[3]

Once commanders have a clear understanding of the BEB role and visualize an operational approach and end state, their role becomes one of the development of effective mission orders for subordinate units. Unfortunately, this is where BEBs often fall short. In a time-constrained environment, touch points between the commander and staff are often sacrificed at a time when they are most needed. This results in minimal or ineffective BEB planning. Ultimately, this leads to delayed, often vocal, orders to subordinate units; late linkups with supported task forces; missed rehearsals; and unsynchronized operations.

It is imperative for BEB commanders to describe their visualization to the staff, and Army Doctrine Reference Publication 5-0 provides sufficient detail on developing commander's intent, planning guidance, and commander's critical information requirements. But capturing all necessary guidance can be difficult given the flood of information that is present during mission analysis and the pressure to meet timelines for the next engagement. A prebuilt commander's guidance template (in Microsoft Word®, Microsoft PowerPoint®, or hard copy on laminated sheets) is a proven technique in a time-constrained environment. It allows the BEB commander to quickly disseminate intent, course-of-action development guidance, and critical-information requirements during or immediately after the battalion mission analysis brief.

Techniques vary, but the ability to provide the staff with a digital or hard copy of planning guidance allows the commander to maximize the effectiveness of the staff touch point and quickly transition to other requirements on the battlefield. As a best practice, the commander of the 588th BEB "Lone Stars" uses a digital version of commander's guidance that is located on a tactical operations center laptop computer. During mission analysis, the commander adds notes directly to the template and huddles with the battalion executive officer, operations and training officer, and planner immediately after the analysis to discuss his intent, key tasks, desired end state, and planning guidance across all BEB elements. This technique allows the BEB staff to continue effective planning and preparation for the next commander touch point at the course-of-action development brief. Again, products and techniques vary but the ability to provide detailed planning guidance for the staff facilitates planning and the generation of orders. In turn, this facilitates effective troop-leading procedures at the company and platoon levels.

There is no doubt that BEBs play an important role in BCT operations, from synchronizing engineer assets to training and employing enablers in support of tactical missions. Success begins with commanders and their ability to set conditions for subordinate units and then implement staff systems to ensure follow-through. By understanding the BCT commander's vision for using the BEB, leading up and across, and driving the operations process through clear commander's guidance, BEB commanders will continue to find success in decisive-action training.

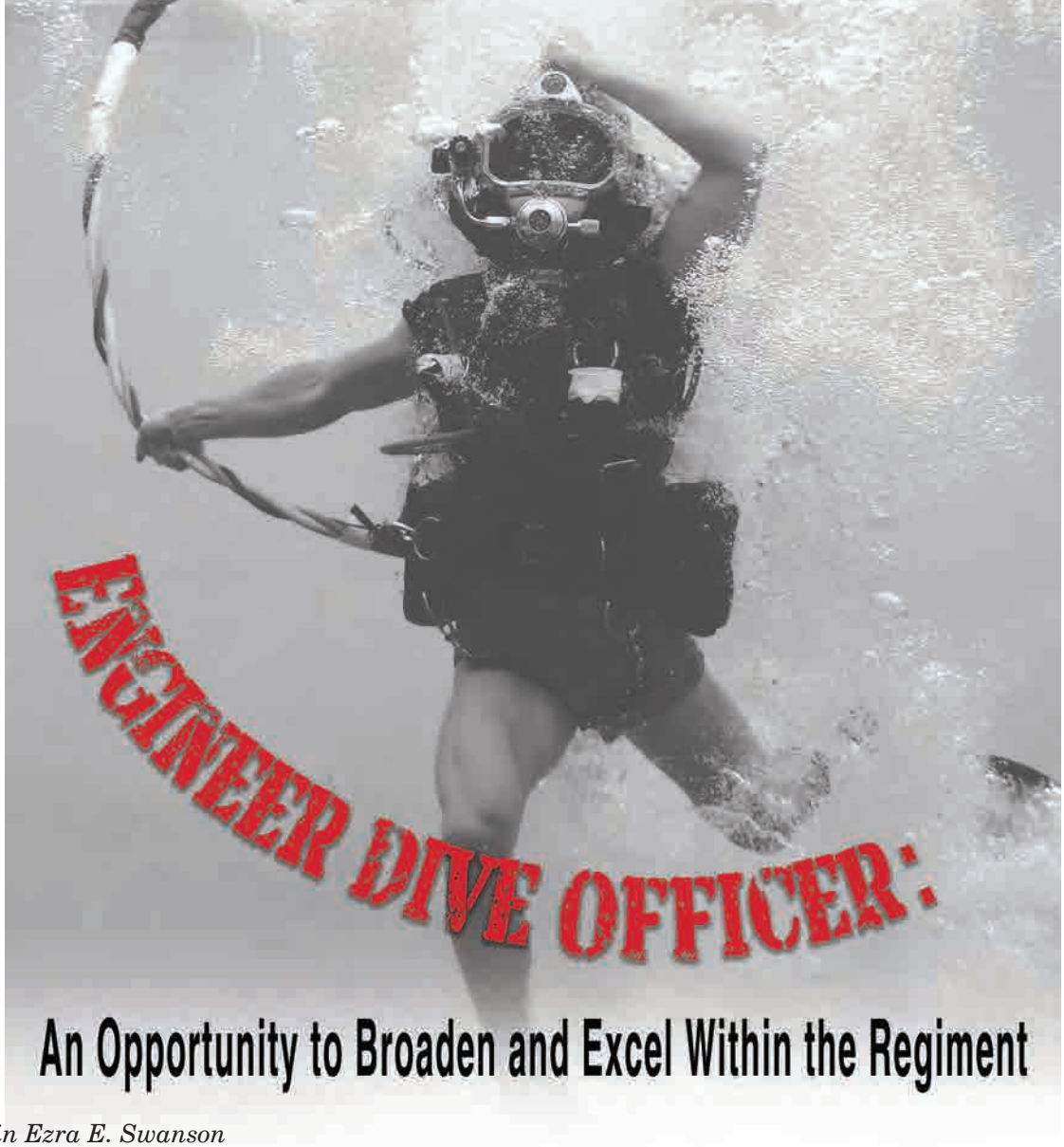
Endnotes:

[1]Army Techniques Publication 3-34.22, *Engineer Operations–Brigade Combat Team and Below,* 5 December 2014.

[2]Army Doctrine Reference Publication 5-0, *The Operations Process*, 17 May 2012.

[3]Ibid.

Lieutenant Colonel Hilliard served as Sidewinder 07, the senior BEB trainer, at the National Training Center, Fort Irwin, California, from July 2016 to July 2017. He holds a bachelor's degree in civil engineering from Auburn University, a master's degree in engineering management from Missouri University of Science and Technology at Rolla, and a master's degree in civil engineering from Montana State University. He is currently a student at the U.S. Army War College in Carlisle, Pennsylvania.



ENGINEER DIVE OFFICER:

An Opportunity to Broaden and Excel Within the Regiment

By Captain Ezra E. Swanson

Serving as a company grade engineer officer offers many of the most exciting assignments and experiences in the Army. Engineer lieutenants can choose assignments as varied as those involving, route clearance, mobility augmentation, geospatial engineering, bridging, firefighting, serving as a sapper, and the focus of this article—diving. Each of these capabilities fits into a niche in accomplishing the mission of the Engineer Regiment, and each provides a unique proving ground for company grade officers. Most new officers are familiar with the fields of combat engineering and vertical and horizontal construction; but low-density engineer specialties, such as diving, are less well known. This article attempts to close that knowledge gap by providing a brief overview of the unique and exciting positions, missions, and broadening experiences that engineer dive officers receive and explaining how an engineer lieutenant (or junior captain) may become an engineer dive officer.

Demanding Positions

Following dive school, lieutenants are assigned to dive detachments as operations officers, who fill the roles of platoon leaders and detachment executive officers. As platoon leaders, they are responsible for planning and executing all missions and operations, including those as diverse as ship salvage, hydrographic survey, and force protection, in addition to regular unit operations, such as weapons qualification and field training.

As executive officers, these lieutenants are responsible for the maintenance, operation, and accountability of more than 70 line items of equipment valued at more than $4 million. Some of this equipment is standard Army equipment such as vehicles, weapons, and radios, but the majority consists of diving and life support equipment, the care of which is critically important. Failing to identify a problem with a regulator until a diver is 100 feet below the surface is not an option. Finally, executive officers must act as their unit movement officer for operations throughout the continental United States and around the world. These movements vary in size but can require as many as 15 shipping containers.

Captains command the dive detachments and serve as the subject matter experts on engineer diving within their command, whether it be the U.S. Army Forces Command, U.S. Army Central, or U.S. Army Pacific. The dive commander

must understand engineer dive capabilities, how to employ them, and how to execute and resource training without the traditional support of post training areas or combat training center rotations. There are no range control personnel to help coordinate training or combat training center experts to support ship salvage, port opening, or bridge repair training. The dive commander must work closely with the chain of command and external organizations to secure realistic training.

Unique Missions

This broad range of responsibility provides engineer dive officers with unique opportunities to understand operations in the joint, interagency, intergovernmental, and multinational environment. Engineer dive officers can expect to work directly with foreign militaries, sister Services, and government organizations. These circumstances significantly test their ability to extend influence beyond the chain of command and achieve mission success in challenging environments. Each year, engineer dive officers coordinate and lead their detachments in joint exercises such as Roguish Buoy with North Atlantic Treaty Organization allies in Canada, ice diving exercises with allies in Norway, and underwater tools and equipment training with members of Jordanian and Kuwaiti militaries.

Major General Anthony C. Funkhouser, deputy commanding general for military and international operations at the U.S. Army Corps of Engineers (left), jumps in the water to take part in a change of command ceremony.

Engineer divers undergo drown-proofing training.

To secure training and provide support to sister Services, engineer dive officers regularly coordinate missions and provide support to all Services. This support ranges from routine operations, such as ships husbandry operations for the U.S. Coast Guard, to complex inter-Service missions, such as ship salvage. A good example of this support is the recent salvage of a 110-foot Coast Guard vessel at U.S. Marine Corps Air Station Cherry Point, North Carolina, by the 511th Dive Detachment. The unit received the salvage request from the Coast Guard, coordinated site access through the Marine range maintenance department, and secured the necessary equipment through the U.S. Navy Emergency Ship Salvage Material System at the Naval Sea Systems Command.

To maintain proficiency with their mission-essential tasks, engineer dive officers coordinate directly with the U.S. Army Corps of Engineers to provide support on complex projects and disaster response from Ketchikan, Alaska, to Houston, Texas, to New York City.

Engineer dive officers also regularly work with the Defense Prisoner of War/Missing in Action Accounting Agency (DPAA) on underwater recovery missions throughout Southeast

Engineer divers conduct salvage operations in the Houston, Texas, ship channel.

broadening. Many engineer dive lieutenants have taken advantage of the post-key development timeline and have been selected for opportunities such as the Technical Engineer Competency Development Program, Worldwide Individual Augmentation System taskings, aide-de-camp positions, and other select opportunities within the Engineer Regiment. Engineer dive lieutenants use these assignments to broaden themselves and expand their expertise beyond military diving. Only those top lieutenants who have performed well as operations officers and taken the initiative to broaden their skill sets are selected for return commands.

Asia, where they interact with local nationals, contractors, and foreign militaries. In working with these agencies, the officers coordinate military interdepartmental purchase requests, key leader engagements, and major equipment movement in addition to planning dive operations.

Broadening Experiences

Engineer dive officers enter their key development positions shortly after graduation from dive school or from the Engineer Captains Career Course. This immediate assignment to key development positions gives dive lieutenants and captains 2 to 3 years for

Post-command engineer dive captains are the only officers with the unique qualifications required to serve as underwater recovery team leaders at DPAA. Only one of the 20 DPAA recovery teams is qualified in underwater recoveries, meaning that the team is constantly in demand, conducting searches to bring home the remains of missing personnel. Engineer dive captains have also been selected to serve in assignments as diverse as Engineer Captains Career Course small-group instructor, U.S. Army Corps of Engineers project manager, U.S. Military Academy instructor, and Asymmetric Warfare Group strategist.

Divers practice ice diving in Norway.

A dive officer inspects a dam for deterioration.

Selection

The selection for engineer dive officers is competitive and open only to Soldiers in the Regular Army. Only three engineer lieutenants were selected from the 19 who applied during the 2016 selection period. The selection is conducted in three phases—diver physical fitness test, in-water proficiency test, and board interview. Candidates start the day with the diver's physical fitness test, including—

- A 500-yard swim (side or breast stroke) in 14 minutes or less.
- 42 push-ups in 2 minutes.
- 50 curl-ups (Navy sit-ups) in 2 minutes.
- 6 pull-ups with no time limit.
- A 1.5-mile run in 12.75 minutes or less.

After a short break for breakfast, candidates return and receive the in-water aptitude screening to determine their level of confidence in the water. These evolutions are often described as all of the challenges of dive school rolled into one morning. The dive detachments require leaders who are unquestionably confident and comfortable in the water. The highest attrition occurs during the in-water evaluation phase. No candidates are dropped in the first phase but about half drop voluntarily during the second phase. Finally, the remaining candidates attend an interview with the engineer dive officer selection board to determine if they possesses the leadership and mental skills to perform well as a leader of an engineer dive detachment.

The selection process has gone through a significant change in the past 2 years. Previously, only lieutenants were selected; however, in addition to the lieutenants selected during the 2016 selection period, two captains were also chosen to serve as dive detachment commanders. Captains attending the Engineer Captains Career Course and lieutenants attending the Engineer Basic Officer Leader Course with graduation dates in September through December are invited to attend. Engineer officers interested in attending dive school should make sure they have completed one of these courses and are ready to sign up when the selection brief is presented.

Following graduation from the Engineer Captains Career Course, the Engineer Basic Officer Leader Course, or the master of science degree program at Missouri University of Science and Technology at Rolla, selected candidates begin a 3-week prescreen course at Fort Leonard Wood, Missouri. Here, candidates complete their dive physicals, learn basic dive physics and medicine, and gain the water confidence they will need to pass the 6-month Joint Dive Officer Course at the Naval Diving and Salvage Training Center in Panama City, Florida.

The Joint Dive Officer Course includes Army, Navy, and Coast Guard company grade officers who endure numerous physically challenging water confidence tests. They also face technical and academic challenges. Candidates are taught and tested on topics such as—

- Underwater welding.
- Salvage calculations.
- Hyperbaric chamber operations.
- Scuba operations.
- Underwater remote vehicle operations.
- Dive physics.
- Dive medicine.

Conclusion

Junior officers looking for a challenge and the opportunity to broaden themselves should consider aligning their timeline and preparing their mind and body to apply for an assignment in the engineer dive field. To leaders and future leaders, I hope you will use this knowledge to better mentor your current and future subordinates. To current and future junior officers, I hope to see you in a future dive class.

Essayons!

Captain Swanson commands Company A, 169th Engineer Battalion, 1st Engineer Brigade. He is a graduate of the Engineer Basic Officer Leader Course and the Engineer Captains Career Course. He holds a bachelor of science degree in economics 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.

511th Engineer Dive Detachment Salvage Training:

Preparing for Deployment Without a Combat Training Center Rotation

By First Lieutenant Grant W. Rice

Army engineer divers are a little-known bastion of professionalism and leadership within the Engineer Regiment. A single 25-Soldier detachment can provide combat, general, and geospatial engineer support to theater commanders, combining mission requirements of sapper, vertical, horizontal, and topographic (bathymetric) units, while completing these requirements underwater. *Essayons* is the unit's founding principle as divers train on the equivalent of nine mission-essential tasks to meet the full spectrum of Army engineer diving responsibility. Collective tasks include—

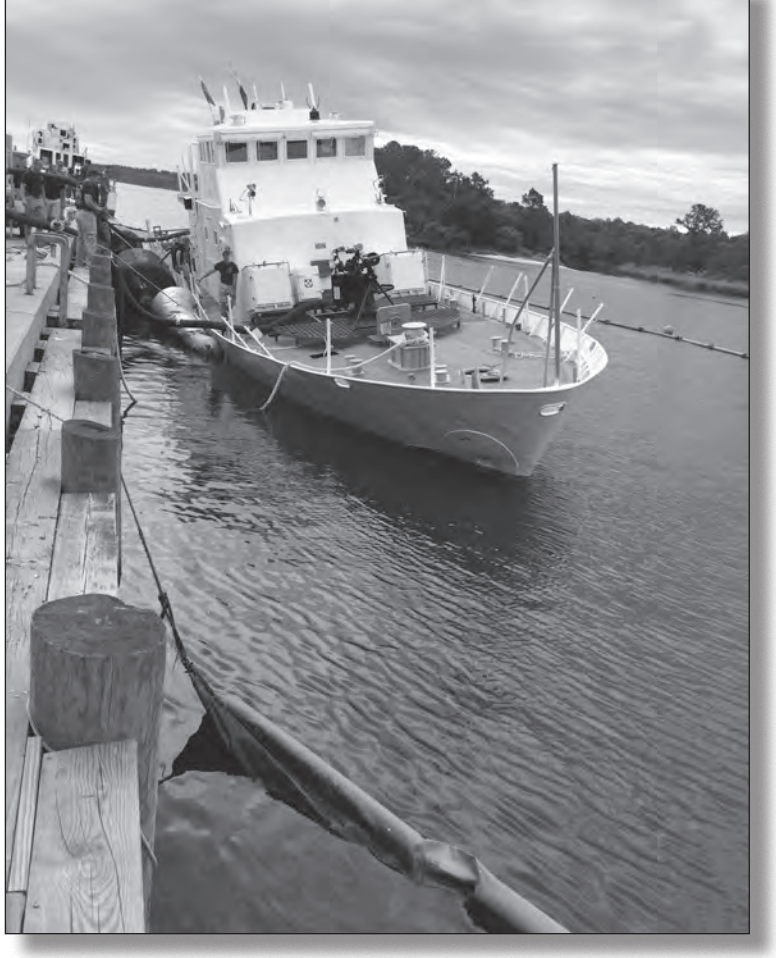
- Underwater heavy construction.
- Underwater cutting and welding.
- Salvage.
- Demolitions.
- Hydrographic survey.
- Hyperbaric medicine.
- Beach and river reconnaissance.
- Bridge reconnaissance.
- Side scan sonar.
- Mine and countermine operations.
- Repair of other vessels operations.
- Search and recovery operations.
- Dewatering operations.
- Ships husbandry capabilities.

