ARMY CHEMICAL REVIEW

The Professional Bulletin of the Chemical Corps
July-December 2005

WWI

LEARNING FROM THE PAST...

WWII

Korea

MOVING INTO THE FUTURE...

Vietnam

Operations Desert Storm and Shield

GWOT

THE CHEMICAL CORPS

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Back cover: Tribute to fallen Dragon Soldiers by Diana Travis.

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This issue of Army Chemical Review is dedicated to the Dragon Soldiers who have lost their lives in the Global War on Terrorism. Pages 28 and 29 pay tribute to those Soldiers.

Chief of Chemical

Brigadier General Stanley H. Lillie

Recently, Fort Leonard Wood celebrated the 87th birthday of the US Army Chemical Corps and Regiment. I am proud to be a Dragon Soldier and want to share our history and where we are heading in the future. I would like to share with all Dragon Soldiers the speech I gave during the Regimental Review.

"Today, we're engaged in a great struggle with religious fundamentalists and zealots who believe the way to achieve their goals is to destroy the United States. It is a struggle as serious and as dangerous as any our Nation has ever faced—and Dragon Soldiers are there! They're there because the mission of the Chemical Corps is as vital now as ever before as we continue to play a pivotal role in defending the homeland as well as providing freedom to others around the world. We're on a journey; one that began 87 years ago. It is the journey of our Corps—and it is a personal journey for each of us. But before we can progress in our journey and understand what the future has in store, we must understand from where we came.

"It was a warm and sunny day on the 22d of April 1915, outside the small village of Langemarck, near Ypres, in Belgium, that our journey began and chemical warfare was born. It was just like any other spring day as the winds shifted and the evening breeze began to blow. I imagine most of the Allied troops thought the breeze a welcome event. As that breeze continued to blow, the first step of our journey began—you see, that breeze carried the contents of 6,000 chlorine-filled cylinders over Allied positions, causing 5,000 casualties.

"Our history, our journey, started on that field over 90 years ago. Since then, we have taken many turns. It began with the development of trench fans and crude protective masks made of cotton gauze. By the end of World War I, we had developed durable, reusable masks and decontamination techniques and equipment. And on 28 June 1918, we were born as a Regiment. Led by Major General William Sibert, we made great strides in understanding the nature of chemical weapons and defending our Army against the insidious horror of chemical warfare. Major General Sibert had a huge challenge—to form a Corps and develop doctrine, equipment, and organizations. He did it with great success. He personally ensured that success.

"While each step of our history has been a collective journey for our Corps, it was also a personal journey for all those brave doughboys, and it would continue to be a personal journey for those that would follow. We took turns in our journey, through World War II and Korea, where Dragon Soldiers fired hundreds of thousands of 4.2-inch mortar rounds in support of maneuver units in all theaters of the Wars.

"Because of our success in World War II and through the leadership of a newly appointed Chief of Chemical [Major General Anthony McAuliffe], Major General McAuliffe's forthright thinking provided a more strategic approach. He said, 'It required the experiences of World War II to demonstrate that the most important basic factors in a nation's military strength is its war production and ability to convert smoothly and quickly its industry, manpower, and other economic resources.' By the way, I think he also said something about 'nuts' while leading the famed 101st Airborne Division at Bastogne. Major General McAuliffe took it personally, dedicated himself to his profession, and excelled!

"Vietnam Dragon Soldiers were not only prepared for nuclear, biological, and chemical warfare, but they also developed and used flame devices, herbicides, riot control agents, and people sniffers. Led by Major Herb Thornton, they became tunnel rats—developing doctrine and techniques for tunnel-clearing operations. Major Thornton was an innovator who devoted himself to excellence. He took it personally!

"During the Cold War, the Chemical Corps came from the depths of near disestablishment, with a reduction in personnel to just over 200 Soldiers. It was a dark time for our Corps—even our senior Army leaders failed to understand the horrendous nature of the threat of biological, chemical, and nuclear weapons. However, all was not lost. Through herculean efforts and personal leadership, Major General Gerry Watson convinced our senior leaders of our importance and developed the construct we still use today. Dragon Soldiers were assigned to every command level—from company

(Continued on page 4)

Regimental Command Sergeant Major

Command Sergeant Major Patrick Z. Alston

Many years ago, the US Army Chemical Corps introduced its first regimental command sergeant major (RCSM). Command Sergeant Major Bobby Weston was appointed in June of 1986 and assumed the duties of shaping and developing our Corps. Command Sergeant Major Weston served until July 1988. Since then, many professional senior noncommissioned officers have served at the helm, steering the Chemical Corps into the transformation of the future.

The past has propelled the Corps, and the vision of our former leaders has equipped Dragon Soldiers with the ability to conduct transformational business in the millennium through the plans, ideas, and leadership of former regimental command sergeants major: Wayne Bricker (1988 to 1989), John Roberts (1989 to 1991), Larry Nettles (1991 to 1992), Carl Lyons (1992 to 1994), Richard Garrett (1994 to 1997), James Van Patten III (1997 to 2001), James Barkley (2001 to 2002), and Peter Hiltner (2002 to 2004).

As the 10th Regimental Command Sergeant Major of the Chemical Corps, it is a distinct honor and privilege to serve our Corps in this capacity. The Chemical Corps is heavily engaged in onward movement and upward mobility, and I am honored to be a part of the planning and motivated to play a vital role in what is transpiring.

I have heard the saying, "There are three types of people: those who make things happen, those who watch what happens, and those who wonder what happened." As the Corps moves forward, conduct an assessment of your involvement and summarize what type of person you are. Base your assessment on the values-based system that is housed in our warrior ethos and transformational Army.

The past has propelled the Corps, and the vision of our former leaders has equipped Dragon Soldiers with the ability to conduct transformational business in the millennium through the plans, ideas, and leadership of former regimental command sergeants major…

The forward movement of the Corps has instituted an abundance of firsts. In June of 2003, the Chemical Corps was short almost 500 sergeants. The Corps had just over 1,300 specialists—with 450 in the primary zone, 515 in the secondary zone, and 115 on the sergeant promotion list. As a result of the automatic promotion of sergeants in March 2005, military occupational specialty 74D is now short only 97 sergeants. And the Chemical Corps was instrumental in gaining approval for this policy. Additionally, Jackeline Fountain was appointed to the rank of command sergeant major, making a mark as the first female in the history of the Corps to be appointed to the rank. And Terry Fountain became the 13th Corps Support Command (COSCOM) Command Sergeant Major, another first for the Chemical Corps. For the first time, Chemical Corps personnel hold three nominative-level command sergeant major positions and five brigade level positions.

The activity of Corps members is evident in the participation at last year's Regimental Review and Green Dragon Ball. More than 900 personnel attended—the largest attendance of any ball celebrated at Fort Leonard Wood, Missouri. The Chemical Corps Regimental Association (CCRA) has reduced the lifetime membership fee from $300 to $99 and now has an all-time membership high of 650. I urge you to get involved in the Corps!

(Continued on page 5)

(Continued from page 2)

to corps and chemical organizations designed to provide reconnaissance, decontamination, and smoke operations. The Corps was saved! We were back in business! It was now time to redevelop training, equipment, doctrine, and techniques. At the direction of another remarkable leader, Major General Bob Orton, the modernization of doctrine, equipment, and training was accelerated. A key part of this mission was the development and the deployment of Fox recon vehicles and units to Operation Desert Storm, which proved a tremendous asset to field commanders. Once again, these two Dragon Soldiers made it personal and continued their vital involvement at every turn. Our Regiment's journey did not stop.

"On September 11, 2001, our Nation was viciously attacked, and we found ourselves engaged in a Global War on Terrorism. This turn of our journey has us deploying Dragon Soldiers around the world each day. And they continue to make our Corps stronger. Early on, Brigadier General Pat Nilo (Retired) spearheaded efforts in two key areas. First, she led the way in instituting CBRN protection of our critical installations and developed new domestic-response capabilities. Second, to ensure chemical Soldiers were trained and prepared for their new missions, she gained approval for the construction of the First Lieutenant Joseph Terry CBRN Responders Training Facility. This vision will soon become a reality. For Brigadier General Nilo, it was personal!

"We have successfully reorganized, restructured, task-organized, and conducted numerous new and full-spectrum missions. In the last few years, we have moved from smoke, decon, and recon missions to missions involving hazardous-material response, biological detection, and site characterization. A new joint interagency organization was formed (the Iraqi Survey Group), and Command Sergeant Major Stan Kusko led Dragon Soldiers in sensitive-site exploration during the critical search for weapons of mass destruction. He made it personal!

Today, we're engaged in a great struggle with religious fundamentalists and zealots who believe the way to achieve their goals is to destroy the United States. It is a struggle as serious and as dangerous as any our Nation has ever faced—and Dragon Soldiers are there!

"The last 87 years have seen many challenges in the journey of the Chemical Regiment. We have had many successes, and our Soldiers and families have sacrificed a great deal—yet we continue on that journey. As Winston Churchill once said of the American involvement in World War I, and which still stands true today, 'To fight in defense of his native land is the first duty of the citizen. But to fight in defense of someone else's native land is a different proposition. To cross the ocean and fight for strangers, far from home, upon an issue of which one has had no say, requires a wide outlook upon human affairs and a sense of world responsibilities.'

"We are all grateful for your sacrifices each day, but in the Regiment's journey, we have left some of our brothers and sisters behind. For they have made the ultimate personal sacrifice. Most recently, eleven of our Dragon Soldiers have made that sacrifice in defense of freedom in the Global War on Terrorism. We honored them at the Regimental Review and at the Dragon Ball. The eleven Dragon Soldiers that have fallen are (see *pages 28 and 29*):

Corporal Mark A. Bibby
Second Lieutenant Benjamin J. Colgan
Staff Sergeant Robert S. Johnson
Corporal Forest J. Jostes
Specialist Mark J. Kasecky
Staff Sergeant Morgan D. Kennon
Specialist Lizbeth Robles
Sergeant Thomas C. Rosenbaum
Sergeant Stephen R. Sherman
Sergeant Gregory L. Wahl
Sergeant First Class Mickey E. Zaun

"You may be wondering where our journey will take us next or what is in store for our Regiment in the future. As the Army evolves into a new era of modularity, so must the Chemical Corps evolve. We are focused more than ever on the full spectrum of chemical, biological, radiological, and nuclear defense. We are no longer looking just at the traditional CBRN threat. The enemy has advanced in its technology, so we must adapt. We have revamped our doctrine and expanded our training. Dragon Soldiers now find themselves executing and advising on new missions of base defense and convoy security, as well as occupational health and environmental hazards—all in the context of joint and combined warfare. Many are performing these missions on this very day, and they continue to show the knowledge, passion, and dedication required to excel. They are making the journey personal!

"With this in mind, we will continue to develop doctrine and equipment to further our relevance and capabilities in the current operational environment. New systems such as the Stryker NBC recon vehicle, the Joint Biological Standoff Detection System, and the Chemical Unmanned Ground Recon System are just a few that will afford us more capabilities than we've ever had before. We will not stop or even pause. Our journey continues.

"As our first chief, Major General Sibert said, 'I speak with some experience when I say that there is no field in which the future possibilities are greater than in chemical warfare and no field in which neglect to keep abreast of the times in research and training would be more disastrous.' With that in mind, we will continue to develop, change, and expand our missions, equipment, and training to ensure we can support our Army and our Nation in any conflict or situation in our future.

"Dragon Soldiers, remember no matter what new technology is developed or what new capability is achieved, it would all be irrelevant without those of you standing in the gap today. You are the Chemical Corps' ultimate system, you are the 21st-century capability, and you are the key we cannot fight without. But you must have a passion, a drive, a burning desire in your gut, and love in your heart for our business. You must take it personally! For our Regimental history is the sum of the personal journeys of all Dragon Soldiers who have gone before, and it is because of our personal journeys each day that the Regiment is as vital and strong as it has ever been throughout our history.

"It has been 87 years, a long journey in human years, but a relatively short journey in the history of mankind. We celebrate our past but must look to the future to write the next chapter. The journey does not stop now. We cannot afford to stop or even pause.

"We have seen where we came from and know where we are in the present. I promise our journey into the future will be exciting, fast-paced, and involve full-spectrum CBRN missions, training, and equipment. Make it personal! Elementis Regamus Proelium."

(Continued from page 3)

The Command Sergeant Major George L. Murray Award, a new program to honor the top noncommissioned officer and the top junior enlisted Soldier in the Chemical Corps was initiated this year (see *Corps Honors Top Enlisted Soldiers, page 36*). The first recipient of the NCO of the Year Award was Staff Sergeant Travis Dauer, 21st Chemical Company (Airborne), Division Support Command, 82d Airborne Division, Fort Bragg, North Carolina. The first recipient of the Soldier of the Year Award was Specialist Marcos Silva, Headquarters and Headquarters Detachment, 84th Chemical Battalion, Fort Leonard Wood. Many civilian vendors contributed to make the award process a success, enabling us to see involvement in the Corps like never before.

We presented Sergeant Major of the Army Kenneth O. Preston with the Chemical Corps' highest award, the Order of the Dragon. Sergeant Major of the Army Preston is the first SMA to receive the award at Fort Leonard Wood.

As the Corps continues to drive forward with onward movement and upward mobility, I urge each and every Dragon Soldier to get on board—the train only stops momentarily, but the opportunities to get involved are abundant. The future of the Corps looks great! We are engaged and prepared to meet every operation and contingency. We are, and will continue to be, the Corps of the future!

Fort Leonard Wood Celebrates the Groundbreaking of State-of-the-Art CBRN Responders Training Facility

By Mr. Victor Ellis and Mr. Pat Olson

"Our vision is for the Chemical Corps to be a superbly equipped and trained force that is a true combat multiplier for the combatant commander. The US Army Chemical School is helping accomplish this mission by preparing our Army to fight and win, unhindered by threatened or actual CBRN hazards. We are a professional corps of Soldiers that are imbued with the warrior ethos and are technically and tactically ready to face the challenges of the future. Together, we provide a synergistic effect that makes Chemical Corps Soldiers both vital and relevant for the combatant commanders, the joint warfighters, and the defense of the homeland."[1]

—Brigadier General Stanley H. Lillie
Chief of Chemical

On 28 June 2005, Fort Leonard Wood, Missouri, celebrated the groundbreaking ceremony for the First Lieutenant Joseph Terry Chemical, Biological, Radiological, and Nuclear (CBRN) Responders Training Facility. Major General Randal R. Castro, Commanding General of Fort Leonard Wood and the Maneuver Support Center, and Brigadier General Stanley H. Lillie, Chief of Chemical and Commandant of the US Army Chemical School (USACMLS), joined with distinguished visitors to take part in the historic ceremony. The $15-million facility, scheduled to open in 2007, will provide state-of-the-art training for Army National Guard civil support teams (CSTs), US Army chemical units with homeland security missions, Department of Defense (DOD) emergency response teams, and CBRN installation support teams (ISTs). The training facility will focus on CBRN individual response certification training to Soldiers and Airmen and will be named in honor of First Lieutenant Joseph Terry.

The first shovels of dirt are turned at the groundbreaking ceremony.

