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Assured Mobility in Urban and Complex Terrain



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United States Army Engineer School
573-563-8080 / DSN 676-8080

COMMANDANT
MG Randal R. Castro
563-6116
<randal.castro@us.army.mil>

ASSISTANT COMMANDANT
COL(P) Todd T. Semonite
563-6192
<todd.semonite@us.army.mil>

REGIMENTAL COMMAND SERGEANT MAJOR
CSM Clinton J. Pearson
563-8060
<clinton.pearson@us.army.mil>

DEPUTY ASSISTANT COMMANDANT
COL Lou L. Marich
563-8080
<lou.marich@us.army.mil>

DEPUTY ASSISTANT COMMANDANT–USAR
COL Gerald Lago
563-8045
<gerald.lago@us.army.mil>

DEPUTY ASSISTANT COMMANDANT–ARNG
LTC Dennis V. Smith
563-8046
<dennis.v.smith@us.army.mil>

CHIEF OF STAFF
LTC Anthony C. Funkhouser
563-7116
<anthony.funkhouser@us.army.mil>

TRADOC SYSTEMS MANAGER for ENGINEER COMBAT SYSTEMS
COL Robert Nicholson
563-4081
<robert.nicholson@us.army.mil>

TRADOC PROGRAM INTEGRATION OFFICE–TERRAIN DATA
COL Thomas Crabtree
329-1908
<thomas.crabtree@us.army.mil>

COMMANDER, 1st ENGINEER BRIGADE
COL Joseph Schweitzer
596-0224, DSN 581-0224
<joseph.schweitzer@us.army.mil>

DIRECTOR OF TRAINING AND LEADER DEVELOPMENT
COL Paul W. Kelly
563-4093
<paul.w.kelly@us.army.mil>

DIRECTOR OF ENVIRONMENTAL INTEGRATION
Dr. Rebecca Johnson
563-4129
<rebecca.johnson1@us.army.mil>

DIRECTOR OF FUTURES CENTER–ENGINEER
COL Richard M. Hornack
563-7955
<richard.hornack@us.army.mil>

HUMANITARIAN DEMINING TRAINING CENTER
Mr. Rodney A. Robideau
596-3870
<rodney.a.robideau@us.army.mil>

COUNTER EXPLOSIVE HAZARDS CENTER
LTC Kent D. Savre
593-4085
<kent.savre@us.army.mil>

By Order of the Secretary of the Army:
PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:



Sandra R. Riley
Administrative Assistant to the
Secretary of the Army
0532705

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UNITED STATES ARMY ENGINEER SCHOOL

COMMANDANT
Major General Randal R. Castro

MANAGING EDITOR
Shirley Bridges

CONTRIBUTING EDITORS
Karin Gan
Cheryl Green
Kathy Webber

GRAPHIC DESIGNER
Jennifer Morgan

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Back Cover: Soldiers in urban surroundings

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Clear The Way

By Major General Randal R. Castro
Commandant, United States Army Engineer School



Welcome back to our Fall issue of *Engineer*. We are proud to get this latest issue out to the field. Because of the tremendous feedback we received on our last issue, we are running a second installment on engineer operations in urban and complex terrain. We continue to compile great input from the Regiment on this preeminent subject. This topic continues to challenge our Regiment and the Army. It is such a focused subject that we, in conjunction with the Army Engineer Association (AEA), considered how we could gather our experienced field commanders with the schoolhouse and leaders of industry to discuss the matter.

We were able to accomplish this dialogue the last week of October at the AEA Engineer Regimental Conference in Orlando, Florida. In his "Master and Commander" article on page 4, Lieutenant Colonel Tony Funkhouser goes into more detail on what was discussed. Let me tell you that it was one of the best engineer conferences ever. I say "ever" because of the positive feedback I received. It was a solution-focused week with an outstanding turnout of colonel and lieutenant colonel commanders and command sergeants major and key leaders from across the force from the Active, National Guard, and Reserve Components. Leaders were afforded the opportunity to voice their concerns and/or solutions to specific challenges we discussed during breakout sessions. These work groups exposed the passion our leaders have toward developing solutions to this complex problem of enabling mobility in concert with maneuver in urban and complex terrain. As many of you know, there is no "silver bullet" solution, so we must develop a holistic and comprehensive solution set.

A couple of years ago, the Engineer School spearheaded our doctrine development and trained the force on the current doctrine and tactics, techniques, and procedures (TTP). Today, with a threat that is changing daily, our leaders in the field are developing not new TTP, but current "best practices" that have generated success for our engineers deployed in theater. We at the schoolhouse are able to capture these and will ensure that we train these **skills** to our young leaders heading out to the field. We are even seeking ways to procure the **tools** you say you need to accomplish the engineer missions you are performing as full-spectrum engineers! The challenge for our Regiment and the Army is that the next war will not be the war we are fighting today. Therefore, we must be a future-focused organization to shape the Regiment while enabling the Current Force. No easy feat! It is your passionate input and dialogue with the Regiment that will allow us to enable the Current Force.

A special thanks to all who attended the conference and especially to the AEA leaders, the guest speakers—to include Lieutenant General Melcher, Brigadier General Ham, Major General Bostick, and Lieutenant General Strock (whose briefs can be found in the Engineer School's Army Knowledge Online [AKO] folder)—the leaders of industry, and those who worked diligently behind the scenes to make everything happen. Also, my thanks to all of you who shared your thoughts and experiences on our Regiment's No. 1 challenge by contributing to this professional bulletin!

Lastly, thanks to all our engineers who are on the front lines accomplishing the mission and preserving freedom. We, and the entire Regiment, are committed to support you and your families! You were all in our thoughts during the holiday season. Be safe and see you next issue!

Carry On!

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We anticipate hosting another training seminar for the leaders of the Regiment during the first week of May 2006. Details will be provided soon on our Web site, on the *Message to the Regiment* e-mail, and here in *Engineer*, The Professional Bulletin of Army Engineers.

Lead The Way

By Command Sergeant Major Clinton J. Pearson
United States Army Engineer School



Greetings from Fort Leonard Wood, home of the Engineer Regiment! I would like to personally thank all of you for your steadfast and honorable service to our nation and our Regiment. Sappers are performing with distinction in Iraq and Afghanistan and in the wake of natural disasters here at home. Today's Soldiers are truly living the Soldiers' Creed. To the families that have lost a loved one, as well as those who have been wounded in action, you will remain in our daily thoughts and prayers. We are eternally grateful for the sacrifices you make each day; you will forever be our nation's greatest treasure.

This article will focus on changes we have seen over the past few months, using the T3 framework: Transform the Regiment, Train Soldiers and Leaders, and Take Care of the Regiment.

Today, the Modular Engineer Force has begun to take shape. We activated the 20th Engineer Battalion and the 507th and the 557th Firefighting Detachments at Fort Hood, the 19th Engineer Battalion at Fort Knox, and the 49th and the 94th Mine Dog Detachments at Fort Leonard Wood. Next in the Transformation starting blocks are the 18th Engineer Brigade, 20th Engineer Brigade, 36th Engineer Brigade, 82d Engineer Company, 618th Engineer Company, 642d Engineer Company, 887th Engineer Company, 275th Terrain Analysis Detachment, 362d Multirole Bridge Company, and 94th Engineer Battalion. To assist these units in the Transformation process, we implemented the Fusion Cell at the Engineer School. This cell has been instrumental in addressing issues regarding installation support, equipment, personnel, and deployment. Representatives from the United States Army Forces Command (FORSCOM); Assistant Chief of Staff, Finance (G-8); Office of the Chief of Engineers (OCE); Human Resources Command; Assistant Chief of Staff, Operations and Plans (G-3); and Assistant Chief of Staff, Personnel (G-1) have been an integral part in assisting the Regiment in transforming to the Modular Engineer Force, and we truly appreciate their support.

The desired way ahead for our Modular Engineer Force is to have command and control oversight over every engineer organization. The exceptions are those engineers embedded in the brigade combat teams (BCTs). Currently, the near future depicts four brigade headquarters: the 18th Engineer Brigade, 20th Engineer Brigade, 36th Engineer Brigade, and 130th Engineer Brigade. The brigade designs have changed, with one of the most significant improvements being the authorization of a second staff sergeant major in each engineer brigade headquarters. We now have a two-year authorization for staff sergeants major in the 19th and 20th Modular Engineer Battalions.

Training embedded engineer Soldiers in the Heavy BCT (HBCT), Infantry BCT (IBCT), and Stryker BCT (SBCT) is not without its unique challenges. We must provide them with the right set of **skills** and **tools** necessary for today and tomorrow. In December 2005, we hosted a working group at Fort Leonard Wood for the embedded sapper company (Echo Company) in the HBCT. The purpose was to define current capabilities, identify capability gaps, identify and recommend solutions, and document recommended solutions. The end state: provide HBCT sapper companies with the necessary skills and tools that enable mobility in concert with maneuver in urban and complex terrain. We must provide those companies with the very best equipment and capabilities available to accomplish their mission.

Another extremely important working group met at Fort Leonard Wood this quarter: First Army's NCO-led Improvised Explosive Device (IED) Defeat Working Group. Members of the Engineer School's Counter Explosive Hazards Center (CEHC) presented top-notch demonstrations that focused the group on techniques used by military working dogs, the interim vehicle-mounted mine detector (IVMMD), and the RG-31 medium mine-protected vehicle. Attendees included CSM Hill (First Army), CSM McCarty (Combined Arms Center), and representatives from Task Force IED, the National Training Center, and CEHC. The attendees realize that we owe it to our Soldiers to make the IED challenge our top priority. It was a very productive session, and all departed with a greater appreciation and understanding of technology intended to defeat IEDs.

My personal congratulations go out to all of you who made the master sergeant promotion list. Your selection is a testament of the Army's confidence in your abilities and your dedication to our Army and fellow Soldiers. Keep up the great work.

In closing, we continue to focus on the Global War on Terrorism, maintaining high standards and leading the way as engineers do. I hope everyone and their families had a safe and Happy New Year and that you remembered the Soldiers away from home who were not with their families. May God bless the fallen comrades and keep watch over our sons and daughters as we continue to fight the fight. Essayons!

MASTER AND COMMANDER:

Engineer Leaders Seeking the Skills and Tools to Close the Gaps

By Lieutenant Colonel Anthony C. Funkhouser

Many of you did not have the opportunity to participate in the recent Army Engineer Association (AEA) Engineer Regimental Conference in Orlando, Florida. The conference was unique this year, with three tracks that allowed focused working groups in assured mobility, United States Army Corps of Engineers/Assistant Chief of Staff for Information Management/Information Management Agency (USACE/ACSIM/IMA), and AEA industry. It was a privilege to listen to different perspectives of the challenges we face in enabling mobility in concert with maneuver in urban and complex terrain. This article provides some feedback to the field on what the United States Army Engineer School Commandant, Major General (MG) Randal R. Castro, discussed and what the Engineer School is doing to close these gaps. The working group model allowed us to focus on current shortfalls and to use the Regiment's resident expertise to address these challenges and recommend solutions.



Engineer Soldiers conduct MOUT training with smoke.

The conference began with a briefing from MG Castro, who broke down the problem using a common reference for all present: the military decision-making process. He laid out the facts and the specified and implied tasks and restated the problem of how best to enable mobility in concert with maneuver in urban and complex terrain. He laid out the doctrinal terms so everyone was on the same sheet of music. He explained that there is a difference in the old term of military operations in urban terrain (MOUT) and the new term of urban operations (UO). MOUT focused on a conventional force-on-force fight—fought on urban terrain—while UO is much more complex with our conventional forces fighting an unconventional force. In UO, there is a dynamic interaction with the population, the infrastructure, and the threat. We will have to use our ability to repair the infrastructure to influence the



Engineers use the "stack" technique during MOUT training.

population, thus denying the threat freedom of movement. MG Castro posed the question that maybe we should anticipate the future war to increase in complexity as a combination of MOUT and UO.

He also clarified the definitions of the three types of terrain. Most importantly, he laid out the difference in urban and complex terrain.

- *Urban terrain* includes airspace, supersurface, intra-surface, surface and ground, and subterranean corridor, infrastructure (including toxic industrial chemical storage and/or release), and human dimensions.
- *Complex terrain* is characterized by steep and heavily dissected terrain containing steep slopes with sudden elevation changes, circuitous gaps, and passes with a large number of severe slope variations. This includes arid and jungle environments.
- *Open and rolling terrain* primarily includes the topographic characteristics of flat desert and vegetated plains.

Once everyone understood the terms, he refocused on the problem statement: *How do we best enable mobility in concert with maneuver in urban and complex terrain?* This assured mobility challenge became our focus during the breakout groups. The Engineer School has focused on capability gaps in our recognized engineer formations. MG Castro explained that there is no "silver bullet" to remedy the problem. He refers to a "silver path" with a holistic set of solutions that incorporate doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF). The gaps that our silver path will focus on include the following:

- Movement/route clearance (countering improvised explosive devices [IEDs], vehicle-borne improvised explosive devices [VBIEDs], mines, and booby traps)
- Engineer reconnaissance/infrastructure assessment
- Urban engineer scout operations (brigade combat team [BCT] sappers)
- Masters of urban terrain
- Restoration and reconstruction
- Aging engineer equipment
- Engineer staff skills

MG Castro explained how the Engineer School is focused on closing these gaps by identifying the skills and tools that are needed in the Regiment. He succinctly laid out his vision of where the Regiment is headed and the progress made. This became his theme throughout the remainder of the brief. As we close these gaps, "The Regiment you see today…is not the Regiment of tomorrow." Our efforts to close the requirement gaps today will bring us closer to the capability requirements of the Future Engineer Force.



Soldiers use a mine detector to search for IEDs in Iraq.

A couple of years ago, the Engineer School led the way on doctrine and tactics, techniques, and procedures (TTP), while the combat training centers concentrated on training the collective force. However, only a couple of years later, the units in theater are developing new TTP daily from firsthand experience, and the role of the school has been to quickly capture the lessons learned, get them into our instruction, and redistribute them back to the field at large. The Engineer School has become a primary source of reachback knowledge on technical questions from the field as well. Full-spectrum operations have broadened our requirements for technical skills. Based on this paradigm, field units are the center of gravity for our current doctrinal TTP, which are really the current "best practices." The Engineer School will integrate these TTP into instruction, but simultaneously must be the architects of the Future Engineer Regiment. The Engineer School must look forward and understand that we will not fight the same war in the future. Therefore, the school must be a future-focused organization and shape the Regiment while continuing to enable the Current Force.

The Engineer School has had great success in closing a number of gaps. The school is working with the Ordnance School to better integrate engineers and explosive ordnance disposal (EOD) personnel at the BCT and task force levels. We are successfully expanding the role of engineers with IEDs, unexploded ordnance (UXO), and captured enemy ammunition (CEA). We have worked closely with EOD personnel to publish Field Manual Interim (FMI) 3-34.119, *Improvised Explosive Device Defeat*, and established protocols for commanders to use in theater. This has increased our sapper capabilities. The Explosive Ordnance Clearance Agent (EOCA) Course is training more engineers each month and awarding an additional skill identifier (ASI).