Since 2001, the 74th, 86th, 511th, and 569th Engineer Dive Detachments have been continuously deployed to Kuwait to support U.S. Army Central Command missions. As with many other theater engineer assets, there is no centralized combat training center (CTC) to support unique diving training requirements, requiring commanders to apply

Divers from the 511th conduct reconnaissance of the vessel before intentionally sinking it.

Objective T standards to guide the training evaluation of mission-essential task (MET) proficiency for enduring deployments.

Objective T is training guidance that is meant to ensure that the Army has a common standard for assessing and reporting readiness for decisive action by establishing objective task proficiency evaluation standards. The most challenging standard to achieve under this rubric is the one associated with the dynamic and complex environment, which requires achievement of the highest overall assessment. The dynamic environment is defined as a situation in which operational variables and enemy tactics, techniques, and procedures change in response to the execution of a friendly unit's mission. A complex operational environment requires a minimum of four operational variables such as terrain, time, military, and social. Like other noncombatant engineer units that contain low-density military occupational specialties, diver units do not have a CTC to establish complex and dynamic conditions to easily evaluate training. For engineer divers to meet the established criteria within Objective T, the unit must devise a complex and dynamic training opportunity, which cannot be achieved in the 25-foot depth available at Fort Eustis, Virginia. Previously, engineer divers had maintained a mutually beneficial relationship with the U.S. Army Corps of Engineers, completing a wide variety of underwater engineering tasks that align with assigned METs at a fraction of the cost of contracting a commercial dive company. However, due to legal restrictions, the U.S. Army Corps of Engineers began contracting its underwater engineering needs to private contractors. Since then, Army engineer divers have been searching for military construction missions in order to train in realistic environments outside of less-effective home station training.



The vessel begins to list toward the pier during the intentional sinking phase.

The 511th Engineer Dive Detachment leaders contacted numerous military bases surrounding their Fort Eustis home station but struggled to find any organization that wanted to hire the team to complete real-world projects that aligned with unit METs. By chance, the detachment spent a portion of its training budget to conduct inspections of several waterfront facilities at Marine Corps Air Station Cherry Point (MCASCP) in December 2015. While conducting the inspections, the team demolished two derelict piers that were hazards to watercraft navigation. This action enhanced training value and also provided training for two METs. The professionalism of the unit made a lasting impression; and when a 110-foot U.S. Coast Guard cutter begin sinking in port at MCASCP in January 2016, the air station officials immediately called the 511th for support. The decommissioned vessel was scheduled to be used for U.S. Marine Corps fixed-wing asset target practice at a bombing range at sea. If it sank prematurely, the vessel would become a significant obstruction to a major

A diver prepares to enter the water to install the final patch that would allow the vessel to be raised from the bottom.

The 110-foot vessel begins to list again while raising from depth.

commercial fishing channel and incur significant U.S. Environmental Protection Agency fines due to fluids leaking from the vessel's transmissions. Also, the installation planned to sell the two transmissions at an estimated $1.5 million each, but salt water would ruin any residual value.

The 511th sprang into action, traveled 250 miles within 72 hours, prevented the vessel from sinking completely, and rendered the vessel seaworthy with an improvised concrete patch. During what the 511th named Exercise Buoyant Trident, the team saved the air station an estimated $3 million, while preventing the closure of a major shipping and fishing channel. However, the 511th Detachment did not fully benefit from Exercise Buoyant Trident since training for many collective tasks did not occur during the real-time response to the vessel sinking. Therefore, unit leaders requested additional time to use the vessel as a training platform. The engineer divers planned to intentionally sink, then subsequently salvage, the cutter using dewatering and lift-bag techniques. If successful, the detachment would complete the Army's largest salvage of the previous 25 years in murky water, during night conditions, interfacing with organizations outside the chain of command, and facing unknown bottom conditions.

There were three critical decision points where detachment leaders were required to weigh the risk of mission failure against the benefit of mission success. These points, combined with the environmental conditions, added to the operational environment challenges that made this training complex and dynamic.

The first critical decision point (due to the uncertainty of mission approval by the installation authorities) was whether or not to initiate movement to MCASCP from Joint Base Langley–Eustis, Virginia. Despite persistent efforts for approval throughout a 90-day planning window, the detachment was not approved to sink the vessel during the planned initial movement to MCASCP. Despite the uncertainty of approval, the 92d Engineer Battalion, 20th Engineer Brigade, consistently supported the training, recognizing that detachment leaders only needed approval from several MCASCP installation agencies. While the leaders secured those approvals, the Soldiers cut holes in the decking and resealed several compartments where the transmissions had been removed. Final approval from all stakeholders was achieved just 48 hours before the detachment was required to redeploy to home station to pack equipment for departure to Kuwait. All parties agreed that the deliberate risk management mitigated the consequences of mission failure, which could have blocked a major commercial fishing channel or incurred an additional $100,000 in costs to build cofferdams for a deliberate salvage of the vessel. In the end, the benefit of instilling confidence in the Soldiers to conduct any salvage for U.S. Army Central Command outweighed the risks inherent in executing complex and dynamic training. Therefore, the detachment proceeded on an abbreviated timeline despite increased risk and potential consequences.

The second critical decision point was whether to proceed with sinking the vessel with the control measures in place. The 511th could not conduct a rehearsal on a project of this size because the complexity of a large vessel salvage cannot be adequately simulated through scaled rehearsals. Therefore, the uncertainty surrounding this mission required deliberate planning through all contingencies to prepare for any situation. However, with a deliberate sinking, there is a point of departure where additional efforts can only guide the vessel—not stop its sinking. Unit leaders would be unable to stop the vessel from sinking once the deck submerged below the surface because salvage would require that all breaches in the hull be patched and watertight.

Despite the control measures in place during the sinking, the cutter threatened to damage the pier when the vessel listed noticeably to one side before the deck became fully submerged. At that point, the 511th leaders needed to make a last-minute decision to break contact or accept the necessary risk in continuing to flood the vessel. The detachment commander and first sergeant weighed the risks, conferred with the vessel maintenance crew, and decided that the vessel's ballast tanks were filling unevenly, causing it to list. By quickly switching the location of the pump outlet, divers could more safely lower the vessel the final 6 feet and

Divers consolidate the pumps at the large, rear compartment to complete the salvage.

allow the vessel to settle into the mud without capsizing or damaging the dock. As the pumps resumed the deliberate sinking, the most dangerous phase of the operation was complete. The vessel sat squarely on the bottom and was ready for patching efforts to begin.

The third critical decision point was whether to build a new patch for the aft compartment or move the bow pump to the rear of the vessel, using a partially submerged hatch to help dewater the largest compartment of the ship. In order to sink the vessel, the team cut holes using underwater tools in each of the five subdeck compartments of the ship. To salvage the vessel, the divers constructed corresponding metal patches with watertight pump hose fittings to dewater each compartment and gradually lift the vessel back to the surface. If any patch were not watertight, the 1,500 gallon-per-minute pump would be unable to remove water from the interior faster than the water was leaking in. However, when the vessel was approximately halfway salvaged, with the bow on the surface, progress was halted and the ship was maintained at a constant depth. The team turned off the pumps and identified a visible leak in the patch covering the largest compartment. Leaders narrowed the possible courses of action to either rebuilding the patch in the aft compartment or repurposing the second bow pump to help dewater the failing aft compartment. The team made rapid calculations and opted to allow the bow pump to dewater the aft compartment rather than fabricate a new patch. Upon repurposing the second pump, there was enough pumping capacity to remove the water from the aft compartment, showing immediate progress. Soon, the hull was above the surface, guaranteeing the remainder of the salvage. The team persisted through limited visibility and driving rain to finally bring the vessel to the surface, completing the largest and most complex Army engineer diving salvage operation in the past 25 years. There are no defined processes for training theater-level assets such as engineer divers. The 511th Detachment sought opportunities and accepted the necessary risk to adequately prepare for deployment because there is no opportunity to train a dive unit at a CTC. The 511th trained 29 Soldiers on 82 individual and 36 collective tasks to meet 20th Engineer Brigade qualification tables, while also supporting MCASCP requirements on a $44,000 mission budget. No home station training could have accomplished the same objectives, and the unit successfully matched the quality of a traditional CTC rotation to certify unit readiness for deployment. Only through creativity and the application of the *Essayons* spirit can theater units validate their capability using Objective T. The 511th Engineer Dive Detachment deployment training serves as a model to other units for balancing risk and benefit in providing complex and dynamic training outside of a CTC rotation.

"The professionalism of the unit made a lasting impression; and when a 110-foot U.S. Coast Guard cutter begin sinking in port at MCASCP . . . the air station officials immediately called the 511th for support."

First Lieutenant Rice serves as a platoon leader for the 511th Engineer Dive Detachment at Joint Base Langley–Eustis and executive officer of the detachment at Kuwait Naval Base. He is a graduate of the U.S. Army Ranger School, the U.S. Army Airborne School, the Sapper Leader Course, and the Marine Engineer Dive Officer Course. He holds a bachelor's degree in economics from Colorado College, Colorado Springs, Colorado.

Engineer Doctrine Update

U.S. Army Maneuver Support Center of Excellence

Capabilities Development and Integration Directorate
Concepts, Organizations, and Doctrine Development Division

Doctrine Update

Under the Doctrine 2015 initiative, the Army established a doctrine hierarchy by creating four tiers of publications:

- Army doctrine publications (ADPs) cover fundamental principles.
- Army doctrine reference publications (ADRPs) provide detailed information on fundamental principles.
- Field manuals (FMs) cover tactics and procedures.
- Army techniques publications (ATPs) provide techniques on specific areas.

This doctrinal framework was established to create a true hierarchy (such that the manuals at the top drive those below) to facilitate the updating of doctrinal publications, and to make it easier to access and understand the doctrinal responsibility of each member of the profession.

The Army capstone publications—ADP 1, *The Army*; ADRP 1, *The Army Profession*; and ADP/ADRP 3-0, *Operations*—are at the top of the Army doctrine hierarchy. Together, they establish the foundation and framework for the remaining supporting doctrine. ADP 1 and ADRP 1 were prepared under the direction of the Army Chief of Staff and articulate his vision for the Army. They explain why the United States maintains the Army, describe what the Army provides to the Nation, and list the foundational aspects of what the Army does. They connect Army doctrine to joint doctrine and frame the Army's strategic roles. ADP/ADRP 3-0 establish the current Army operational concept of unified land operations and provide the fundamentals of how the Army conducts operations as part of a joint team working with unified action partners.

In support of the Army doctrinal hierarchy, the Engineer Regiment currently is the proponent for a total of 43 publications: one FM, 13 ATPs, and 29 technical manuals (TMs). The Engineer Doctrine Team manages the FM and ATPs and works closely with the U.S. Army Engineer School Directorate of Training and Leader Development to manage the engineer TMs. The keystone manual of the Engineer Regiment is FM 3-34, *Engineer Operations*. The remaining engineer publications are subordinate to FM 3-34. The current hierarchy of engineer manuals is shown in Figure 1. All of these publications are available on the Army Publishing Directorate Web site at <www.apd.army.mil>.

Doctrine provides the warfighter with a common language of fundamental principles; supporting tactics, techniques, procedures; and terms and symbols. Understanding doctrinal publications is a critical requirement of being a military professional and a successful engineer commissioned officer, noncommissioned officer, or enlisted Soldier. By knowing the doctrinal hierarchy, Army engineers can begin a continuous educational journey.

Please contact us if you have any questions or recommendations concerning doctrine:

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ENGINEER DOCTRINE UPDATE

U.S. Army Maneuver Support Center of Excellence

Capabilities Development and Integration Directorate

Concepts, Organizations, and Doctrine Development Division

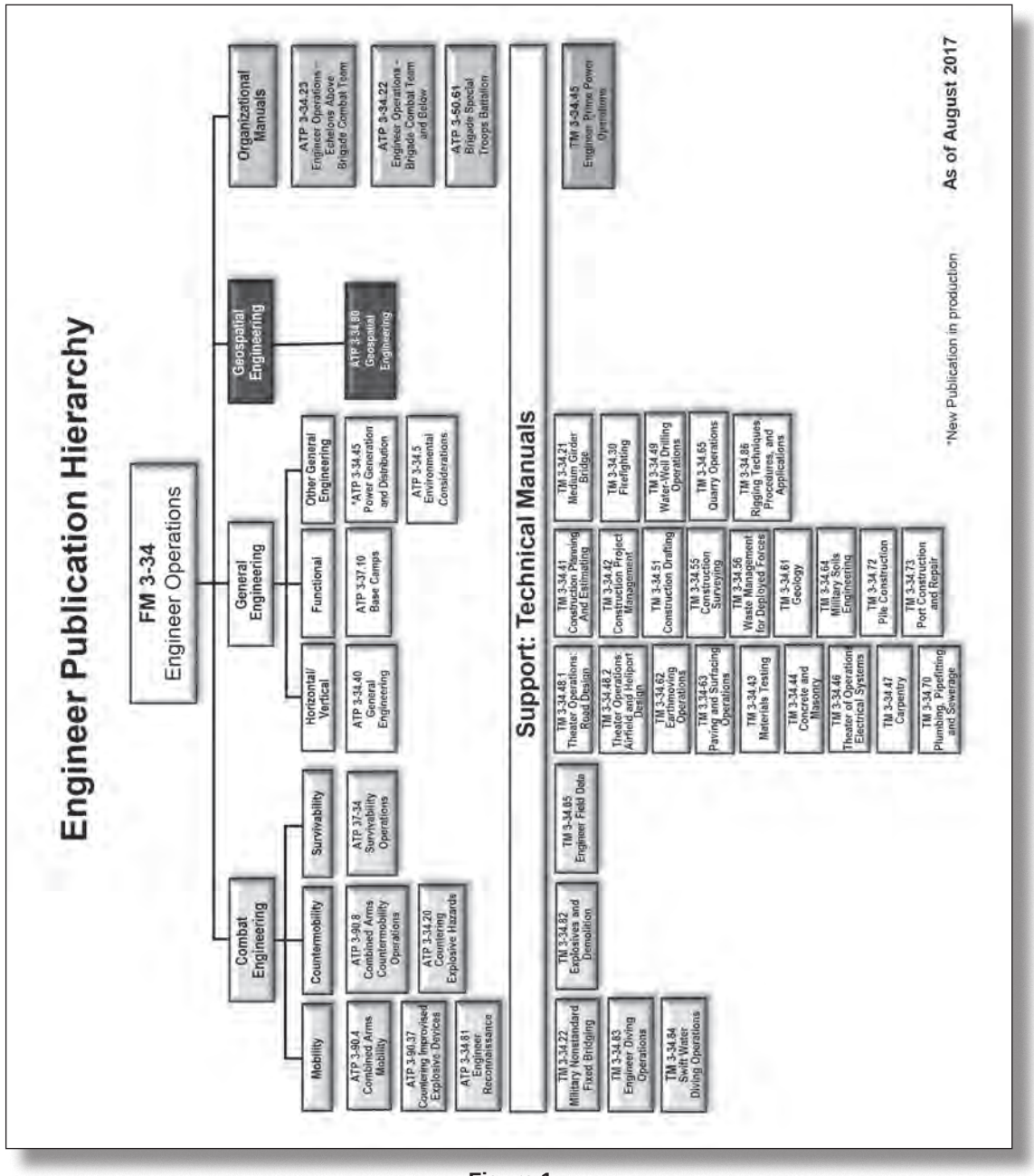


Figure 1

EGYPT AND ISRAEL
TUNNEL NEUTRALIZATION EFFORTS IN GAZA

By Mr. Lucas Winter

Over the past 15 years, the Egyptian Armed Forces (EAF) and the Israeli Defense Forces (IDF) have had limited success in interdicting movement across smuggling tunnels in Rafah, which is located between the Palestinian Gaza Strip and Egypt's Sinai Peninsula. These tunnels, many of which are rudimentary, are of various shapes and sizes and are used to transport small items. They are hard to detect from above ground, as they are often small enough or deep enough to neutralize detection methods. The simplest tunnels are big enough for a person to crawl through; many are big enough for two people to walk along side-by-side. Most are shored up with wooden supports; some are lined with wooden panels or even concrete. Goods are shuttled using mechanized pulley systems attached to canoe-shaped containers made from scrap metal. In larger tunnels, mining carts on rails are used for transport. Some of the Rafah tunnels are large enough for vehicles and livestock. The largest among them has been reported to be 30 meters deep and 3 kilometers long.

The most common access points to these tunnels are vertical shafts or egresses. When there is enough space, tunnels may also have larger, slanted entrances. The absence of technology to accurately identify or map rudimentary tunnels below a depth of about 10 meters means that neutralization attempts usually begin at tunnel entrances. Some entrance shafts lead nowhere; others are one of many replaceable access points to a tunnel network. Caving or cementing a tunnel shaft might block a particular tunnel branch, but it does not usually render an entire tunnel network inoperable.

Photos by the Israeli Defense Force

IDF paratroopers operate within Gaza.

Gaza Under Israeli Occupation

The modern history of the Rafah tunnels began in 1982, when Israel ceded control of the Sinai Peninsula to Egypt, as stipulated by the 1978 Camp David Accord. Israeli forces remained in the Gaza Strip, which had previously been occupied by Egypt. The border separating Egyptian-controlled Sinai from Israeli-controlled Gaza was demarcated by a 100-meter wide buffer zone running through the town of Rafah. Extended families owning land on either side of the new border were divided. Early smuggling was done through irrigation pipes linking the territory that was divided into Sinai (where the fields were) and Gaza (where the irrigation pumps were); restrictions on movement made the irrigation system obsolete, and the pipes were repurposed to smuggle lightweight, expensive goods such as gold, drugs, and spare parts for light weapons.