First Lieutenant Terry served in Company D of the 86th Chemical Mortar Battalion during World War II. On 3 December 1944, First Lieutenant Terry saved six men from certain death following a prolonged artillery barrage in Vossenack, Germany. The actions taken by First Lieutenant Terry in the face of adversity during combat operations serve as a prime example of unselfish dedication and behavior that exemplifies what we now refer to as *Warrior Ethos*. "Warrior ethos compels all Soldiers to fight through all conditions to victory, no matter how long it takes and no matter how much effort is required. It is the Soldiers' selfless commitment to the Nation, mission, unit, and fellow Soldiers."[2] For his heroic acts, First Lieutenant Terry was awarded the Distinguished Service Cross.

In keeping with Public Law 103-160 and the mandated consolidation of all DOD chemical and biological defense programs, the USACMLS is focusing on the modernization of and improvement to the operational warfighting ability of the Corps.[3] Through the vast efforts of Soldiers and civilian personnel at Fort Leonard Wood, a consolidated effort was formally undertaken in February 2003 to design a new building and training area. From the initial design through the various stages of design reviews and a cost value engineering study, the final design depicts a CBRN Responders Training Facility that will meet the emerging needs of a Nation at war and help combat the ever-present threat of terrorist attacks on our homeland.

The main facility design incorporates an exercise control room that serves as the nucleus for visually monitoring and capturing training conducted concurrently. Cameras, to include infrared capability for areas with limited visibility, will be positioned throughout the facility. The design incorporates six classrooms, an after-action review facility, and offices for staff and cadre. Two large bay areas will provide indoor decontamination training exercises. Two virtual reality simulation areas will be incorporated into the main facility design.

An urban exercise training area will include a factory, a post office, and two warehouses to facilitate realistic CBRN identification, evacuation, and decontamination training. The buildings will be interconnected by an underground tunnel system that will have various access routes common to the contemporary operating environment. One of the warehouses will have a three-story design that includes blast damage to the exterior and interior. A two-lane roadway leading to an overturned tanker truck will provide training in spill cleanups. Pressurized and nonpressurized tank cars, a boxcar, and a dedicated intermodal container are some of the features of the railcar training area. A remote area will provide an elaborate on-site cave complex to support confined-space and clandestine-laboratory training.

An artist's rendition of the CBRN Responders Training Facility

The USACMLS first-response training is taught by the 3d Chemical Training Brigade, Incident Response Training Department (IRTD). There is no dedicated facility at Fort Leonard Wood to conduct this training, so it is conducted in a facility intended for training during inclement weather. The following training is currently offered:

- **Installation Emergency Responder Training Course**. This course is designed to provide installation law enforcement, emergency medical service, medical, firefighting, installation operations center, and first-responder rescue personnel with the basic skills and knowledge needed to react to a terrorist, CBRN, or hazardous-material (HAZMAT) incident.
- **Installation Staff Planners Course**. This course is designed to familiarize installation planners, installation operations center personnel,

emergency disaster planning officers, and emergency response working groups with the procedures for preparing an installation to respond to a CBRN incident.

- **Civil Support Skills Course**. This course is designed to train and certify individual Army National Guard CST-WMD personnel in CBRN and civilian HAZMAT response at the technician level.

The following training will be added when the new facility is complete:

- **Installation Support Team Course**. This course is designed to train ISTs on chemical, biological, radiological, nuclear, and high-yield exposives (CBRNE) hazards, sampling, reconnaissance, survey operations, basic decontamination procedures, and the use of personal protective equipment. The course also provides the installation commander with an organic capability to mitigate the effects of a CBRN incident.
- **Gas Chromatograph/Mass Spectrometer Course**. This course is designed to train DOD civilian and military personnel on operational procedures and implementation and maintenance techniques.
- **Chemical Unit Domestic Reconnaissance Course.** This course is designed to teach chemical officers and enlisted personnel the tactics, techniques, and procedures needed to conduct a domestic reconnaissance mission.
- **Chemical Unit Mass-Casualty Decontamination Course**. This course is designed to teach Chemical Corps officers and enlisted personnel the techniques necessary to perform team domestic response mass-casualty decontamination.

From the contemporary architecture and modern building design to the vast training areas, the CBRN Responders Training Facility was designed to impart our military with the knowledge, skills, and abilities to effectively operate and defend our Nation from a CBRN terrorist attack. Regardless of the type of threat, the reality is that our homeland is not immune to a terrorist attack. And deadly chemicals, radiological materials, and dangerous biological agents are routinely transported on our interstate highways. The Chemical Corps is vigilant of these concerns and, through the new training facility, seeks to better prepare our military to support this critical role. The new facility and its state-of-the-art provisions will enable our military to expand their warrior expertise from the battlefield to the streets by providing military assistance to civil authorities (as directed in Defense Reform Initiative Directive 25).[4]

The DOD continues to prepare chemical warriors to serve in the domestic arena as combat multipliers for our Nation's homeland security. Working alongside six other federal agencies (the Department of Homeland Security, Department of Justice, Federal Emergency Management Agency, Environmental Protection Agency, Department of Health and Human Services, and Department of Energy), the Corps will join the front line of defense against adversaries seeking to counter our operational advantages with their own strategic effects. While our Nation stands unrivaled in its ability to project combat power, the USACMLS remains committed to defending our Nation (at home and abroad) against terrorist threats—long before they happen—through realistic training and support to civil authorities.

Endnotes

[1]"CBRN Defender," *Military Medical Technology Online Edition,<http://www.military-medical-technology.com/print_article.cfm?DocID=653>*, accessed on 29 June 2005.

[2]"ArmyStudyGuide.com," *<http://www.armystudyguide.com/Warrior-Ethos/index.html>*, accessed on 29 June 2005.

[3]Public Law 103-160, Section 1703 (50 United States Code [USC] 1522).

[4]Defense Reform Initiative Directive 25, *DOD Plan for Integration of the National Guard and Reserve Component Into Domestic Weapons of Mass Destruction Terrorism Response*, 26 January 1998.

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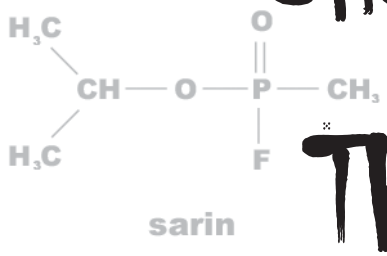
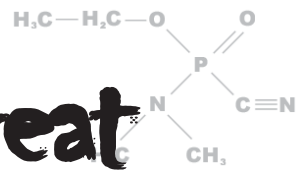
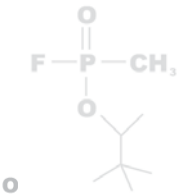
Chemical Terrorism: The Next Threat







By Mr. Steven L. Hoenig

Since the events of 11 September 2001, the American people, the federal government, and state and local entities have been on alert for the next terrorist attack. And the amount of resources dedicated to preparing for the next attack has reached billions of dollars (see the table below).[1] The United States has committed an enormous amount of time, personnel, and training and is more prepared for a biological attack than ever before.

1998	1999	2000	2001	2002	2003*
$89 million	$343 million	$432 million	$503 million	$2.9 billion	$4.3 billion
* Budget requested for Fiscal Year 2003.					

Bioterrorism Preparedness Funding

Since the first anthrax letter of September 2001, the number of incidents of suspicious white powders sent to health labs has increased dramatically. Within a few weeks of the first anthrax incident, the Illinois Department of Health received a total of 1,496 samples requiring testing. The Michigan and Oklahoma Departments of Health received 228 and 762 samples, respectively. The US Army Medical Research Institute of Infectious Diseases (USAMRIID) received 5,078 samples. By the end of January 2002, the Florida Department of Health received 9,148—the Miami laboratory received 6,098 samples, the Jacksonville laboratory received 1,864 samples, and the Tampa laboratory received 1,186 samples. Fortunately, since the first case in 2001, most of the cases of anthrax in the mail have turned out to be common household products (such as flour, baking powder, and cornstarch).

The vigilance of first-responder personnel has proven to be an effective deterrent. However, the resources so far have been directed to bioterrorism (rightly justified to meet the threat). Now we need to focus on an area that has been looming overhead but ignored for some time—chemical terrorism. But what is the likelihood that the next attack will be chemical and not biological? For the answer, several factors must be considered:

- The level of fear that a chemical attack creates.
- The limited amount of time required for a chemical agent to be effective.
- The limited resources for the treatment of victims.
- The level of protection and treatments for victims and first responders.
- The recognition and detection limitations.
- The amount of agent release.

The first and foremost reason for a terrorist attack is obviously to invoke terror. There is little doubt that the 1995 Tokyo subway attack caused fear and panic in the victims, emergency responders, health officials, and general public. The fear and panic associated with the subway attack was much greater than the fear and panic associated with the anthrax mail incidents. Imagine an office building in which people suddenly fall unconscious at their desks. People

would panic and create a situation of mass hysteria to exit the room or building. The amount of exposure or toxicity and the number of injuries would be immense.

The amount of time for chemical agents to be effective is only a matter of seconds to minutes. Exposure to a nerve agent can be fatal in as little as fifteen minutes. If a nerve-agent antidote is not administered within the appropriate time, death will occur. Immediate medical response is needed if massive deaths are to be avoided. In contrast, the average time period between exposure and the development of symptoms for anthrax ranges between 2 and 72 days. The availability of rapid detection methods allows for the timely and orderly diagnosis, treatment, and intervention to anthrax exposure.

The utilization of resources is a critical factor in a chemical attack because the effect on victims is immediate. In the Tokyo subway attack, more than 5,500 people were affected. A large number of the victims, all requiring immediate diagnosis and/or on-site treatment, can seriously tax emergency-responder personnel and resources. The local hospitals would be overwhelmed, and the supply of nerve-agent antidote would be exhausted in minutes (at facilities with limited supplies). In the case of an anthrax attack, where the time factor is extended, the victims could be sent to outlying hospitals so that no one hospital is overwhelmed and the resources are not taxed. Additional prophylaxes and vaccines can be shipped in for treatment. Victims exposed to anthrax have the luxury of time on their side; victims exposed to nerve agents do not.

Another factor to be considered is the first-responder personnel. Most first responders have the option of being vaccinated against anthrax for protection, but there are no vaccines for nerve agents. If first responders treat victims of an unknown attack without first donning the proper personal protective equipment (PPE), they could become victims themselves. If a victim is assessed and nerve-agent exposure is suspected, the proper treatment can be administered. For protection against anthrax exposure, adequate protection is provided by using the N95 respirator face mask, latex gloves, and a smock or coveralls. However, for nerve-agent exposure, a full-face respirator, impermeable gloves, and an impermeable suit would be required for appropriate protection. PPE is not a standard-issue item for police and emergency medical service personnel.

Detection is another critical factor to consider. Everybody is on the outlook for suspicious white powders. The US Postal Service has installed biological detectors in mail facilities, and there are stations with biological early-warning systems located in some cities (to monitor the environment for biological agents in the air). Even though detection systems for chemical agents are available, there are currently no active monitoring systems in place. Nerve agent could be concealed in something as simple as a cologne bottle, and a massive release could go unnoticed until large numbers of people become sick.

Another factor to consider is the amount of agent released. A large-scale biological attack would require a significant amount of biological agent to be released in a populated area. In a chemical attack, only a small amount of agent needs to be released to be effective. A single drop of nerve agent on the skin can be fatal. A small amount of nerve-agent vapor released into recirculated air in an office building would prove deadly to dozens of people—hundreds would become ill almost immediately. In the Tokyo attack, out of the 5,500 people who fell ill, only 11 people died. A properly deployed nerve agent has the potential to kill hundreds or even thousands of people.

The results of a chemical attack have the potential to be enormous. Our efforts are targeted toward a potential biological attack. But now, more than ever, there is a pressing need to direct our resources to prepare for a possible chemical attack. To ignore the possibility that it may happen is to invite disaster. The best defense is to educate, train, and equip those entrusted to protect the citizens and visitors of this great Nation.

Endnotes

[1] Dean Rosen, Senate HELP Committee.

Mr. Hoenig serves as the Miami Chemical Terrorism Coordinator at the Florida Department of Health, Bureau of Laboratories. For additional information, contact Mr. Hoenig by telephone at (305) 325-3279 or by e-mail at <steven_hoenig@doh.state.fl.us>.

Maximizing Homeland Defense Operations Using WMD-CSTs

By Major Jim Demyanovich

In 1998, the Department of Defense (DOD) created national guard-based military teams that have come to be known as weapons of mass destruction–civil support teams (WMD-CSTs). WMD-CSTs are small military detachments with the equipment and expertise to provide military support to domestic WMD events at the state level or, when federalized, provide support to the US military. Though the initial plan was to create only a few geographically dispersed regional teams, WMD-CSTs have been created across the United States, expanding to all US states and territories.

WMD-CSTs were established to perform specialized tasks in response to WMD event consequence management and hazardous-effects mitigation. A WMD event may include chemical, biological, radiological, and nuclear (CBRN) and/or other toxic industrial material (TIM) releases. CSTs have the manning structure, training, and equipment to provide states with a trained national guard unit that has WMD-specific capabilities. The major capabilities are technical expertise and a robust communications suite, followed by portable hazardous-material (HAZMAT) analysis capabilities. CSTs also perform limited casualty handling and posess limited decontamination equipment. In general, CSTs have less than two dozen well-trained reservists equipped with robust communications and a small set of WMD-centered response equipment to accomplish WMD support missions. *Figure 1* shows the duties for CST reconnaissance missions and for operations at a WMD incident. Specific WMD-CST capabilities are cited in Field Manual (FM) 3-11.22.[1,2]

First Line of Defense

First responders throughout the Nation stand now, as they have throughout our history, as the on-scene mitigators of crises in our communities. The local responders are the fire, police, emergency medical, and similar services that respond to conventional fires, earthquakes, and hurricanes and to accidental or terrorist-initiated, WMD-like events. And their role has gained increasing importance since the events of 11 September 2001, where it became evident that the goal of terrorists is to inflect maximum American casualties. The first responders and their response capabilities serve our communities and will continue to do so. WMD-CSTs

The CST provides assessments and a presumptive identification to analyze most chemical, biological, radiological, nuclear, and high-yield explosive (CBRNE) agents and substances. The CST's sophisticated detection, analytical, and protective equipment allows operations to take place in environments that contain many different CBRNE and TIM. The personal protective equipment (PPE) used by CSTs provides extensive protection from HAZMAT.

CSTs have the unique ability to assess CBRNE events. This is accomplished through the expertise of personnel and the use of several computer-based modeling programs. In addition, the survey and medical teams' high state of training and advanced technology equipment allow for accurate and timely sample collection and identification of CBRNE agents and substances. The CST also provides the ability to act as a CBRNE reconnaissance force that can provide a unique view at the incident site.

The assessment process also supports deliberate and crisis action planning. Assessments include the use of intelligence preparation of the battlespace (IPB). Needs assessments also occur to determine the capabilities required to support the required response actions. Assessments occur prior to, during, and after an incident. The assessment process is ongoing.