The mine detection and search dog programs are also growing since there is a great demand in theater for search dogs. The Engineer School will continue to grow its mine dog detachments and anticipate a continual increase in the number of dogs available for the field.

MG Castro has placed a great deal of emphasis on providing BCT sapper companies with the ability (skills and tools) to enable mobility in concert with maneuver in urban and complex terrain. He wants to use the integrated concept development team (ICDT) to make the engineer force mobility enablers as opposed to being used as infantry. What are the unique skills and tools we bring to the fight as engineers? The Counter Explosive Hazards Center (CEHC) identified the core tasks our Echo Companies in the BCTs are performing and cross-walked the skills and tools required. From there, they looked at commercial off-the-shelf options and prioritized them by cost. These capabilities will be made available to units that train in the CEHC programs. We still need assistance from the field, so if you have recommendations, please let us know. Additionally, CEHC is teaching the skills for engineers to operate the interim vehicle-mounted mine detector (IVMMD), the Buffalo mine-protected clearance vehicle, and the RG-31 medium mine-protected vehicle.

MG Castro continued with all the geospatial advances we have made with respect to the transformation. There are now geospatial organizations at every level of operational command. This has created the need to expand our military occupational specialty (MOS) 215D terrain warrant officer population. We have also improved the Digital Topographic Support System (DTSS) training for our geospatial personnel. For the remainder, we have continued to increase geospatial training in all our courses. What many of us knew as Maneuver Control System-Engineer (MCS-Eng) is now completely embedded into the MCS software and gives our engineers in the field a software package that allows the user to add attachments to graphic objects for more detailed information. This includes project files created in Microsoft® Project to track current construction projects.

Lastly, he explained where the Regiment stands on modernizing the fleet. Priority of effort is going to route clearance. The initial fielding of the IVMMD, the Buffalo, and the RG-31 to theater will be complete in the second quarter of fiscal year 2006. Construction equipment dollars continue to flow for the high-mobility engineer excavator (HMEE) Type III and for the uparmoring of the deployable universal combat earthmover (DEUCE) and HMEEs. With respect to bridging assets, there are several hundred million dollars allocated to equip the multirole bridge companies (MRBCs) with dry support and ribbon bridges. Since the Wolverine bridge program is complete, we will work on procuring the expeditionary assault bridge to replace the armored vehicle-launched bridge (AVLB) for the heavy force.



Interim Vehicle-Mounted Mine Detection System



RG-31 Medium Mine-Protected Vehicle

MG Castro closed by stating, "We are a nation at war, and our No. 1 mission is to prepare Soldiers for war. We are too close to the problem at the school, so we need to solicit your help for solutions. There is a paradox of complex warfare in that we can't keep up with the complexities. We must have a reachback capability to tap into a knowledge base that addresses all aspects of engineer operations in full-spectrum operations. One solution set is for the Engineer School to provide mobile training teams like the Sidewinders at the National Training Center to reach out to our engineer units and train them on functional skills. The school must find the voids in our units and fill them with functional courses to provide the skills and tools. We must also be adaptive, especially as we deal with this complex warfare. We can guess that future war will be a combination of UO and the traditional MOUT—a combination of conventional and unconventional fighting in urban and complex terrain. The Future Engineer Force is where we are going, so don't wring your hands about it. We will work through the issues. We will protect what we have and continue to give the Army options. That is our commitment to you. I understand that the hazy part of our future is *maneuver support*, but you will eventually be a proud part of what develops from this."

Lieutenant Colonel Funkhouser is the Chief of Staff at the United States Army Engineer School.

Assuring the Mobility of the FBCT

By Captain Bryon L. Mansfield

Though the concept of assured mobility has been integral to military operations throughout history, it has not been explicitly addressed as a separate concept until recently. The concept of assured mobility encompasses all those actions that guarantee the force commander the ability to move and maneuver where and when he desires—without interruption or delay—to achieve his intent. This concept forms the basis for the mobility of a Future Combat Systems (FCS)-equipped future brigade combat team (FBCT).

The assured mobility concept has four imperatives and six fundamentals that, when conducted properly, reduce the likelihood of enemy interdiction and minimize the need for traditional breaching. These nested and overlapping critical tasks are essential to the assured mobility mission to prevent or mitigate impediments to mobility.

The four imperatives of assured mobility are—

- Develop the mobility input to the common operational picture (COP).
- Develop, establish, and maintain operating areas.
- Attack the enemy's ability to influence operating areas.
- Maintain mobility and momentum.

The six fundamentals of assured mobility are—

- *Predict* actions and circumstances that could affect the ability of the force to maintain momentum.
- *Detect* early indicators of impediments to battlefield mobility using intelligence, surveillance, and reconnaissance (ISR) assets; identify alternatives; and establish surveillance.
- *Prevent* potential impediments to maneuverability from affecting the battlefield mobility of the force by acting early; monitor and protect cleared routes.
- *Avoid* detected impediments to the battlefield mobility of the force; if prevention fails, identify alternatives.
- *Neutralize*, reduce, or overcome (breach) impediments.
- *Protect* against threat force weapons and tactics, techniques, or procedures effects through the application of technology or tactical behavior. This is a continuous process.

The Army's future warfighting concepts place a premium on the ability of the ground force to achieve a position of advantage at all levels of warfare to seize the initiative and conduct rapid, decisive operations. In the past, our conceptual thinking about providing mobility was centered on reactive measures. Our processes, task organizations, equipment procurement, and Soldier and leader training all centered on mitigating the loss of mobility. However, in the contemporary operational environment, the challenges of an adaptive adversary and future warfighting concepts demand a fundamental shift from the old framework to one that emphasizes proactive mobility—the concept of assured mobility.

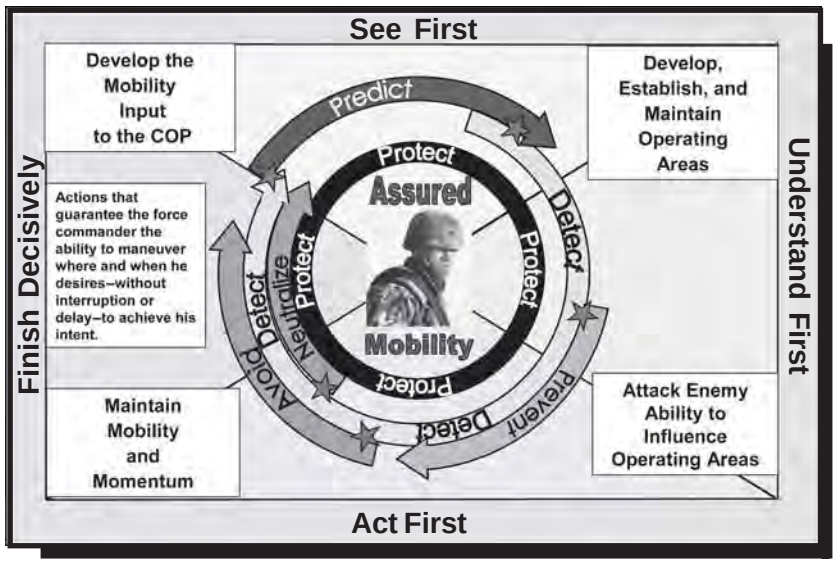
Assured mobility is a vital, enabling combined arms concept that defines one of the predominant roles of engineers and provides the linkage between their actions, force application, focused logistics, and protection. Achieving assured mobility requires a deliberate thought process that drives a series of overlapping and nested actions that will enable our forces to see first, understand first, act first, and finish decisively. This is a continuous process throughout the battle.

Current Force vs. FBCT

Mobility operations of the past hinged on embedding mobility enablers within the maneuver force because the technology of the time could not provide this capability at the platform level. The Engineer Regiment has undergone significant organizational changes over the years to bring this capability to the force. Regardless of the manpower issues, these enablers were relatively slow, large, and cumbersome vehicles that were easily identified, targeted, and eliminated by threat forces.

Aside from this, the majority of these rapidly aging assets existed in limited numbers. The operational effects of this were that the maneuver commander could not always move his units in a manner that facilitated speed, tactical initiative, and/or surprise. This limitation allowed the threat force into our decision cycles and gave them the ability to affect our maneuverability through the implementation of effective obstacle plans. Note that one of the key misunderstandings is that man-made obstacles are not typically employed to simply kill like other weapon systems. They are carefully placed to diminish the initiative, manpower, resources, or capabilities of one's opponent or to divert forces to areas that place them in a position of disadvantage.

There are two key differences at the macro level between the assured mobility of the Current Force and the FCS-equipped FBCT. The first is in the enabling technologies that permit a commander to predict and prevent or avoid impediments to the maneuverability of his unit earlier in a developing operation—the proactive piece mentioned earlier. The second is in the provision of mobility at the platform level. Key maneuver platforms will have the ability to locate, avoid, and/or survive the effects of many of the battlefield hazards that they will encounter. Coupling platform-level survivability with the predictive tools that identify hazards earlier greatly increases, at least in concept, the mobility of the FBCT. The simple math is that the less time spent in a reaction mode at an



Critical command, control, communications, computers, intelligence, surveillance, and reconnanisance (C4ISR) linkages between processes/ capabilities

obstacle or breach site, the lower the overall risk, the more lives saved, the more fully mission-capable vehicles, and the more firepower conserved for additional missions.

FBCT Assured Mobility

The vision of the FBCT overcomes many of these past shortcomings through key leaps in technology at a holistic level. The FCS is a uniquely large and complex U.S. Army acquisition initiative to develop a full range of technologically superior, interoperable, and cohesive systems. Often referred to as a "family of systems" or "system of systems," the combined capability of the FCS will be greater than the mere sum of its parts. Current plans equip the majority of our brigade combat teams (BCTs) between 2020 and 2030; however, we have already started the tenuous process of this transformation.

Field Manual (FM) 3-34, *Engineer Operations*, describes assured mobility as all those actions that guarantee the commander the ability to deploy into theater and maneuver where and when he desires without interruption or delay. However, this is not just about technical improvements to fighting platform mobility. It incorporates a better understanding of the friendly/enemy disposition and the three-dimensional battlespace (subterranean, ground-level, and aerial) to permit commanders to act first within the threat opponent's decision cycle to win the battle and finish decisively.

Superior situational awareness and selected fusion of information at various levels will provide leaders at all levels the tools necessary to make better-informed decisions on the fly. This improved situational awareness enables faster maneuver, not necessarily by moving faster, but by avoiding obstacles and providing the ability to recognize and converge on an open route or gap in an enemy defense.

The FBCT will achieve assured mobility through the employment of a family of systems that use a layered approach to harness the capabilities of the strategic, operational, and tactical systems to conduct predictive analyses. Developing the situation begins by receiving mobility information from national collection assets, higher headquarters assets (special operations forces [SOF], sensors, and signal intelligence), and organic assets (unmanned aerial vehicles [UAVs], unmanned ground vehicles [UGVs], and sensors). However, in the FCS vision, every platform is also a sensor itself. All of this information is harnessed in the Battle Command Network, where it is fused with other sources of information in order to analyze it (with the help of automated tools).

The last step in this process is displaying the appropriate level of detailed information on the real-time COP. Leaders down to the small-unit level are enabled by the automated, virtual three-dimensional modified combined obstacle overlay (MCOO) to see potential impediments to maneuverability for both ground and air platforms (mobility choke points or potential enemy missile, rocket, artillery, and mortar systems). Every FCS manned platform, Future Tactical Truck System (FTTS), and Soldier system will provide information to enable these leaders to identify the best mobility corridors to support their schemes of maneuver, significantly expediting dissemination and implementation of this mobility data.

The commander will then use this information from the COP to develop, establish, and maintain an acceptable operating area. Choosing operating areas is critical to the commander's ability to focus reconnaissance assets. The leaders have access to automated decision aids that use predictive algorithms that will be programmed to consider enemy doctrine, tendencies, and history regarding obstacles and antiaccess techniques. These are combined with known enemy disposition and terrain information to develop a prediction of the enemy plan to deny the FBCT freedom of maneuver. Based on this predictive analysis, reconnaissance troops use aerial and ground sensors with radar-based mine detection sensors to identify mined areas. Keep in mind that other assets have likely been observing most of this future operating area long before the FBCT entered the theater.

First-dimension impediments along subterranean corridors (booby-trapped caves or utility access ways) and third-dimension impediments (enemy air defense artillery [ADA], Man-Portable Air Defense Systems [MANPADS], obstacles such as antiair mines, and craters in runways at landing zones) are detected and avoided if possible. Based on detections, the commander selects and places demands on the intelligence system to further focus detection efforts in the operating area. Previous predictions are confirmed or denied, and an updated MCOO and predictive analysis are provided to commanders. This process is ongoing as it is today, but dissemination is much faster. This plan includes prediction of enemy actions and required sensor coverage to fill information voids within the operating area. Through this proactive process, ISR assets such as UAVs, unattended ground sensors (UGS), and/or the Intelligent Munitions System (IMS) may be assigned the role of observing critical areas to provide leaders with a higher fidelity of information before decisive commitment of assets to a given course of action. These ISR assets are linked with precision effects to form an active protective system that denies the enemy's ability to influence or degrade mobility at these critical points.

This is one way for the FBCT commander to attack the enemy's ability to influence lines of operation. These actions include any and all specific actions taken to preclude, deny, or prevent enemy maneuver or interdiction of FBCT routes. The commander proactively attacks those enemy systems capable of directly or indirectly impeding friendly ground or air maneuver, thus disrupting, neutralizing, or destroying his interdiction capability before it can be applied. The commander leverages capabilities such as precision munitions, dynamic obstacles (IMS and UGS), and joint effects to destroy enemy capability and deny him freedom of action. UGS and IMS are emplaced to overwatch key points on lines of operation and cue internal or external effects.

The combination of integrated attack operations (divisional/corps active/passive air and missile defense [AMD], aviation, and fires) enables domination and exploitation of the aerial battlespace and denies sanctuary to those systems that could impede friendly maneuver. Destruction of enemy air defense radars and weapons is the most effective shaping operation in support of third-dimension maneuver and is important in thwarting enemy antiaccess strategies at landing zones.

The FBCT must then maintain its mobility and momentum. Most mobility impediments can be mitigated through prediction, detection, and prevention. Impediments to ground mobility detected at standoff can be avoided by maneuver. There will be situations in which operational requirements dictate negotiation of areas that contain obstacles. These currently tend to use up the vast part of our operational time and resources. Even with decent intelligence, commanders typically are left in discovery-by-encounter roles that put troops and operations at increased risk.