The 1993 Oslo Accords granted the Palestinians partial self-governance, but Israel retained full control over Gaza border crossings, airspace, and maritime routes. Israel claimed that shortly after the Oslo Accords, Gaza's Palestinian factions intensified their use of subterranean conduits to arm themselves. In 1994, Israel erected a security barrier around the Gaza Strip. The IDF monitored the Rafah border from atop a concrete wall some 30 meters behind the security barrier.

After 2000, Israel launched a campaign to demolish Rafah homes near the border and

establish a buffer zone. In May 2004, the IDF launched Operation Rainbow to destroy smuggling tunnels and to expand the buffer zone dividing Gaza from Egypt to about 300 meters. Operation Rainbow was triggered by an attack that killed five IDF soldiers along the border. The IDF sealed Rafah and deployed helicopter gunships, tanks, and infantry troops to various neighborhoods of Rafah. Armored bulldozers demolished homes in two Rafah refugee camps, amidst international criticism.

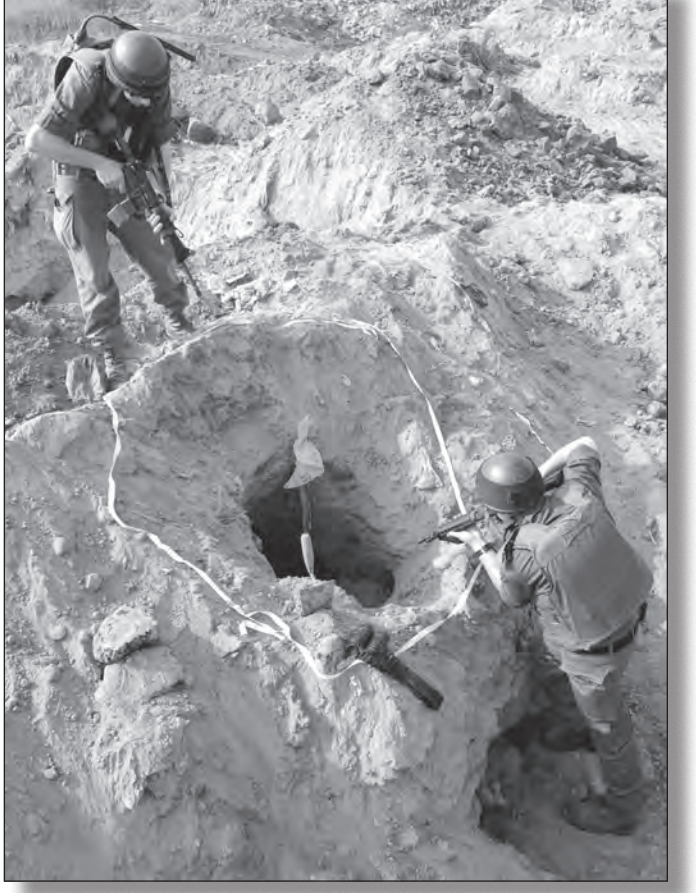
Israeli leaders had floated a plan to withdraw from Gaza several months before the launch of Operation Rainbow. In 2005, Israel withdrew all of its settlers and military positions from Gaza. The last Israeli forces withdrew from Gaza in September 2005, handing control of the Gaza side to the Palestinian Authority. The Egyptian side of Rafah was closed, allegedly for renovations.

In coordination with the Israeli withdrawal from Gaza, Egypt and Israel signed the Philadelphi Accord, named after the 13 kilometers of shared border between Egypt and Gaza in Rafah (the Philadelphi Route). The accord allowed Egypt to deploy a 750-man contingent of guards along the border in a part of Sinai that was to remain demilitarized. Israel retained full control over Gaza's seacoast and airspace, and cross-border traffic at the Rafah crossing was limited to people and that year's export harvest from Gaza. European observers monitored the crossing, and Israel had access to a live video feed. Materials entering Gaza from Egypt had to pass through the Israeli-controlled Kerem Shalom border crossing to the south, on the border between Egypt, Gaza, and Israel.

The Rafah crossing reopened in November 2005, with the Palestinian Authority in control on the Gaza side. Two months later, Hamas soundly defeated the Palestinian Authority party (Fatah) in the legislative elections. Low-level conflict for control over Gaza broke out between the two factions, and the Europeans tasked with monitoring the Rafah crossing fled due to safety concerns. They also left the Kerem Shalom crossing. Israel began implementing quotas on goods entering the Gaza Strip.

The Hamas tunnels came to the attention of global media in the summer of 2006, when Gaza gunmen used them to infiltrate an IDF position near Kerem Shalom. Two Israeli soldiers were killed, and one was captured. In response, Egypt indefinitely closed the Rafah border crossing. From that point forward, Hamas became inexorably linked to tunnels, whether they were tunnels used for smuggling in Rafah, military assault tunnels leading into Israel from Gaza, or defensive structures built beneath Gaza.

Once Hamas achieved full control over Gaza, they began "a program of industrial-scale burrowing underground" along the Rafah border.[1] Between 2008 and 2013, considered the "Golden Era of Tunneling," merchants and laborers in Gaza and Egypt became wealthy from cross-border smuggling. Local production limitations, combined with Israeli prohibitions, created high demand for items smuggled into Gaza. Disparities in prices and currency values meant that



Israeli Defense Forces find a tunnel near the Erez crossing.

Gaza's residents could afford a variety of products from Egypt, and smuggling became a multimillion dollar industry. The buffer zone Israel had created in 2004 turned into a warren of tarp-covered tunnel shafts. According to one calculation, there were nearly 2,500 tunnels beneath the Rafah border crossing, although that number likely refers to entrances or tunnel segments rather than actual cross-border passageways. An entire economy developed around the tunnel-smuggling business servicing the Gaza market. In Egypt, it extended well into the North Sinai capital of al-Arish, nearly 60 kilometers west of Rafah.

Egyptian Tunnel Neutralization Efforts

In December 2008, Israel launched Operation Cast Lead in Gaza. The offensive was largely aerial, and its targets included parts of Rafah. During this operation, the EAF took the lead in tunnel neutralization efforts, launching a campaign on its side of Rafah by plugging entrances with solid waste, sand, or explosives and flooding passages with sewage. The Egyptian government also committed to building a 25-meter-deep underground steel barrier to halt cross-border tunneling traffic. Even if it had been feasible, the project was ineffective. As one report notes, "Egypt cited logistical problems such as difficulties hammering steel plates more than four meters deep in stony ground. Tunnel operators cut through completed segments with blow torches, nullifying the multimillion dollar project for the cost of a few thousand dollars."[2] The plan was abandoned by 2012.

"Israeli and Egyptian forces have used similar methods to interdict Gaza's smuggling tunnels: installing underground barriers, digging water-filled moats, sealing tunnel shafts, and creating buffer zones."

EAF maneuvering space in North Sinai was constrained by the Camp David Accords and by the government's fraught relationship with local residents. Tensions and distrust between the government and local residents increased following the mass arrest of Sinai men in 2006 after a string of bombings in Sinai tourist areas. Egyptian security apparatus dominated government presence in the area. The Interior Ministry was among the biggest losers in the power reshuffle that followed President Hosni Mubarak's February 2011 resignation, and security forces in the North Sinai withdrew as soon as Mubarak resigned. Some Egyptian government operatives were chased away by local armed militias. The Supreme Council of the Armed Forces quickly filled Egypt's post-Mubarak power vacuum. Within weeks of the Mubarak regime overthrow, the council had deployed the army to reassert government control over North Sinai.

Security in North Sinai remained slippery for the rest of 2011, and the council gradually deployed additional troops and armored personnel carriers to the area. Mohammed Morsi was elected to Egypt's presidency the following summer. As a member of the Muslim Brotherhood, Morsi was on friendly terms with Hamas leaders on the other side of the tunnels. A mere 5 weeks after his inauguration, Morsi came under strong pressure to deal with the problem of the tunnels. On 5 August 2012, unknown assailants killed 16 Egyptian military and security personnel near the border. They then seized an armored personnel carrier and rammed it into the border gate and across into Israel, where they were eventually killed.

In response to the attack, the EAF launched Operation Sinai, which brought specialized troops, heavy armor, and attack helicopters into parts of Sinai that were still technically considered demilitarized. Egypt's national media greeted the operation with enthusiasm, though there was little evidence to back government claims of heavy, armed engagements. In Rafah, the EAF had been conducting sporadic tunnel interdiction measures since 2009. The frequency with which tunnel shafts were plugged, caved, or flooded may have increased during Operation Sinai, but the results of the measures were similar. According to some newspaper reports, EAF interdiction efforts created little more than a temporary nuisance to tunnel owners.

Poorly concealed, rudimentary tunnel shafts were most commonly targeted; bribery and difficulty in accessing the more sophisticated tunnels and their access points may have kept them safe. As with Israel's 2004 accounting system, collapsed shafts were likely counted as destroyed tunnels. In February 2013, an Egyptian court ordered the Morsi government to ramp up efforts to close all tunnels and illegal crossings into Gaza. Morsi's detractors accused him of blocking EAF antitunneling activities in deference to his Hamas allies. After Egyptian soldiers were temporarily abducted near the border in May 2013, Egyptian media clamored for stronger measures than the government was providing. In July 2013, Morsi was overthrown by a military-led coalition headed by Defense Minister Abdel Fattah al-Sisi.

The aftermath of Morsi's overthrow saw Egypt's ruling class enveloped by fear and hostility toward anything related to the Muslim Brotherhood, including Hamas. Tunnel interdiction activities were immediately ramped up, driven by fears that Hamas would seek to destabilize Egypt's new ruling coalition by smuggling in weapons and trained fighters via Rafah's tunnels.

In the summer of 2013, EAF engineers began demolishing houses adjacent to the border with Gaza. Open-source satellite imagery confirms that several structures near the border were razed. Online footage shows the demolition of a few of these structures. Some reports were quick to characterize the efforts as practically definitive. Yet the policy of forced displacement and home demolition near the border only severed the shortest branches of tunnel networks; furthermore, it came at high social and political cost.

Following Israel's 2014 Operation Cast Lead targeting Gaza, EAF tunnel interdiction efforts spiked again. Satellite imagery shows that shortly after the Israeli offensive began, extensive razing occurred on the Egyptian side. By then, EAF and state security personnel throughout North Sinai had come under regular attack by a network of armed Sunni insurgents calling themselves Ansar Bayt al-Maqdis, "The Supporters of Jerusalem." The group, which in late 2014 became the "Sinai Province" of the Islamic State of Iraq and Syria (ISIS), was eager to recruit from the ranks of bored, angry, and unemployed males who felt unfairly targeted by the military operation. Taking a page from the ISIS playbook in Syria and Iraq, they began a sustained campaign to kill government personnel and collaborators while targeting vulnerable security targets. In the summer of 2014, the group ambushed and executed 25 policemen, car-bombed the military intelligence headquarters in Rafah, and perpetrated other attacks.

In October 2014, Ansar Bayt al-Maqdis fighters killed more than 30 Egyptian soldiers. In response, Egypt deployed more troops and armor along the highway linking Rafah to the town of al-Arish. The Egyptian government declared a state of emergency in North Sinai and began demolishing additional homes in Rafah. Media reports described how the Egyptian military knocked on doors and gave residents 24 hours to vacate homes located 300 meters from the border. A total of 880 homes were required to be vacated to enforce a 500-meter-wide buffer zone. Egyptian authorities had proposed the 500-meter buffer zone the year before, but local leaders rejected the idea, arguing that it would unfairly

(continued on page 34)

THE ARMY ENGINEER OFFICER Brand

By Major Gaetano K. Simeti

During a February 2016 professional development briefing about career progression, Colonel Adam S. Roth, Deputy Chief of Staff for the Reserve Component at the 99th Regional Support Command, Joint Base McGuire–Dix–Lakehurst, New Jersey, noted that what was important was not *who you know*, but rather *who knows you*. To build a professional reputation, he advised officers to develop a personal brand. This prompted the question: What is the U.S. Army engineer brand? This article discusses the purpose of a brand, elements that contribute to the Army engineer brand, and elements that contribute to a personal brand. The conclusion contains recommendations for further study and concept development.

We examine the brand through the lens of the following description: "A brand is a promise to the market and a means to differentiate yourself from competition."[1] For Army engineers, our "market" includes commanders, Service members, civilians, and contractors within the U.S. Army. Our "competition" includes the U.S. Navy, U.S. Marine Corps, and U.S. Air Force. Our regimental brand promise is spelled out in great detail in Department of the Army (DA) Pamphlet (Pam) 600-3, *Commissioned Officer Professional Development and Career Management,*[2] and DA Pam 600-25, *U.S. Army Noncommissioned Officer Professional Development Guide.*[3] It could be argued that the Army engineer brand has already been established.

DA Pam 600-3 describes the Engineer Regiment as follows:

> *Purpose/mission of the Engineer Regiment.* The Engineer Regiment is a sub-profession of the larger profession of arms. It is a body of people—not just equipment or organizations—with a passion to serve as an engineer Soldier who embodies the Warrior Ethos and a technical set of skills. These technical skills set the Engineer Regiment apart via its unique services and knowledge that the Army needs to accomplish its missions. The purpose of the Engineer Regiment and its role within the U.S. Army is first and foremost to bring the three unique capabilities of combat, general, and geospatial engineering to support the overall efforts of the Army. Engineer warriors lead to serve ground forces: a regiment inspired to answer the commander's call.[4]

This institutional description exemplifies the pride that we take in being engineers and the difficulty that we have in communicating what we do. The description is also clearly aspirational rather than prescribed, and it offers a wide berth for determining how professional identity can be shaped and presented. Army engineers have the benefit of the highly visible and emotive aspects of the Engineer Regiment. For example, the Sapper tab immediately sends a nonverbal message of leadership and tactical skill, which is reinforced with the annual Best Sapper competition held during Engineer Regimental Week. Engineer Soldiers can see the fruits of their labor in the form of completed horizontal and vertical projects, which stand as a testament to their skill sets. In the geospatial realm, engineer experts can also see a finished product, albeit with slightly less emotional impact. When we consider the elements of the institutional descriptions in relation to our personal brand, we embark upon an exercise in identity acceptance and self-determination.

"For Army engineers, our 'market' includes commanders, Service members, civilians, and contractors within the U.S. Army."

The Engineer Regiment already does a number of things that promote the Army engineer brand. However, messaging has become a greater challenge due to the increased number and variety of communication platforms. A quick glance around a battalion or brigade headquarters reveals a plethora of professional journals such as *Engineer*, *The Military Engineer*, *Joint Forces Quarterly*, and other publications on display. The Facebook™ page for the Best Sapper competition gathers thousands of *likes*. The U.S. Army Corps of Engineers receives a lot of press coverage as a result of national events such as the construction of the Dakota Access Pipeline and the response to Hurricane Katrina. The Engineer Branch homepage on the U.S. Army Human Resources Command Web site provides a wealth of information about what Army engineers need to do to get ahead.[5] Taken individually, it is easy to see how engineers could have an identity crisis. Taken collectively and viewed through the lens of the Army engineer, however, it is easy to see why members of the Engineer Branch are regarded as jacks of all trades.

This corporate brand is what shapes ideas and identity within the Engineer Branch and throughout the military community. This corporate brand is inculcated into Army engineers through shared experiences, stories, and images.

A deliberate system of recognition and information shaping is necessary for the individual engineer brand to be embraced throughout the ranks. Some questions that could be explored for further development include—

- Beyond the broad strokes of DA Pam 600-3, what specified or implied tasks does an engineer officer need to be able to complete at different grades?
- What career counseling can be conducted for Soldiers who plan to stay in the Army for only one tour versus those who plan to make the Army a career?
- How can big data be used to develop career tracks for individuals?
- What recruitment techniques and incentives can be used to increase the number of degreed engineers in the Engineer Regiment?
- What mentorship programs can be established to groom and prepare officers for Broadening Opportunity Programs?
- What does the rest of the Army think an engineer officer is or should be?
- How should branding success be demonstrated or measured?
- How can social media best be leveraged?

Building a personal brand is no easy task. There is no definitive way to measure a personal brand, and events outside the individual's span of control can influence external perceptions. Recognizing that the goal of branding is to provide a "promise" to leaders, subordinates, peers, and outside stakeholders, further development of the engineer officer brand can help direct individual efforts and inform general expectations.

Endnotes:

[1]David Diamond, "What Is the Purpose of a Brand?" 12 January 2014, <https://www.quora.com/What-is-the-purpose-of-a-brand>, accessed on 7 June 2017.

[2]DA Pam 600-3, *Commissioned Officer Professional Development and Career Management*, 3 December 2014.

[3]DA Pam 600-25, *U.S. Army Noncommissioned Officer Professional Development Guide*, 11 September 2015.

[4]DA Pam 600-3.

[5]U.S. Army Human Resources Command, <https://www.hrc.army.mil/content/Engineer% 20Officer%20Welcome%20Page>, accessed on 12 June 2017.

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("Egypt and Israel," continued from page 32)

forcibly displace many people. A decree that was passed in 2014 delineated an area around much of Rafah, calling it the new buffer zone. Most of the town was to be relocated to "New Rafah," if and when the replacement town was built.

Attacks against the Egyptian military escalated in tandem with evacuations and demolitions in Rafah. In January 2015, a heavily fortified military base in al-Arish came under direct fire from militants. In September, the EAF launched its heaviest offensive in North Sinai, dubbed Operation Martyr's Right, after an attack that killed anywhere between a dozen and 100 Egyptian troops, depending on the source. There was much about the Egyptian operation that seemed driven by revenge rather than a strategic plan.