Figure 1. WMD-CST capabilities

have not supplanted civil first responders. The WMD-CSTs are not equipped or trained to replace local HAZMAT, fire, rescue, ambulance, or other emergency response assets.

Civil First-Response Command and Control

The Incident Command System (ICS) is a nationally adopted set of guidelines for civil emergency responders. The ICS is a formalized framework of specific methods to command, control, communicate, support, and conduct operations in incident responses. The ICS is not a new system, but formal use as a common system recently began throughout the United States. Within the military, knowledge and experience with the civil ICS is extremely limited and is primarily restricted to DOD installation first-responder forces. Military units do not normally receive ICS training.

The ICS, while structured in a framework very similar to military combat organizations and missions, uses unique language, structure, and response functions. The ICS outlines a structured response to all emergency situations, providing first responders a way of planning, organizing, and executing a mission—whether it is very small or very large. The ICS is unique. Unfortunately, Active Army military forces that could potentially be assigned to support a major domestic WMD event are largely unfamiliar with ICS and first-responder procedures.

Unique Training

Along with their military individual and unit operations training and specific training on their organic unit equipment, WMD-CSTs are trained in ICS. Hence, WMD-CSTs become a rare DOD resource because they not only speak the language of ICS but also the language of the military. They can, therefore, be an effective on-site conduit for DOD support in a domestic incident. By virtue of their missions, WMD-CSTs will likely arrive on scene during the postevent stage of an incident (although it is possible for them to be present at locations supporting high-visibility, national security events in a preplanned mode). WMD-CSTs are normally deployed to a scene as backup to the initial call made by first responders. Since WMD-CSTs operate in fixed areas, they can use opportunities to consistently train with local first-responder forces in exercises. Over time, they can become very familiar with the particular needs and capabilities of their regional first-responder forces. When needed, WMD-CSTs provide an added backup capability in WMD events.

Critical Value

The most critical aspect of WMD-CST support is the *value added*, which includes providing significant support to an event response and a leverage of available resources through the use of local, state, and federal forces. Instead of acting as reconnaissance or recovery forces under HAZMAT conditions, the WMD-CST possesses the ability to conduct planning and communicate needs and assessments between military and civil response forces. In this way, they serve as a military support command post (WMD center) for the on-scene command. In large military organizations, the WMD center is called the Nuclear, Biological, and Chemical Center (NBCC) and is operated by trained WMD technical specialists. The NBCC is a key command post element and a knowledge-gathering and assessment center focused on subject matter expertise, information assessment, situational awareness, and critical decision-making recommendations on WMD event consequence management. (*Figure 2* depicts military NBCC[3] and WMD-CST[4] missions.)

In many ways, CSTs, with their technical experts and communications gear, are equipped to be a WMD response command/evaluation post. For myself, having served for many years as the NBCC chief in tactical command posts (but not in WMD-CSTs), it appears that WMD-CSTs are most effectively employed much like tactical military NBCCs. The dedicated tactical mission of the NBCC is to maintain CBRN (the military parlance to WMD) situational awareness in a geographic area during tactical operations. In many ways, the WMD-CSTs can act as the states' NBCCs during WMD events and as a forward NBCC to support state, DOD, or other federal WMD incidents.

This forward-NBCC concept provides an enormous function at a WMD scene that belies the WMD-CST unit size. The function is largely due to WMD-CST military and civil response familiarity and organic communications capabilities. This niche or key role in military support to domestic civil response appears to be the command post functionality. With expertise in both military and civil response methods of operations, plans, and procedures, this unique functionality within the DOD could facilitate interagency support in homeland security.

The WMD-CST command post has all the essential ingredients to be an effective NBCC. It has extensive, organic communication equipment that is staffed with personnel who

NBCC

The critical mission of the NBCC is to conduct CBRN battle management. This mission includes—

- Planning and coordinating chemical unit operations.
- Conducting CBRN vulnerability analyses.
- Receiving, processing, and disseminating CBRN reports.
- Maintaining and evaluating contamination information.
- Advising the commander and staff on CBRN defense measures and smoke and flame operations.

NOTE: The commander may supplement this mission with his own.

WMD-CST

The mission of the CST is to support civil authorities at domestic CBRNE incident sites. This mission includes—

- Identifying CBRNE agents and substances.
- Assessing current and projected consequences.
- Providing advice on response measures.
- Providing assistance with appropriate requests for additional support.

Figure 2. Missions

have expertise in military operations and ICS. This command post function is a unique and key feature that WMD-CSTs can provide to the homeland defense effort. CSTs also possess unique, though limited, capabilities to perform small-unit physical WMD *boots-in-the-hot-zone* missions. But the communications, command, and control links of the WMD-CST can dramatically leverage strength, facilitate federal incident support, and provide the military with the catalyst needed for military forces to effectively integrate their abilities into the existing ICS structure established at an incident.

The current WMD-CST missions to conduct reconnaissance or HAZMAT operations dilute and detract from the ability of the WMD-CST to perform the most critical mission of providing continuous on-scene event information and assessments at a WMD incident. Using continuous, 24-hour, 7-day operations during a post-WMD event, two shifts of personnel could easily consume all WMD-CST personnel resources in real-world responses.

Achieving Maximum Effect

The WMD-CSTs are manned, equipped, and tasked to perform missions akin to the tactical NBCC. Other missions currently envisioned for the CSTs can be conducted by civil first responders (such as HAZMAT teams). In civil response events requiring deployment, WMD-CSTs must focus their capabilities on a primary mission that can support (mitigate) mass effects at a WMD scene by acting as the on-scene NBCC. Naturally, local first responders will always be the first on scene (regardless of the event) to provide a HAZMAT response and assessment. The mitigation operations possible through the use of WMD-CSTs come from expertise in WMD and communications functions. WMD-CSTs should focus their efforts on becoming the best they can be as NBCC equivalents—a full mission unto itself in a WMD incident.

The capabilities of the WMD-CST are broad, but shallow. I believe that WMD-CSTs can play an important role for our Nation and government, one that allows them to focus their capabilities on particular areas—WMD-centric communications expertise; facilitated reach-back capability; military-operations experience; and the knowledge of civil first-responder functions, roles, and missions. These important missions are unique and should become the primary focus in the DOD military support channel to civil response command post operations.

Endnotes

[1]FM 3-11.22, *Weapons of Mass Destruction Civil Support Team Tactics, Techniques, and Procedures*, 6 June 2003.

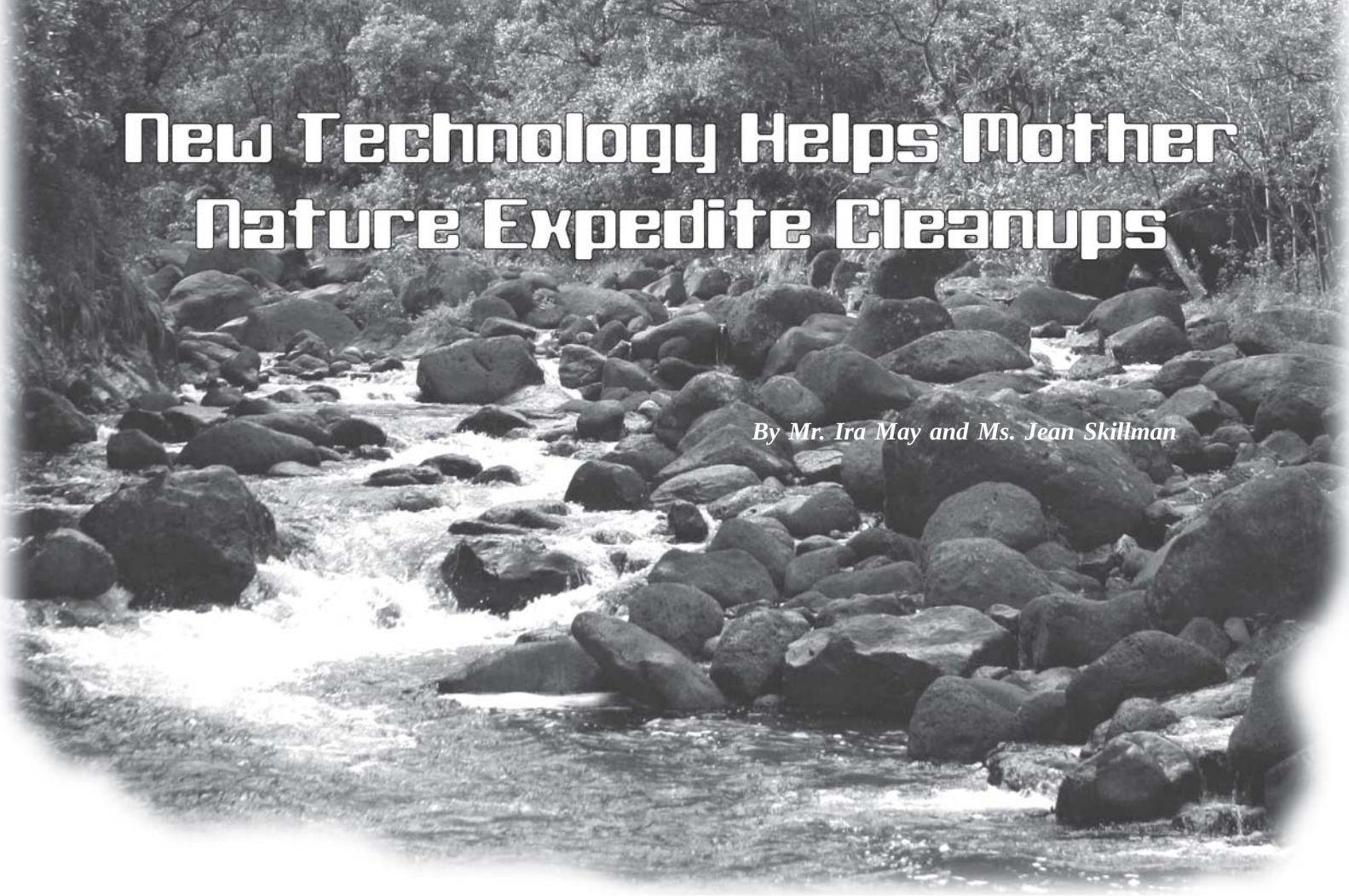
[2]FM 3-11.22 is currently under revision. The broad mission of the WMD-CSTs will likely continue as written, although a more-focused approach that maximizes capabilities may occur.

[3]Army Training and Evaluation Program 3-117-40-MTP, *Mission Training Plan for the Chemical Section and Nuclear, Biological, and Chemical Center*, 26 September 2003.

[4]FM 3-11.22, *Weapons of Mass Destruction Civil Support Team Tactics, Techniques, and Procedures*, 6 June 2003.

Major Demyanovich is an Army nuclear and counterproliferation officer working in the Chemical/Biological Directorate of the Defense Threat Reduction Agency. He holds a bachelor's degree in mechanical engineering from Pennsylvania State University and a master's degree in operations research from the Naval Postgraduate School.

New Technology Helps Mother Nature Expedite Cleanups



By Mr. Ira May and Ms. Jean Skillman

Chlorinated solvents are the source of some of the Nation's most problematic groundwater contamination. According to a national water quality assessment by the US Geological Survey between 1992 and 1999, 70 percent of domestic and public wells contain at least one form of chlorinated solvents, nitrates, or pesticides, and 47 percent had at least two compounds. The widespread use of solvents such as dry cleaning agents, engine degreasers, and paint removers has not only polluted the Nation's groundwater but, according to the Army Environmental Security Technology Certification Program (ESTCP), represents one of the largest remediation liabilities for the Department of Defense.

The Army Challenge

Groundwater testing and cleanup is a major function of the US Army Environmental Center (USAEC). Many Army installations are fighting contamination from chlorinated solvents such as trichloroethylene (TCE), perchloroethylene (PCE), and trichloroethane (TCA) caused by dry cleaning procedures, equipment maintenance, and electronics manufacturing.

In the past, conventional treatments such as pump and treat and air sparging have been the technologies of choice for cleaning up groundwater contaminated with chlorinated solvent. Pump-and-treat remediation pulls the contaminated groundwater to the surface, removes the contaminants, and either recharges the aquifer with clean water or discharges the water into a lake or river. Most often, the systems are designed to restore the aquifer enough so that later wells can supply potable water.

Air sparging is an *in situ* (in-place) remedial technology that reduces concentrations of chlorinated solvents adsorbed onto soils and dissolved in groundwater. The technology involves the injection of contaminant-free air into the subsurface saturated zone, enabling a phase transfer of hydrocarbons from a dissolved state to a vapor. The air is then vented through the unsaturated zone. Both technologies, while reliable, are costly and time-consuming.

Tarheel Army Missile Plant

Tarheel Army Missile Plant (TAMP), a former Army-owned and contractor-operated facility in Burlington, North Carolina, recently completed a pilot program using a new in situ remediation technology that has shown promising results for better, faster, and cheaper chlorinated-solvent cleanup.

Groundwater and soil contamination were discovered at TAMP in 1993. Petroleum hydrocarbons and chlorinated volatile organic compounds from recent electronic manufacturing and 1950s missile manufacturing were detected in the soil and groundwater. A combined pump-and-treat and soil vapor extraction/air-sparging system was installed to remediate the soil and groundwater. The approach was effective for the treatment of the petroleum hydrocarbons, but the elevated levels of the chlorinated solvents persisted.

A Solutions-IES field services manager inspects the installation of EOS injection well vaults. The wells are tied together with double-walled PVC pipes, allowing injections and extractions in alternate wells.

The US Army reached an agreement with the state of North Carolina to reduce the chlorinated solvent contamination at the TAMP source by 50 percent within three years to meet interim regulatory requirements. Eight different remedial options were evaluated by the USAEC before they selected an in situ bioremediation technique using Emulsified Oil Substrate (EOS®) from Solutions-IES, Incorporated. The food grade soybean oil solution seemed the best choice to stimulate the reductive dechlorination process and remediate the contaminated groundwater. The EOS technology seemed to be the right fit for the slow-moving aquifer found in this geology.

Reductive Dechlorination

During the dechlorination process, diluted EOS is injected into the aquifer and followed with chase water to distribute and immobilize the oil droplets. Once in the subsurface, the food grade substrates biodegrade, consuming dissolved oxygen and releasing hydrogen to stimulate reductive dechlorination. By using a natural soy-based product, we are in essence helping Mother Nature expedite the process that would normally clean contamination from the soil and water. The EOS acts as a food for the bacteria by providing energy that stimulates the breakdown of contaminants. And extensive laboratory studies and field demonstrations have proven that EOS can stimulate complete reductive dechlorination of TCE, PCE, and TCA to nontoxic ethene and/or ethane with just one treatment. The chemicals added during in situ bioremediation are normally short-term, but the EOS has a much longer effect.

Pilot Test Design

The pilot test of the EOS process was implemented in July and August of 2004 to treat a 100-square-foot area that had relatively high TCE concentrations. Site conditions posed some unique technical challenges, including relatively low-yielding soil and saprolite, the need to run all piping below grade, and the requirement to design around an underground pedestrian tunnel in the test area. The final site included eight wells manifolded together into four well pairs. The injection was completed in two steps. During the first step, the diluted emulsion was gravity fed into half of the wells and chased with groundwater supplied from the other paired wells. After several weeks, the system was reversed and EOS was injected into the other half of the four paired wells. Visual inspection of the wells showed that the milky white EOS emulsion was effectively distributed throughout the low-permeability aquifer.