In the future, the greater situational awareness provided to the commander will give him the ability to choose to avoid impediments by bypassing them or require him to breach them. To avoid by bypassing or using precision neutralization will require knowing the precise locations of impediments (mines and improvised explosive devices [IED]; unexploded ordnance [UXO]; and chemical, biological, radiological, and nuclear [CBRN] hazards). To enable this, the combination of explosive ordnance/infrared radiation-equipped UAVs and UGVs with ground and aerial mine detection equipment will be employed. Wide-area surveillance from FBCT and divisional assets, and route reconnaissance by combined arms battalion assets, will identify changes from previous reconnaissance, thus identifying recently emplaced buried or surface-laid scatterable mines or the emplacement of IEDs to cue the ground mine-detection-equipped UGV. Change detection will allow leaders to find an unobstructed bypass or to precisely employ UGVs confirming the exact location of the mines and IEDs to neutralize (deactivate, jam, or destroy) them.

The FBCT will likely be dependent on augmentation from corps and/or division support modules to conduct traditional deliberate breach, CBRN detection and marking, and large gap-crossing operations. In areas with large concentrations of displaced civilians, civil affairs and psychological operations (PSYOPs) assets may be employed to mitigate the effects of displaced civilians on FBCT operations.

Conclusion

Providing assured mobility is a continuous process that must be applied en route to and beyond the objective. Distributed, layered capabilities are critical to reducing the effects of mobility impediments to the lowest acceptable levels of risk to the force. By applying the four imperatives and six fundamentals of assured mobility, the unit of action is able to maintain momentum, maneuver out of contact to achieve a position of advantage, and if required, conduct tactical assault at a time and place of its choosing. There are still plenty of challenges left in this process for leaders and technical engineers to manage over the course of the next 10 to 20 years. Despite the advances in technology, it will be the Soldiers and leaders of today's Army who will assure the mobility of the Future Force.

Author's Note: The development of this concept and of the FCS are the work of a great number of people. This article is based on TRADOC Pamphlet 525-66, *Force Operating Capabilities*, and conversations and briefings with many of its authors. FCS is recognized as fundamentally new and different, and as such, its organization and operations are merely the truth as it is today. The reality of the future may prove this analysis wrong.

Captain Mansfield is an acquisition officer for the TRADOC Systems Manager-Assured Mobility, assigned to 1st Engineer Brigade, Fort Leonard Wood, Missouri. Previous assignments include company commander, S-3 operations, and assistant S-3 construction officer. He manages systems for explosive detection and neutralization for the Current and Future Forces. He holds a bachelor's in biology, specializing in genetics, from Purdue University.

COUNTER EXPLOSIVE HAZARDS CENTER

By Major Iain Church

The United States Army Engineer School Counter Explosive Hazards Center (CEHC) at Fort Leonard Wood, Missouri, is a fully operational and enduring organization providing the Army with innovative solutions to counter explosive hazards. Approved by the Army Assistant Chief of Staff, and Plans Operations (G3) in November 2004 with an effective date of October 2005, the CEHC has rapidly transformed from an ad hoc team to a fully functional Center of Excellence, while simultaneously supporting the Global War on Terrorism. The mission of the CEHC is to "s*ynchronize and integrate explosive hazards countermeasure concepts, technology, and materiel across the [doctrine, organization, training, materiel, leadership and education, personnel, and facilities] DOTMLPF spectrum to support assured mobility, protect the force, and counter explosive hazards in the contemporary environment."*

CEHC Initiatives

To stay ahead of the improvised explosive device (IED) threat in the contemporary operational environment (COE), the CEHC is working several initiatives to enable assured mobility in urban and complex terrain. Some major areas of focus are IED defeat contingency training, training integration with the combat training centers (CTCs), route reconnaissance and clearance operations, military search operations, enhanced sapper company skills and tools, explosive ordnance disposal (EOD)/engineer integration, an engineer robotics system, and IED defeat information management.

IED Defeat Contingency Training

The CEHC fills the gap between institutional training and unit training requirements for the COE. Using state-of-the-art equipment and field-tested techniques, the CEHC develops and continually updates courses on IED awareness and defeat and delivers world-class training and support to joint forces involved in the Global War on Terrorism. This instruction enables units to receive theater-specific training prior to deployment, allowing them to focus on the mission during transition of authority. To ensure that the training is up-to-date and relevant, the CEHC gathers the latest intelligence on explosive hazards tactics, techniques, and procedures (TTP) employed by the enemy, as well as TTP developed by deployed units to counter that threat.

Training Integration With the CTCs

The CEHC; the National Training Center (NTC) at Fort Irwin, California; and the Joint Improvised Explosive Device Defeat



Students become familiar with using the Buffalo's arm in a static environment before operating the arm from inside the vehicle.

(JIEDD) Task Force (TF) have teamed to form the Joint Center of Excellence for IED Defeat. The CEHC provides the individual and unit training on IED defeat equipment and techniques, while the NTC integrates these new capabilities into task force operations and validates emerging concepts in a joint and combined arms environment. The JIEDD TF evaluates these promising technologies and provides the resources required to enable the force. This team will be expanded to include all three CTCs and joint training centers.

Route Reconnaissance and Clearance Operations

The purpose of route reconnaissance and clearance operations is to detect and neutralize explosive hazards, thus protecting the force and providing commanders freedom of maneuver. Successful route reconnaissance and clearance requires the ability to improve or sanitize routes, a thorough knowledge of the route to detect changes, and the ability to safely neutralize explosive hazards. As the Army's lead for route reconnaissance and clearance, the CEHC has played a significant role in formalizing our doctrine and equipment sets currently used in theater and is forging ahead to test and validate new technologies to enhance the route clearance package. In addition, the CEHC has developed a course to train operators, mechanics, and leaders to conduct route reconnaissance and clearance operations. Since conception, this course has been attended by every deploying unit identified to conduct this mission in theater.

Military Search Operations

Military search is the application of systematic procedures at every level of command to locate specified targets in support of military or civil police operations. Specified targets include people, information, and materiel resources employed by an adversary. As the Army's lead for military search operations, the CEHC equips unit searchers and search advisors with a wide range of skills and tools that allow them to conduct person, vehicle, unoccupied and occupied building, area searches, as well as manual route clearance. Emphasis is placed on conducting searches that stand up to legal scrutiny.

Enhanced Sapper Company Skills and Tools

Through intelligence-gathering efforts and analysis, the CEHC lead an Engineer School team to identify means to increase the near-term capabilities of the brigade combat team (BCT) sapper company. Several innovative tools were identified to augment the reconnaissance capabilities, explosives, communications, and weapons already embedded in this vital sapper unit. The team also cross-walked the additional skills that unit leaders can obtain through existing courses (such as the Explosive Ordnance Clearance Agent, Urban Mobility Breaching, and Sapper Leader Courses) or new training in areas like special infrastructure assessment (sewage, water, electricity, academics, and trash [SWEAT]).

EOD/Engineer Integration

EOD and engineer units have unique and complementary roles regarding explosive hazards, and this necessitates close coordination when operating in the COE. To better support assured mobility, EOD and engineer leadership recently changed the approach to IED neutralization in theater. Under certain situations, IEDs are designated as obstacles and can be breached (neutralized) by engineer companies. To provide this IED-neutralization capability to engineers, the CEHC has formed a liaison with the United States Army Ordnance Munitions and Electronic Maintenance School, Redstone Arsenal, Alabama, to develop a 2-week Improvised Explosive Device Breacher Course. This course will concentrate specifically on the interrogation of suspect devices and the remote neutralization of simple IEDs.



Students are instructed in the use of remote pulling techniques.

Engineer Robotics System

The change in the IED neutralization approach has led to the development of an engineer robotics system that allows IEDs to be interrogated and neutralized from a safe distance. The CEHC has investigated multiple robotic systems that meet theater requirements and is working fielding and training initiatives to rapidly increase capabilities in the force. The intent is to further enhance route clearance teams and sapper companies.

IED Defeat Information Management

Information management is a critical component of IED defeat. The CEHC is collecting, vetting, analyzing, organizing, and disseminating the myriad of information on this pertinent subject. The CEHC was instrumental in developing Field Manual Interim (FMI) 3-34.119, *Improvised Explosive Device Defeat*, published in September 2005. This interim manual made significant changes to a commander's doctrinal options for dealing with IEDs. The CEHC is transforming Field Manual

(Continued on page 16)



Constructing Landing Strip Hammer:

Planning and Executing an Operation Iraqi Freedom Mission Readiness Project

By First Lieutenant Joseph Sahl

In December 2004, leaders of the 62d Engineer Battalion (Heavy) began coordinating with the Department of Public Works and the United States Air Force to make improvements to a landing strip—called Landing Strip Hammer—at Fort Hood, Texas. Used in the early 1990s, the landing strip was designed to handle C-130 aircraft. The improvements would allow C-17s, as well as other aircraft, to land there.

The Project

The 62d worked for more than eight months on the project, along with the 68th Engineer Company (Combat Support Equipment). The runway construction provided the perfect Operation Iraqi Freedom mission readiness opportunity to train on many critical battle tasks. The 68th was tasked to do most of the on-site construction with support from the 62d in the form of haul assets, some equipment, survey support, and a vertical construction unit from Alpha Company that built a tail wall for the culvert under the taxiway.

Phase I

Construction was divided into three phases. Phase I began in late January 2005 and involved clearing and grubbing the "maintained area," which was more than 8.5 acres surrounding the landing strip. The 68th removed obstacles (such as trees, shrubs, and rocks) that extended more than 6 inches above the existing grade. In the last weeks of the project, the area was graded again to remove new growth. Phase I also involved surveying the area to place initial boundary stakes for the runway and taxiway. The 68th then began removing the topsoil within the boundary stakes in order to remove any organics and ensure that there was room for 20 inches of quality fill and base material.

Unfortunately, February and March were the wettest months central Texas had experienced in quite some time, and there were fewer than ten days when this work could be done. The soil was so wet that any time heavy equipment was used, the site became messy and more work was often created. During these rainy weeks, the 62d's equipment platoon began operating the borrow pit and hauled fill whenever the weather allowed. As topsoil was removed from the landing strip, many soft, wet spots were found, and initial estimates were increased. The round trip between the landing strip and the borrow pit took approximately one hour; fill became a valuable commodity. The original plan called for the equipment platoon to haul the fill and the 68th to emplace it during Phase II.



Soldiers using scrapers to remove the existing base to stockpile for later use

Phase II

Phase II involved compacting and grading the fill to bring the runway and taxiway within 6 inches of grade. Because the base was purchased, the plan was to be very deliberate with the fill to ensure that none of the base would be wasted. This made Phase II the toughest and definitely the longest phase, but it was beneficial when the base was placed on top.

As the weather cleared and the ground dried, it became apparent that the haul assets could not keep up with the equipment at the site due to the long turnaround time. What was hauled in a week could usually be placed within a day and a half, so the plan was adjusted to compensate. Most of the work at the site was halted as the 68th combined haul and personnel assets with the equipment platoon. They performed 24-hour haul missions for three weeks and hauled more than 35,000 cubic yards of fill. Once this stockpile was in place, work was resumed at the site. The fill, picked up by the scrapers and often pushloaded by the dozers, was laid down in 6-inch lifts. The lifts were compacted by high-speed soil compactors, and then the surveyors would test compaction with a nuclear densometer.

Portions of the existing runway were usable and had to be tied in to the new fill, so as fill was added to the new side, the existing runway was ripped up and combined with the new fill to ensure that crevices would not form later. While 1st and 3d Platoons, 68th Engineer Company, removed topsoil and compacted fill, the majority of 2d Platoon extended the culvert that ran underneath the taxiway. The old tail wall was destroyed and part of the taxiway was cut back so the old culvert pipe could be accessed. The additional 30-foot pipes were bound to the existing pipes and sealed. Then the Soldiers spent several days tamping the fill around the new culvert pipe extension until the rollers could be used. Alpha Company, 62d Engineer Battalion, built the forms and placed the concrete for a new tail wall later that month, and the culvert extension was completed.

Phase II was completed with the help of Bravo Company, 62d Engineer Battalion, who came from Fort Sill, Oklahoma, for a battalion field training exercise. Also, Marines from the Marine Wing Support Squadron 473d spent more than a week working on the runway and helping to perform equipment maintenance. During this phase, Soldiers combined efforts to haul and then emplace more than 40,000 cubic yards of fill. The runway was raised as much as 9 feet in some places. The entire landing strip (including the runway, taxiway, and two turnarounds) was within 6 inches of the final grade. The longitudinal and transverse slopes were all well within the allowable slopes determined by the Air Force.

Phase III

Phase III involved compacting and grading the base over the fill to bring the landing strip up to final grade. The base, which had been stockpiled on top of the existing taxiway until it was ready to be used, was picked up by the scrapers and laid down in 4- to 6-inch lifts. The 68th used its smooth-wheel rollers to compact the base, along with two rented 9-wheel rollers to help with the final compaction.

Once the rain let up in March, there was almost no moisture for the rest of the project. The 68th used water distribution trailers behind M916 tractor trucks to bring in water. During the heat of the Texas summer, it became very challenging to keep the fill and base moist enough to meet compaction requirements. The 68th worked 24-hour operations for more than a month to keep the water coming. Light sets were used, and the Soldiers became proficient in operating their equipment at night. When optimal moisture content was reached, the fill and base reached compaction easily and the final phase moved quickly.

While final grading and compacting were conducted, other Soldiers worked to improve the drainage on the site. Ditches were dug on the outsides of the taxiway and runway to prevent water from settling on or near the landing strip. The ditches in between the runway and taxiway were connected to the culvert that went under the taxiway, and the water was routed out to a stock pond outside of the maintained area. The drainage was also improved along the access road—which has since been



Soldiers compact fill between the two culvert pipes they emplaced. The culvert will be used to drain water from the area between the runway and the taxiway. Water was directed from either end of the runway and channeled through this culvert into a retention pond outside of the maintained area.

renamed "Trailblazer Avenue" in recognition of the work done by the 68th Engineer Company "Trailblazers"—leading up to the landing strip.

Lessons Learned

Many hours went into planning, coordinating, and constructing Landing Strip Hammer, and lessons were taken from each aspect of the project. Most of the lessons learned were simply common sense reminders of the importance or precedence that some tasks took over others.

Planning Stage

Weekly meetings with the survey sections during the project allowed the surveyors to have a working knowledge of the project. A good initial survey and periodic quality control checks were essential to meet the timeline without any unnecessary delays or mistakes. In this case, several different survey teams were involved, and it was essential that they were all working with the same, most up-to-date data.

Cross Training and Licensing

One of the biggest benefits to the landing strip project was the cross training that the operators received. As the project progressed, more Soldiers became licensed and qualified on the various equipment, even if it was outside of their military occupational specialty. This gave the unit the flexibility needed to meet expected construction demands in Iraq.

Conclusion

The Landing Strip Hammer project provided the 62d Engineer Battalion excellent training in preparation for Operation Iraqi Freedom. Officers, noncommissioned officers, and Soldiers benefited from planning, supervising, and constructing this landing strip.

Soldiers from the 62d, in addition to elements from the Marine Wing Support Squadron 473d, were involved in the construction. The runway was extended and widened, and the maximum slope was decreased. The taxiway was widened, the culvert extended, and a new tail wall was built. The mission was completed with an approximate savings of $627,000 to the Army.

Maintaining Landing Strip Hammer will continue to provide a training benefit to engineer units at Fort Hood, and the landing strip will be a valuable training facility for the Army and other services for many years.