Operation Martyr's Right included a plan to create a moat by flooding a trench that had been dug near the border with some combination of seawater piped in from the Mediterranean Sea and freshwater pumped from the aquifer below. Local leaders had proposed the concept of a moat the year before as an alternative to the buffer zone plan. A moat had also been considered and abandoned by Israel 2004. In September and October 2015, the EAF pumped limited amounts of water into the deep trench they had dug along the border. The plan was criticized for the potential negative impact of the deep seawater canal on Rafah's aquifers. The main aquifer is at a depth of about 45 meters, which limits the depth of the tunnels. According to some reports, tunnel owners adapted by reinforcing their tunnels with concrete and/or metal to protect against humidity and to withstand pressure from above. Some reports claim that even the EAF's trial runs nearly brought tunneling to a halt, though it is unclear whether this was a temporary condition or a durable state of affairs.

The IDF and EAF have employed similar methods for interdicting Gaza's rudimentary smuggling tunnels, including installing underground barriers, digging water-filled trenches, sealing tunnel shafts, and creating buffer zones. These interdiction methods have all had political costs, and tunnel diggers have found relatively simple ways of circumventing them. As a result, tunnels are likely to remain a persistent feature of this and similar operational environments.

Endnotes:

[1]Human Rights Watch, "Razing Rafah: Mass Home Demolitions in the Gaza Strip," October 2004, <https://www.hrw.org/reports/2004/rafah1004/rafah1004full.pdf>, accessed on 7 July 2017.

[2]Nicholas Pelham, "Gaza's Tunnel Phenomenon: The Unintended Dynamics of Israel's Siege," *Journal of Palestine Studies*, Vol. 41, No. 4, 2011–2012, p. 6, <http://palestine-studies.org/jps/fulltext/42605>, accessed on 7 July 2017.

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Constructing Forward Landing Strip Warhorse

By Captain Joseph T. Barnhill

Leaders of the 46th Engineer Battalion (Heavy) began coordinating with the operations group and the G-3 engineer cell at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana, in July 2016, to construct a forward landing strip on Berry Drop Zone at Fort Polk. The organizations designed the landing strip—Forward Landing Strip Warhorse—to allow rotational units in combat training center exercises to launch and recover unmanned aerial systems, which were previously restricted to Fort Polk Army Airfield. The battalion tasked the 687th Engineer Construction Company to complete the project, which would provide a dedicated site for rotational units to access their unmanned aerial assets during all phases of JRTC operations.

A scraper emplaces a 3-inch lift of dirt for the base course.

The 687th Engineers used the forward landing strip construction as an opportunity to train and validate essential tasks critical to their mission to provide general engineering support to maneuver commanders in support of unified land operations. The battalion Headquarters and Headquarters Company worked closely with the 687th to draft the construction plans and provide survey support throughout the duration of the project.

Phase 1

Project execution occurred in three phases. Phase 1 began in mid-October and involved clearing and grubbing the area

The command post had a clear view of the construction site. The company operationalized the project in order to exercise mission command systems.

surrounding the landing strip. The 687th Engineers removed trees and shrubs to provide clear approach and takeoff zones for the aircraft and removed the organics from the topsoil. Soldiers from the Headquarters and Headquarters Company surveyed the area and emplaced grading stakes for the 60- by 1,000-foot runway and 10-foot shoulders.

October is typically a very wet month in west-central Louisiana, so proper site drainage was crucial to the success of the operation. The company removed an old stockpile of sand, which was overgrown with vegetation and impeded downhill water flow, to create positive drainage off the landing strip. Next, the unit reshaped the ground surrounding the runway to tie in with a draw on the northern side of the project site, which provided natural drainage for the area.

Phase 2

Phase 2 involved grading and compacting fill material to bring the landing strip to within 6 inches of the final grade. The 687th Soldiers cut material from the surrounding area to ensure positive drainage, which continued to be a concern. Heavy-equipment operators used scrapers to cut and spread the in situ material in 6-inch lifts to create the base for the runway. Soldiers followed with high-speed soil compactors, and surveyors tested compaction to ensure that the fill material had properly settled.

Haul operations occurred simultaneously with the landing strip base construction. Operators hauled 1,400 cubic yards of select grade material from an area near Geronimo Drop Zone, 14 kilometers away, to emplace a 6-inch surface course that was compacted to a 15 percent California bearing ratio, an expression of the strength of a surface evaluated by a penetration test. The 687th Engineers, with assistance from the equipment platoon of the 509th Infantry Battalion, conducted 24-hour haul operations to bring adequate select grade material on site for Phase 3.

Phase 3

Phase 3 began when the landing strip was within 6 inches of final grade and the select grade material was in place. Soldiers graded and compacted the select course fill over the base to bring the landing strip to final grade. The 687th Engineers used a hydraulic excavator to load 10-ton dump trucks with the select grade material. The material was spread in 4-inch lifts, which operators then graded and compacted with a smooth-wheeled vibratory roller. Soldiers used palletized load system-mounted water distributor modules to ensure that the fill was moist enough to meet compaction requirements. Surveyors verified that the select grade exceeded a California bearing ratio of 15 percent and that the longitudinal and transversal slopes were within U.S. Air Force specifications.

Engineers improved drainage and access to the site, while others finished the final grading and compaction. Soldiers emplaced V-ditches to the north and south of the runway to tie in with a creek, which was part of the natural drainage. The rock crusher attachment of the hydraulic excavator

A high-speed compactor and vibratory roller compact the base course.

The select grade is compacted.

created rip-rap to be emplaced to protect the ditches from erosion. The unit constructed a combat trail on the northeast side of the landing strip to provide rotational units with an access road leading up to the landing strip. The company completed work on 23 November 2016 and then signed the site over to the JRTC Operations Group.

Forward Landing Strip Warhorse was the first construction project conducted by the 687th since it transformed from a horizontal company to an engineer construction company. The project represented an opportunity to refine systems, techniques, tactics, and procedures, accounting for the change in the unit table of organization and equipment. There were several lessons learned that were not only applicable to engineer construction companies, but also to formations across the Engineer Regiment.

Lessons Learned

Working with the equipment platoon from the 509th Infantry Battalion taught 687th Engineer leaders a valuable lesson in effectively managing engineer forces. As the current force structure continues to stress the need for interoperability between brigade engineer battalions and engineers in echelons above brigade, it is increasingly vital to efficiently manage various types of engineer units. The equipment platoon of the 509th Infantry Battalion has a different mission set than the 687th, so engineer leaders were required to identify their capabilities and determine the most effective way to use them to accomplish the mission. Recognizing the need to maximize the efficiency and capabilities of engineer forces is a lesson that will pay dividends whenever a unit is called upon to build, breach, or bridge.

Another valuable lesson, especially for the younger Soldiers working on the project, involved conducting field maintenance. Operations at Forward Landing Strip Warhorse marked the first time that many of the Soldiers had performed preventative maintenance checks and services outside of a motor pool environment. They learned the value of preventive maintenance and, through repetition, improved their ability to troubleshoot and remedy faults to keep equipment fully mission-capable. This was extremely important for low-density equipment such as the vibratory roller, which was crucial to mission accomplishment. During the course of the construction project, Soldiers realized that preventive maintenance is not just a mundane task to be performed every Monday, but is a vital part of the daily battle rhythm that ensures mission accomplishment.

The construction project provided the 687th Engineer Construction Company with excellent training in preparation for its mission to provide general engineering support to maneuver commanders in support of unified land operations. Officers, noncommissioned officers, and Soldiers benefited from planning, resourcing, supervising, and executing the project. The forward landing strip gave Soldiers and leaders the opportunity to validate and refine project management systems and processes while also saving the Army approximately $224,000 in labor costs. The landing strip is a training facility that will benefit JRTC rotational units for years to come.

Captain Barnhill is the commander of the 687th Engineer Construction Company, 46th Engineer Battalion, 20th Engineer Brigade, Fort Polk. He holds a bachelor's degree in Russian from the U.S. Military Academy–West Point, New York.

Photo courtesy U.S. Army Communications-Electronics Research Development and Engineering Center

Incorporating Electronic Attack in Breaching Operations

By Major Michael P. Carvelli

Combined arms breaching is a complex task that requires the skillful application of fire and maneuver to identify and reduce enemy obstacles. It is one of the pinnacles of military engineer operations. Extensive training is required to execute a successful breaching operation. To be sure, almost every weapon system is employed in the operation, from small arms to infantry fighting vehicles and tanks to artillery and aircraft. However, many breaching operations fail to incorporate electronic warfare (EW) systems. If breaching operations were to include EW systems, then they would be more successful.

Breaching is a synchronized combined arms operation under the control of a maneuver commander.[1] Successful obstacle breaching depends on the combined arms battalion effectively applying the following breaching fundamentals:

- Suppress.
- Obscure.
- Secure.
- Reduce.
- Assault.[2]

The first fundamental, suppress, occurs when units use direct and indirect fires to protect friendly forces. When enemy forces are present near an obstacle, friendly units must effectively suppress the enemy before the obstacle can be reduced. EW systems increase the ability of friendly units to effectively suppress the enemy.

Multi-Domain Battle

EW involves the use of electromagnetic and directed energy to attack the enemy or to control the electromagnetic spectrum.[3] Electronic methods of attack enlarge a commander's breadth of suppressive tools for use in breaching operations. Electromagnetic jamming is the deliberate radiation, reradiation, or reflection of electromagnetic energy to prevent or reduce an enemy's effective use of the electromagnetic spectrum. The electronic attack task increases effective suppression in a breach; jamming is intended to degrade or neutralize the enemy's combat capability, effectively denying the enemy its ability to communicate. Although the incorporation of EW in land operations is not new, it is consistent with the U.S. Army Training and

Doctrine Command Capabilities Integration Center Multi-Domain Battle Concept.

The Multi-Domain Battle Concept calls for ready ground combat forces that are able to outmaneuver adversaries through extension of combined arms across all domains.[4] Integrating EW capabilities in breaching operations exemplifies this concept in several ways. First, Army units must integrate joint EW platforms in all operations in order to achieve objectives. Using airborne and ground EW assets to support breaching operations expands the means available to effectively suppress the enemy. Next, adding EW capabilities creates and exploits temporary windows of advantage, to include anti-access and aerial denial environments. These temporary windows of superiority allow friendly units to quickly achieve objectives. Finally, EW capabilities provide flexible means to seize, retain, and exploit the initiative by presenting the enemy with multiple dilemmas. Disrupting the enemy's decision-making cycle this way allows friendly units to gain advantages. The addition of EW as an element of offensive fires adds to the existing complement of fires in Army organizations.

Organization

Brigade combat teams, brigade engineer battalions, and maneuver battalions already possess EW personnel within their organizations. The brigade combat team headquarters includes an EW element consisting of an EW officer, an EW technician (warrant officer), three EW noncommissioned officers, and a spectrum manager.[5] A battalion has a single EW representative—a noncommissioned officer—on its staff with responsibilities that include—

- Integrating EW into the battalion planning process.
- Submitting airborne electronic attack requests.
- Coordinating with the brigade combat team EW element.
- Coordinating with airborne EW assets to provide situational awareness, including actions on the desired target.[6]

These existing EW organizations provide the conduit through which EW assets must be included in combined arms breaching operations.

Organizations conducting breaching operations must include their EW elements in staff planning. There are several reasons for this requirement. First, there are a limited number of EW assets available across the joint force. Ensuring that the need is correctly identified and requested early allows reaction and planning time for available assets. Next, intelligence collection requirements might increase, depending on the effect needed during the breaching operation. Each EW asset requires detailed information to deliver appropriate effects on the target. Finally, EW must be included throughout the planning process as asset availability and target effects change. Existing EW elements can adapt to changing situations only if they are included throughout the process.

Considerations

When reviewing battalion EW noncommissioned officer duties and responsibilities, most of the tasks listed are focused on counter radio-controlled improvised explosive device electronic warfare (CREW) systems. These tasks have shaped EW as an element of protection, not fires. Incorporating EW into the suppressive fires portion of a breaching operation is not the norm. However, including EW systems begins to achieve the end state laid out in the Multi-Domain Battle Concept. Employing EW within suppressive fires provides a credible capability to overcome enemy anti-access and aerial denial, secure terrain, and defeat enemy forces.

Existing EW elements are adequately staffed to provide the necessary capability for planning efforts. However, ground-based EW systems may not exist or be as effective as needed. Incorporating EW in breaching operations will expose shortfalls in doctrine, organization, training, materiel, leadership and education, personnel, and facilities. Achieving the end state laid out in the Multi-Domain Battle Concept requires new ideas and the rebirth of old ones.

Ground EW systems cannot be solely focused on CREW systems. Instead, a full complement of EW platforms must be used to battle current and emerging threats. Engineer operations require EW systems to achieve greater levels of success. Countering improvised explosive devices requires EW systems to enhance protection, and CREW systems have shown their value time and again in Operation Enduring Freedom and Operation Iraqi Freedom. Imagine how an offensive EW system mounted on an armored breacher vehicle or Bradley infantry fighting vehicle could suppress enemy communications at the point of the breach. Disrupting enemy communications degrades the enemy ability to employ fires and maneuver units. Surely, incorporating electronic attack systems makes engineers more lethal at the point of the breach.

Endnotes:

[1]Army Training Publication 3-90.5, *Combined Arms Battalion,* 5 February 2016.

[2]Ibid.

[3]Army Training Publication 3-36, *Electronic Warfare Techniques*, 16 December 2014.

[4]U.S. Army Capabilities Integration Center, *Multi-Domain Battle: Combined Arms for the 21st Century*, <http://www.arcic.army.mil/App_Documents/Multi_Domain_Battle.pdf>, accessed on 31 July 2017.

[5]ATP 3-36.

[6]Ibid.

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Truck Bombs and Standoff:
Using Blast Modeling for Installation Threat Management

By Lieutenant Colonel Clarence B. Kemper III

It may be an unpleasant reality, but a search point is also a kill zone. Whenever an improvised explosive device (IED) is discovered—in a vest or a vehicle—that is where someone will try to detonate it. Entry control points (ECPs) and other checkpoints must be located and designed as part of a comprehensive defensive perimeter and must be adapted as threats change. There are numerous examples of ECPs that were designed to accommodate traffic flow, assure the comfort of the searchers, improve the lighting, reduce the overall footprint of the site, or meet any number of secondary design criteria but neglect the primary function: to detect a large explosive weapon and prevent it from entering the perimeter.

The enemy analyzes a base and its defenses. Any location outside the secured perimeter is a threat. A long, serpentine approach to the ECP is irrelevant if there is a regular traffic flow directly adjacent to an installation perimeter. Enemies choose where to attack. They probe to find the weaknesses.

The U.S. Marine Corps barracks area in Beirut, Lebanon, was destroyed by a 20,000-pound trinitrotoluene (TNT)-equivalent blast in 1983 after a truck crashed through a checkpoint. In 1996, the Khobar Towers in Saudi Arabia, housing U.S. military, was hit with 22,000 pounds of explosives that were detonated from an access road. The perimeter of the U.S. Embassy in Baghdad, Iraq, was breached in 2005 by a garbage truck smashing through concrete barriers, then detonating to kill three and wound 30. In 2013, a truck bomb breached the perimeter at Forward Operating Base (FOB) Ghazni, Afghanistan, opening the way for a dozen enemy fighters to attack. Domestically, we have a history of vehicle bombs that stretches back from the Wall Street bombing in 1920, which killed 38 and injured 143 in New

Photo by Lieutenant Colonel Clarence B. Kemper III

Refueling facilities for helicopters like the UH-60 Blackhawk above were part of the expansion that made FOB Gardez a significant target.

York City; the World Trade Center attack in 1993; to the 1995 bombing of the Alfred P. Murrah Federal Building in Oklahoma City. Intelligence shows that these events are studied by our present-day adversaries.

Sometimes the defenders get lucky. In November 2013, a truck transporting 61,500 pounds of liquid homemade explosives was intercepted by Afghan security forces in Paktia Province, making international news. The driver attempted to detonate the explosive but was shot and wounded. The target was Gardez City. The estimated potential explosive yield was 40,000 pounds of TNT. After reviewing the roads near the regional bases, FOB Gardez was quickly closed because it was only 20 to 50 meters from a four-lane civilian highway. Blast analysis showed that the proximity to the road endangered the majority of the FOB personnel and facilities. The FOB was eventually razed.

Getting Left of the Boom

Form dictates function. Design matters. And design determines the engagement area. Successful security becomes progressively detailed. In the notional FOBs in Figures 1, 2, and 3 (pages 44-45), the location of the outer ECP is based on the design threat. It's where defenders prefer an IED go off rather than inside the base. Similarly, the cooldown yard is situated for the design threat. While it is impossible to absolutely prevent weapons or explosives from being smuggled in, searches at ECPs reduce the threat (see Figure 1).

Standoff distance is critical with explosive hazards. It is not just the size of the shot that creates danger; distance from the shot is also crucial. Blast effects decrease at the rate of the distance squared. For example, blast effects are reduced to one-quarter if the distance between blast and target is doubled. Double that distance again, and the effects are reduced to one-sixteenth. The advantage of blast as a weapon is that it goes over and around barriers and inside buildings. Blast can also cause injury and death through secondary effects, such as building collapse or the generation of window shards.

Blast fragments, on the other hand, travel until they strike something. The maxim is, "If you can see the shot, the fragments can see you." In cased explosives such as artillery shells, 10 to 15 percent of the overall weight is typically used for explosives in order to maximize shrapnel, which is the most efficient casualty-producing mechanism. Suicide vests are often augmented with nails or other items to expand the lethal range of the blast. Primary fragments are those that are part of the shell or device. Secondary fragments consist of gravel, concrete, glass, and other objects propelled by the blast, and they can be as deadly as shrapnel. The threat is normally calculated in terms of blast and fragment radii. However, it can also be estimated in terms of volume of explosives. That volume becomes a critical size for search crews to look for.