A Solutions-IES employee excavates a trench for the installation of a custom-engineered, below-grade EOS recirculation system.

effective, the Army has already reached the interim groundwater remediation goals for the site. Additional sampling is planned to confirm the long-term effectiveness of this approach.

TCE and its breakdown products are some of the biggest problems facing the Army and industry today. The best idea is to move away from technologies that only stop the contamination and move toward the technologies, like in situ remediation, that actually clean the water in the ground.

For more information on this and other environmental programs, see the USAEC Web site at *<http://aec.army.mil>*.

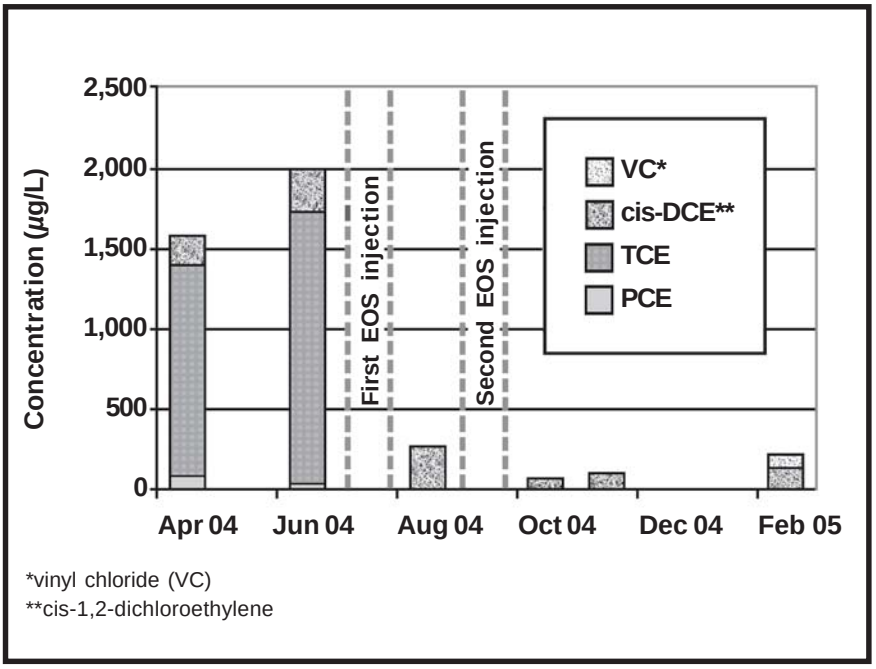
Mr. May is a senior geologist in the Cleanup Division of USAEC. He has been with USAEC since 1985 and has been involved in more than twenty major installation projects involving installation restoration and base closure activities. He is presently running the Army Groundwater Extraction and Treatment Effectiveness Review Program. Mr. May studied geology at the Hebrew University of Jerusalem and Johns Hopkins University and did graduate work at the University of Delaware in trace metal geochemistry.

Ms. Skillman is a public affairs representative for USAEC. She holds a bachelor's degree in communications from the University of Maryland and served twelve years on active duty as a US Navy journalist.

Monitoring the Results

Groundwater samples were collected from existing wells in the pilot test area before and after injection to evaluate the treatment effectiveness. Within weeks after injection, anaerobic conditions in the treatment zone were effectively established. Soon thereafter, TCE concentrations decreased by 99 percent and have remained low. Within five months, degradation daughter products were detected, confirming on-going biodegradation.

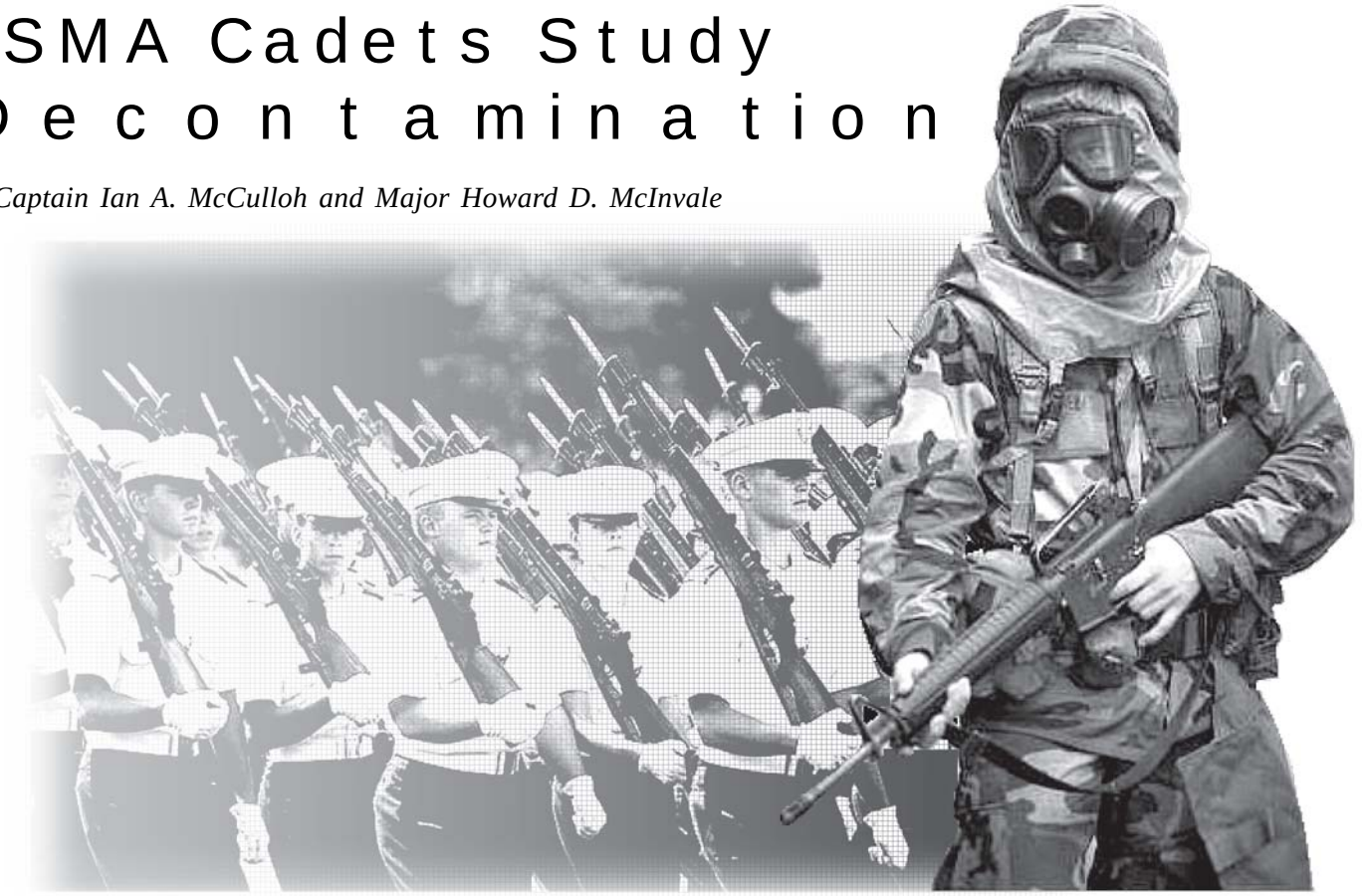
The pilot test was originally designed to treat the plume source and evaluate whether this approach should be expanded to treat the entire plume. Because the treatment has been so



This graphic illustrates the rapid decrease in chlorinated volatile organic compounds in the pilot test area following EOS injection.

USMA Cadets Study Decontamination

By Captain Ian A. McCulloh and Major Howard D. McInvale



What do West Point cadets know about decontamination? The US Military Academy (USMA) Class of 2007 recently investigated how to optimally allocate manpower and other resources to conduct a thorough decontamination mission. This study was conducted as part of a course in probability and statistics, the fourth and final core mathematics course at the USMA. The mathematics program at USMA empowers students to solve real and ill-defined problems. This course project on decontamination highlighted the ability of the cadets to go beyond the traditional problems seen in most textbooks and apply problem-solving concepts to a practical and meaningful issue.

The project assigned decontamination augmentees to different detailed equipment decontamination (DED) stations. Because the thorough decontamination process is time- and resource-intensive and extremely difficult to execute on a large scale, simulation offered valuable insight on improving the process. The core mathematics program at USMA makes extensive use of technology in its curriculum, and that technology was applied to the decontamination problem. With the use of mathematics software, students at the undergraduate level can now develop solutions that were once possible only at the graduate and professional levels.

Nearly 800 sophomore cadets, divided into teams of two or three, tackled this problem. The teams' solutions involved fitting statistical distributions with data collected by the US Army Test and Evaluation Command (ATEC) and using Monte Carlo simulation to model the thorough decontamination process. Cadet teams, creative in their strategies, recommended effective plans to significantly reduce the overall time to decontaminate vehicles and equipment. This wide variety of solutions was evidence of the high-caliber quality of this student population.

For most soldiers, mission-oriented protective posture (MOPP) and chemical, biological, radiological, and nuclear (CBRN) training is hot, miserable, and something they want to avoid. However, after this project, an entire group of future West Point graduates may view MOPP and CBRN training in a more positive light. As first impressions go, these future leaders may view the Chemical Corps as a more relevant, technical, and exciting branch.

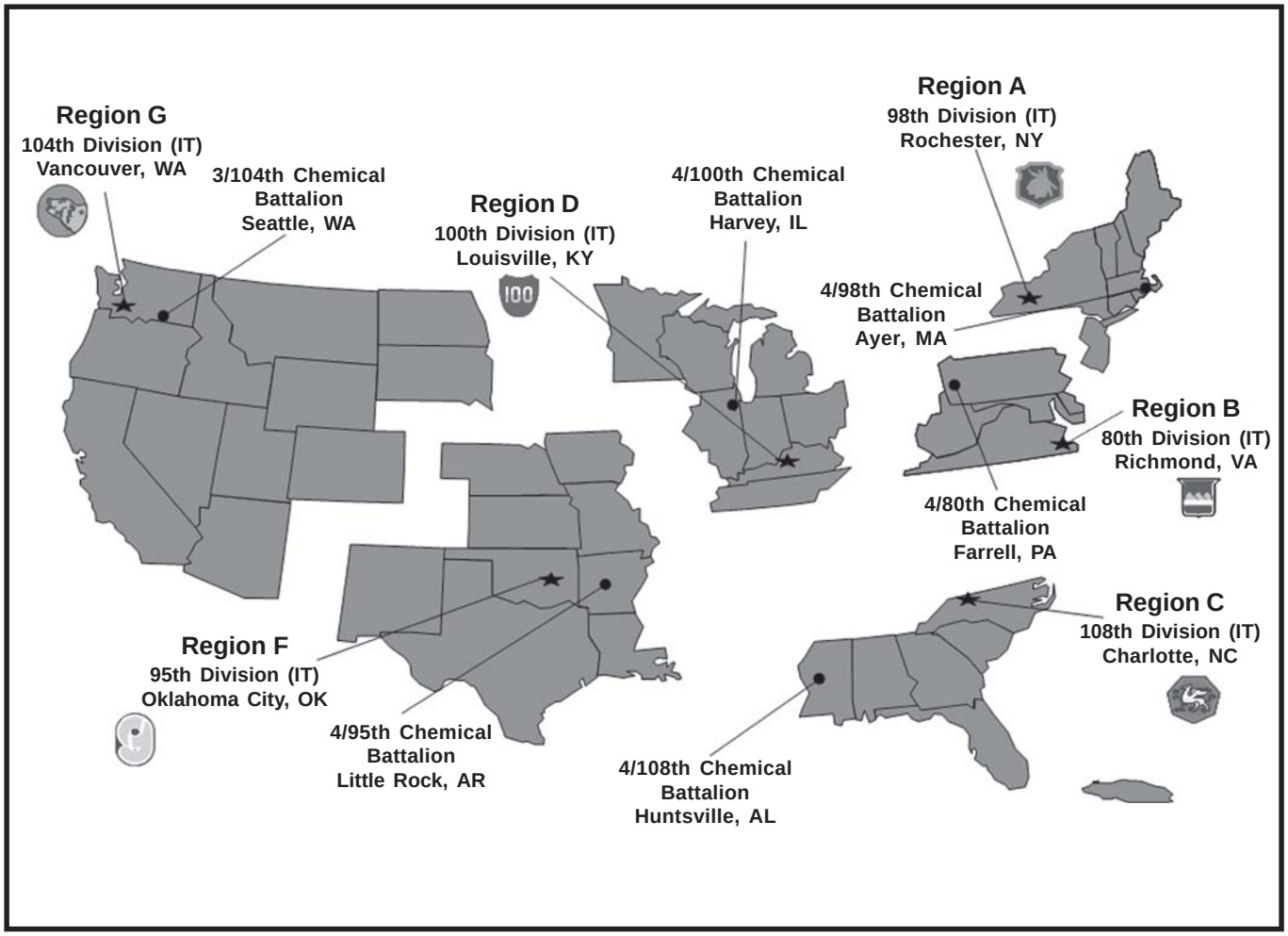
Captain McCulloh is a chemical officer and instructor in the Department of Mathematical Sciences at USMA.

Major McInvale is an infantry officer and an assistant professor in the Department of Mathematical Sciences at USMA.

The Total Army School System Battalion

By Ms. Heather Gunter, Mr. Robert Davis, and Sergeant First Class Steven Sisson

The Total Army School System (TASS) is comprised of accredited and integrated Active Army, Army National Guard, and US Army Reserve schools that provide standard training and education for the Army. The TASS battalions are arranged in regions and are functionally aligned with their training development proponent. The TASS training regiments and brigades provide command and control functions, oversight guidance, and support to individual school battalions. To promote coordination, resource management, and standards in the Corps, chemical TASS battalions are geographically divided into six regions (A, B, C, D, F, and G).



Geographic distribution of chemical TASS battalions

The reserve component (RC) chain of command is responsible for training RC Soldiers, including Title XI Soldiers. Title XI is a congressionally mandated program that provides Active Army training and education support to the RC. Congress funds the Title XI program to increase the readiness of the RC and enhance the overall effectiveness of the Army. The following courses are offered in support of inactive duty training (IDT) and active duty training (ADT):

- **74D10 Reclassification Course**. The 74D10 course is designed to produce a disciplined, motivated, and physically fit Soldier. The Soldier is trained in combat survival skills; combat techniques; chemical, biological, radiological, and nuclear (CBRN) detection and identification; and decontamination, smoke, and reconnaissance operations. The different phases of the course are designed to be trained at multiple locations. The 74D10 contains one or more of the following phases:

  - Phase 1. Distance learning.
  - Phase 2. ADT.
  - Phase 3. IDT.
  - Phase 4. ADT.