First Lieutenant Sahl is the executive officer for the 68th Engineer Company, 62d Engineer Battalion, 64th Corps Support Group, Fort Hood, Texas. He previously served as the 3d Platoon leader for 68th Engineer Company and was the officer in charge of the Landing Strip Hammer project. He holds a bachelor's from Texas A&M University and is a graduate of the Engineer Officer Basic Course.



Environmental Considerations
as Part of the Military Decision-Making Process

By Mr. Albert M. Vargesko

It is not just about endangered species, cleaning up spills, or being in compliance! Operations and simulations confirm that environmental considerations include many areas that might be low on the commander's (and staff's) priority list, but still need to be considered as part of the military decision-making process (MDMP).

Consider the following scenario: *U.S. deployed forces are about to conduct a deliberate river-crossing operation against a smart, determined but outnumbered, enemy. Multiple crossing sites are planned. One brigade combat team (BCT) will cross at a point in the river parallel to an underground petroleum pipeline. Not far away is an underground natural gas pipeline. Each one has exposed standpipes and valves on both sides of the river. The terrain is complex, with a mix of small built-up urban areas and rolling agricultural fields. Another BCT has a forward base established less than 1 kilometer away from a commercial phosphorus plant. A municipal power plant in the area of operations was destroyed by U.S. forces because the enemy was using it for hiding an antiaircraft battery. It is harvest season, and the farmers are trying to get their crops in before the rainy season starts. The U.S. mission is to destroy enemy forces, shore up the fledgling elected government and train their forces, and stay on to conduct stability and reconstruction operations (SRO) along with nation building. Winning the hearts and minds of the local population is an important implied task. Another key implied task is to conduct the mission with minimal casualties, both U.S. and civilian.*

This was the scenario facing the United States Army Maneuver Support Center (MANSCEN) (Engineer, Military Police, and Chemical Schools) Captain's Career Course Warfighter III in their culminating exercise at the MANSCEN Battle Lab. Their responsibility was to address the environmental considerations.

- Environmental considerations should be clearly identified during the MDMP and the intelligence preparation of the battlefield (IPB). A thorough terrain analysis, to include identification of the existing infrastructure, would reveal that choosing a river-crossing site adjacent to these pipelines is not a good choice. These pipelines could be blown—either on purpose or by accidental artillery/mortar fires—and create a significant blast, illuminate the crossing sites, spill burning petroleum product in the river, and put the crossing at risk. Destruction of these pipelines would also have a significant adverse impact on the civilian population.

- Selecting a forward operating base so close to a commercial phosphorus plant is not a good idea in the interest of force health protection. The fumes from this plant could make Soldiers sick. If the plant were deliberately blown by the enemy, there could be significant loss of life (military and civilian) from toxic fumes carried downwind. The destruction of this plant would also adversely impact the farming community.
- Loss of the power plant may or may not affect combat operations, but in the aftermath of its destruction, a lot of time, money, and effort would be required to make it operational again. If destruction of the power plant is not absolutely necessary, it should not be targeted. The negative impacts of destroying the power plant should be weighed before the final decision is made to destroy it. There might be alternatives to reducing the enemy fire coming from the facility that do not require the plant's destruction.
- Since this is an agricultural area, there will be many feed stores in the area with agrochemicals present. These chemicals are easily made into explosive devices, which a determined and desperate enemy would employ. It would be an important priority in the offensive operation to secure these stores—to deny their use by the enemy and to protect them for future use by the agricultural community once combat ends.
- The farmlands, vineyards, orchards, and so on should be avoided to the extent that is militarily possible. Any follow-on SRO will be made simpler if the civilian population still has a means to make a living and stay employed. It might be necessary, as part of combat operations, to destroy some of the agriculture in the area, but the consequences would have to be addressed in the aftermath by the national government and the United States.

Other environmental considerations associated with military operations that can impact the operation include dust suppression, insect and/or vermin infestation, infectious-waste disposal, hazardous-waste disposal, and protection/preservation of historic, religious, and cultural sites.

For more information on environmental considerations during military operations, visit the United States Army Engineer School Directorate of Environmental Integration Web site at <*www.wood.army.mil/dei*>.

Mr. Vargesko is a doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) integration specialist with the United States Army Engineer School, Directorate of Environmental Integration, Fort Leonard Wood, Missouri. He received his environmental experience with the Missouri Department of Natural Resources. A retired lieutenant colonel, he holds a bachelor's in geography from the Indiana University of Pennsylvania and a master's in military art and science from the Command and General Staff College at Fort Leavenworth, Kansas.

("Counter Explosive," continued from page 11)



Students conduct a route reconnaissance and clearance operation.

(FM) 20-32, *Mine/Countermine Operations*, into FM 3-34.210, *Explosive Hazards Operations*, which is scheduled to be published in fiscal year 2006.

The CEHC developed an Improved Explosive Device Defeat Train-the-Trainer (IEDD-T3) Course to enable trainers to prepare their units for the current IED threat. The training audience was recently expanded to include deploying units from all services. The CEHC conducts IEDD-T3 training at Fort Leonard Wood and via mobile training teams.

Summary

The CEHC has made dramatic progress over the past year, in both supporting the Global War on Terrorism and standing up an enduring Center of Excellence. CEHC initiatives have played a vital role in preparing units for operations in theater with emphasis on IED defeat. The center is focused on future needs, and systems are in place for continued progress to meet the needs of our force in the coming years. The CEHC will continue to market its capabilities to the field to enable the leadership to understand how these capabilities can be used to increase operational success and force protection.

Major Church is chief of the Countermeasures Division, CEHC, Fort Leonard Wood, Missouri. His previous assignments include two tours in Northern Ireland, bomb disposal officer for the 33d Engineer Regiment (EOD) with deployment operations to Kosovo and Bosnia, and second-in-command of an air support squadron in which he saw active service during the first six months of Operation Iraqi Freedom. He is a graduate of the Royal Military Academy Sandhurst.

United States Joint Forces Military Training Center Targets Deploying Units

By Major Michael J. Malone

The United States Joint Forces Military Skills Training Center, located at Fort Sam Houston, Texas, has shifted focus from international competition to training small units for deployment. Originally, the mission of the Center—operated by the United States Army Reserve Command—was to train U.S. Reserve officers, cadets, and midshipmen who had completed the Confédération Interalliée des Officiers de Réserve (CIOR)—(translated as Interallied Confederation of Reserve Officers) professional development course to compete in the annual North Atlantic Treaty Organization (NATO) CIOR Military Skills Competition, with the ultimate goal of winning a gold medal. But considering the ongoing training needs in support of the Global War on Terrorism, that goal no longer seemed adequate. Training for competition is now secondary to the mission of providing effective professional development and peak performance training in leadership and advanced military skills to small deploying units.

The Center reevaluated its end customer, deciding that the Department of Defense would be better served with well-trained, cohesive combat teams than with the prestige of winning the CIOR competition among our allies. The Center cadre is composed of Soldiers who are tops in their warfighting skills. The United States Army Reserve and United States Marine Corps Reserve marksmanship cadre include several who wear the President's Hundred Tab, which is awarded to the top 100 shooters each year at the national shooting match at Camp Perry, Ohio. The lead land navigation instructor is a United States Navy Reserve SEAL officer who—because of his expertise—has been tasked with teaching land navigation skills to active duty Navy SEALs. Opening the curriculum to include pre-mobilization training for deploying teams seemed to be the logical next step.

The most recent beneficiary of this shift in mission focus was Facility Engineer Team (FET) 19, United States Army Facilities Engineering Group–Southwest, 416th Engineer Command. Scheduled to deploy to support base camps with engineer services and construction management, FET 19 underwent a 3-day team-building exercise at Camp Bullis, Texas. The exercise involved intensive training on the M9 pistol and M16A2 rifle, advanced land navigation, and combat first aid. The pistol and rifle training went beyond the engagement of static targets and focused on real-world decisions the Soldiers would be making in a deployment environment.

The training did not focus solely on warfighting skills, but integrated a constant theme of team building throughout. With facilitation from the Center cadre, the individual team members discussed their personal backgrounds and objectives for the deployment. In several subsequent sessions, the team had an opportunity to review higher-level command missions—from the commander in chief to the team's group commander. The culminating event was the development of the team's mission statement—by the team—as it related to their upcoming deployment: *Deploy to the United States Army Central Command's area of responsibility and effectively provide quality facility engineering and engineer planning support to assist supported forces in the accomplishment of their mission.* This exercise will prove invaluable to the cohesiveness of the team as it continues its preparation for deployment.

Even though it's no longer the primary mission, the Center still trains selected Reserve officers to compete in the annual NATO CIOR Military Skills Competition. Approximately160 Reserve officers and cadets from 19 NATO countries take part in the competition, which tests the competitors in warfighting skills such as rifle marksmanship, pistol marksmanship, orienteering/land navigation, land and water obstacle courses, combat first aid, and NATO policies (including the law of war) in a 3-day military competition. The competition not only provides international exposure to junior officers but also develops friendships and strengthens the NATO bond—which is an ideal way to foster cooperation between the various Reserve forces.

For more information, contact the United States Joint Forces Military Training Center at (210) 221-1206 or view its Web site at <*www.uscior.army.mil*>.



Major Malone is a civil engineer with the United States Army Facility Engineering Group–Southwest and will be deploying with FET 19.

USAES Deploys Katrina Recovery and Relief Support

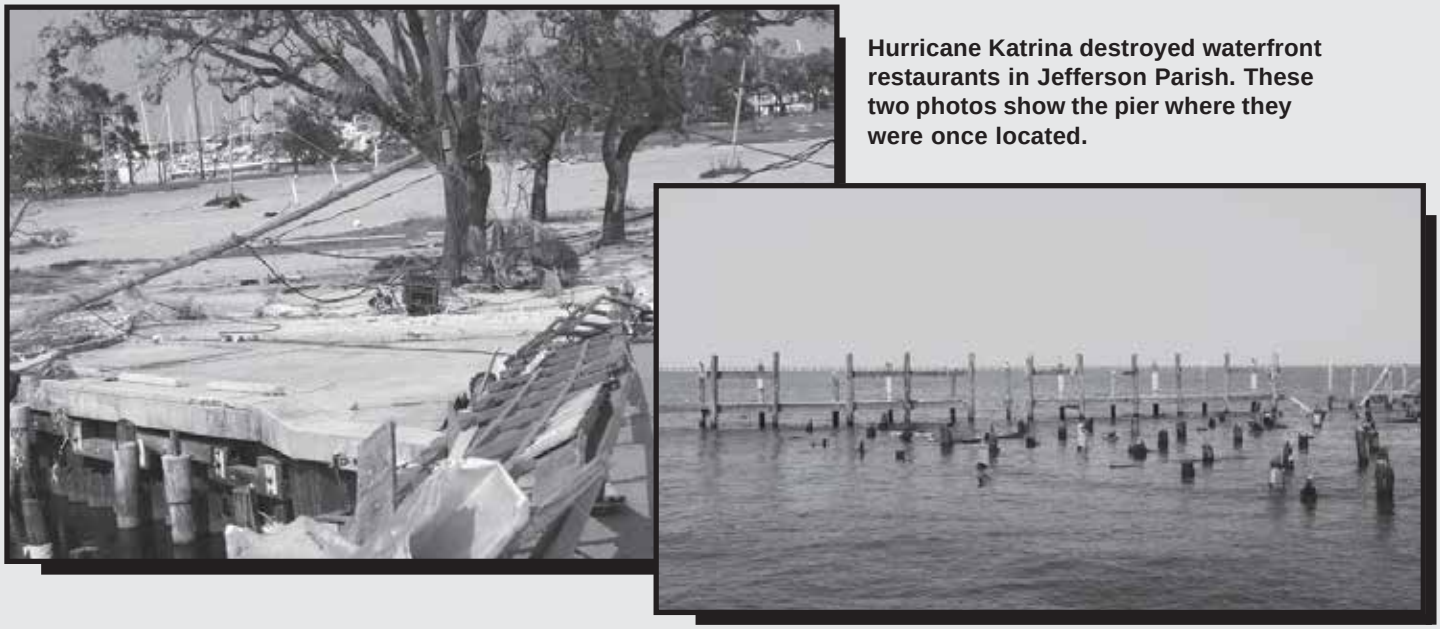
By Major Jason Hedges, Royal Australian Engineer

In the wake of the devastation caused by Hurricane Katrina and Hurricane Rita, the United States Army Engineer School (USAES), Fort Leonard Wood, Missouri, responded to the United States Army Corps of Engineers® request for support within 24 hours. In September and October 2005, USAES deployed 21 volunteers—Team Katrina—to Louisiana and the surrounding regions. This was no easy task; among other things, orders had to be prepared and travel arrangements had to be made, to include finding available rental cars on short notice.

The volunteers—USAES faculty members, support staff, and students—were assigned to critical liaison or headquarters staff positions by the Corps. They were responsible for providing leadership and operational planning support. Upon arrival, Team Katrina personnel were deployed to almost every affected parish and immediately began to work alongside Corps of Engineers employees, local officials, state and federal agencies, and nongovernmental organizations to provide much-needed emergency support to citizens of the Gulf Coast. Many Team Katrina personnel were employed as liaison officers, facilitating valuable information flow between the Corps of Engineers and the local authorities. They also contributed significantly to the development of a common operational picture for Corps commanders. Their efforts enabled the commanders to see, understand, and act as part of the overall emergency support function. As emphasized by a Team Katrina member serving as an assistant operations officer in the Louisiana Recovery Field Office, communication was the bottom line. He and other Team Katrina personnel held key headquarters positions to support the Corps's chain of command and kept information flowing.

Team Katrina personnel were exposed to the complexity of the interagency framework of large-scale disaster response operations. A captain serving as an operations officer with the Joint Field Office in Louisiana worked closely with the Federal Emergency Management Agency (FEMA). They accomplished many things, including setting up a fully functioning operations center within a week. This operations center tracked all recovery operations for the state of Louisiana, to include Operation Blue Roof (a free program that places temporary roofs of blue plastic sheeting on homes or facilities); debris removal; ice and water delivery; as well as meals, ready-to-eat (MRE) delivery. The liaisons from each parish reported real-time updates to the operations center.

The extent of the damage to New Orleans and the surrounding areas needed to be seen to be believed; the devastation was significant. Structural assessment, debris removal, and sanitation problems were the big issues faced.



Hurricane Katrina destroyed waterfront restaurants in Jefferson Parish. These two photos show the pier where they were once located.



Debris from the restaurants was pushed into a pile near the lake in Jefferson Parish.



A statue is the only surviving piece of this monument in Jefferson Parish.



Debris and wind damage were apparent in Old Metarie, Jefferson Parish.