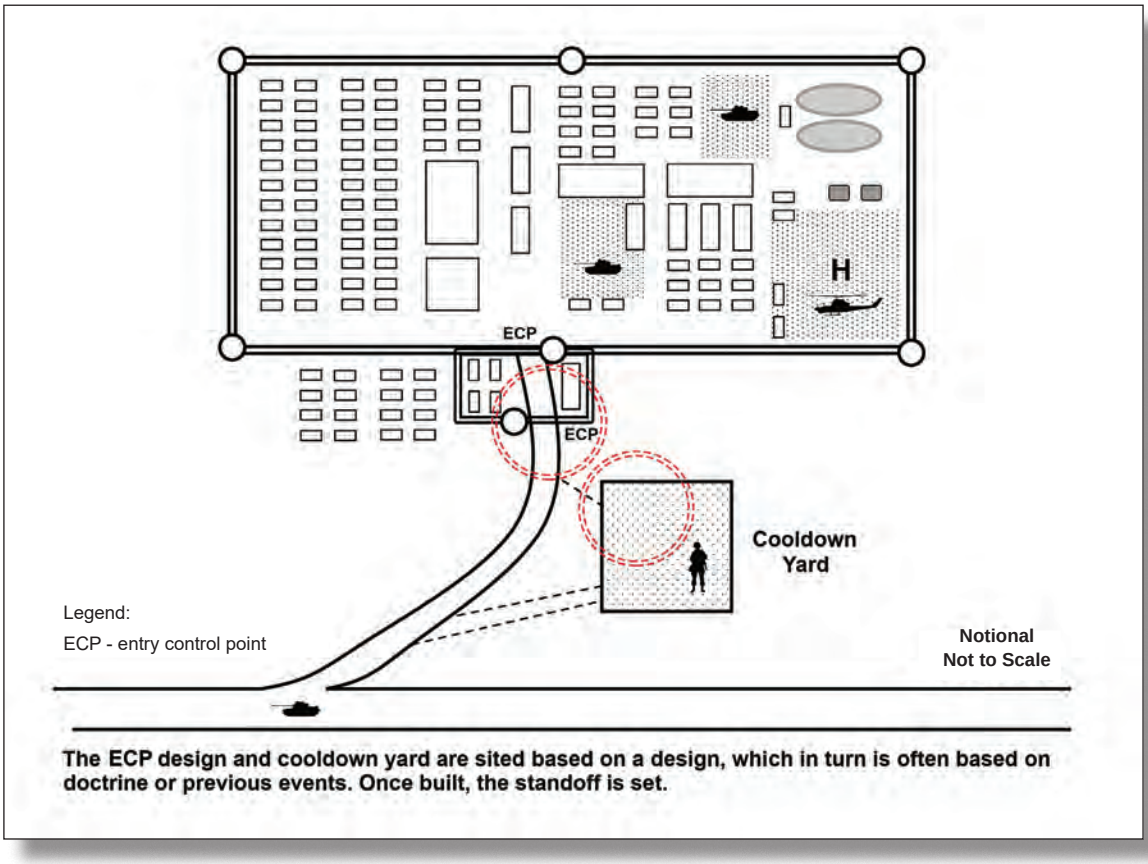


Figure 1. FOB 1

An effective ECP can be constructed after calculating the largest shot that can be concealed at that point in the security process. Initial searches take place outside the perimeter where larger threats are sought. Searchers at each successive point look for progressively smaller threats. When the net explosive weight (without casing, packaging, or projectiles) is less than or equal to the ECP design threat explosive weight, the blast and fragments created by suicide vests or vehicle-borne IEDs can be stopped by protective structures such as HESCO Bastion Concertainers® or concrete T-walls. If the protective structure design of an ECP cannot withstand a shot based on the volume allowed in the previous search, either the ECP or the search needs to be revised. Searches at the final ECP are the last chance to detect and stop a mass-casualty threat so that it does not enter the base.

Using Better Tools, Achieving Better Solutions

Blast analysis is the key tool in determining the *critical size* of the shot with respect to the *terminal effects*, or how much damage a specific weight of explosives can create given the location, structures, and explosive materials. The critical size is the threshold weight of explosive in a given location that overcomes the specific protective measures. The critical size, in turn, is used to determine the *critical volume* of the explosive device. If the explosive weight of the shot is known, the density of the explosive material dictates how much space it occupies. The *critical volume* refers to the physical dimensions the explosive material must occupy in order to be a critical shot. The same explosive material in the same location in a smaller package has less explosive weight and cannot overcome the protective measures. These figures set up the necessary search parameters. A decade ago, computer programs only calculated the *doughnuts of death,* or the circles of various hazard severity, based on theoretical blast effects on a flat, open field. They did not address the way that protective structures or terrain change blast effects or describe the vulnerability of specific structures and construction types. The programs could not determine the effectiveness of protective structures and the resulting reduction in casualties. They were intended to provide a fast, simple hazard distance to troops who have no engineering experience.

Better tools are available. The U.S. Army Corps of Engineers Protective Design Center (PDC) provides references, software tools, instructional information, and training for engineering issues concerning protective structures, blast mitigation, designs to protect from indirect fire, entry control point design, and other issues.[1] These tools require detailed input.

As with any hazard assessment, site analysis is critical. Gathering data for blast analysis is similar to an engineer reconnaissance of a minefield; combat engineers return with full composition, breach sites, and bypasses, while nonengineers come back with a vague circle labeled "minefield." An analysis is only as accurate as the data input. An experienced construction commissioned or noncommissioned officer can work with the PDC to learn how to use those better tools or provide enough detailed engineering information to the PDC for reachback assistance with the tools.

One of these tools is ConWep, a collection of conventional weapons effects calculations that allows users to calculate blast effects and ballistic penetration for specific materials and thicknesses. It can model specific artillery shells, uncased explosives, and specific bullets and velocities. Another is Antiterrorist Planner for Bridges©, which assists in bridge-specific protection and assessment. The most advanced tool associated with the PDC is the U.S. Government program Vulnerability Assessment and Protection Option (VAPO). The program requires gaining access through the Defense Threat Reduction Agency. It allows users to model large, complex buildings and small, simple structures such as Southeast Asia huts and tents. It accounts for structural shielding such as blast walls and bunkers and has a primary fragment program. Terrain files, which can be critical in places such as Afghanistan, can also be imported.

Commercial packages are available. Most are designed for commercial blasting needs and do not translate well to force protection applications, but some apply to military situations as well as blast events in industrial facilities. 3D Blast© from Applied Research Associates can evaluate 3D blast effects on nine preset building designs. ExDam®, by Breeze Software, models blast and effects on structures. Breeze Software has related software that models fire, fuel-vapor explosions, and chemical releases.

Addressing Design Hazards

Engineers use building codes to systematically develop safe and reliable structures. Codes require addressing design hazards such as wind and snow loads. They are assessed based on historical data. The design threat is also determined based on historical data. Ideally, the assumed threat is communicated to the FOB mayor cell.

In Figure 1, the blast design threat is shown by the red circles. Fragments can be stopped by structures, but standoff is needed to mitigate blast. Standoff requirements are used to position the cooldown yard and determine the distance needed between the outer and inner ECPs. Enemy threat, however, is adaptive. Once the walls are set, the enemy can attempt to gauge what is needed to breach them. The locations of the ECPs are the same—the first checkpoint leads either into the FOB or into the cooldown yard. The enemy task is to determine the size of the shot needed to defeat the existing standoff. This is explained in Figure 2.

Establishing a new checkpoint farther from the FOB can push out the first enemy contact and reduce the subsequent threat. Progressing toward the FOB, each checkpoint features more detailed searches and increased use of technology and resources.

Figure 3 shows three checkpoints. The purposes of the first are to divert traffic to the cooldown yard and conduct a quick inspection for large items. This is followed by searches at the outer and inner ECPs. The initial checkpoint is intended to

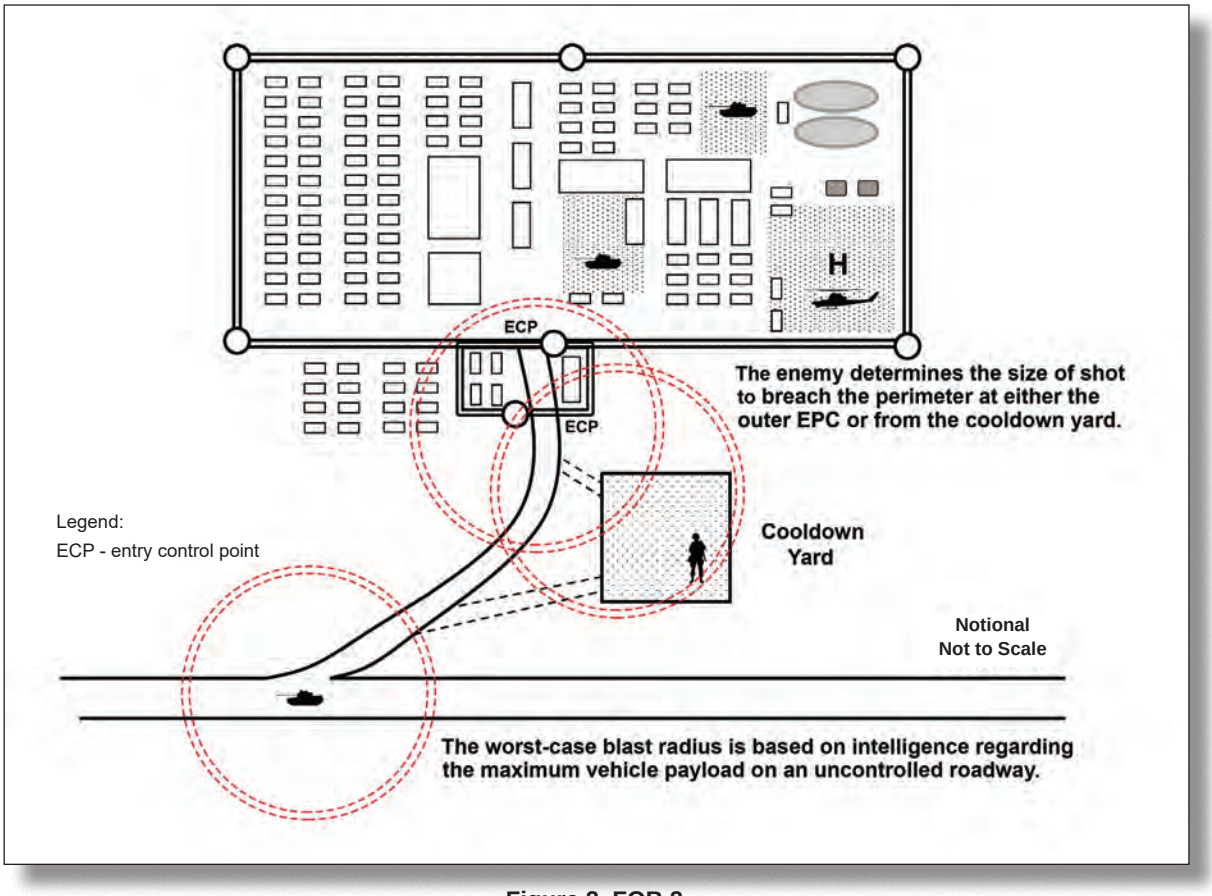


Figure 2. FOB 2

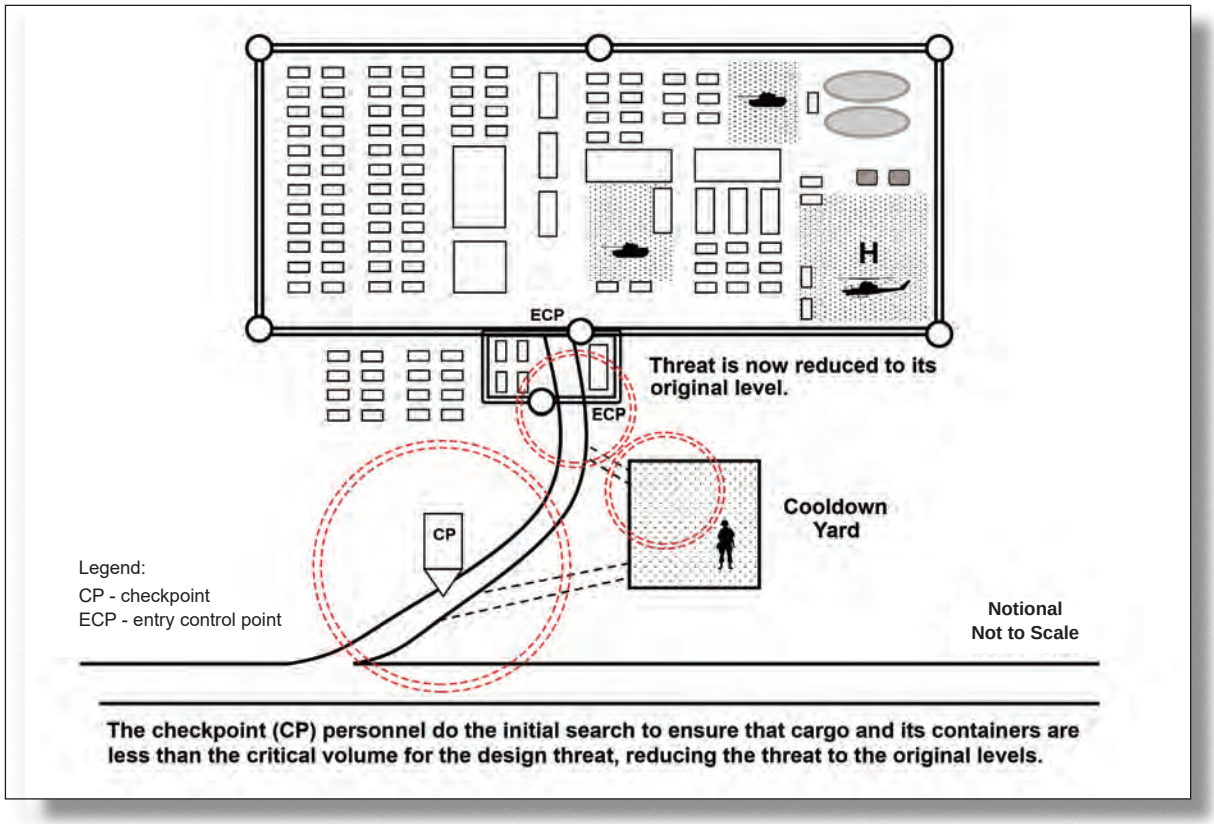


Figure 3. FOB 3

reduce the residual threat to the original design parameters. The friendly task is to properly place the checkpoints with appropriate search criteria and resources, especially if the outer checkpoints are controlled by host nation or third-nation troops. No matter how many checkpoints are established, the first will engage the largest, most dangerous threat.

Getting Inside the Decision Cycle

Actions at FOB Gardez revealed how to get ahead of the enemy decision cycle. Blast analysis showed that FOB Gardez needed to be closed in response to the new threat. The original intent of FOB Gardez was to serve as a small provincial reconstruction team base. These are typically intended to be austere and in close proximity to a city to build relations with the community. This makes the location inherently unsafe with respect to a vehicle-borne IED attack. Higher risk is often assumed in such cases since a major attack would only harm those assisting the local area. The loss of the base would not directly impact the security of United Nations forces.

"Blast analysis is the key tool in determining the critical size of the shot with respect to the terminal effects, or how much damage a specific weight of explosives can create . . ."

Years after the base was constructed, the provincial reconstruction team was gone and the base had expanded in size and intent. The assets included artillery; intelligence, surveillance, and reconnaissance assets; helicopter refueling facilities; a mail office; and even a small post exchange. It had become a more significant target and was less connected to the local population. While the restricted approach to other bases gave some measure of warning, a truck bomb on the highway close to FOB Gardez would provide no warning.

In engineering terms, this would be a "single mode failure," where only one thing must go wrong to create catastrophic effects with no opportunity to mitigate the results. In this case, it was a truck bomb on a main supply route that could take out the region's quick-reaction force, artillery overwatch, and a rotary-wing refueling point. Henry Petroski's book, *Design Paradigms: Case Histories of Error and Judgment in Engineering,* explains this common failure mechanism evolution from "safe" to "unsafe."[2] An original design is heavily analyzed and well understood. The design is modified over time; and subsequent changes are made, assuming that reevaluation is not needed. The original assumptions and constraints are not passed forward. Eventually, the new design extends past the original assumptions and fails. Fortunately, the lesson of FOB Gardez was paid for only in treasure—not blood.

Bases evolve over time in response to mission requirements and enemy threats. A lot of information goes into base camp development. Communicating engineering constraints and force protection vulnerabilities is important. Military engineers can support the process by translating the key engineering aspects to friendly forces information requirements and commander's critical information requirements for the mayor's cell, the base defense operations center, the operational environment owner, and others as appropriate.

This is the *warn* aspect of risk mitigation—warn the user of the residual risks that cannot be eliminated by design. It is not possible to eliminate all risks, particularly in a combat zone. For protection from truck bombs, the terrain around a base, together with barriers and ECPs, constrains vehicular approaches. Blast analysis determines the threshold distance for the payload volume of a given size of vehicle. This becomes a defensive planning factor, which can be calculated for protecting purpose-built bases and existing facilities.

Expeditionary operations require the assumption of risks. Whether considering the rapid occupation of existing facilities or the development of purpose-built basing, engineering is needed to proactively determine the various vulnerabilities present and develop mitigations for them. Blast analysis is just one tool to develop these mitigations. Failing to mitigate blast-related threats can be catastrophic to the people on the base and the missions the base supports.

Endnotes:

[1]U.S. Army Corps of Engineers PDC, <https://pdc.usace.army.mil/>, accessed on 2 August 2017.

[2]Henry Petroski, *Design Paradigms: Case Histories of Error and Judgment in Engineering*, Cambridge University Press, Cambridge, United Kingdom, 27 May 1994.