- **74D30 Basic Noncommissioned Officers Course.** The 74D30 course uses battle-focused training concepts to equip chemical noncommissioned officers (NCOs) (career management field [CMF] 74) with the required technical and tactical skills necessary to perform the missions of squad leader, company NBC NCO, battalion NBC NCO, and computer plotter operator. The 74D30 course also prepares the NBC NCO to train Soldiers to use NBC detection and decontamination equipment and provides guidance on establishing, administrating, and applying NBC defensive measures. The training phases, which may be trained at multiple locations, are major assets in this course. The following phases are offered:

  - Phase 1. Common core.
  - Phase 2. ADT.
  - Phase 3. IDT.
  - Phase 4. ADT.

- **74D40 Advanced Noncommissioned Officers Course.** The 74D40 course is based on battle-focused training for CMF 74. Senior NCOs, leaders, and trainers are taught the technical and tactical skills needed to accomplish missions at the platoon, brigade, and division levels. Using small group instruction, students are taught the skills necessary to train and lead Soldiers in combat. The training phases of 74D40 may consist of one or more of the following training sessions (offered at multiple locations):

  - Phase 1. ADT.
  - Phase 2. IDT.
  - Phase 3. ADT.

- **Nuclear, Biological, and Chemical Defense Course**. The NBC Defense Course is designed to teach officers and enlisted Soldiers, both Active Army and RC, the skills and knowledge necessary to perform the additional duty of NBC officer or NCO at company and detachment levels.

Current Issues

Over the next three years, the Title XIs in the chemical TASS battalion regions will be downsized. Currently, the Title XIs act as the liaisons between regions and with the US Army Chemical School. In the future, there will only be the quality assurance element (QAE) (comprised of civilian personnel) and two Title XI slots.

The Total Army Training System (TATS) courseware currently takes twelve months or more from commandant or assistant commandant approval to implementation at the TASS battalion level. The Maneuver Support Center at Fort Leonard Wood, Missouri, has a Digital Training Access Center (DTAC) with its own server (operated by the Directorate

of Common Leader Training [DCLT]). The courseware is available at <*http://crxxi.wood.army.mil/anonymous/login.htm*>, where it can be directly accessed by TASS personnel granted DTAC administrator rights. TASS battalion personnel must have an Army Knowledge Online (AKO) user identification and password to access the site. After accessing the AKO, personnel should select *Knowledge* to gain access to current courseware. Additional options include *Communities* and *Subject Matter Expert* links. The additional links provide access to QAE personnel at the Chemical School. There is also a link to post-courseware questions. QAE personnel will address all questions and provide timely feedback. The TASS battalions can request hard copies of the courseware through the Army Training Support Center (ATSC) (see <*http://www.atsc.army.mil/*>).

Ms. Gunter is an instructional systems specialist for the US Army Chemical School, TASS Accreditation and Quality Assurance Element. She has a master's degree in workforce education and training development.

Mr. Davis is a training specialist for the US Army Chemical School, TASS Accreditation and Quality Assurance Element. He has a master's degree in training and organizational development and is a retired chemical sergeant major with 26 years of military experience.

Sergeant First Class Sisson is the Title XI noncommissioned officer in charge at the US Army Chemical School, TASS Accreditation and Quality Assurance Element.

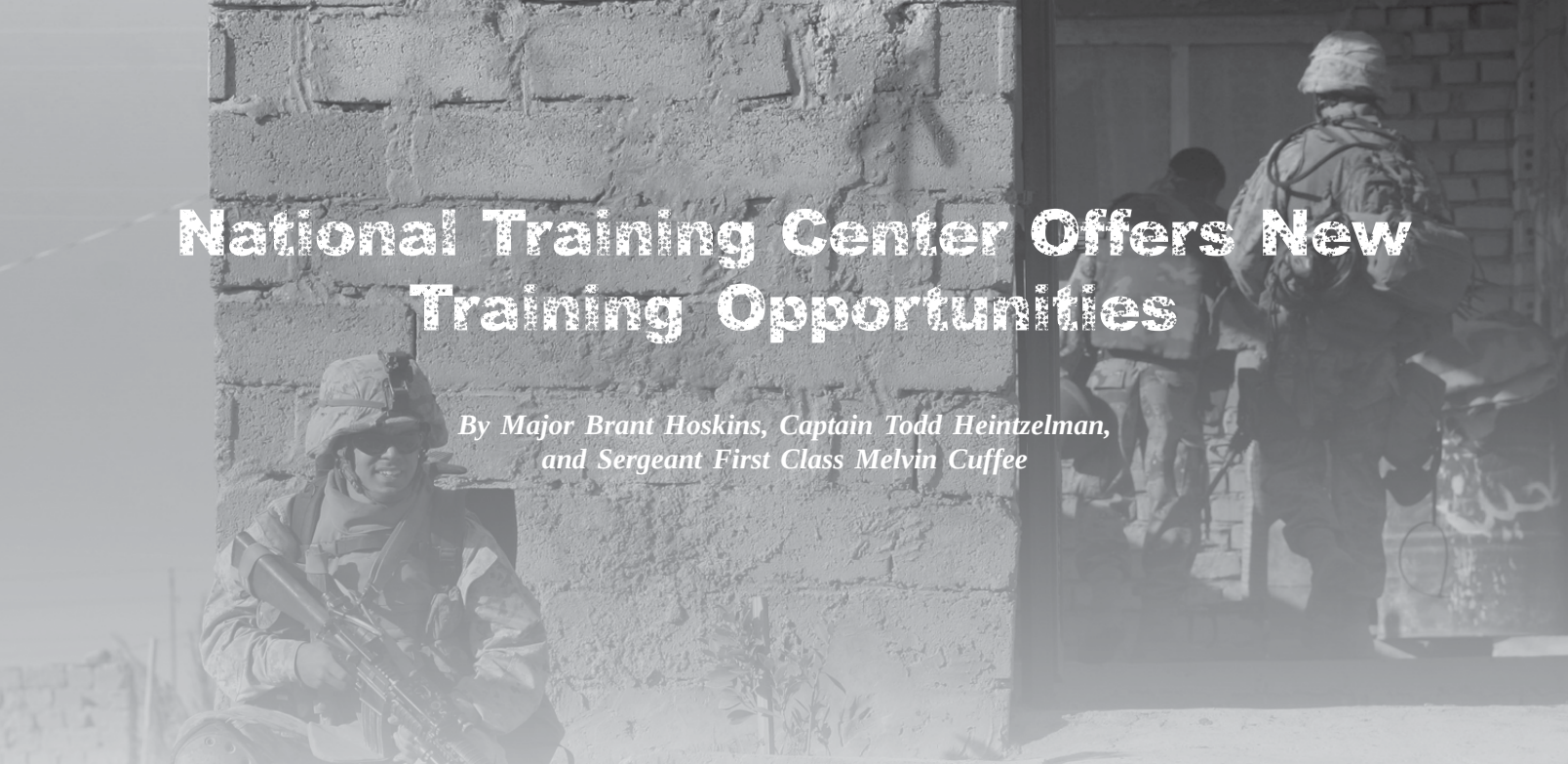
Quality Assurance Office Offers Online Survey

By Ms. Heather Gunter

As our Nation continues the Global War on Terrorism, we must train the critical tasks required for success on the battlefield. Since the conditions will vary with each operation, our Soldiers must receive training on a wide variety of tasks to function in the common operating environment and accomplish the mission. Existing tasks may need to be revised, new tasks may need to be developed, and doctrinal changes may be warranted. To obtain ideas, concerns, and comments, the US Army Chemical School has established the Quality Assurance Feedback Program to solicit feedback from graduates and their supervisors.

Twice a year, the Quality Assurance Office compiles information gathered in an online survey. The survey questions are based on the critical tasks related to each course, and the graduate responses are vital to the training development process at the Chemical School. If you do not respond to the survey, the Chemical School will not be able to fully understand what is current and relevant in the training offered. Complete the survey! Your input can make a difference.

The preferred survey completion time is 6 to 12 months following graduation. Graduates and supervisors of graduates are encouraged to provide feedback. To access the survey, go to <*http://www.wood.army.mil*>, select *Quality Assurance Surveys*, and complete the survey that applies to you. Additional comments regarding tasks may be sent by e-mail to <*ATZTQAOCM@wood.army.mil*>.



National Training Center Offers New Training Opportunities

By Major Brant Hoskins, Captain Todd Heintzelman, and Sergeant First Class Melvin Cuffee

The brigade combat team (BCT) gave the task force 18 hours to prepare and execute a cordon-and-search mission of three buildings in the industrial area of town known as Abar Layla. Human intelligence (HUMINT) reports indicated that a known bomb maker and an insurgent financier would be conducting a meeting with local insurgent leaders. The mission of the task force was clear—to kill or capture the insurgents to prevent future attacks on coalition forces. The task force followed its battle drill and conducted troop-leading procedures down to the squad level. One hour prior to the search, as the outer cordon was being set, B Company received sniper fire and the command post received two mortar rounds. Although no casualties were reported, it was clear that the enemy knew the task force was coming.

"Bandit 6, this is Bandit Oscar. The outer cordon is set. Request permission to establish inner cordon."

"Bandit Oscar, Bandit 6 affirmative. Establish the inner cordon."

Six minutes pass before the first report comes over the command net from the inner cordon. "Bandit 6, this is Cowboy 6. Positions C1, C2, and C3 are established. C4 is not yet established. An unknown number of insurgents firing small arms from Building B175 have pinned down my squad near Building B182."

"Cowboy 6, this is Bandit 6. Roger, stand by. I am sending B13 and B14 [M1A1] to SBF 1. As soon as they arrive, coordinate directly to fire and maneuver your squad into and through Building B175. Notify me as soon as C4 is occupied so we can begin the search."

Twelve minutes later, a loud blast is heard. "Bandit Oscar, this is Cowboy 6. Contact!"

The task force commander knew from the sound of the explosion that something drastic had happened. "Sir," the company commander's voice quivered, "I need CASEVAC [casualty evacuation] now! I have four KIA [killed in action] and three wounded—all litter priority. Also send the vehicle recovery team. B13 is severely damaged and not able to move under its own power."

The operation came to a screeching halt; CASEVAC was now the priority. In the ensuing investigation, it was discovered that B14 had fired upon insurgents in the building with a high-explosive antitank round that immediately caused the sympathetic detonation of more than 1,000 gallons of ammonium nitrate fertilizer and diesel fuel. It was later discovered that Building B175 was actually the regional production and storage facility for the Iraqi State Fertilizer Company. The lesson learned on this day was clear—involve the chemical officer in the intelligence preparation of the battlefield (IPB) and subsequent planning. The chemical officer possesses information about mission locations. In this instance, if he had participated in the planning, the unit may have eliminated the insurgent threat with minimal casualties and collateral damage.

This training scenario (and many similar scenarios) are offered at the National Training Center (NTC) at Fort Irwin, California. Over the past two years, monumental changes have taken place at the NTC with one purpose in mind:

providing Soldiers with the best possible training prior to deployment into hostile theaters. Chemical, biological, radiological, and nuclear (CBRN) training is no exception. We have received wonderful feedback from chemical Soldiers in the field, and this information has helped us tailor NTC training and facilities to enhance Soldier preparations. In an effort to continue providing quality training at the NTC, we feel it is necessary that fellow chemical Soldiers and leaders know how we have changed, what we have to offer, and how we can work together to maximize the training benefits offered to Soldiers during the month-long stay.

A Brand New NTC

"This is not your father's NTC" is a comment frequently made by senior leaders. Prior to Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), NTC training was focused almost solely on the high-intensity end of the contemporary operational environment (COE), with minor diversions into stability operations and support operations (SOSO). In the CBRN arena, this meant large-scale artillery attacks or tactical ballistic missiles (TBMs) with long- and short-duration agents. This training paid off handsomely for the Army during OIF and OEF, but the reality of in-theater operations has changed and, therefore, so has the NTC. As OIF and OEF theaters have matured, unit after-action reviews (AARs) and reach-back programs have reflected the need for changes to ensure continued relevance. This change required a transition from the high-intensity range to the mid-low-intensity range (SOSO), while still maintaining the capability to return to the high-intensity COE. By incorporating the changes to the COE, the NTC is able to offer Soldiers the best training possible (with even more exciting opportunities on the horizon).

Urban Training Sites

Since 2002, the number of urban training sites and villages at the NTC has increased from 4 to 12. These villages vary in size from a few buildings to elaborate towns with markets, mosques, businesses, and houses. During the rotations, operational forces and Arabic-speaking role players occupy these villages. The size of the populations may vary from as low as 25 to more than 250. Soldiers are consistently challenged by the unique dynamics presented in the villages. These scenarios often depict insurgents using the villages as safe havens to stage attacks on coalition forces or as cover to fire mortars on local base camps (see *Figure 1*).

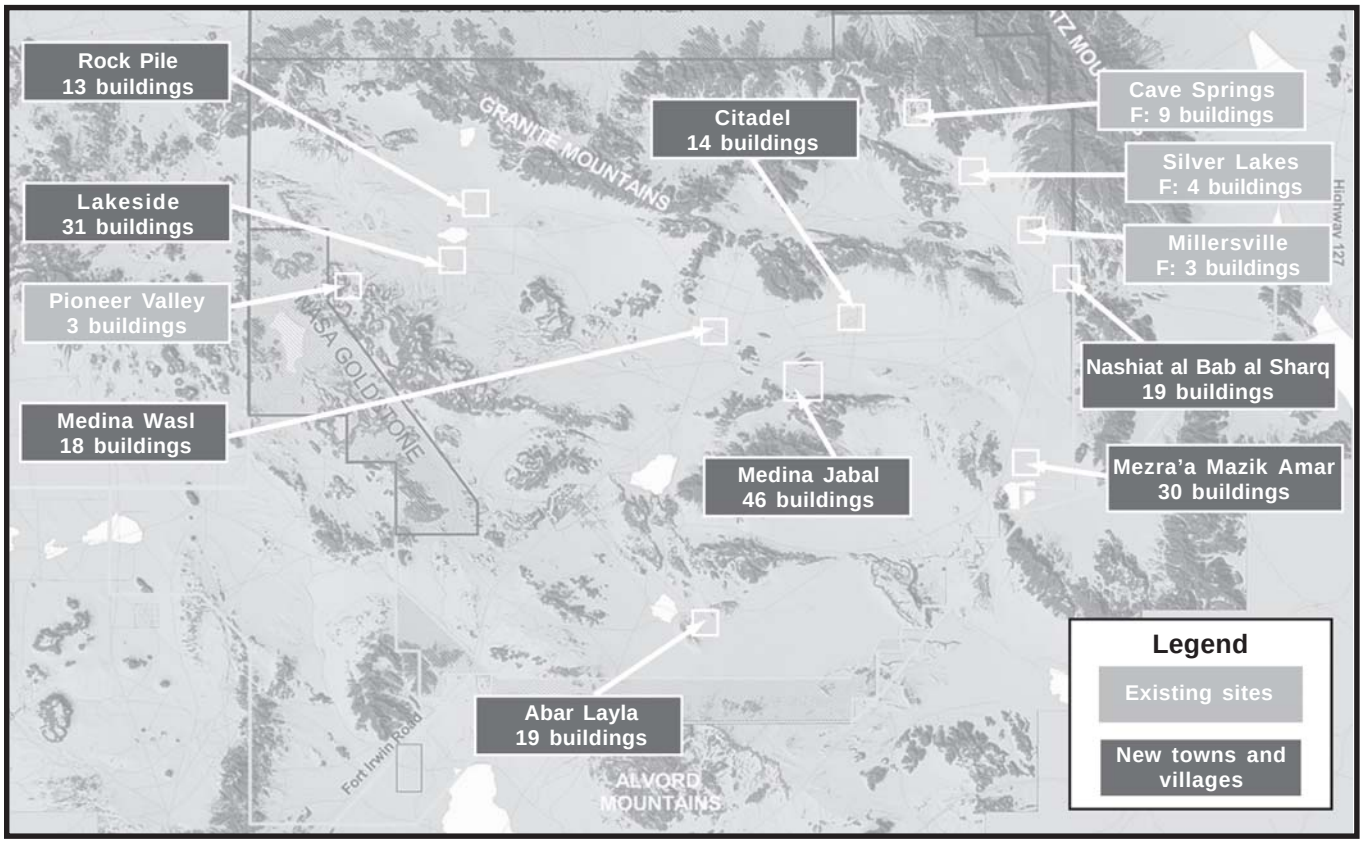


Figure 1. Urban training sites

Tunnel Complexes

The addition of intricate tunnel complexes throughout the training area has provided new training opportunities (see *Figures 2 and 3*). Remote insurgent bases and clandestine ammunition caches are included in the training scenarios (see *Figure 4, page 24*).