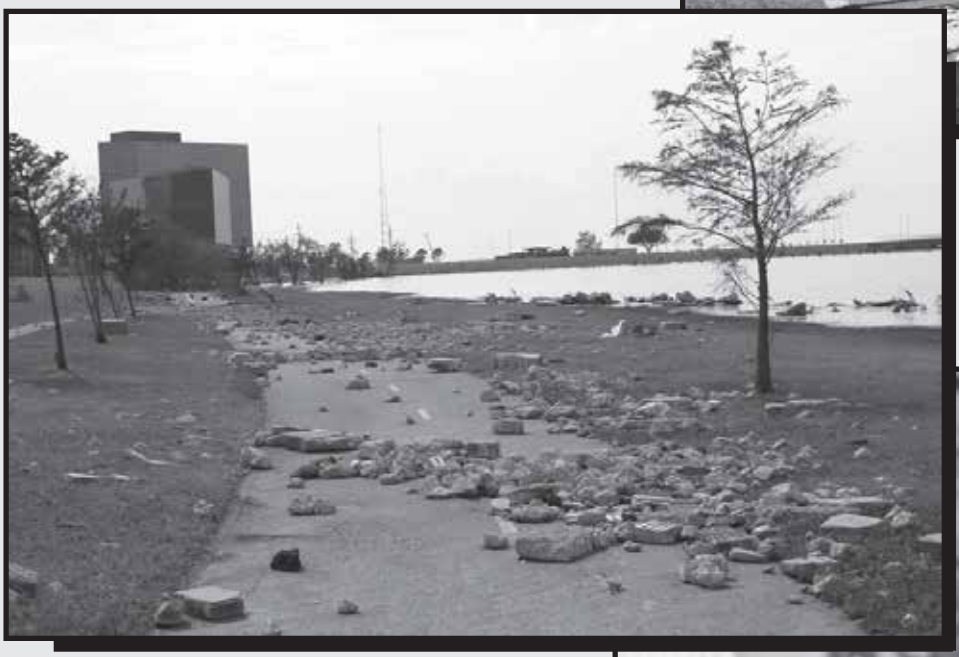


The building in the background, located North of Interstate 10 in Jefferson Parish, had most of its windows blown out during the hurricane.

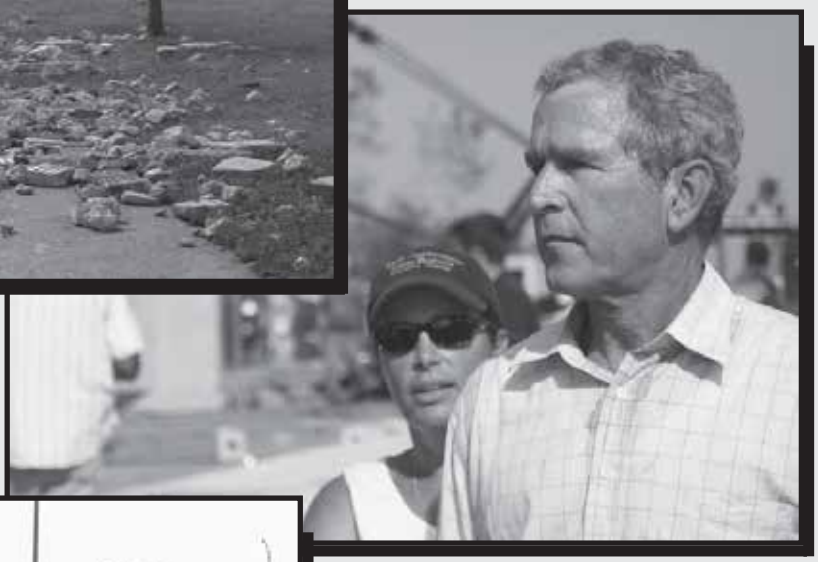


This is the site of the oldest house in New Orleans, built in the 1700s. It was completely destroyed by Hurricane Katrina.





Scattered debris was all that was left of a makeshift levee for Lake Ponchatrain.



President George W. Bush visited Louisiana to view the devastation in September while Team Katrina members were deployed. Also shown in the picture is the president of the Jefferson Parish Levee Board.

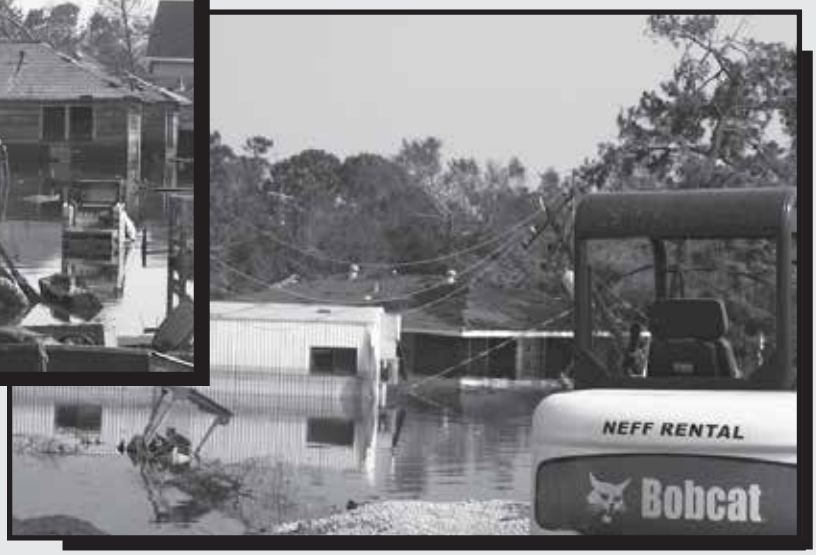


This is an Interstate 10 staging area for evacuations in Jefferson Parish.

Storm surges and levee failures caused by Hurricane Katrina, a Category 4 storm, left much of Orleans Parish flooded. Water poured through and over the levees. The 17th Street Canal—which separates Jefferson and Orleans Parish in New Orleans, Louisiana—experienced structural failures. The canal's levee was the site of one of the major levee breaches. When Hurricane Rita hit just twenty days later, levee repairs were not complete and some areas began to flood again.







These photos show flooding in the area adjacent to the 17th Street Canal.



This photo shows the breach in the 17th Street Canal levee.



Repairs were made to the 17th Street Canal, and some debris was removed.

Team Katrina personnel provided invaluable junior leadership focus to Corps of Engineers operations at the tactical level. The military uniform, regardless of branch or service, gave instant credibility and an expectation of leadership and agility. A task force was created to drain water from the area—Task Force Unwatering. One Team Katrina member who served as a liaison officer for the task force stated that the experts with the skills and techniques were brought together to execute the tasks. The task force operated temporary pumps, brought in sandbags and rock, and sealed breached areas in the levees.



Flooding occurred at City Stadium, Morgan City, Louisiana.



Pressure forced water up through this drain pipe.



This housing area near Lake Ponchatrain, Metarie, in East Orleans Parish, suffered extensive flood damage.



This car dealership in Plaquemine Parish was also flooded.



City Park in Orleans Parish was completely underwater.



These photos show some of the extensive damage at a Yacht Club in Orleans Parish.







This yacht was found three blocks away from the lake in Orleans Parish.

At the recent Army Engineer Association Engineer Regimental Conference, Lieutenant General Carl A. Strock, Chief of Engineers, praised the efforts of Team Katrina personnel. *"The team from the Engineer School provided exceptional support to the Corps of Engineers and made a significant difference to the people of the Gulf Coast."*

The decision by USAES to deploy Team Katrina generated numerous benefits. It proved to be an overwhelmingly positive experience, both professionally and personally. It exposed junior leaders to not only the Corps of Engineers but also to the vast array of governmental and nongovernmental agencies and organizations operating in a very complex framework to achieve humanitarian assistance on an unprecedented scale within the United States. Team Katrina personnel also had a unique opportunity to directly assist their fellow Americans in a time of need.

Major Hedges is an exchange instructor and chief of the Engineer Captain's Career Course, United States Army Engineer School, Fort Leonard Wood, Missouri. A military representative of Australia, he is a graduate of the Royal Military College of Australia, Duntroon, and the Australian Command and Staff College. He holds a master's in project management and a master's in management and defence studies.

All photographs courtesy of Major John Espe.

A Picture Is Worth a Thousand Lives

By Dr. JoAnne Castagna

We've all seen the images of Hurricane Katrina's destruction—flooded streets, destroyed homes, shattered families. It's these same images that are helping rebuild the lives of our fellow Americans in the Gulf Coast.

More than 1,600 United States Army Corps of Engineers (USACE) employees are supporting the Federal Emergency Management Agency (FEMA) and other state, federal, and volunteer agencies in the recovery efforts throughout Mississippi and Louisiana (see Figure 1). But before the recovery efforts could begin, the region needed to be mapped out. The hurricane had blown away most of the street signs, so rescue and recovery teams had no idea what streets they were on.

USACE uses a geographic information system (GIS)—a computer-based information system and analytical tool—to create the necessary maps. According to one of the three USACE action officers who are responsible for deploying and managing GIS teams throughout the disaster region, the GIS takes data from various sources—including aerial photography, flood zones, and demographic data—and combines these layers of information in various ways as overlays to perform spatial analysis and produce a map that depicts the results of that analysis.

USACE uses GIS images in performing the following recovery efforts:

- **Assessing post-disaster damage.** To assess damage, maps are created of the entire region. First, aerial photos are taken of the region and then are laid over geographic coordinates. This information is brought into a computer mapping system to create a map.
- **Rescuing and recovering.** The GIS teams gather data on where hurricane victims are located and feed this information into the GIS database. This data is combined with the aerial photography and other geographic data to produce maps that search-and-rescue workers can use to locate and recover stranded individuals.
- **Building temporary homes.** Temporary housing is only allowed to be developed on land that is not prone to

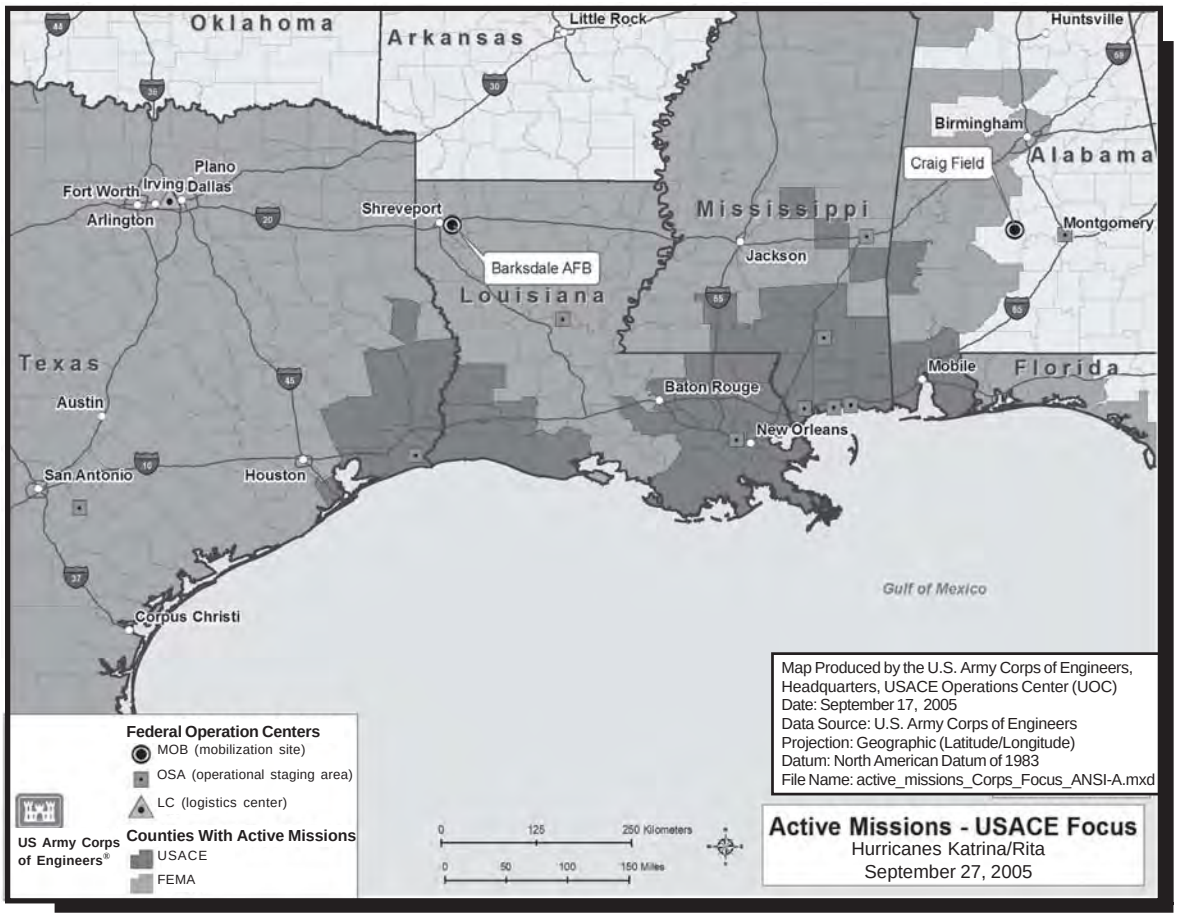


Figure 1. Active Missions

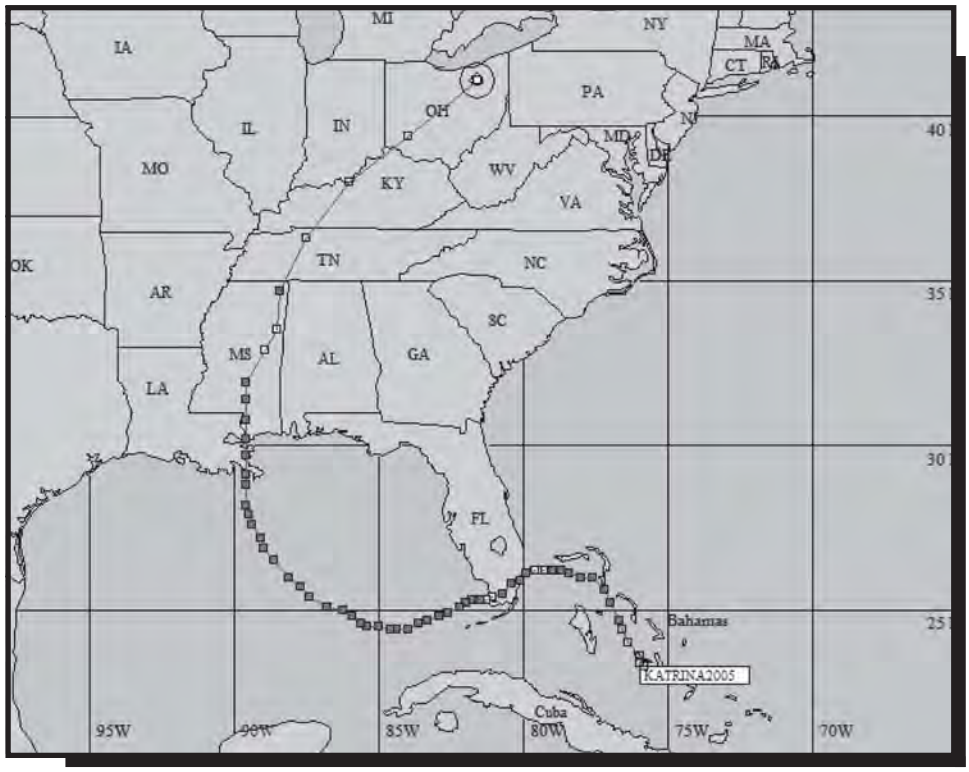


Figure 2. Katrina's Path

flooding, is safe, and is in the proximity of services such as hospitals and schools. Data on the flood zones is combined with other data types to produce maps that show the best locations for temporary housing.