Lieutenant Colonel Kemper is the commander of the 475th Engineer Detachment, a U.S. Army Reserves explosive hazards coordination cell with the 412th Theater Engineer Command. He is a professional engineer, a consulting professional engineer, and a board-certified forensic engineer. His practice includes modeling blasts and predicting structural response.

("Lead the Way," continued from page 5)

Finally, I look forward to visiting as many units as possible in the next few months to see what great things are happening out there in support of the rest of the military force.

Essayons!

Endnotes:

[1]Army Regulation 600-82, *The U.S. Army Regimental System*, 5 June 1990. (Status: Inactive.)

[2]Army Regulation 870-21, *The U.S. Army Regimental System*, 13 April 2017.

[3]Army Regulation 670-1, *Wear and Appearance of Army Uniforms and Insignia,* 25 May 2017.

[4]Department of the Army Pamphlet 670-1, *Guide to the Wear and Appearance of Army Uniforms and Insignia,* 25 May 2017.

Best Practices for Engineers: A Blackhorse Perspective

By Captain Dominic A. Senteno

The operations of rotational units and the 11th Armored Cavalry Regiment were observed throughout 22 rotations from 2014 to 2016 at the National Training Center (NTC), Fort Irwin, California. The use of available engineer assets during those rotations varied with each unit and with the rotational design. This article discusses some of the common lessons learned, considers the use of combat and general engineering support, and highlights the best practices used to enable the engineers to support their maneuver units to their utmost ability.

Engineer duties were to—

- Establish security for engineers.
- Maintain observation over obstacles.
- Use and synchronize the following SOSRA fundamentals of breaching:
  - Suppress.
  - Obscure.
  - Secure.
  - Reduce.
  - Assault.
- Establish and publish priorities for engineer support.
- Use engineer reconnaissance.

The Engineer Branch is remarkably diverse, which makes it capable of completing almost any task. The most common engineer units that are integrated with maneuver elements fall into the disciplines of combat engineering or general engineering. As highlighted in Joint Publication 3-34, *Joint Engineer Operations*, combat engineers "directly support the maneuver of land combat forces," while general engineers are those who "provide infrastructure and modify, maintain, or protect the physical environment."[1] By doctrine, engineers can be used in a myriad of ways. During offensive operations, they provide support by breaching obstacles, deploying demolitions, constructing combat roads, supporting mobility, conducting reconnaissance, and providing horizontal construction. During defensive operations, engineers provide support by placing mines and munitions, hardening facilities, constructing obstacles and positions, and supporting countermobility and survivability. As providers of maneuver support, engineers play a unique role that is not completely committed to direct contact with the enemy but enhances the ability of maneuver elements to engage with and destroy the enemy. This is accomplished by tasking engineer elements to support specific units directly or to support units in a general area.

Most of the rotations required units to conduct offensive and defensive operations. During these operations, it was necessary to include engineers in planning and execution. The best method observed for emplacing or reducing obstacles was through the forward deployment of reconnaissance and security assets (with local security provided by a maneuver force) while the engineer element emplaced or reduced an obstacle. However, some units found themselves pushing the engineers forward ahead of the security elements. The lack of a security force left the engineer elements vulnerable to direct and indirect fires, which significantly impacted their effectiveness. Other elements provided engineer units with their own avenue of approach or engagement area without the direct or indirect support necessary to defeat enemy capabilities.

The most successful obstacles were those that were integrated into an engagement area. This is because for an obstacle in an engagement area, there are multiple observers and many methods of engaging the enemy. Some units constructed obstacles in areas without observation, and an obstacle without observation is not an obstacle in the true sense of the term. Without observation, there is no way of confirming that an obstacle is achieving its desired effect. This may seem obvious, but it is a challenge for units that want to deny multiple avenues of approach to the enemy, primarily because the units lack the combat power to support the scale of their plans. A practice that has proven successful in defense is the use of observation posts, with personnel drawn from scout or reserve forces.

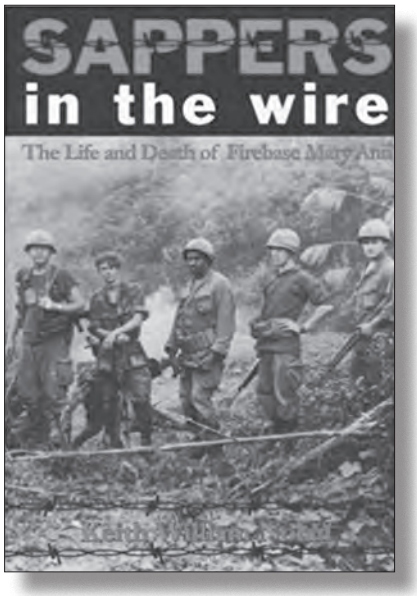
The most successful combined arms breaches occurred when units synchronized their SOSRA drills, supported by the triggering events, staff, and tempo of the operation. The synchronization of the SOSRA drill is supported by the conditions set and the triggers for each phase of the breach, the facilitation and coordination of assets for the operation by the staff, and the ability to remain flexible to the ever-changing tempo of the operation. The units used reconnaissance elements to establish indirect fires, which did not cease as the elements built screens with smoke generators.

(continued on page 48)

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.



Sappers in the Wire: The Life and Death of Firebase Mary Ann, by Keith William Nolan, Texas A&M University Press, 29 October 2007, ISB-10 1585446432

Reviewed by Staff Sergeant David Allen

Under the concealment of heavy fog on the night of 27–28 March 1971, North Vietnamese sappers infiltrated Fire Base Mary Ann, an outpost occupied by the 1st Battalion, 46th Infantry Regiment, in the middle of North Vietnamese Army territory. The sappers quickly overran the outpost, lobbing grenades and charged satchels into structures before friendly forces had time to react. By the time the attack ended, 30 U.S. Soldiers had been killed and 82 wounded. The unit, still stigmatized by the My Lai Massacre just a year before, saw careers up and down the chain of command ruined as a result of the raid. Leaders at all levels were blamed for the complacency that had allowed the assault to succeed.

In *Sappers in the Wire,* the author, Keith Nolan, relives the night of the attack and recounts the failings that led to the defeat. He relied on official documents and personal journals and letters and conducted extensive interviews with dozens of survivors to record an accurate account of what happened that evening and to describe the situation at the installation in the months before the attack.

The attack occurred as American forces were beginning to withdraw from Vietnam and, as Nolan notes, deployed forces were fragmented. Soldiers, aware of the drawdown, were resentful at risking their lives for what was perceived as a lost cause. Racial tensions were also increasing throughout the Army. Drugs and alcohol were cheap and easy to procure. Career Soldiers were looked at with disdain by draftees, and officers and noncommissioned officers who tried too hard to enforce standards risked being shot or fragged by their own troops in garrison. It wasn't unheard of for individual Soldiers—or entire squads—to refuse orders to go out on patrol.

Despite that, the U.S. Soldiers built up an impressive record outside the wire, with patrols aggressively clearing trails, fighting off ambushes, and uncovering weapons caches. Soldiers earned several medals in the process; but back at the fire base, Nolan reports that Soldiers and leaders alike maintained a relaxed attitude, particularly toward base security. Teams conducting security often slept though their shifts, and officers rarely conducted checks to ensure that sentries were alert. Trip flares placed in the perimeter wire to alert guards of intruders were not maintained. According to one Soldier, Claymore mines, which were to be set up outside the wire before each shift, were instead being discarded in the grass as useless because the Soldiers had removed the flammable C-4 explosive charges to heat their rations.

In that environment, the 409th Vietcong Main Force Sapper Battalion, a well-trained unit with a record of success against American and South Vietnamese forces, crept inside the wire and wreaked havoc before being detected. Soldiers were unable to mount much resistance through the chaos, and most of the defenders who were killed—including a company commander—died without a fight. The U.S. Army,

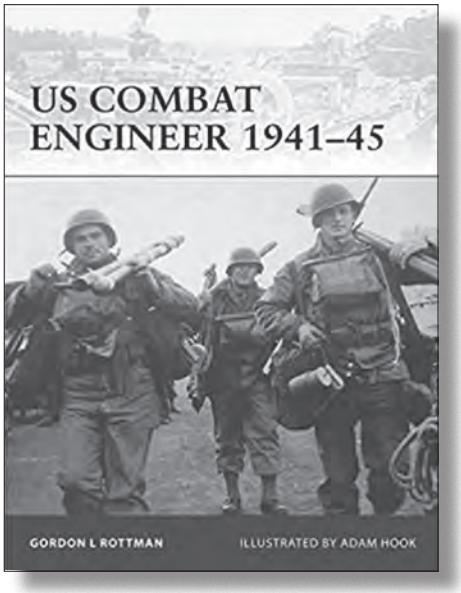
facing an outcry from an outraged public, found leaders at the company, battalion, brigade, and division levels to be culpable in the lax defensive conditions, ending several careers in the process. The commander of the 196th Light Infantry Brigade, Colonel William S. Hathaway, who had been selected for brigadier general, was instead demoted to lieutenant colonel. Major General James L. Baldwin, commander of the 23d Infantry Division, was reassigned and received a letter of admonishment.

Nolan displays a tenacious research ability, intricately describing the firebase attack and numerous other ambushes and skirmishes in the days leading up to it. He refuses to gloss over the effects of battle, describing injuries in horrific detail. He also covers the professional and informal interaction between the Soldiers and ensures that even those with small roles in the book stand out as individuals.

If there's a fault in the book, it's that Nolan goes into too much detail. The book is frontloaded with so many names and unit designations that it is difficult to follow at first, although biographies of several of the major players are listed at the beginning of the book. Maps of the camp, which appear along with photos in the middle section of the book, would be more useful near the beginning.

However, in the end, *Sappers in the Wire* stands the test of time. Twenty years after its initial printing, it still provides valuable lessons on how to win and how to lose. Lessons learned in the jungle 50 years ago—the importance of attention to detail, the critical dangers of complacency—are timeless and still hold full value in today's theaters. The book should be recommended, if not required, reading for leaders at all levels.

Staff Sergeant Allen serves as the assistant intelligence noncommissioned officer in charge for the 19th Engineer Battalion, Fort Knox, Kentucky. He is a graduate of the Defense Language Institute (Hungarian) and the Basic Intelligence Analyst Course. He holds a bachelor's degree in journalism from the University of Maryland University College and a Juris Doctor degree from the University at Buffalo School of Law, Buffalo, New York.



U.S. Combat Engineer 1941–45, by Gordon L. Rottman, Osprey Publishing Ltd., 20 July 2010, ISBN: 9781846035791

Reviewed by Mr. James E. McCarthy

In *U.S. Combat Engineer 1941–45*, Gordon Rottman, an Army veteran of Vietnam, captures the experience of a typical engineer Soldier during World War II via rich descriptions and rare photographs, creating a captivating and convincing image of engineers at war. Rottman paints a picture of the evolution of the modern Engineer Regiment from its humble antecedents within the Civilian Conservation Corps to the enormously large (by today's standards) World War II regiment, with more than 700 separate engineer combat battalions (ECBs). He covers the recruitment, training, lifestyle, and tactics of U.S. combat engineers of the time.

While *U.S. Combat Engineer 1941–45* is essentially a coffee table book with numerous photographs of engineer life and equipment, Rottman provides a detailed narrative of life as a combat engineer. Unlike today's Engineer Regiment, virtually all the military engineers of the World War II era were of the combat variety. This means that in addition to the core competencies of breaching obstacles and emplacing defensive works, they needed to be proficient in operations as diverse as running a sawmill to building a nonstandard fixed bridge.

In keeping with Osprey Publishing's roots as a resource for modelers and miniatures enthusiasts, *U.S. Combat Engineer 1941–45* is rich in photographs and color illustrations. Topics are as varied as a private Soldier's "junk on the bunk" TA-50 layout to a collection of the typical demolition charges that were available for use, ranging from a 1-pound nitrostarch charge to the 40-pound M3 shaped charge, which could punch through 60 inches of concrete. Pictures and descriptions of the typical dump trucks, chain saws, weapons, and bridges that combat engineers commonly used abound in the 64-page book.

Rottman also includes enough detail on engineer organization to satisfy the casual reader, if not an actual engineer. He describes the impact of the Civilian Conservation Corps on the nascent engineer Noncommissioned Officer Corps. He explains the routine of stateside camp life, to include initial-entry training and rations. He explains how it became necessary to reorganize engineers from a regiment-based system with a fixed number of ECBs per regiment to a system of groups, which allowed the

echelon-above-brigade group headquarters to control a surge of ECBs to provide direct support to the divisional organic combat engineer battalion. He describes the tactical employment of the Signal Corps Radio (SCR) 625 mine detector (original cost $495) and explains how the Germans often defeated it by mixing shrapnel and other metal debris into the mud. Rottman even describes flamethrower operations and notes that, in the European Theater of Operations, these were withdrawn from battalions in 1944 and available upon request from ordnance depots.

If Rottman's effort falls short, it is in the limitations of the format. Osprey Publishing relies upon illustrations to tell the story, so the narratives are often poorly sourced. Indeed, there are only 11 references in the book's bibliography, to include two unit histories and the 1943 version of Field Manual 5-5, *Engineer Field Manual, Engineer Troops*.[1] While Rottman's narrative is richly descriptive (as in the section on weekend furloughs, ladies of the evening, and social illnesses), the lack of sourcing moves the narrative to the category of "war story" very quickly. *U.S. Combat Engineer 1941–45* does not really have the space necessary to describe tactical action in any detail. Instead, it contains three anecdotal vignettes of common engineer operations—one example of a wet-gap crossing and two examples of obstacle reduction. Sadly, Rottman does not describe specific units and their actions, such as "Those Damned Engineers" of the 291st ECB and their defensive actions versus *Kampfgruppe Peiper* at Trois Ponts and Stavelot or the 168th ECB and its valiant stand at St. Vith during the Battle of the Bulge.

U.S. Combat Engineer 1941–45 is an interesting foray into World War II Army engineering. It is a quick read and well worth one's time. Whether the reader is an historian or a serving engineer, Rottman offers something of interest to all.

Endnote:

[1]Field Manual 5-5, *Engineer Field Manual, Engineer Troops,* 11 October 1943. (Obsolete)

Mr. McCarthy is a retired infantry officer and avid history buff. A Booz Allen Hamilton, Inc. contractor in support of the Global Threat Mitigation Program, he currently serves as the U.S. Army Forces Command engineer analyst at the Maneuver Support Center of Excellence, Fort Leonard Wood, Missouri.

("Best Practices for Engineers," continued from page 45)

Elements often conduct frontal attacks and exploit success at locations with the fewest casualties. However, when units failed to establish suppression and obscuration, they left their security and breach elements vulnerable to the enemy defense. Although casualties are expected in breaching operations, it is the duty of leaders to reduce the risk and increase the survivability of their Soldiers.

A best practice for the management of engineer equipment is coordination between the brigade operations officer and the brigade engineer. The brigade engineer (or senior engineer) uses the operational plan, technical manuals, knowledge of capabilities, and whereabouts of all engineer equipment to produce the priorities of engineer support. The brigade engineer provides a detailed timeline that lists which element receives support, the amount of personnel and equipment to be provided at each location, the amount of time allocated for each element, and the locations of linkup points and obstacles (with their desired effects). Information about the established priorities for engineer assets and the amount of time dedicated to each priority allows maneuver commanders to complete the remainder of the troop-leading procedures. Failure to manage the use of equipment and personnel can lead to the loss of multiple echelons and the effects that contribute to overall mission success.

The final practice that has led to the success of many units at NTC is the use of engineer reconnaissance. Units commonly relegate engineers to reconnaissance elements. Although engineers do not have the same systems and equipment as scouts, some units still use them as a combat force multiplier in the reconnaissance fight. The best use of the engineers in the role of reconnaissance is in augmenting the scouts in teams used to identify and reduce obstacles and enemy engineer assets. Engineer reconnaissance teams perform their best when operating with reconnaissance elements—not acting as separate scout forces.

It is the application of these techniques and tactics that lead to unit success and allow engineers to support maneuver elements to their utmost ability. Units win when they—

- Establish security for engineers.
- Maintain observation over obstacles.
- Use and synchronize the SOSRA drill.
- Establish and publish priorities for engineer support.
- Use engineer reconnaissance.

Endnote:

[1]Joint Publication 3-34, *Joint Engineer Operations,* 6 January 2016.

Captain Senteno serves as the assistant professor of military science and the executive officer for the California Polytechnic State University Reserve Officer Training Corps, 8th Brigade, San Luis Obispo, California. He previously served with the 58th Combat Engineer Company, 2d Squadron, 11th Armored Cavalry Regiment at Fort Irwin. He holds a bachelor's degree in mathematical sciences from the U.S. Military Academy–West Point, New York.

MOBILITY AND SURVIVABILITY in World War I

By Second Lieutenant Robert A. Fisher

Wars are won by skillful maneuvering that permits a fighting force to engage the enemy with violent action. The primary battlefield task of U.S. Army engineers is to provide maneuver elements with mobility and survivability, while countering enemy mobility. A century ago, when the United States became involved in World War I, the engineer role was no different. The support provided by the U.S. Army engineers proved invaluable at a crucial moment when the Allies appeared all but defeated. U.S. Army engineers helped turn the tide of the Great War by providing mobility and survivability for the American Expeditionary Force (AEF).

Loading some of the many thousands of ties made by the 20th Engineer Regiment mills for AEF operations in France.

World War I was a war of engineering. Maneuver elements found themselves stationary, as the enemy checked their advances with deadly new weapons such as machine guns and long-range artillery. In an effort to shelter themselves from their enemy's unprecedented firepower, engineers dug intricate networks of trenches. Since the infantry remained in the trenches for extended periods of time, the engineers went to great lengths to ensure that the infantry found living conditions in the trenches comfortable—or at least bearable. Although engineers had found a way to firmly fortify their positions, both sides knew they had to move decisively to prevail in the seemingly endless conflict. Commanders had to find a way to breach enemy defenses.