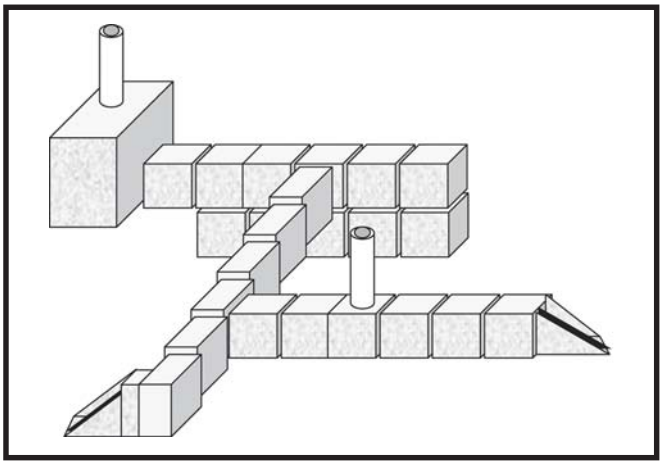


Figure 2. Alpine Valley

Base Camps

Base Camps Detroit, Seattle, Denver, and Dallas now dot the NTC landscape (see Base Camp Denver in *Figure 5, page 24*). These semipermanent structures have large tents for sleeping, eating, and command and control (C2) operations. Entry and exit points are strictly controlled; guard towers are occupied 24 hours a day, 7 days a week; and detainee facilities are operational. The base camps receive a steady stream of mortar and rocket attacks, which forces units to react to the threat and rehearse tactics, techniques, and procedures (TTP).

New Training

The changing nature of threats from Iraq and Afghanistan has allowed us to develop interesting and challenging CBRN training that targets not only chemical Soldiers but also the BCT leaders and their staffs. *Figures 6 through 9, pages 24 and 25,* depict some of the CBRN training conducted in the last year.

Future projects include oil fires, a pesticide production facility, and a damaged water treatment plant. The exciting

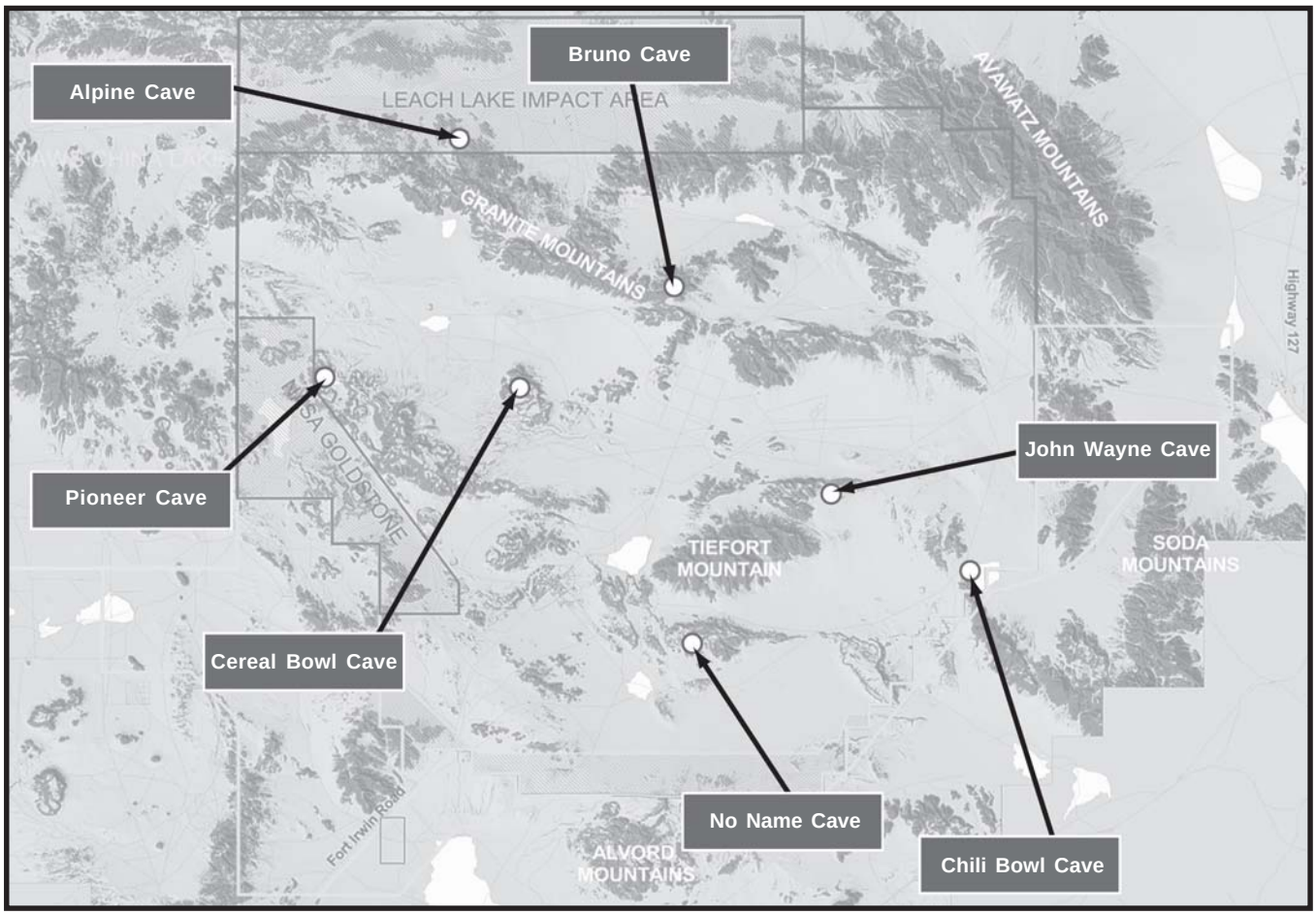


Figure 3. Tunnel/cave locations

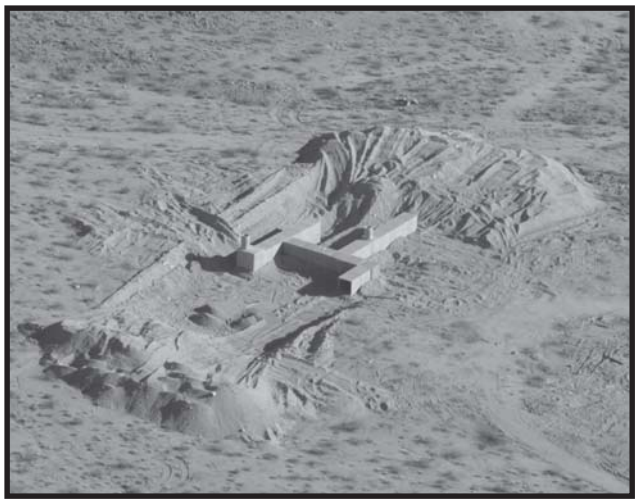


Figure 4. Example of an uncovered cave

Figure 5. Base Camp Denver

part of these scenarios is that they not only target chemical, biological, radiological, nuclear, and high-yield explosive (CBRNE) training objectives but other SOSO training objectives. For example, an operational oil pipeline, fertilizer plant, and pesticide production facility all provide jobs. If damaged, they create an industrial hazard and anger in the town's population. It takes only one event to demonstrate to senior BCT leaders that toxic industrial chemicals (TIC) and toxic industrial material (TIM)

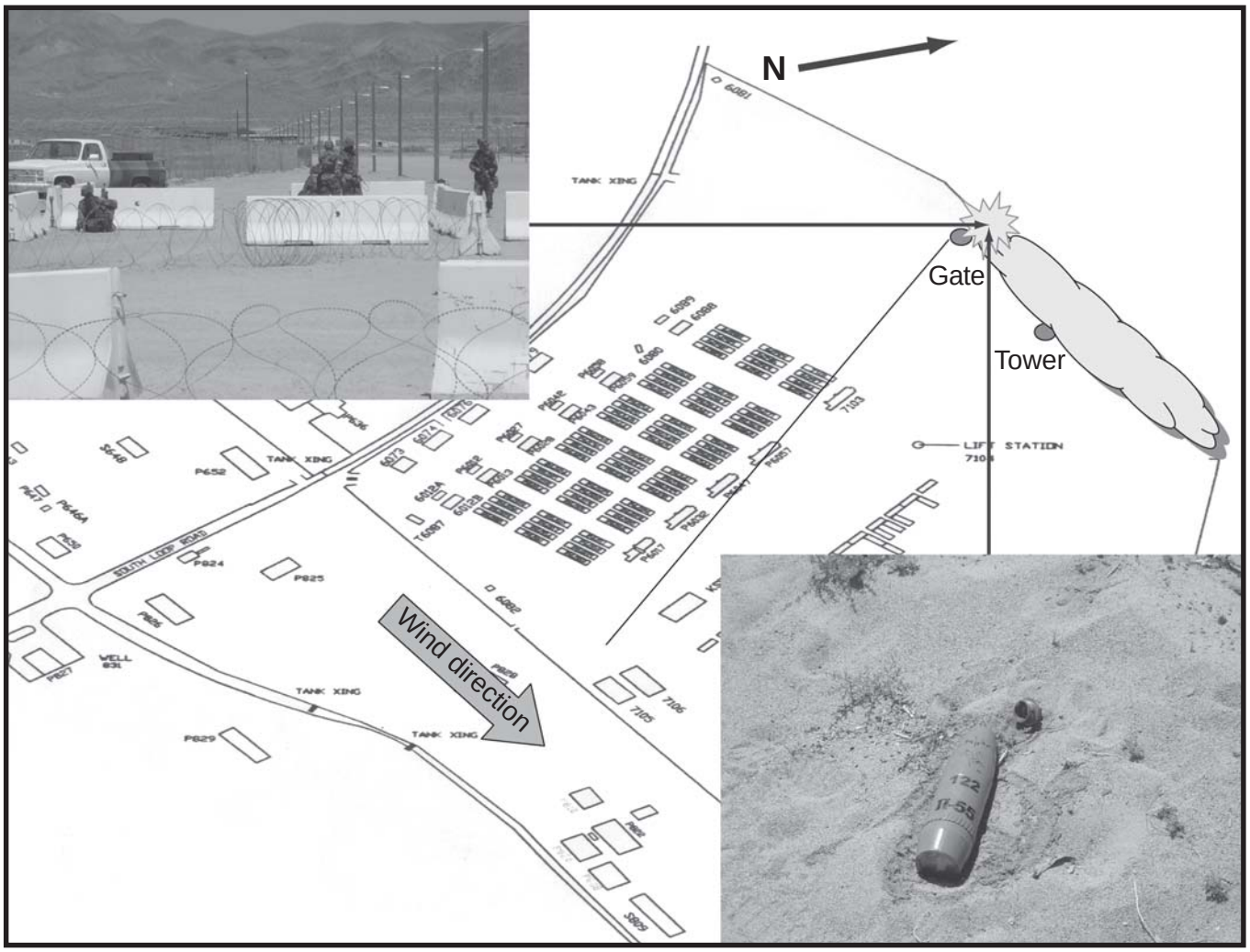


Figure 6. On 17 May 2004, insurgents used a WME improvised explosive device in the vicinity of Baghdad. On 29 May 2004, the device made its first appearance at NTC.

Figure 7. Terrain decontamination of a pesticide spill at Mezra'a Mazik Amar

hazards cannot be ignored. The unique scenarios to combat weapons of mass effect (WME) also challenge our Soldiers. How do you rid half a town of the noxious vapors from a pesticide spill—with suppression, terrain decontamination, weathering, or evacuation? We have been able to develop some "out-of-the-box" training at the NTC, but the potential for even more relevant and focused training exists.

What Can Be

Through conversations with chemical leaders who have spent time in Iraq or Afghanistan, it is very apparent that experiences are varied and, therefore, the opinions about CBRN training for deploying units is varied. The ideas range from constructing sophisticated clandestine laboratories and elaborate industrial facilities to using coincidental contact with WME ammunition and scenarios

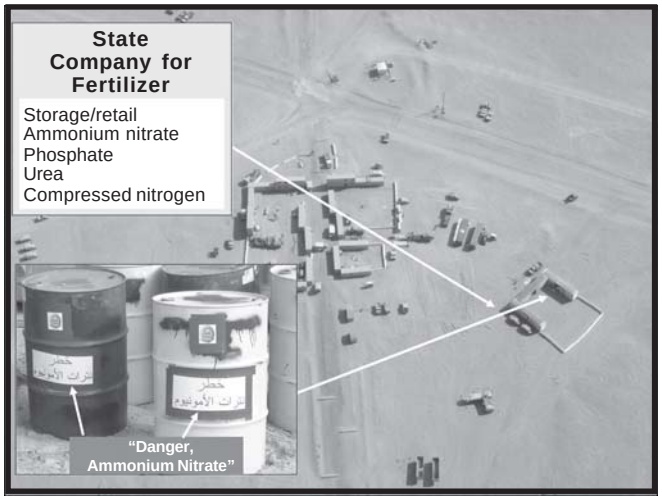


Figure 8. Fertilizer storage facility, Medina Wasl

involving insurgent use of WMEs. All of the ideas are solid and provide excellent training events, but they often are not incorporated because the necessary coordination between player units and the NTC is not made. Coordination may sound like an insurmountable bureaucratic hurdle, but the process is straightforward. With a little foresight in planning, the sky is the limit. The timeline for rotation to the NTC, as outlined in Forces Command (FORSCOM) Regulation 350-50-1, is shown in *Figure 10, page 26.*[1] Refer to the timeline, and then use the following guidelines to ensure that specific CBRN training is included in your training package:

- At D-360: Submit your CBRN training requirements to your BCT commander for his consideration and approval. This is the most important step because he will have to "go to bat" with the division and corps commanders. Ensure that approved CBRN training objectives are included with the other training objectives submitted in the D-210 letter to corps headquarters for approval.