- **Removing debris.** The GIS maps show engineers where debris is located. Engineers can calculate how much debris there is from these maps and determine how much it would cost to remove it. These maps also show where the land is clear. Clear land is needed for "staging areas" to hold the equipment that will be used to remove the debris. In addition, GIS maps show engineers the optimal routes for removing and transporting the debris.
- **Pumping floodwater.** The GIS can perform three-dimensional (3-D) analysis and modeling that shows how long it will take for floodwaters to subside, using different rates of pumping. In addition, GIS teams in the field can provide data about where pump stations are located and which ones are working and not working. This data was used to help calculate how long it would take to pump water out of the region.
- **Identifying impacted communities.** The GIS can be used to create demographic maps that identify what economic and racial groups are impacted the most. These maps are created by combining hurricane path data with the aerial images, wind speed data, and census data (see Figure 2). These maps are used by various groups involved in the rescue-and-recovery efforts, including the American Red Cross.

GIS mapping is one of several tasks that must be initiated immediately when acting on a disaster relief situation. Communicate, coordinate, and cooperate are the three essential Cs for getting things going and accomplishing what is needed in a short amount of time in disaster situations. Following are suggestions for engineers who are faced with initiating a disaster relief mission:

- **Plan ahead.** Have a strategy in place before a disaster occurs.
- **Create a team of diversified specialists.** Many of the GIS team members are non-GIS specialists who come from other disciplines. These other additional skills can combine to meet the many needs during a disaster.
- **Organize and utilize available resources.** USACE needed to take aerial photography of the disaster and was able to immediately call on a contractor to perform that work.
- **Keep lines of communication open.** USACE worked closely with other agencies, and the working relationship was great, due to their frequent communication. One GIS team leader had two teleconference meetings with FEMA and other federal and state agencies daily.

There are a variety of ways that the GIS can be used to help support disaster missions. A picture is worth a thousand words, and if that picture has a lot of useful information on it, people can relate to it.

Dr. Castagna is a technical writer/editor for the United States Army Corps of Engineers, New York District. She writes about the district's diversified civil and military projects and studies and has been published in more than 50 national and international publications. In 2004, her writing received accolades from the Department of the Army.

Military Review Seeks Essays for 2006 Professional Military Writing Competition



For the 2006 General William E. DePuy Professional Military Writing Competition, *Military Review* seeks original essays on subjects of current concern to the United States Army. This contest is open to all. The Global War on Terrorism, evolving threats, force reform, insurgency/counterinsurgency, cultural awareness in military operations, tanks in urban combat, transitioning from combat to stability and reconstruction operations, ethical challenges in counterinsurgency, historical parallels to current operations, better ways to man the force—the possible topics are limitless. Winning papers will be carefully researched, analytically oriented critiques, proposals, or relevant case histories that show evidence of imaginative, even unconventional, thinking. Submissions should be 3,500 to 5,000 words long.

First prize is featured publication in the May-June 2006 edition of *Military Review,* a $500 honorarium, and a framed certificate. Second and third prizes offer publication in *Military Review,* a $250 honorarium, and a certificate. Honorable mention designees will be given special consideration for publication and certificates.

Essays should be submitted with an enrollment form not later than 1 April 2006 to *Military Review*, ATTN: Competition, 294 Grant Avenue, Fort Leavenworth, Kansas 66027-1254, or via e-mail to <*milrevweb@leavenworth.army.mil*> (Subject: Competition). For a copy of the enrollment form and additional information, visit *Military Review*'s Web site at <*http://www.leavenworth.army.mil/milrev/*>.

••••••*The Engineer Writer's Guide*••••••

Engineer is a professional-development bulletin designed to provide a forum for exchanging information and ideas within the Army engineer community. We include articles by and about officers, enlisted soldiers, warrant officers, Department of the Army civilian employees, and others. Writers may discuss training, current operations and exercises, doctrine, equipment, history, personal viewpoints, or other areas of general interest to engineers. Articles may share good ideas and lessons learned or explore better ways of doing things.

Articles should be concise, straightforward, and in the active voice. If they contain attributable information or quotations not referenced in the text, provide appropriate endnotes. Text length should not exceed 2,000 words (about eight double-spaced pages). Shorter after-action-type articles and reviews of books on engineer topics are also welcome.

Include photos (with captions) and/or line diagrams that illustrate information in the article. Please do not include illustrations or photos in the text; instead, send each of them as a separate file. Do not embed photos in Powerpoint®. If illustrations are in PowerPoint, avoid excessive use of color and shading. Save digital images at a resolution no lower than 200 dpi. Images copied from a Web site must be accompanied by copyright permission.

Provide a short paragraph that summarizes the content of the article. Also include a short biography, including your full name, rank, current unit, and job title; a list of your past assignments, experience, and education; your mailing address; and a fax number and commercial daytime telephone number.

Articles submitted to *Engineer* for publication must be accompanied by a written release from the author's unit or activity security manager. All information contained in the article must be unclassified, nonsensitive, and releasable to the public. *Engineer* is distributed to military units worldwide and is also available for sale by the Government Printing Office. As such, it is readily accessible to nongovernment or foreign individuals and organizations.

We cannot guarantee that we will publish all submitted articles. They are accepted for publication only after thorough review. If we plan to use your article in an upcoming issue, we will notify you. Therefore, it is important to keep us informed of changes in your e-mail address or telephone number. All articles accepted for publication are subject to grammatical and structural changes as well as editing for style.

Send submissions, in Microsoft® Word, by e-mail to <*engineer@wood.army.mil*> or send a 3 1/2-inch disk or a CD, along with a double-spaced copy of the manuscript, to: Managing Editor, *Engineer Professional Bulletin*, 320 MANSCEN Loop, Suite 348, Fort Leonard Wood, Missouri 65473-8929.

Note: Please indicate if your manuscript is being considered for publication elsewhere. Due to the limited space per issue, we usually do not print articles that have been accepted for publication by other Army professional bulletins.

NGA Supports CGSC

"NGA provides significant capabilities and expertise in terrain visualization and digital imagery as we push our students to fully analyze the available data so that they can make better command decisions in the heat of battle."

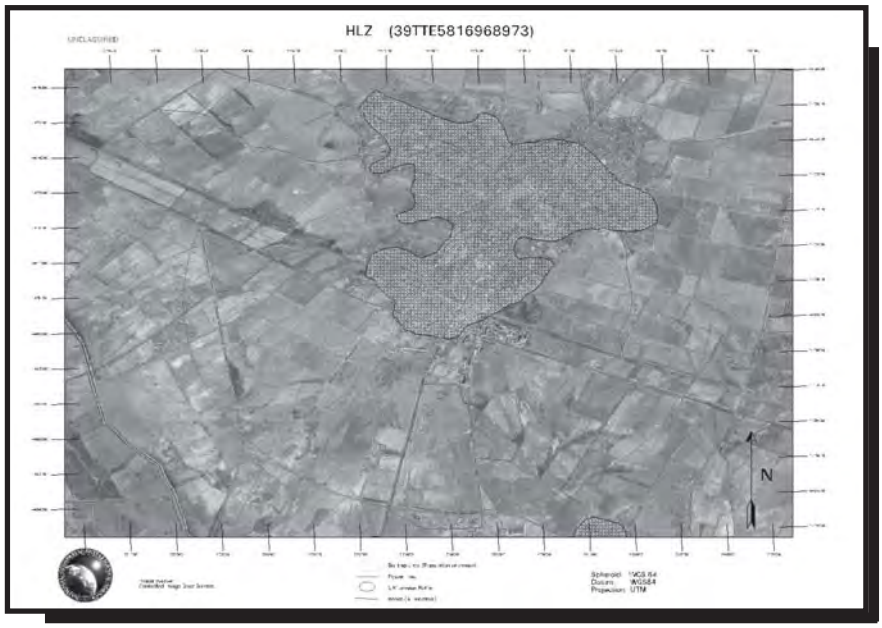
LTC(R) Jonathan M. Williams
Instructor, Center for Army Tactics
Command and General Staff College

By Mr. Ralph M. Erwin and Ms. Marsha M. Mocaby

The National Geospatial-Intelligence Agency (NGA) is an integral part of the education process of joint military exercises at the Army's Command and General Staff College (CGSC), Fort Leavenworth, Kansas. For the past four years, the NGA Support Team–Army (NST–A) and NGA Production and Analysis Directorates' EurAsia/Africa Office (PE) have supported the annual division-level exercise. This past April, ten NST–A and PE analysts were directly engaged with students in their staff groups during the execution phase of the simulation-driven exercise.

Concept

CGSC has developed an intermediate-level education (ILE) concept for midcareer military officers. This concept provides for an ILE common-core course followed by an advanced applications program. The focus of the ILE common-core course is to teach about the joint, interagency, and multinational operational warfighting environment. During the ILE common-core course, NGA is introduced as a Department of Defense combat support agency and a member of the United States intelligence community. Following the core course, CGSC students continue into the advanced applications program, which focuses on their immediate follow-on duty requirements. During the advanced applications program, NGA is integrated into the curriculum for space applications, military intelligence, and joint planner courses.



The CGSC Tactics Cell built a geo-intelligence product to support a hostage evacuation operation. (Space Imaging® LLC-purchased ClearView licensed imagery.)

Collaboration

The collaboration between NGA and the CGSC has been unique and challenging for both the professional analysts and the military students. By integrating NGA geospatial intelligence and imagery analysts into the classrooms, students gained an information edge on mission analysis and decision-making processes. In turn, the NGA analysts were able to see directly how geospatial intelligence was used to achieve military objectives based on warfighter battlespace visualization requirements. Students submitted requests for information that guided the analysis by the NGA professionals. Analysts generated standard and nonstandard geospatial intelligence products for CGSC students.

The student decision makers in this year's exercise were provided with relevant, accurate, predictive, and actionable geospatial intelligence. The instructors and students achieved a reliable understanding of the battlespace by integrating specific geospatial

(Continued on page 29)

A Project of Patience

By Mr. Paul W. Dobie and Lieutenant Colonel Vicki Flack

In June 2005, we were serving as the facilities engineer and the construction engineer with the United States Army Materiel Command (AMC) Field Support Battalion in Bagram, Afghanistan. The battalion needed state-of-the-art field maintenance and base camp facilities constructed to support their mission and faced the challenge of making this happen in a land of unique, perplexing, and almost insurmountable barriers. These facilities not only would provide the workplace for all maintenance and administrative functions but also would house the entire workforce. They were to be government-owned, contractor-operated facilities.

AMC Construction Project

An aggressive AMC construction project evolved to provide the backbone of support to the Soldiers. However, throughout the construction effort, significant challenges had to be dealt with, such as the lack of Western standards, multiple contractors, the quality of work, local holidays, timelines, mission priorities, security and force protection issues, transportation issues, and dust storms. In Iraq, the response to getting something done was often "two weeks." In Afghanistan, it was "two weeks, but with patience."

Sprungs Into Action

Sprung Instant Structures—which resembled large Bedouin tents with ribs—had been chosen as the solution to the facilities issue. Constructed of extruded aluminum arches, a Sprung structure is integrally connected to an all-weather outer membrane and engineered to withstand high winds. The first Sprung structure was already up and was providing a workplace for the Soldiers. The framework was established and the concrete was in place for the remaining three structures, which were scheduled to be completed by 31 August. Patience soon became a necessary commodity as construction continued on this major project—an underlying priority in the midst of vehicle upgrade and maintenance, which were the primary missions.

Combined Task Force Sword Support

The construction project matured with assistance from Combined Task Force Sword engineers. The task force included a group of Korean engineers, who went into full swing, placing concrete for the life support area, the office complex, the wash rack facility, the paint booth foundation, and a knee wall for a K-Span building. The Korean team placed more than 3,300 cubic meters of concrete. Troop construction support continues from Headquarters, 18th Engineer Brigade, and a detachment of Polish engineers.

Life Support Area

In conjunction with the major construction effort to support mission requirements was a "mini base camp" or life support area, which provided significant improvements in the living conditions in Bagram, over the existing base camp huts (B-huts) and tents. Originally estimated for completion at the end of July, the unique Afghanistan transportation challenges delayed delivery of all materials until early September. With Murphy's Law an active participant, the infrastructure that supports the living units was a true project of patience.

The construction of the base camp was a team effort of contractors, coalition engineers, and AMC. Despite weather conditions that brought severe dust storms, solving problems and doing things right was the daily routine. We met our goal of having the workforce living on-site before Christmas, while continuing to be flexible in supporting mission requirements.



Skeleton ribs of a relocatable Sprung Instant Structure



Materials for partitions for the living structure

Conclusion

The statement "*mission first*" has been the mainstay of the engineering and construction effort in Bagram. The battalion commander instilled in the unit his philosophy to *"support the Soldier by serving the Soldier, protecting the Soldier, and sustaining the Soldier."* The construction project, which created maintenance and base camp facilities in a barren wasteland, was a project of patience and a credit to the effective use of combined joint task force engineering assets, while utilizing both international and local contractors. It is a success story for AMC and for Operation Enduring Freedom.

Mr. Dobie is a civil engineer with Lockheed Martin Information Technology, Sytex Business Unit. He previously served with the United States Army Corps of Engineers for 30 years, with significant experience in response operations and program management. He is a graduate of Old Dominion University, Norfolk, Virginia.

Lieutenant Colonel Flack, an engineer officer, serves as the executive officer and construction engineer for the AMC Field Support Battalion, Bagram, Afghanistan. She is a graduate of the United States Military Academy.



("NGA," continued from page 27)

intelligence data sets, expert analysis, and visualization tools (such as the Maneuver Control System-Light and NGA's FalconView™.)

Recommendations

To continue enhancing the CGSC curriculum and incorporate NGA's intelligence preparation of the environment (IPE), the following will be addressed:

- Integrating NGA regional, geospatial intelligence, and imagery analysts into the mission-planning phase of CGSC exercises.
- Engaging a terrain team-like capability sponsored by the United States Army Engineer School, United States Army Training and Doctrine Command (TRADOC) Program Integration Office–Terrain Data (TPIO–TD).
- Increasing the instructor and student awareness about NGA support and capabilities during the entire education process.
- Identifying anticipated geospatial intelligence and IPE products for battlespace visualization, mission analysis, and decision making to support the exercise.
- Increasing the insertion of mobile training teams and train-the-trainer sessions led by the NGA Defense Geospatial-Intelligence School.
- Identifying how imagery analysis and exploitation (as part of the imagery intelligence cycle) can be incorporated as part of the exercise simulation during the ILE core course and advanced applications program.
- Incorporating knowledge bases and understanding of different human behavioral patterns, cultures, regions, and societal influences necessary for stabilization, reconstruction, and humanitarian support missions into the ILE core course and advanced applications program.