One method the engineers turned to was the centuries-old technique of sapping. Sappers attempted to dig a tunnel up to an enemy trench and detonate explosives underneath it. Sapping was a perilous job since there was always a risk of cave-ins. Sometimes sappers on both sides dug at the same time and place, leading to vicious underground melees. Armies attempted to combat sapping by digging a forward counter-trench, known as a *sap*. The sap served as a forward outpost where a lonely sentry provided early warning of any suspicious activity, including disturbances in the ground that indicated underground sapper activity.

20th Engineers loading lumber and ties on French cars.

Another method of breaching involved the use of a recent advancement in ordnance: the bangalore torpedo. The torpedo was invented 2 years before the start of the war by an officer in Great Britain's Corps of Royal Engineers in response to the latest advancement in countermobility: barbed wire. Employing bangalores was also a dangerous task that could only be done under covering fire. Detonating them was an entirely different matter, since it required the sappers to promptly move to a safe distance. Once a breach had been opened, maneuver forces had to move quickly and aggressively to exploit it.

In the end, the armies were so entrenched that neither sapping nor bangalores had much effect on the battlefield.

Commanders on both sides attempted to find other ways to regain momentum. Innovations ranged from a simple change in tactics to entirely new weapon systems. When the United States entered the war in 1917, the stalemate remained on the Western Front, but these innovations in warfare had proven their potentials. The Canadians won the Battle of Vimy Ridge using innovative assault tactics, and the British proved the powerful potential of tanks in warfare at the Battle of Cambrai. But in that same year, Russia plunged into revolution, allowing Germany to shift units from the east to the Western Front. This could potentially shift the balance, and both sides believed that time was against them.

Photo courtesy Forest History Society, Inc.

10th Engineers loading logs in Mortumier, France, in 1918.

General John J. Pershing, AEF commander, recognized the need to regain mobility. He knew that advancements in weaponry meant that combat tactics needed to be updated if the senseless carnage were ever to end. Although he was eager to end the stalemate of engineering trenches, he knew that the massive Allied maneuver elements needed extensive support. Most of the resources in France were already depleted, so all the necessary supplies had to come from the United States. To obtain the supplies, the U.S. Army Corps of Engineers (USACE) accompanied the AEF in France.

The AEF had been hastily cobbled together from volunteers and a cadre of Regular Army Soldiers. Although it had been deployed to France, it was not combat-ready. General Pershing estimated that the AEF required another year of training. The 1st Infantry Division was not deployed to the front lines until the fall of 1917, and the 2d Infantry Division was not deployed until the spring of 1918. In addition to requiring extra combat training, U.S. forces had a crucial support mission. There were inadequate supply routes in France where the AEF needed to operate. With reinforcements on the way from the United States, the Americans needed better roads and railways. Also, many more supply depots at seaports and along the lines of communication needed to be constructed to accommodate the AEF. The task of providing these necessary structures fell to USACE.

USACE in France was divided into three divisions:

- Construction and Forestry.
- Military Engineering and Engineer Supplies.
- Light Railways and Roads.

The 15th, 16th, 17th, and 18th Engineer Regiments worked to augment the railroads for the massive number of American Soldiers arriving monthly. Railways had already proven decisive in the early days of the war, enabling the French to deploy reinforcements to the front lines faster than the Germans. However, the French railways were occupied with evacuating casualties from the front lines. To transport the increasing numbers of doughboys arriving in France, the railways needed to be upgraded and maintained. This required a significant amount of wood for the ties. To provide this timber, the Division of Construction and Forestry was tasked with logging in France.

In addition to constructing all the necessary support structures, the division was responsible for providing the AEF with the timber needed for railway ties. The French did not have the manpower to procure enough timber in their own country, so American engineers were granted permission by the French government to cut timber in the local forests. This timber was used to construct all the necessary railways, docks, and supply depots to allow the rapid movement of the AEF. Furthermore, French hospitals were already full of their own wounded, so Americans needed to construct their own hospitals.

The largest of the engineer regiments was the 20th Engineer Regiment, raised in the forested regions of the Pacific Northwest. The U.S. Forest Service played a significant role in recruiting Soldiers—primarily lumberjacks—for the unit. About half the officers had worked in sawmills and logging companies, another quarter were forestry experts, and the remainder were trained military officers. At its peak strength, the regiment was larger than most divisions, although it remained officially titled a regiment. The engineers worked tirelessly to provide the timber necessary for railroad ties and structures. Even if the tools were unavailable, they always found a way to accomplish their mission of providing the Allies with mobility and survivability assets.

In the spring of 1918, the Germans launched Operation Michael, an all-out offensive against the Allies. Since Russia had recently surrendered, the Germans were now free to concentrate all their forces on the Western Front. The Germans used new tactics, and they quickly realized their greatest advances of the war. Instead of the usual long bombardment announcing the arrival of an infantry attack, the Germans opened with a short but concentrated barrage. This was immediately followed by an assault against the weakened portions of the trench by elite storm troopers armed with flamethrowers, submachine guns, and hand grenades. Finally, the main body of infantry surrounded and annihilated any remaining pockets of resistance that were too strong to fall in the initial attack. But when it appeared that the Germans were finally on the home stretch, attrition became the arbiter.

The Germans had regained momentum in the war of maneuver, but they had already lost the war of attrition. By this point, both sides were exhausted from 4 years of costly, fruitless attacks and counterattacks. The Germans had finally breached the Allied trenches, but their supplies were running out and they had lost a quarter of a million men. On the Allied side, the British and French were also running dangerously low on men and supplies but the Americans had 25 fresh divisions ready for combat.

With the American troops on their side, the Allies were able to successfully counterattack. Although casualties were high for the Allied offensive, it had a critical advantage over the Germans: supplies. USACE had constructed such an effective supply network that the United States was able to put 250,000 men into France each month and ensure that they were well-fed and had all necessary support. The Division of Construction and Forestry had constructed more than enough hospitals for the combat troops. By July 1918, there were at least 50,000 hospital beds, far exceeding the numbers necessary.

On the 11th hour of the 11th day of the 11th month of 1918, Germany finally admitted defeat and signed an armistice with the Allies. Although this ended the fighting, the armistice did not end the role of USACE. France's infrastructure had been left in ruins, and the U.S. Army helped its allies after the fighting just as it had during the war. The 20th Engineer Regiment fulfilled its duty in war and peace by remaining in France for another year to help the French repair their roadways.

USACE provided the Allied forces with invaluable mobility and survivability assets. Thanks to the improved lines of supply and communication, the Allies deployed fresh troops and supplies to the front lines at a rapid rate. This gave the Allies a crucial advantage over the weary German army since both sides were at the breaking point. The support provided by the Army engineers allowed the war to become a maneuver war once again, and the Allies went on the offensive. After four grueling years of fruitless stalemate, the Allies finally prevailed, due in no small part to the maneuver support provided by USACE.

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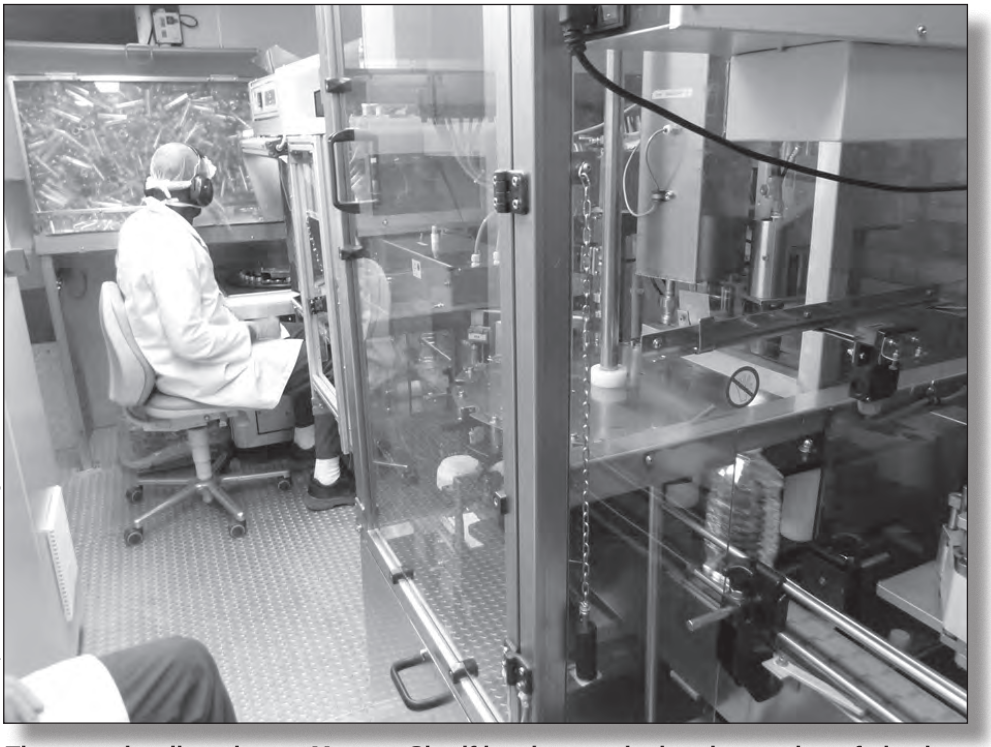
SUSTAINABILITY FOR DEFENSE

By Mr. Nathaniel L Whelan and Mr. Jeroen Rottink

During military missions, protection of the environment is never explicitly among the highest priorities. Nonetheless, environmental protection (EP) can be an important enabler and force multiplier during military missions. EP has been a U.S. Department of Defense (DOD) concern since before the 1970s, when major environmental legislation was enacted with the Clean Air Act[1] and significantly expanded with the Clean Water Act.[2] The U.S. Army Environmental Command (USAEC) was established in 1972, beginning with a program to destroy U.S. stocks of toxic chemical agents and munitions. In 1975, USAEC began managing the new Installation Restoration Program to develop a process for evaluating environmental conditions at Army installations. DOD was the first organization to establish a formal structure to implement an environmental management system, which was subsequently adopted by other countries. Today, the U.S. military uses environmental management systems to continuously improve its environmental performance.



Photos by Ms. Stephanie San Miguel

The water bottling plant at Mazar-e-Sharif has been reducing the number of plastic water bottles brought to bases in Afghanistan.

The North Atlantic Treaty Organization (NATO) has also made significant progress in developing EP policies and doctrine. Addressing EP considerations as an integral part of planning and executing NATO military activities can significantly support mission success.

Proper EP Planning

Although environmental issues often have a significant impact on operations, there has been little guidance available to advise commanders in deployed contingency operations. U.S. policy requires adherence to U.S. environmental laws, if feasible, and many of the substantive concepts from U.S. domestic environmental laws are adopted in various policy formats. While U.S. domestic environmental laws do not generally apply to overseas military operations, environmental operations planning should begin with the overarching U.S. policy. Executive Order No. 12114, *Environmental Effects Abroad of Major Federal Actions*,[3] creates "National Environmental Policy Act-like" rules for overseas operations by requiring environmental impact analyses of major federal actions affecting the environment outside of the United States. DOD Directive 6050.7, *Environmental Effects Abroad of Major Department of Defense Actions*,[4] implements Executive Order 12114 and provides guidance for environmental analysis. Each Service implements the directive with its own regulation.

Within NATO, the Environmental Protection Working Group (EPWG), established by the Military Committee Joint Standardization Board in 1999, produced Standardization Agreement (STANAG) 7141, *Joint NATO Doctrine for Environmental Protection During NATO-Led Military Activities*.[5] It is the covering agreement to Allied Joint Environmental Protection Publication (AJEPP) 4,

Joint NATO Doctrine for Environmental Protection During NATO-Led Military Activities.[6] AJEPP 4 provides direction and guidance on environmental planning and risk management. While it cites the importance of EP, it recognizes that operational imperatives have primacy. Even so, through early integration of EP aspects in operations planning, it is possible to prevent later, more costly environmental problems.

According to AJEPP 4, consideration should be given to the protection of water, soil, air, flora, and fauna and particular attention should be paid to the storage and handling of petroleum, oils, and lubricants (POL); hazardous materials; and waste. Planning for waste should incorporate prevention, reduction, and recycling. Noise and the impact of birds and their migratory routes on flight safety and cultural property protection should also be considered. AJEPP 4 addresses the responsibilities of commanders in the planning and execution of a mission, and it provides an overview of EP education and training opportunities.

The Resolute Support Mission wastewater treatment plant in Kabul has a permit from the Afghan National Environmental Protection Agency to discharge treated water into the Kabul River.

Policy Direction

After promulgation of STANAG 7141, it became apparent that NATO lacked EP policy. This gap was filled upon the approval of Military Committee (MC) 469, *NATO Military Principles and Policies for Environmental Protection*, on 30 June 2003, which aims "to facilitate the integration of EP into all NATO-led military activities, consistent with operational imperatives."[7] According to the policy, environmental aspects must be taken into account as early as possible in the planning process and throughout the execution of the exercise or operation.

Another important NATO policy, also recently revised, is MC 560, *MC Policy for Military Engineering*.[8] MC 560 describes the concept for the delivery of an effective military engineering capability, which is essential to success in operations. According to the policy, military engineering supports all operations in all phases and incorporates specialist areas of expertise, such as EP. The military engineering role in EP is further developed in Allied Joint Publication 3.12, *Allied Joint Doctrine for Military Engineering*.[9]

Procedures in Place

Since its start in 1999, the STANAG portfolio of EPWG has grown significantly. In addition to STANAG 7141/AJEPP 4, EPWG programs of work, in some cases combined with a series of NATO Science for Peace and Security workshops, formed the basis for the following promulgated NATO EP STANAGs:

- AJEPP 2 (STANAG 2582), *Environmental Protection Best Practices and Standards for Military Camps in NATO Operations,*[10] provides NATO commanders with best EP practices to use in the various stages of a deployed camp, which is often in an area where EP infrastructure is lacking or the initial tempo of operations leaves no time for extensive EP measures.
- AJEPP 3 (STANAG 2583), *Environmental Management System in NATO Operations,*[11] provides the EP officer with insight into the NATO operations planning process and with tools to integrate EP into the process.
- AJEPP 5 (STANAG 2510), *Joint NATO Waste Management Requirements During NATO-Led Military Activities,*[12] provides waste management guidance, including the application of principles such as the precautionary and "polluter pays" principles, and the waste management hierarchy of reduce, reuse, recycle, and remove.
- AJEPP 6 (STANAG 6500), *NATO Camp Environmental File During NATO-Led Operations*,[13] outlines the content of the environmental file of a deployed camp during all phases of a mission. The file serves as an archive of environmentally relevant matters pertaining to the camp and is part of the documentation for transfer of the camp to another troop-contributing nation or to the host nation.
- AJEPP 7 (STANAG 2594), *Best Environmental Protection Practices for Sustainability of Military Training Areas,*[14] provides national EP officers and authorities with a collection of best practices themed by habitat/ecosystems, flora, fauna, wetlands, soils, fire, noise/vibration, geographic information systems, and environmental training/outreach.

German forces at Mazar-e-Sharif maintain environmentally safe, double-walled fuel storage tanks for the generators that power the installation.

EP STANAGs, AJEPPs, and terminology are available from the NATO Standardization Office Web site at <http://nso.nato.int>.

U.S. EP Planning

During U.S. joint operations, the joint force commander is responsible for the integration of environmental considerations during training, planning, and conduct of operations and the joint force engineer is the staff proponent for these activities. Joint Publication 3-34, *Joint Engineer Operations,*[15] provides the framework for the integration of environmental considerations into joint operational engineer planning. Working with other staff officers, the engineer determines the impact of operations on the environment and the corresponding effect of the environment on Service members, then integrates environmental considerations into the decision-making process. The engineer oversees the writing, publishing, and updating of Annex L (Environmental Considerations) of the operation order or operation plan. The goal of the operation order planning process is to plan an operation that achieves mission objectives while observing environmental requirements and minimizing the environmental effects. It is U.S. policy to conduct a good-faith environmental audit to reduce potential adverse consequences to the host nation's environment.

In the absence of definitive environmental guidance within applicable international agreements, joint force commanders should establish guidance in the operation order/operation plan that will protect force health, limit adverse public health impacts, consider the U.S. liability, and be consistent with mission goals.

Improved Efficiency

During recent NATO summits, the heads of state and government have declared that NATO will work to significantly improve the energy efficiency of its military forces and to establish common standards, reduce dependence on fossil fuels, and demonstrate energy-efficient solutions for the military.[16] NATO's Smart Energy Program, which began in 2011, aims to improve the energy efficiency of allied armed forces through means such as the increased use of renewable energy and better energy management.

Exercise Capable Logistician is a biannual NATO standardization and interoperability field-training exercise designed to address NATO interoperability challenges on the coalition battlefield. Recent Capable Logistician exercises included the participation of a Smart Energy program multinational integrated logistics unit to demonstrate smart energy solutions. Capable Logistician 2015 in Hungary included a range of energy-efficient technologies, which were evaluated to cut costs while enhancing interoperability and military effectiveness.[17] Energy technologies evaluated included microgrids to improve base camp energy management; renewable energy sources, such as wind and solar power; shelter insulation; low-energy technologies evaluated for water purification; light-emitting diode lights; Soldier power solutions; and small, portable fuel cells for NATO soldiers. Operational scenarios included responding to power cuts, diesel and water contamination, and generator breakdown.

Environmental Protection Training

U.S. EP training is offered through a number of DOD and other federal organizations; a list of links is provided on the USAEC Web site.[18] Also, 40-hour courses in environmental compliance officer training are offered through the U.S. Army Engineer School, Fort Leonard Wood, Missouri, and the 7th Army Training Command Combined Arms Training Center, Vilseck, Germany.