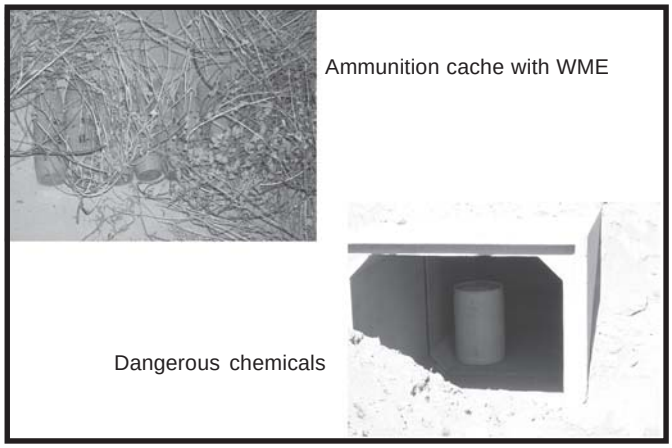


Figure 9. Ammunition cache with WME, Cave Complex

- At D-150: Coordinate with the Bronco 62 team during the leader training program. We will discuss approved training objectives, pending scenarios, and other important information. Since the leader training program is conducted during the scenario development phase, there is flexibility to work with the planning team to incorporate a commander's training requirements.
- At D-Day: Ensure that the BCT chemical officer and noncommissioned officer in charge attend the Bronco 62 team in-brief orientation, and coordinate with the CBRN observer/controller team. This face-to-face coordination will allow

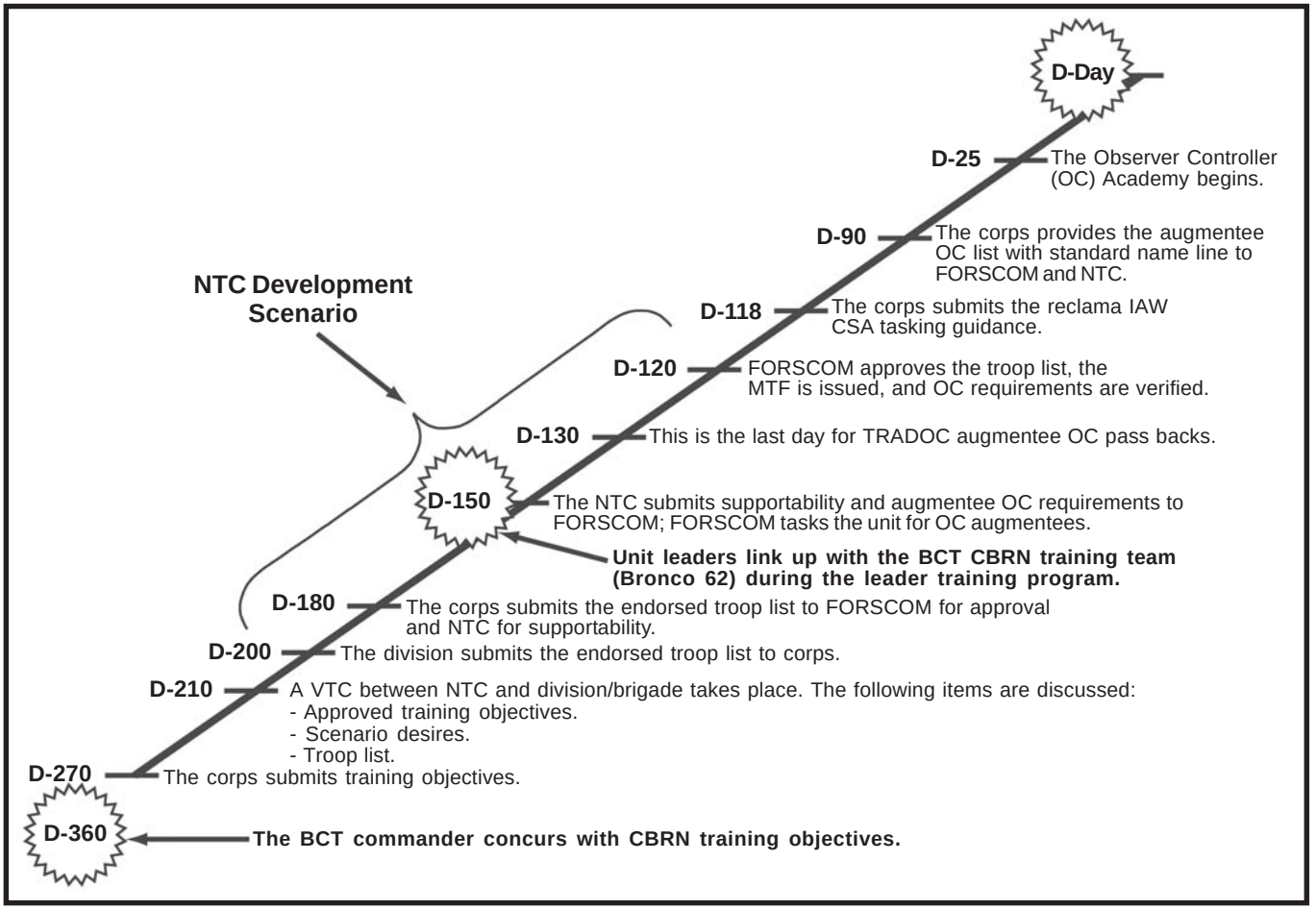


Figure 10. NTC troop list cycle

us to discuss last-minute changes and resolve pending issues.

- Contact the Bronco 62 team by phone (DSN 470-6668 or commercial 760-380-6668) or visit our Web site at <*www.irwin.army.mil*> any time. We will be more than happy to answer questions, discuss training objectives, and provide general information or assistance.

Final Thoughts

Current operations clearly demonstrate the continued need to train CBRN tasks. The NTC, in conjunction with our chemical partners in the field, possesses the land, the facilities, and the ability to provide training opportunities that meet applicable standards and relevance. The key to getting this done is coordination prior to arriving at the NTC. Contact the Bronco 62 team at the earliest opportunity. We will make every effort to ensure that your unit training needs are met. Our goal is to take advantage of the experience gained in theater and ensure that Soldiers are prepared for operations in theater.

Endnote

[1]FORSCOM Regulation 350-50-1, *Training at the National Training Center*, 1 July 2002.

Major Hoskins is the senior brigade CBRN trainer at the NTC. His previous assignments include commander, 89th Chemical Company, Fort Carson, Colorado; assistant regimental chemical officer, 3d Armored Cavalry Regiment, Fort Carson; company tactical officer, Chemical Officer Basic Course, Fort McClellan, Alabama; brigade and battalion chemical officer, 1st Armored Division, Germany; and reconnaissance platoon leader, 25th Chemical Company, Germany.

Captain Heintzelman is the chemical company trainer at the NTC. His previous assignments include commander, 62d Chemical Company, Camp Humphreys, Korea; platoon leader, assistant operations staff officer (S3), and battalion logistics staff officer (S4), 23d Chemical Battalion, Camp Carroll, Korea.

Sergeant First Class Cuffee is the brigade chemical platoon trainer at the NTC. He was previously assigned as platoon sergeant for the Fox reconnaissance vehicle, 2d Platoon, 51st Chemical Company, where he deployed to Bahrain, Kuwait, and Iraq in support of Operation Neon Falcon, OEF, and OIF.

Chemical Corps Museum Receives Recertification

By Mr. Kip Lindberg

The US Army Chemical Corps Museum was recently recertified by the Center of Military History. On 9 June, Brigadier General John S. Brown (Retired), Chief of Military History, presented the recertification certificate to museum director H. Dale Durham and his staff at the 33d Annual Army Museum Training Course.

Earlier this year, a team comprised of personnel from Army and civilian museums inspected the Chemical Corps Museum. The team performed an evaluation and submitted its findings for additional evaluation by the certification panel at the Center of Military History. Based on the panel's findings, the chief curator made his recommendation to Brigadier General Brown for final approval.

The museum staff worked diligently to ensure that the team submitted a favorable evaluation, beginning their self-assessment nearly a year before the scheduled inspection. The Chemical Corps Museum was last inspected in 1985. The recent inspection was the first inspection since its relocation from Fort McClellan, Alabama, to Fort Leonard Wood, Missouri, in 1999.

Brigadier General John S. Brown presents the recertification certificate to H. Dale Durham, museum director; Lonnie Garrett, exhibits specialist; and Kip Lindberg, curator of collections.

***The Gallery* is a new museum exhibit open for viewing.**

Since 1980, all Army museums have been required to undergo evaluation to measure their adherence to Army regulations and established standards of museum professionalism. Modeled after the accreditation program of the American Association of Museums, the Army Museum System Certification Program ensures that museums meet or exceed competency levels in essential areas such as collection accountability and management, physical security, museum programs and publications, exhibit designs, and administration.

The staff at the Chemical Corps Museum is honored to receive this peer recognition of its commitment to preserving and interpreting the heritage and history of the Chemical Corps.

Mr. Lindberg is the curator of collections at the US Army Chemical Corps Museum.

"Let us solemnly remember the sacrifices
seas, in the air, and on foreign shores, to
reconsecrate ourselves to the task of pro
shall not have been in vain."

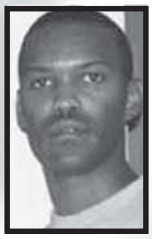
—President

Corporal Mark A. Bibby

Hometown: Watha, North Carolina

Unit: Headquarters, Headquarters Detachment, 422d Civil Affairs Battalion, Greensboro, North Carolina

Killed: 21 July 2003



Second Lieutenant Benjamin J. Colgan

Hometown: Kent, Washington

Unit: 2d Battalion, 3d Field Artillery Regiment, 1st Armored Division
Giessen, Germany

Killed: 1 November 2003

Staff Sergeant Robert S. Johnson

Hometown: Castro Valley, California

Unit: 1st Battalion, 24th Infantry Regiment, 1st Brigade, 25th Infantry Division (Stryker Brigade Combat Team), Fort Lewis, Washington

Killed: 21 December 2004

Corporal Forest J. Jostes

Hometown: Albion, Illinois

Unit: 1st Battalion, 82d Field Artillery Regiment, 1st Cavalry Division, Fort Hood, Texas

Killed: 4 April 2004

Staff Sergeant Morgan D. Kennon

Hometown: Memphis, Tennessee

Unit: 3d Battalion, 327th Infantry Regiment, 101st Airborne Division (Air Assault), Fort Campbell, Kentucky

Killed: 7 November 2003

This casualty list from the ongoing Global War on Terrorism was current as of publication date.

of all those who fought so valiantly, on the preserve our heritage of freedom, and let us noting an enduring peace so that their efforts

Dwight David "Ike" Eisenhower (1890–1969)

Sergeant First Class Mickey E. Zaun

Hometown: Brooklyn Park, Minnesota

Unit: US Army Special Operations Command, Fort Bragg, North Carolina

Killed: 28 January 2005

Sergeant Gregory L. Wahl

Hometown: Salisbury, North Carolina

Unit: 4th Cavalry Regiment, 1st Infantry Division, Vilseck, Germany

Killed: 3 May 2004

Sergeant Stephen R. Sherman

Hometown: Neptune, New Jersey

Unit: 1st Battalion, 5th Infantry Regiment, 25th Infantry Division (Stryker Brigade Combat Team), Fort Lewis, Washington

Killed: 3 February 2005

Sergeant Thomas C. Rosenbaum

Hometown: Hope, Arkansas

Unit: 4th Battalion, 5th Air Defense Artillery Regiment, 1st Cavalry Division, Fort Hood, Texas

Killed: 18 September 2004

Specialist Lizbeth Robles

Hometown: Vega Baja, Puerto Rico

Unit: 360th Transportation Company, 68th Corps Support Battalion, 43d Area Support Group, Fort Carson, Colorado

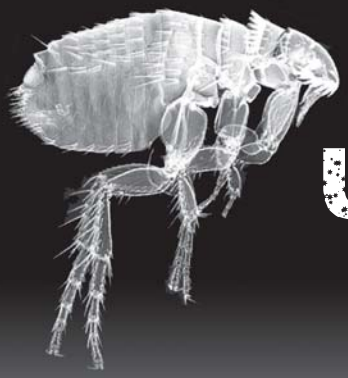
Killed: 2 March 2005

Specialist Mark J. Kasecky

Hometown: McKees Rocks, Pennsylvania

Unit: Battery C, 1st Battalion, 107th Field Artillery Regiment, Army National Guard, Oil City, Pennsylvania

Killed: 16 May 2004



Using the Flea as a Weapon

By Mr. Reid Kirby

Deliberately spreading disease through arthropods is the vector effect of biological warfare. Its modern application in warfare started in the 1930s with Japan. Germany and the Soviet Union also conducted their own investigations in this area around the same time. During World War II, Canada pioneered the vector effect for the Allies.

Interest in vector weapons by the US Army Chemical Corps did not start in earnest until after the Korean War. Today, largely thought of as a throwback of the early days of biological warfare, the possibilities of the vector effect have emerged again after conjecture of the potential introduction of West Nile Virus to North America. Of the agent-vector combinations, the plague flea has the richest military heritage and is worth studying to understand this effect in biological warfare.

Natural History

Plague, a lethal epidemic disease since biblical times, has long been associated with rodents. The ancient Philistines made golden images of mice to ward off epidemics. It was not until the golden age of microbiology that plague was recognized as being caused by the microorganism *Yersinia pestis.* Yersinia pestis is named in honor of Alexandre Yersin, a student of Louis Pasteur, who isolated plague in patients in Hong Kong in 1894.

The role of the flea in spreading plague followed the discovery of the microorganism. Masanori Ogata of Japan first outlined the possible role of the flea in the spread of plague in 1898 (later confirmed by Paul-Louis Simond in France a year later). It was not until 1911 that medical entomology recognized the flea as the vector of plague.[1, 2] The rat was the most likely reservoir for the disease and easily defined the natural spread of the disease along trade routes.

Bubonic plague, the form transmitted by fleas, is so named due to the large oval buboes formed at the lymph node near the flea bite (such as in the groin or the armpit). A rare secondary complication in natural epidemics is the occurrence of the lethal pneumonic plague (spread from human to human), which is an indicator of a biological attack when prominent. Pneumonic plague has a rate-of-action course of one to seven days, a duration-of-action course of one to two weeks, and a lethality rate of about 90 percent in one to two days.

The rate-of-action course of bubonic plague is two to eight days, with hospitalization required for up to ten days to avoid a relapse. In untreated cases, death usually occurs two to four days after the onset of symptoms. The bacteria rapidly spreads through the body, releasing endotoxins after reaching critical mass. The endotoxins cause the victims to go into shock and develop a high fever, rapid pulse, and low blood pressure. The mortality rate in untreated cases is 30 to 60 percent; treatment in state-of-the-art health care facilities reduces the rate to 5 to 15 percent. Though vaccines are available, they are generally only effective against moderate doses and, without semiannual boosters, provide only three months to a year of protection. Recovery from bubonic plague provides only a temporary immunity.