Conclusion

The NST-A and PEs have been successful in demonstrating NGA's core competencies at the Army's CGSC. They have been an integral part of the education process during the ILE core course and advanced applications program. Continued collaboration with the CGSC will enhance the skills of NGA analysts and the decision making of these military leaders.

Mr. Erwin is the NGA Staff Officer to the United States Army Training and Doctrine Command. He is a graduate of the Army War College and holds a bachelor's from Cameron University, Oklahoma.

Ms. Mocaby is a Senior Geospatial Analyst with the NGA EurAsia/Africa Office. She holds a bachelor's in geology and cartography from Southern Illinois University.



Dedication

The following members of the Engineer Regiment have been lost in the Global War on Terrorism since March 2003. We dedicate this issue to them.

Name	Unit	Location
Adams, Private Algernon	122d Engineer Battalion	Graniteville, South Carolina
Adams, Specialist Clarence	91st Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Allen, First Lieutenant Louis E.	42d Infantry Division	Troy, New York
Arnold Sr., Sergeant Larry R.	150th Engineer Battalion, 155th Brigade Combat Team	Lucedale, Mississippi
August, Captain Matthew	1st Engineer Battalion	Fort Riley, Kansas
Ayro, Private First Class Lionel	73d Engineer Battalion, 25th Infantry Division	Fort Lewis, Washington
Barbet, Private First Class Mark	44th Engineer Battalion	Camp Howze, Korea
Barnett, Second Lieutenant Christopher W.	1st Battalion, 156th Armored Regiment	Shreveport, Louisiana
Biskie, Sergeant Benjamin	5th Engineer Battalion	Fort Leonard Wood, Missouri
Boatright, Sergeant Michael	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Bossert, Sergeant Andrew L.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Bowen, Specialist Samuel R.	216th Engineer Battalion	Hamilton, Ohio
Bradley, Staff Sergeant Kenneth	588th Engineer Battalion	Fort Hood, Texas
Brinlee, Specialist Kyle	120th Engineer Battalion	Pryor, Oklahoma
Brooks, Sergeant Cory	153d Engineer Battalion	Winner, South Dakota
Brown, Private First Class Samuel	216th Engineer Battalion	Hamilton, Ohio
Brown, Specialist Philip	141st Engineer Battalion	Jamestown, North Dakota
Bunch, Specialist Joshua	91st Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Byers, Specialist Casey	224th Engineer Battalion	Ottumwa, Iowa
Caradine, Specialist Ervin	91st Engineer Battalion	Fort Hood, Texas
Carroll, Specialist James D.	230th Engineer Battalion	Mckenzie, Tennesee
Carter, Specialist Justin B.	1st Battalion, 15th Infantry Regiment	Fort Benning, Georgia
Castro, Specialist Johnathan	73d Engineer Battalion, 25th Infantry Division	Fort Lewis, Washington
Chan, Specialist Doron	411th Engineer Brigade	Windsor, New York
Chance, Specialist James	890th Engineer Battalion	Columbia, Mississippi
Cheatham, Private First Class Jonathan	489th Engineer Battalion	Camden, Arkansas
Christensen, Staff Sergeant Thomas	652d Engineer Company	Ellsworth, Wisconsin
Cooley, Sergeant First Class Sean M.	150th Engineer Battalion, 155th Armor Brigade	Lucedale, Mississippi
Corral, Sergeant Dennis	1st Engineer Battalion	Fort Riley, Kansas
Creamean, Specialist Tyler L.	73d Engineer Battalion, 25th Infantry Division	Fort Lewis, Washington
Davis, Private Brandon	1st Engineer Battalion	Fort Riley, Kansas
Davis, Specialist Raphael	223d Engineer Battalion	Calhoun City, Mississippi
Davis, Specialist Robert G.	864th Engineer Battalion	Fort Lewis, Washington
Diaz, First Lieutenant Carlos J.	2d Battalion, 69th Armor Regiment	Fort Benning, Georgia
Dill, Staff Sergeant Christopher W.	1st Brigade, 98th Division	Pennsauken, New Jersey
Dima, Sergeant Catalin	411th Engineer Brigade	New Windsor, New York
Dostie, Specialist Thomas J.	133d Engineer Battalion	Portland, Maine
Drexler, Private Jeremy	91st Engineer Battalion	Fort Hood, Texas
Eckert Jr., Sergeant Gary A.	983d Engineer Battalion	Monclova, Ohio
Esposito, Captain Phillip T.	42d Infantry Division	Troy, New York
Evans II, Specialist Michael S.	1088th Engineer Battalion	New Roads, Louisiana

Name	Unit	Location
Falaniko, Private Jonathan	70th Engineer Battalion	Fort Riley, Kansas
Farrow, Staff Sergeant Jeffery J.	146th Quartermaster Company	Fort Totten, New York
Faulkner, Sergeant James	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Fettig, Specialist Jon	957th Engineer Company	Bismarck, North Dakota
Franklin, Private First Class Michael W.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Gabrielson, Sergeant First Class Dan	652d Engineer Battalion	Spooner, Wisconsin
Garceau, Specialist Seth K.	224th Engineer Battalion	Burlington, Iowa
Gaunky, Private First Class Anthony A.	3d Brigade Special Troops Battalion	Fort Campbell, Kentucky
Gelineau, Specialist Christopher	133d Engineer Battalion	Gardiner, Maine
Gibbs, Private First Class Mathew V.	648th Engineer Battalion	Statesborough, Georgia
Gienau, Second Lieutenant Richard B.	224th Engineer Battalion	Burlington, Iowa
Gilman, Sergeant Benjamin	41st Engineer Battalion	Fort Drum, New York
Goldberg, Specialist David	52d Engineer Battalion	Fort Carson, Colorado
Haight, Specialist Charles	14th Engineer Battalion	Fort Lewis, Washington
Hall Jr., Specialist Robert E.	467th Engineer Battalion	Greenwood, Mississippi
Hattamer, Staff Sergeant Stephen	652d Engineer Company	Ellsworth, Wisconsin
Hawkins, Staff Sergeant Omer	44th Engineer Battalion	Camp Howze, Korea
Hendrickson, Staff Sergeant Kenneth	957th Engineer Company	Bismarck, North Dakota
Hodge, Sergeant Jeremy M.	612th Engineer Battalion	Tiflin, Ohio
Hoffman, Sergeant First Class James	1st Engineer Battalion	Fort Riley, Kansas
Hollinsaid, Staff Sergeant Lincoln D.	11th Engineer Battalion	Fort Stewart, Georgia
Holmes, Specialist James	141st Engineer Battalion	Hettinger, North Dakota
Hoyer, Private First Class Bert	652d Engineer Company	Ellsworth, Wisconsin
Hubbell, Specialist Cory	46th Engineer Group	Fort Rucker, Alabama
Hufstedler, First Lieutenant Doyle	1st Engineer Battalion	Fort Riley, Kansas
Hurley, First Lieutenant Joshua	326th Engineer Battalion	Fort Campbell, Kentucky
Huxley, Private Gregory	317th Engineer Battalion	Fort Benning, Georgia
Jackson, Specialist Marlon	94th Engineer Battalion,	Vilseck, Germany
Jodon, Sergeant Andrew J.	3d Battalion, 69th Armor Regiment	Fort Stewart, Georgia
Johnson, Private First Class Rayshawn	299th Engineer Battalion	Fort Hood, Texas
Jones, Sergeant First Class Michael D.	133d Engineer Battalion	Belfast, Maine
Jordan, Specialist Curt	14th Engineer Battalion	Fort Lewis, Washington
Kading, Sergeant First Class Matthew R.	983d Engineer Battalion	Monclova, Ohio
Karr, Specialist Michael	1st Engineer Battalion	Fort Riley, Kansas
Kimbrough, Lieutenant Colonel Wayne	416th Engineer Command	Darien, Illinois
Kiser, Sergeant Timothy C.	340th Forward Support Battalion	Red Bluff, California
Koch, Specialist Matthew A.	70th Engineer Battalion, 3d Infantry Division	Fort Riley, Kansas
Koenig, Staff Sergeant Lance	141st Engineer Battalion	Jamestown, North Dakota
Landrus, Staff Sergeant Sean	1st Engineer Battalion	Fort Riley, Kansas
Lawton, Staff Sergeant Mark A.	244th Engineer Battalion	Grand Junction, Colorado
Longstreth, Private First Class Duane	307th Engineer Battalion	Fort Bragg, North Carolina
Lutters, Specialist Derrick J.	891st Engineer Battalion	Pittsburg, Kansas
Mahlenbrock, Specialist David	65th Engineer Battalion, 25th Infantry Division	Schofield Barracks, Hawaii
Manzano, Private First Class Pablo	54th Engineer Battalion	Bamberg, Germany
Martin, Private First Class Ryan	216th Engineer Battalion	Hamilton, Ohio
Mason, Specialist Nicholas C.	276th Engineer Battalion	West Point, Virginia
McCaffrey Sr., Specialist Patrick R.	579th Engineer Battalion	Petaluma, California
McNail, Specialist Robert A.	150th Engineer Battalion, 155th Armor Brigade	Lucedale, Mississippi
Menyweather, Staff Sergeant Eddie E.	588th Engineer Battalion, 4th Infantry Division	Fort Hood, Texas

Name	Unit	Location
Meyer, Private First Class Jason M.	11th Engineer Battalion, 3d Infantry Division	Fort Stewart, Georgia
Miller, Corporal John W.	224th Engineer Battalion	Burlington, Iowa
Millsap, First Sergeant Timothy J.	70th Engineer Battalion	Fort Riley, Kansas
Mitchell, Sergeant Keman	4th Engineer Battalion	Fort Carson, Colorado
Mitchell, Specialist Sean R.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Monta, Sergeant Ruth S.	1st Battalion, 15th Infantry Regiment	Fort Benning, Georgia
Moothart, Sergeant Travis	1st Engineer Battalion	Fort Riley, Kansas
Moreno, Specialist Jaime	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Morgan, Specialist Dennis	153d Engineer Battalion	Winner, South Dakota
Murray, Sergeant David J.	1088th Engineer Battalion, 3d Infantry Division	New Roads, Louisiana
Nakis, Specialist Nathan	52d Engineer Battalion	Fort Carson, Colorado
Neusche, Specialist Joshua	203d Engineer Battalion	Joplin, Missouri
Nieves, Specialist Isaac	82d Engineer Battalion	Bamberg, Germany
Norquist, Specialist Joseph	588th Engineer Battalion	Fort Hood, Texas
Nurre, Sergeant Joseph C.	463d Engineer Battalion	Weirton, West Virginia
Ojeda, Specialist Ramon	84th Engineer Battalion	Schofield Barracks, Hawaii
Ottolini, Staff Sergeant Michael	579th Engineer Battalion	Petaluma, California
Palacios, Specialist Gabriel	588th Engineer Battalion	Fort Hood, Texas
Paliwoda, Captain Eric	4th Engineer Battalion	Fort Carson, Colorado
Pankey Jr., Sergeant Larry W.	467th Engineer Battalion	Greenwood, Mississippi
Parker, Private First Class James	588th Engineer Battalion	Fort Hood, Texas
Parker, Private First Class Kristian	205th Engineer Battalion	Slidell, Louisiana
Penamedina, Staff Sergeant Abraham	20th Engineer Battalion	Fort Hood, Texas
Pinkston, Sergeant Foster	878th Engineer Battalion	Augusta, Georgia
Pintor, Captain Dennis	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Poulin, Sergeant Lynn R.	133d Engineer Battalion	Belfast, Maine
Preusse, Corporal Randall D.	386th Engineer Battalion	Austin, Texas
Ramsey, Specialist Christopher J.	1088th Engineer Battalion	New Roads, Louisiana
Raney, Private First Class Cleston	1st Engineer Battalion	Fort Riley, Kansas
Reed, Staff Sergeant Johnathan R.	1088th Engineer Battalion	New Roads, Louisiana
Reyes, Sergeant Luis R.	947th Engineer Battalion	Durango, Colorado
Reyna, Private First Class Seferino J.	70th Engineer Battalion, 1st Armored Division	Fort Riley, Kansas
Rodriguez, Staff Sergeant Joseph E.	8th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Rooney, Sergeant First Class Robert	379th Engineer Company	Nashua, New Hampshire
Ruhren, Specialist David A.	276th Engineer Battalion	West Point, Virginia
Rusin, Private First Class Aaron	44th Engineer Battalion	Camp Howze, Korea
Rymer, Specialist Lyle	239th Engineer Battalion	Fort Chaffee, Arkansas
Seesan, First Lieutenant Aaron N.	73d Engineer Battalion, 25th Infantry Division	Fort Lewis, Washington
Smette, Sergeant Keith	957th Engineer Company	Bismarck, North Dakota
Smith, Sergeant First Class Paul	11th Engineer Battalion	Fort Stewart, Georgia
Soelzer, Captain Christopher	5th Engineer Battalion	Fort Leonard Wood, Missouri
Splinter, Major Christopher	5th Engineer Battalion	Fort Leonard Wood, Missouri
Strange, Private First Class William	91st Engineer Battalion	Fort Hood, Texas
Tobler, Specialist Brandon	671st Engineer Brigade	Portland, Oregon
Trevithick, Specialist Richard	9th Engineer Battalion	Schweinfurt, Germany
Tyrrell, Private Scott	299th Engineer Battalion	Fort Hood, Texas
Tyson, Second Lieutenant Andre D.	579th Engineer Battalion	Petaluma, California
Unruh, Specialist Oliver	44th Engineer Battalion	Camp Howze, Korea
Vargas-Medina, Staff Sergeant Oscar	84th Engineer Battalion	Schofield Barracks, Hawaii

Name	Unit	Location
Villanueva, Sergeant First Class Joselito	9th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Walker, First Lieutenant Laura M.	864th Engineer Battalion	Fort Lewis, Washington
Ward, Private First Class Andrew	44th Engineer Battalion	Camp Howze, Korea
Warren, Staff Sergeant Charles H.	648th Engineer Battalion	Statesborough, Georgia
Washington, Specialist Bennie J.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Webb, Sergeant Charles	82d Engineer Battalion, 1st Infantry Division	Bamberg, Germany
Wegar, Specialist Michael	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Wentz, Specialist Cody	141st Engineer Battalion	Williston, North Dakota
White III, Private Robert C.	864th Engineer Battalion	Fort Lewis, Washington
Widner, Specialist Vernon R.	3d Brigade Special Troops Battalion	Fort Campbell, Kentucky
Wilkins III, First Lieutenant Charles	216th Engineer Battalion	Hamilton, Ohio
Williams, Sergeant Arthur	44th Engineer Battalion	Camp Howze, Korea
Wolf, Specialist James	52d Engineer Battalion	Fort Carson, Colorado
Wood, Sergeant Brian	9th Engineer Battalion	Schweinfurt, Germany

Regimental Awards

Each year, we recognize the best engineer company, lieutenant, noncommissioned officer, and enlisted Soldier—in each of the components—for outstanding contributions and service to our Regiment and Army. Every engineer unit in the Regiment can submit the name and achievements of its best of the best to compete in these distinguished award competitions. Only the finest engineer companies and Soldiers are selected as recipients of these awards. The Soldiers will carry throughout their careers the distinction and recognition of being the Engineer Branch's best and brightest Soldiers and leaders. Following are the results of the 2004 selection boards for the Itschner and Outstanding Engineer Platoon Leader (Grizzly) Awards, the Sturgis Medal, and the Van Autreve Award:

Active Army

Itschner Award: Alpha Company, 20th Engineer Battalion (Combat), 1st Calvary Division, Fort Hood, Texas.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant Gary P. McDonald, Charlie Company, 20th Engineer Battalion (Combat), 1st Calvary Division, Fort Hood, Texas.