NATO provides support for one EP distance learning and two EP resident courses:

- Advanced Distance Learning 033, *Introduction to Environmental Awareness,* on the NATO Joint Advanced Distributed Learning Web site (<https://jadl.act.nato.int>), consists of four modules that provide a broad overview of the main environmental protection themes of NATO-led military activities.

- The M3-77 Environmental Management for Military Forces Course, hosted by the NATO School (<http://www.natoschool.nato.int/>) in Oberammergau, Germany, is 2 weeks in duration and is aimed at officers, operational planners, and civilian equivalents involved with EP. The course provides a familiarization with environmental law; NATO EP policy, doctrine, and standards; and procedures and practices at the operational level. Course graduates are able to advise commanders on the assessment, control, and mitigation of environmental risks and to integrate environmental considerations into operational planning.
- The NATO Military Environmental Protection, Practices, and Procedures Course, hosted by the Military Engineering Centre of Excellence (<http://www.mileng-coe.org>), Ingolstadt, Germany, is 1 week in duration and is aimed at commissioned and noncommissioned officers and civilian equivalents engaged in EP activities, assigned to either an operation or to a national or NATO headquarters supporting an operation. The aim of the course is to familiarize the student with the knowledge and skills necessary to integrate NATO EP requirements during NATO-led military operations in accordance with NATO STANAGs and policies.

The Common EP Language

U.S. and NATO EP policy, guidance documents, and resources promote common standards and procedures for environmental management, which support interoperability, simplify compliance with environmental laws, and contribute to the mission. As multinational exercises and operations become the norm for U.S. forces, EP standards will provide a "common language," ensuring sustainability of the environment and the mission.

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[15]Joint Publication 3-34, *Joint Engineer Operations*, 6 January 2016, <http://dtic.mil/doctrine/new_pubs/jp3_34.pdf>, accessed on 21 June 2017.

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[17]Steve Mapes, Office of the Under Secretary of Defense (Acquisition Technology and Logistics) Energy, Installations, and Environment/Operational Energy Plans and Programs, *Trip Report: Capable Logistician 2015,* 15–17 June 2015.

[18]DOD and federal environmental training is available at the USAEC Web site at, <https://aec.army.mil /Opportunities/Training/DODandFederal.aspx>, accessed on 21 June 2017.

Mr. Whelan manages the Integrated Training Area Management program for U.S. Army Europe and is the custodian of NATO STANAG 2594, Best Environmental Protection Practices for Sustainability of Military Training Areas. *He is a member of the NATO EPWG and supports multinational U.S. European Command- and U.S. Army Europe-directed EP initiatives.*

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A Case For Korea:

Life in the Army's Only Combined Division

By Captain Hemanth Nalamothu and Captain Sungmin Ahn

During their careers, many U.S. Army officers have the privilege of working with counterparts from allied nations. These experiences vary greatly—from combat, to joint training exercises, to exchange programs for professional development. Most are positive; some are less so.

One of the side effects of fiscal conservancy and fewer combat deployments is the reduction of such opportunities to interact with foreign armies. So then, where can junior officers go to enrich themselves professionally and personally? The obvious and popular choices are any duty stations in Europe. Alaska or Hawaii might also qualify as foreign and exotic locales for some Soldiers. Another, perhaps more obscure, choice is the Republic of Korea (ROK).

Assignments to Korea have a bad reputation among some Service members, and this opinion is not entirely misplaced. Stories of challenges range from Soldier issues to culture shock. Many of these anecdotes may be true, but they also mask the underlying benefits that come from working in Korea—not the least of which is the opportunity to work in the U.S. Army's only combined division, the 2d Infantry ROK–U.S. Combined Division (RUCD).

The RUCD is unlike anything else in the Army right now. This storied unit took the unprecedented step in 2015 of fully integrating American and ROK elements within its headquarters. The result was Americans and Koreans working—quite literally—shoulder to shoulder toward a common goal.

Anyone who is familiar with the Korean peninsula may question what is so significant about this since Americans and Koreans have been working closely together for approximately 60 years. However, it is the extent to which Korean officers are integrating with Americans within the RUCD that is unprecedented. As a junior engineer operations officer, one of the authors had the privilege of partnering with an engineer captain from the ROK Army for an entire year. They cooperated on a number of projects and missions, ranging from hosting seminars for Korean officers to theater-wide exercises. Together, they identified shortfalls in the new arrangement at the RUCD and proposed changes. Some changes were implemented immediately; others took more time. Throughout the process, knowledge was transferred, understanding was fostered, and friendships were built.

Assignments to Korea are very challenging. The units on the peninsula live up to their reputation for being able to *Fight Tonight*, a slogan that alludes to their ability to muster their entire formation in a matter of hours. The training is as tenacious and ferocious as the warriors who execute it. Even the terrain can be a challenge, with numerous mountains that tower over the landscape. It is warrior country indeed.

> ***"The units on the peninsula live up to their reputation for being able to* Fight Tonight, *a slogan that alludes to their ability to muster their entire formation in a matter of hours."***

But the challenges are offset by the opportunity to learn, train, and develop into a better Soldier and global citizen. Korea has a host of options available for those brave enough to step outside their comfort zone. A burgeoning exporter of culture, food, and fashion, Korea is quickly becoming a nexus of interesting people and exciting ideas. Another positive feature is its proximity to the rest of Asia and the travel opportunities that location affords. The Land of the Morning Calm offers a great deal for anyone willing to tough out the challenging assignments and bold enough to live in a country that is so markedly different from America. It is certainly not for everyone, but perhaps that's all the more reason to give it a try.

Key Takeaways (Engineer Perspective)

There is a need for improved intelligence sharing between ROK and U.S. systems. One of the major limitations of the RUCD is the inability to easily share critical information between ROK and U.S. planners due to classification issues. A possible solution could be the consolidation of key information on both nation's systems to build a better common operating picture.

ROK officers are the subject matter experts. The ROK officers assigned to the RUCD and attached liaisons are some of the best and brightest members of the ROK Army. They bring a great deal to the fight, especially their visceral understanding of the operational environment—as Korea is their home. They know the people, places, and culture like no American on a 1-year tour could possibly hope to. Learning from them is an absolute must.

The Korean Barrier System is a subject to be studied. The Korean Barrier System is one of the largest barriers ever constructed. Straddling the width of the Korean peninsula, it is a complex obstacle zone colloquially known as the DMZ (Demilitarized Zone). U.S. Army engineers must reacquaint themselves with the nuances of mine warfare and the principles of obstacle emplacement and siting.

RUCD Organizational Structure (Korean Perspective)

The RUCD, activated in 2015, is a new concept pioneered by the 2d Infantry Division for operations on the Korean Peninsula. Its mission is to perform weapons of mass destruction/effects operations and perform offensive, defensive, and stability operations under the unified land operation concept. To support ROK Army operations, 38 ROK officers were assigned to the new division. Before the formation of the RUCD, the 2d Infantry Division experienced difficulties in conducting missions. For example, it took a lot of time to get information from adjacent ROK units during theater-wide exercises. After the RUCD was activated, operations functioned more efficiently. Instead of two separate agencies working independently, there was now one unified organization. To provide additional command and support, the RUCD includes a Korean deputy commanding general and chief of staff and the 38 ROK Army officers serving as staff members.

In the RUCD, there are two positions for ROK Army engineer officers. One is for an engineer major in the division engineer cell, and the other is for a geospatial intelligence officer. Unlike the U.S. Army division structure, the ROK Army division has not implemented a division engineer cell staff. The division has its own engineer battalion, and the battalion commander serves as special staff for the division commander. In the operations section of a U.S. Army division, the division engineer cell includes about eight commissioned and noncommissioned officers to provide engineer support to the commander and provide mission command of engineer subordinates. In the RUCD division engineer cell, the ROK engineer officer serves on staff with a U.S. counterpart. The ROK engineer provides input about the Korea Barrier System and ROK Army engineer mobility and countermobility capabilities. The geospatial intelligence officer belongs to the geospatial intelligence team and provides geospatial analysis within the division area of operations.

The RUCD is an interesting unit with a number of learning opportunities for junior officers. Junior officers can improve their abilities as staff officers through repetitions of the military decision-making process. There are two combined exercises every year in Korea: *Key Resolve* and *Ulchi-Freedom Guardian*. This means that staff officers experience the military decision-making process at least twice at the division level during a year in the RUCD. It is difficult to get this experience on a lower-echelon staff.

Also, the operations that RUCD conducts are at the operational level. Engineer captains usually serve at tactical-level echelons. Working at the operational level improves an officer's understanding of how Army operations function. Seeing the big picture is important for junior officers to better understand how tactical-level missions contribute to the whole operation. The RUCD is the perfect place to give junior officers the opportunity to grasp operational- and strategic-level missions and broaden their views.

Finally, the RUCD exposes junior officers to a different nation's military culture. The most impressive thing about the RUCD meetings was the free discussion that took place among various working groups, regardless of rank. U.S. Soldiers gave their opinions, which were carefully received and respected. This is quite different from ROK Army military discussions, where junior officers usually wait to receive senior officer guidance and rarely have an opportunity to voice their opinions. Through this experience, U.S. officers can improve their own organization's culture based on what they learn from the RUCD.

As with any new organization, there are areas that need improvement. In the RUCD, classification issues can limit the ability to share information. Also, the interoperability of U.S. and Korean computer systems needs to be improved. These issues must be resolved to maximize the effectiveness of the RUCD.

In closing, the authors believe that junior officers from both armies should seek opportunities on the RUCD staff. They will benefit from the exposure to a foreign army, its culture, and its operating procedures. We also strongly believe in the spirit of the RUCD as a way to forge lasting friendships and cooperation between our two countries. That spirit is captured by the saying *Kachi Kapshida*, "We Go Together!"

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Are U-SMART?

Keeping Track of Survey Control Points

By Mr. James K. Garster and Mr. George H. Ohanian

Survey control points are the foundation for every engineering and construction project; and they are used through the entire lifecycle to ensure that the project is designed, constructed, and maintained in the correct location and to the proper height so that it will perform as intended. Survey monuments can take several forms, such as a brass cap, a stainless steel rod, or even a concrete pier, and are constructed so that they do not move over time. Survey control points have defined, validated, and approved coordinates and serve as reference points for future surveying. When surveying needs to be done or geospatial data needs to be connected to existing map data, locating the survey control points is often difficult. When surveyors find a survey control point or survey monument in the area being surveyed, they are frequently unable to track down its coordinates. Sometimes the coordinate values are not included in the current datum, information on the accuracy of the values is missing, or the method of determining the values is unknown. These issues were highlighted by the U.S. Army Corps of Engineers (USACE) after Hurricane Katrina, when the Interagency Performance Evaluation Task Force reported that local survey control was not always consistent from project to project and that coordinates were not up to date in several cases.

A typical survey monument is a brass cap set in concrete.

In the past, project survey control points established by USACE district surveyors were usually stored on a local computer hard drive, listed on the project plans and specifications, or maintained in a field book. Local project survey control was often not accessible outside of the local USACE district branch or section that established it. Often, the coordinates and elevations established on the original design survey were used in other phases of construction without verification or checks to see if they had changed over time. In order to ensure that project survey control is consistent, current, and available to others within (or even outside) a USACE district, it was determined that a centralized database was needed to enable USACE districts to quickly and efficiently manage and verify survey control point information. As a result, USACE developed the USACE Survey Monument Archival and Retrieval Tool (U-SMART).

A high-accuracy global positioning system receiver is set up over a survey control monument.

U-SMART captures local project survey control and primary project survey control information with its connections to the National Spatial Reference System and records it in a database linked to the respective USACE projects. Boundary monuments used to mark real property boundaries can also be added to U-SMART. The U-SMART database allows the point manager in each district to manage and maintain project survey control points; ensure that they are current

and correctly referenced to the National Spatial Reference System (including water level and geodetic datums); and ensure that others within the USACE district, including district contractors, use the most up-to-date control point values. Linking the control points to their respective projects makes it easier for all those working on the project to locate them. U-SMART is controlled access card-enabled to manage database access for those with administrative and input capability. To ensure the integrity of the database, the U-SMART approval process requires point managers to verify data before loading it. U-SMART is linked to, and part of, the USACE CorpsMap suite of tools. U-SMART includes the following features and capabilities:

- User-friendly graphical user interface.
- Input/output via Adobe® portable document format datasheets or Web interface.
- The query, search, and retrieval of project control, including National Spatial Reference System survey control points.
- Association of survey control to a network of points on a USACE project.
- User notification of changes to National Spatial Reference System survey control.
- Linking of water level gage databases (USACE, National Oceanic and Atmospheric Administration, and U.S. Geological Survey).
- Read-only public access to survey control points.
- Survey control point versioning for the storage of superseded values.
- Hyperlinks to National Geodetic Survey and Online Positioning User Service datasheets.
- Comparison to National Geodetic Survey-published coordinates and discrepancy warning to users.
- Contractor access (via USACE users) to add data, with USACE point manager validation before entry into the database.
- Linkage of documents, pictures, survey data (including field notes), and other survey control point-related digital information to each control point in the database.
- Bulk loading of survey control point data.
- Creation of customized reports of survey control points for printing or downloading.

U-SMART can save time, effort, and resources when it is necessary to locate project control in order to verify elevations or coordinates. The use of U-SMART ensures that all participants in a project, including contractors, are using the most up-to-date elevations and coordinates available. This commonality drives consistent and validated information, reduces rework, and ensures that everyone has validated coordinates.

Although originally intended for USACE districts, recent updates to U-SMART now allow Army surveyors and installations to enter and manage their survey control point information in the same way as a USACE district. This benefits the Army surveyors by giving them a tool to store control points and survey data and to share them with others on the installation or elsewhere. Control points added by Army surveyors and installations have their own layer on the U-SMART map tab, where they can be queried, searched, and leveraged by civilian surveyors, unless restricted. Point managers can mark survey control points *For Internal Use Only*, making them accessible only by Army or USACE users who are logged into the database. U-SMART is an easy-to-use tool that will be included in training for the Global Position System–Survey. There is no additional cost for use of U-SMART by Army surveyors, which increases the return on investment for the entire survey community. Training webinars are available for new Army users by contacting the U-SMART Helpdesk at <usmart@usace.army.mil>.

U-SMART includes a public side for those outside the Army or USACE communities. This allows these users to secure information in an easy fashion. Civilian and military surveyors can leverage the abilities of U-SMART as an enterprise tool to protect data, promote data sharing, maintain commonality, and ensure the accuracy and accessibility of survey control. For more information, see the U-SMART homepage at <http://USMART.usace.army.mil>.

This survey monument established in 1969 is still in use today.

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THE MOBILE ASSAULT BRIDGE

By Captain Monica I. Rosario and Mr. Troy D. Morgan

As visitors approach the U.S. Army Engineer Museum at Fort Leonard Wood, Missouri, they will see the facility's newest restoration project, a mobile assault bridge (MAB) acquired in 1987, shortly after the U.S. Army Engineer School stopped teaching MAB operations. For a decade, the bridge sat near the main museum building, where the U.S. Army Military Police and Chemical Museums now stand. When those museums eventually moved to Fort Leonard Wood in the late 1990s, the MAB was placed in storage. In 2014, the museum staff and the craftsmen of the Fort Leonard Wood Logistics Readiness Center began restoring the bridge. Following two long years of work, the renovated MAB was installed in its current location.

In 1959, MAB was developed by the U.S. Army Engineer Research and Development Laboratories at Fort Belvoir,

The renovated MAB in its current location at the U.S. Army Engineer Museum

A four-float MAB raft on the Ohio River transports an M88 recovery vehicle.

Virginia. The first batch of MABs was produced and delivered to the Army between 1963 and 1967. This version of the MAB, which had riveted hulls, was manufactured by one company in California and by another in New York. The MAB was constructed with 32 end bays and 66 interior bays.

After the initial batch of MABs was built, improvements were introduced. The 1970 version had an all-welded hull and improved electrical and hydraulic systems. The Army received 220 bridges of this design between 1973 and 1976. This MAB consisted of four-wheel drive transporters hauling an interior bay or an end bay. Launched into a body of water, these floating bays linked together to form the bridge.

"In 2014, the museum staff and the craftsmen of the Fort Leonard Wood Logistics Readiness Center began restoring the bridge. Following two long years of work, the renovated MAB was installed in its current location."

The two types of superstructures could be interchanged in about 15 minutes with the aid of a crane. The hull was an all-aluminum construction. The sides and deck were 3.175 millimeters thick, while the bottom, bow, and stern were 4.7 millimeters thick. Reinforcing ribs provided additional strength to the sides and bottom of the transporter. The MAB was literally a bridge that could drive down a road and into a river.

The three crewmembers consisted of a driver, who was also the bridge crew chief; an assistant driver, who also acted as the bridge pilot; and a crewman. The 3-person watertight cab was mounted at the front of the hull and could be removed during transportation. Entrance to the cab was through hatches in the roof and rear of the cab. An air compressor provided power for the windscreen wiper, tire inflation, and brake systems. The MAB had two hydraulic systems. A high-pressure system provided power to position the superstructure, raise and lower the wheels, and operate the capstans. A low-pressure system operated the power steering for all four steerable wheels, marine drive functions, and the air blower for wheel-well pressurization. Each MAB had four electrically operated bilge pumps with a combined capacity of 509 liters per minute, located at the four corners of the engine compartment. Two hydraulically operated capstans—one on the forward deck and one on the aft deck—were provided to pull units.

Although the MAB was capable of quickly bridging rivers, it was a maintenance nightmare. MAB maintenance was a backbreaking, often grimy job. The maintenance demands in MAB units were taxing in combat or in training, accounting for more than half of a platoon's time. Good maintenance habits had to be developed and enforced so that maintenance became second nature to MAB crew members. Two crews were often detailed to work on one vehicle at a time, which resulted in faster rehabilitation of the bridges. Safety concerns and the excessive amounts of maintenance required by the system spelled the end of the MAB. In 1983, engineer bridge companies began fielding the Army's new ribbon bridge.

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