Sturgis Medal: Staff Sergeant Scott Smullen, Charlie Company, 27th Engineer Battalion, Fort Bragg, North Carolina.

Van Autreve Award: Corporal Whitney Taylor, Alpha Company, 2d Engineer Battalion, Camp Castle, Korea.

United States Army Reserve

Itschner Award: Detachment 2, 854th Engineer Battalion (In Lieu of [ILO] Utilities Detachment), Kingston, New York.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant Noel Miliam, Charlie Company, 458th Engineer Battalion (Corps) (Wheeled), New Kensington, Pennsylvania.

Sturgis Medal: Staff Sergeant Ryan Patton, Charlie Company, 458th Engineer Battalion (Corps) (Wheeled), New Kensington, Pennsylvania.

Van Autreve Award: Specialist Jeremy Baum, Charlie Company, 458th Engineer Battalion (Corps) (Wheeled), New Kensington, Pennsylvania.

Army National Guard

Itschner Award: Headquarters Support Company, 203d Engineer Battalion (Combat) (Heavy), Webb City, Missouri.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant John R. Vagnier, Bravo Company, 216th Engineer Battalion, Portsmouth, Ohio.

Sturgis Medal: Sergeant Raymond A. Boso, Charlie Company, 216th Engineer Battalion (Combat), Youngstown, Ohio.

Van Autreve Award: Specialist Cory L. Cummings, Detachment 1, Alpha Company, 203d Engineer Battalion (Combat) (Heavy), Joplin, Missouri.

All of the nominees represented their major commands with the highest professionalism and dedication to the Engineer Corps's vision and deserve our highest praise. The award recipients were recognized at the Army Engineer Association Conference, 24-27 October 2005, in Orlando, Florida.

Composting Solid Waste in Military Contingency Operations

By Mr. Joseph Bost, Mr. Stephen Stouter, and Mr. James F. Lee

Armies around the globe have always had to deal with the problem of solid waste. Today, a large percentage of solid waste is packaging materials (cardboard, paper, and plastic), in addition to waste food and sewage sludge. While much of the solid waste generated at base camps is biologically degradable, the solid waste problem presents significant waste management challenges for the U.S. Army. This is a particular concern when we operate in countries where there are few—if any—modern waste disposal facilities.



More than 1,000 boxes of sewage sludge are stockpiled at this base camp. It was composted during the beginning of a pilot study in 2004.

During the past 2 years, the United States Army Europe (USAREUR) Engineer Support Operations (ESO) has tested a composting system that converts up to 85 percent of the putrescible waste (waste that decomposes) generated at base camps into a usable product. Additionally, this composting system greatly reduces pathogens, as well as minimizes odor and bioaerosol emissions. The compost produced by the system can be used in a variety of ways, including erosion control, soil amendment, or land application in agricultural, forestry, or mine reclamation use.

When contingency operations (CONOPS) base camps are initially established, solid waste landfills are normally not available. Solid waste is usually taken to a burn box to be incinerated. This process requires approximately 1 gallon of fuel per cubic meter of waste and reduces the volume of waste by approximately 80 to 90 percent. The residuals (for example, ash and incompletely burned solid waste) must then be transported for disposal. However, many local waste disposal sites are burial pits or excavation sites, and most of them lack liners, daily covers, run-off controls, or other modern techniques used for managing sanitary landfills. These disposal site conditions present another set of significant environmental problems, such as toxic leachate, vector attraction, and even greenhouse gas creation. The process of burning solid waste, including low British thermal unit (BTU) value wastes (for example, dining facility [DFAC] and other organic or wet waste), is to soak it with diesel fuel and incinerate it in a burn box. The burning waste emits toxic, acrid smoke that has led to health complaints from military personnel due to eye and lung irritation. At a base camp in Kosovo, there have been numerous Soldier and chain-of-command complaints regarding smoke from incinerator use.

With troop safety a vital concern, it is critical to effectively treat solid waste and sewage sludge. Soldiers' safety and quality of life are enhanced by reducing pathogens associated with sewage sludge and reducing the amount of solid waste burned. It is also essential to minimize the volume and toxicity of solid waste disposed at disposal sites that lack modern environmental controls. USAREUR ESO has tested various methods to improve CONOPS solid waste management and reduce long-term environmental liabilities and risks.

At a base camp in Kosovo, the practice of burning solid waste ended in October 2005. USAREUR ESO—along with COMP-ANY GmbH and Kellogg, Brown, and Root (KBR)—will use composting combined with recycling and landfill disposal. After successful pilot testing during 2004 and 2005, a full-production mobile aerated static heap composting system was deployed to the base camp in September 2005. The new AGILE™ flex system incorporates semipermeable membrane technology that—

- Mitigates the effects of extreme weather on composting.
- Accelerates the natural composting process.
- Minimizes manpower costs.
- Allows composting to occur within the confines of a small base camp due to the more than 90 percent reduction in odor and vector attraction.

The odor is reduced due to the scrubbing effect of the semipermeable GORE-TEX® membrane cover that also blocks vectors. The AGILE flex system has shown excellent results by minimizing pathogens and other problems created by solid waste in CONOPS. The AGILE flex system increases composting efficiency by using cardboard and paper waste generated by the base population to balance the carbon-to-nitrogen ratio. This is critical to the successful composting of high nitrogen content waste, such as sewage sludge and food or catering waste.

Currently, the Directorate of Public Works at the base camp in Kosovo and KBR manage and compost solid waste consisting of sewage sludge, DFAC waste, wood chips, shredded cardboard, paper, and hay. These ingredients are mixed and placed in a heap over air feeder aeration tubes that extend from a standard International Standards Organization (ISO) shipping container. A GORE-TEX fabric cover is placed over the heap and held to the ground with a water-filled fire hose. Temperature- and oxygen-monitoring probes are inserted through the cover into the heap to record heap temperature and oxygen data. Blower fans, controlled by a computer located in the ISO container, force air into the heap based on real-time feedback from the probes. During the initial 3-week processing period, bacterial activity is controlled as the computer automatically adjusts the air flow to maintain optimum temperature and oxygen levels. Internal compost temperatures easily achieve 150 to165 degrees Fahrenheit. After the initial 3-week period, the compost heap is uncovered and moved to the opposite side of the ISO container. The compost heap is treated with the same procedure for an additional 3 weeks. After the total 6-week period, the compost is ready to be tested and used for soil amendment.

Composting will reduce fuel costs associated with burning solid waste. In the past, the U.S. Army paid $65,000 for a year's worth of JP-8 (jet propulsion fuel, type 8) used as an accelerant to burn waste. That expense will no longer be necessary. Additionally, USAREUR ESO estimates that composting will require fewer man-hours. After successfully treating 100 percent of the sewage sludge and DFAC waste generated by two base camps in Kosovo during 2004 and 2005, the USAREUR ESO firmly believes this composting process will lead the Army into the next generation of solid waste management systems for contingency operations.

The AGILE flex system has proved to be a powerful solid waste management tool through its simplicity, reduced operating costs, reliability in all weather conditions, and the short processing time for the treatment protocol. Also, this system enhances force protection by reducing Soldier transport or escort to off-site waste disposal areas. Because of its compact (ISO container), mobile, and self-contained characteristics, this innovative system is especially beneficial in CONOPS. The ability of this system to successfully treat large amounts of solid waste on-site within a short time period increases its value to the U.S. Army mission.



The crew sets up the AGILE flex system by placing aeration tubes on the ground before covering with the waste heap. The semipermeable membrane cover is on top of the ISO shipping container, which houses blower fans and a computer and provides office space.

Mr. Joseph Bost is the chief of Engineer Support Operations, Office of the Deputy Chief of Staff, Engineer (ODCSENG), and is responsible for the military and civil construction, engineer operations, and environmental programs occurring in the Balkan area of operations. He holds a master's from the University of Southern California.

Mr. Stouter is the program manager for the Corps of Engineers, Afghan Engineer District, Kabul, Afghanistan, and worked with the ODCSENG staff on critical environmental and facilities functions in Kosovo and Bosnia. He holds a degree in biology from Middle Tennessee State University in Murfreesboro.

Mr. Lee is an environmental management officer for ODCSENG, USAREUR, and is responsible for environmental policy and problem solving associated with contingency operations. He holds a degree in energy and environmental management from City University in Bellevue, Washington.

ENGINEER UPDATE

Commercial numbers are (573) 563-xxxx and Defense System Network (DSN) numbers are 676-xxxx unless otherwise noted.

Urban Mobility Breaching Course (UMBC). The UMBC is a 3-week course conducted at Camp Lejeune, North Carolina, by the United States Marine Corps, with assistance from three United States Army engineers. Two weeks of the course are consolidated training, and the remaining week is Army-unique. The maximum Army course load for the UMBC is 15 students. Slots for the course can be reserved through the Army Training Requirements and Resources System (ATRRS).

The UMBC provides advanced information on urban breaching operations. The course consists of in-depth explosive theory; detailed planning that combines operational and training safety issues; urban reconnaissance; and employment of urban breaching assets, including explosive, manual, and ballistic breaching techniques for urban operations. The UMBC teaches the use of Current Force equipment that supports mobility operations in support of the maneuver force.

Students must meet requirements listed in Department of the Army Pamphlet 611-21, *Military Occupational Classification and Structure,* and Army Regulation 600-9, *The Army Weight Control Program;* be a combat engineer noncommissioned officer in the grade of E-5 (P) through E-7 and a graduate of the combat engineer Basic Noncommissioned Officer Course (BNCOC); have no pending Uniform Code of Military Justice (UCMJ) actions; and have no limiting profiles.

Fiscal Year 2006 Class Schedule

Class Number	Report Date	Graduation Date
01-05	16 Oct 05	4 Nov 05
02-05	27 Nov 05	16 Dec 05
03-05	22 Jan 06	10 Feb 06
04-05	26 Feb 06	17 Mar 06
05-05	4 Jun 06	23 Jun 06
06-05	13 Aug 06	1 Sep 06
07-05	10 Sep 06	29 Sep 06

The point of contact for this course is the Directorate of Training and Leader Development (DOTLD) Sergeant Major at (573) 563-4094 or e-mail <*atsedot@wood.army.mil*>. *The* DOTLD Web site is at <*http://www.wood.army.mil/dotld/*>.

Center for Engineer Lessons Learned (CELL). The United States Army Engineer School CELL needs your help. To keep training, doctrine, and combat developments current and to prepare for the future, it is critical that the school continuously receive relevant engineer observations, insights, and lessons (OIL). The CELL can derive information from a variety of sources: unit after-action reports (AARs); tactics, techniques, and procedures (TTP) used by units in and returning from theater; Soldier observations/submissions to the Engineer School; and requests-for-information (RFIs).

This information is used to conduct doctrine, organization, training, material, leadership and education, personnel, and facilities (DOTMLPF) gap analyses and to determine solutions. These solutions are distributed to the Engineer Regiment via new doctrine and training products, *Engineer* (The Professional Bulletin of Army Engineers), and other publications, Web sites, and by answering RFIs. (The Engineer School RFI Web site provides the Engineer Regiment a reach-back capability.)

You can help by forwarding any of these materials from your unit's deployment to the CELL point of contact. Unclassified information can be sent by e-mail to <*Doctrine.Engineer@wood.army.mil*> or <*reggie.snodgrass@us.army.mil*>. Classified information can be sent by secret Internet protocol, routed (SIPR) e-mail to <*snodgrassrg@monroe.army.smil.mil*>. For more information, call (573) 563-4117.

Visual Archive. The History Office at the Engineer School is developing a visual archive. It currently has more than 18,000 photographs, largely from World War II and Korea. Units that would like to contribute photographs (copies) or other visual material should contact Dr. Larry Roberts, Historian, United States Army Engineer School, Fort Leonard Wood, Missouri 65473. Where possible, caption information should accompany the images. If you have questions, call Dr. Roberts at (573) 563-6109.

Reserve/National Guard Instructor/Writers Needed. The Reserve Component Captain's Career Course at the United States Army Engineer School, Fort Leonard Wood, Missouri, currently has instructor/writer positions open for Reserve/National Guard members. These are Individual Mobilization Augmentee (IMA) positions and allow for annual training as well as drill time. The positions open are for engineers in the rank of O-3 and O-4. For more information, e-mail *<tim.obrien1@us.army.mil>.*

Personal Role Radio (PRR). Situations occasionally dictate the need for construction equipment operators to have communication capability with a Soldier on the ground. This is especially true when operating a system that is equipped with add-on armor. One solution is the PRR, which is already being used by multirole bridge companies when employing dry support bridges. The PRR is available for units to order through the General Services Administration (GSA) (refer to the table below).

Personal Role Radio Capabilities

North Atlantic Treaty Organization (NATO) Stock Number	Product Code	Description
5820-99-721-8335	P21050000	*PRR Body (Green) Complete – English* The PRR body is complete with an antenna and an English user card. Must be used with single or dual push-to-talk (PTT) switch assembly. Requires two AA batteries (included).
5820-99-739-4033	P08130000	*Single PTT Switch Assembly (Green)* The single PTT switch assembly is for use with the PRR body.
5820-99-342-4097	P08120000	*Remote Wireless PTT (Green)* The wireless PTT remotely operates the PRR. Supplied with a black adjustable strap and buckle.
5820-99-280-7276	P14360408	*CT/Light Patrol Headset (Green) – Noise-Canceling (NC) Electret Microphone* The vented, single-sided headset has an NC Electret microphone fitted to a flexible boom arm. Fitted with an adjustable headband, the headset can be worn underneath most passive ear defenders.
5965-99-664-9722	P07100000	*Nuclear, Biological, or Chemical (NBC) Boom Microphone Adapter* The adapter is for use with most Davies headset models. One end fits over the headset's boom microphone and the other end plugs into the respirator's speech module.
5820-99-425-3999	C410114	*Carry Pouch (Green) – United Kingdom (UK) Pattern Disruptive Pattern Material (DPM)* The PRR fits inside a heavy-duty polyurethane, textured nylon pouch that attaches to webbing and helps protect the PRR from harsh conditions/impact.

For more information, contact the MANSCEN Futures Center, Engineer Division, at *<bryan.k.barwick @us.army.mil>* or call (573) 563-7992.


PIN: 082909-000