Plague epidemics occur naturally in endemic regions following an epizootic. Epizootics tend to occur in five-year intervals in endemic regions where fleas transmit the disease from rodent to human. Because of the role of the flea, epidemics tend to be self-limiting at temperatures under 45 degrees. The optimum temperature for fleas to transmit plague is 70 degrees; temperatures exceeding 85 degrees kill the bacteria. The temperature-dependent contagion explains why plague epidemics peak during warm, dry seasons and rapidly disappear with the onset of hot temperatures. Rainy seasons sharply reduce the incidences of plague.

There is a biomolecular basis for the temperature elasticity of epidemics. Several days after ingesting infected blood, fleas become blocked. Proliferated bacteria forms a clot that prevents food from entering the flea's stomach. Being famished, the flea attempts to feed through multiple

bites and regurgitates infected blood into its victim. An enzyme that contributes to the blocking of the stomach is active at 77 degrees. When the temperature rises above 98.6 degrees, the clot begins to dissolve. Blocked fleas can live up to 23 days in high humidity and normal room temperatures but die within three to four days from desiccation when exposed to optimum (moderate) temperatures.[3]

History has accounts of four plague pandemics: Egypt in 542, Asia Minor in the 14th century (which resulted in the death of nearly a quarter of Europe's population), Europe in the 15th and 18th centuries, and China in 1860 (an epidemic that continued to rage through the Vietnam War).[4]

Plague is an endemic disease in the western United States, with about ten cases a year reported by people who have had encounters with wild rodents. The first case occurred in San Francisco's Chinatown in 1900. The elimination of plague from endemic regions does not appear to be feasible, but reduced rodent populations, increased public education, and continued monitoring of flea counts on captured rodents will help with the fight.

Military History

The second plague pandemic draws the most interest from scholars of biological warfare. The plague epidemic in Asia Minor started from an epizootic in Mongolia and was carried westward by the Tartars. The spread to Europe may have resulted from a biological assault on the city of Kaffa. The Venetian historian, Gabriel de Mussis, described the siege of this trade center on the Crimean coast by the Tartars in 1346. After a three-year siege, plague broke out in the Tartar camp. Kaffa fell in 1348 after the Tartars catapulted their plagued dead over the city walls. The refugees that fled Kaffa by ship may have initiated the second plague pandemic that seeded throughout Europe from seaport to seaport.[5]

The impact of plague fleas during wartime (though unwittingly), continued in innumerable siege situations (like that of Kaffa) well after the Black Death period. In 1422, infected cadavers were catapulted into the city during the siege of Carolstein. Russian troops attempted to spread plague among Swedish forces using the bodies of plague victims.

It was not until World War II that plague fleas became a distinct biological weapon. Japan made the most pronounced efforts, followed by Canada and then the United States. It is probable that other nations also used fleas as a weapon—as indicated in the infamous Hirsch report on German intelligence of Soviet biological warfare efforts—but there are too few details to recount.

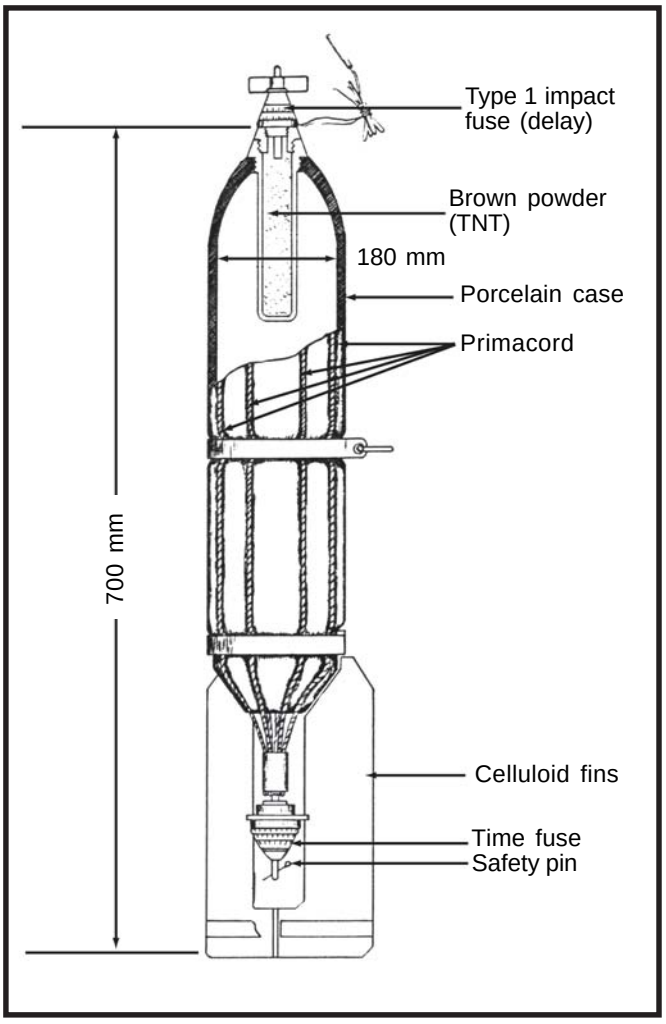
The Japanese started their biological warfare efforts in the 1930s during their occupation of Manchuria and later during their invasion of China. At first, the Japanese experimented with sprays and bursting munitions to release bare germs for a lung effect. But the Japanese lacked an understanding of aerosols and respiratory pathology and soon changed their focus to disseminating plague using the human flea *Pulex irritans*. The flea protects plague bacteria from environmental strains and delivers a dose to its victims through bites. The Japanese experimented by employing plague fleas against China and contemplated use against the United States.[6] The efforts to weaponize plague fleas were conducted under the auspices of Unit 731, the notorious Japanese biological warfare unit disguised as a water purification unit. In 1940, the cities of Chü Hsien and Ningopo were attacked with planes dropping rice, wheat grain, and paper packets of fleas. The drops resulted in an epidemic that killed 120 people. A similar attack followed a year later in Changteh City, killing 24 people. The Allies began investigating the activity of the Japanese, but the investigations failed to uncover any conclusive evidence. Suspicions continued throughout the war.

The most successful plague flea weapon developed by the Japanese was the Uji bomb. The older-type Uji, invented in 1938, was a frangible weapon with a porcelain casing and an inlaid strip of Primacord® to activate an in-

A US Army medical doctor examines a Japanese prisoner of war for signs of biological warfare vaccinations.

flight rupture and plague flea release. It weighed 55 pounds and had the capacity to hold 4.7 gallons. Early field trials demonstrated that thin-walled, metal-cased bombs required excessive quantities of explosives and thus destroyed most of the plague fleas. The Type 50 Uji bomb (introduced in 1940) contained a contact fuse that destroyed the weapon (and its contents) if it failed to burst in the air. It also weighed 55 pounds, but could hold 3 gallons. The Type 100 Uji bomb was a larger version of the Type 50, weighing 110 pounds and holding nearly 7 gallons. The Japanese considered the Type 100 inferior to the Type 50 due to its size and the possibility of damage during ordnance handling.[7]

The Type 50 Uji bomb contained about 30,000 plague fleas. Intended to burst at an altitude of 660 to 980 feet above ground level, field trials at Anta, Manchuria, concluded that 80 percent of the fleas survived dissemination and that coverage was best under conditions with high wind. The Japanese did not give up on producing the biological weapon and conducted around 4,000 dispersal trials and 2,000 human trials to demonstrate the effectiveness of the weapon.[8]



The Type 50 Uji bomb weighed 55 pounds and held 3 gallons.

In May 1944, Unit 731 was prepared to use plague fleas against the United States in the Pacific. With the fall of their garrison at Saipan in June of that year, Unit 731 assembled a team of Soldiers to contaminate the Saipan airfield with plague fleas. A shipload of specialists and biological weapons were en route to a staging area when a US submarine sunk the ship, killing all but one crew member.[9]

In 1944, the Japanese built four gigantic submarines (the I-400 Class) that were capable of launching aircraft to bomb targets on the US West Coast and New York City. The mission, *Operation PX*, was designed to use submarines to launch biological strikes against the continental United States and the Pacific Islands.[10, 11] In March of 1945, the Chief of Staff for the Imperial Japanese Army cancelled the mission and declared it ethically unacceptable.

In many ways, Canada was the pioneer in biological warfare for the Allies during World War II. While Great Britain and the United States only pondered the possibility of developing a weapon with psittacosis, Canada was intent on developing one. After Great Britain and the United States formally established their biological warfare programs, the Canadians worked in areas that the other two nations tended to ignore. Developing biological weapons for the vector effect was one of those areas.

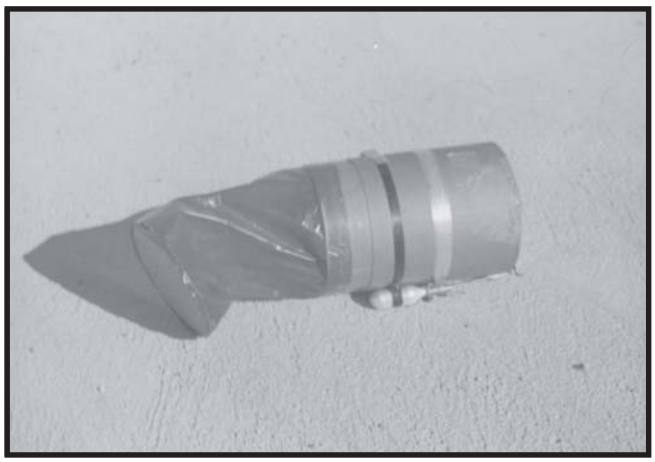
While workers at Canada's Grosse Ile—a secret germ warfare research facility—labored to produce anthrax for the Allies, G.B. Reed, a professor at the Kingston Biological Warfare Laboratory on Queen's University Campus, was seeking an entomologist to develop a different class of weaponry. The intent was to create a colony of fleas for use in combination with both plague and murine typhus. This concept of using a single vector to spread two different diseases simultaneously was an innovative approach.[12]

During the Korean War, the Sino-Soviet block alleged that the United States was employing biological weapons. Contrary to the allegations made by the Sino-Soviet block during the Korean War, interest in agent-vector combinations started after the war.[13, 14] Operation Big Itch used uninfected fleas to determine the coverage patterns and the suitability of the tropical rat flea (Xenopsylla cheopis, formerly termed the oriental rat flea) in terms of survival and appetence. The field trials were conducted at Dugway Proving Ground in September of 1954. The trials used guinea pigs, placed at stations along a 660-yard circular grid, to detect the presence of fleas.

Originally intended for use as an anticrop weapon, the E-14 and E-23 munitions were converted to vector munitions for the field trials. The E-14 munition was a 13-inch-diameter, 9 3/4-inch-long cardboard container with an internal actuator that released carbon dioxide, a piston that moved to expel its contents, and a small chute for clustering the E-86 aerial bomb. The E-23 munition was a 9 3/4-inch-diameter, 18-inch-long cardboard container with an external actuator that reversed a plastic bag to expel its contents. It too included a small chute for clustering the E-77 aerial bomb. Both weapons functioned at 1,000 to 2,000 feet above ground level after release from the cluster bomb, and Operation Big Itch proved a success. Using a functioning height lower than that originally intended, the weapon proved capable of covering a battalion-sized target and disrupting operations for a 24-hour period.

An important consideration was the use of carriers. The carriers allowed the fleas access to air and moisture to keep them alive during delivery. The Japanese filled their Uji bombs with sand and plague fleas. The United States considered two methods: sponge fragments and small paperboard tubes with crepe paper streams to keep the open end closed when rolled. Using the sponge fragments, the E-14 carried 100,000 fleas and the E-23 carried 200,000. Because half of the E-23s failed to function in preliminary tests, only the E-14 was used for the remainder of Operation Big Itch. The E-14 was capable of carrying 80 loop tubes, each containing 3,000 fleas.[15]

In the United States, the plague flea concept was competing against the use of mosquitoes, flies, ticks, and lice. Of these concepts, the United States put most of its energies behind weaponizing yellow fever in combination with the Aedes aegypti mosquito. The United States Navy made significant contributions to the research in the aerosol dissemination of plague, and the British conducted a series of aerosol field trials in the Bahamas. The flea no longer attracted interest.



The E-23 munition proved to be unreliable during Operation Big Itch.

Discussion

The nuclear burst over Hiroshima on 6 August 1945 resulted in 0.13 pounds of weapon per prompt casualty. One of Japan's plague flea weapons approximated this same rate of destructiveness. With vector weapons, the issue is not the weight but the volume. For each vector, there is considerable dead volume needed to sustain life in the atmosphere.

The Japanese Uji Type 50 held 11,000 fleas per gallon of space. The United States improved the 1.5 ratio to 3.5. The E-14 could deliver fleas with a 1 percent loss in viable content, which was a significant improvement over Japan's 20 percent loss more than a decade earlier. The difference between the efforts was likely the choice of plague vectors—the human flea (used by Japan) and the tropical rat flea (considered by the United States)—and their abilities to adapt to host habitats. But regardless of the habitat, both fleas attacked people with equal vigor.

The qualities taken into consideration for biological vector weapons were the[16]—

- **Dispersal and flight ranges.** The maximum distance fleas tend to migrate is around 220 yards. A flea jumps up to a foot at a time and can jump more than 600 times an hour when questing for a host. In comparison, mosquitoes tend to migrate up to 1.5 miles.
- **Extrinsic-incubation periods**. The incubation period is usually temperature-dependent, but irradiation or the addition of certain chemicals can hasten the results. In ideal temperatures, a flea can transmit disease about 15 days after feeding from a plague-infected rodent.
- **Infective periods**. Fleas remain infective throughout their lifespan, but they do not transmit the disease to subsequent generations. The limiting factor is the survival rate of a blocked flea.
- **Infective threshold.** To transmit plague, a rodent must have more than 100 million organisms per milliliter of blood to be able to infect a flea during feeding.
- **Transmission rates.** Only 58 percent of tropical rat fleas are capable of spreading disease after feeding on infected animals. Other species of fleas have lower transmission rates.

- **Vectoral capacity.** In a blocked flea, a single bite inoculates a person with a sufficient number of microbes to result in plague infection.

In 1959, the US Army Chemical Corps board provided guidance for what has often been termed *Entomological Warfare*.[17] The report acknowledged that no formal requirement existed for such weapons, but that there was a belief that guidance was necessary for research and development activities for weapon systems. Like many World War II commanders, the Chemical Corps board believed that the adoption of any vector weapon system was dependent on the persistence, predictability, and control measures.

Along with recommendations for planning aids, logistics, and employment, the Chemical Corps board considered the combinations designed specifically to confuse enemy medical and intelligence personnel (such as using a current system to deliver an incapacitating agent in place of a lethal agent, using multiple agents in a single vector type, or using a single agent with multiple vectors). The range that a vector can spread is significantly larger than what appears in nature or within the experience of medical entomology. For example, fleas can spread tularemia.[18]

The casualty potential of the vector effect results from calculations with finite sets. With such a small number of fleas, the expenditure is dependent on the population density of the target. The table below illustrates the hypothetical coverage properties for a vector munition (comparable to four E-14s). For comparison between flying and crawling disease vectors, the table includes a virus-mosquito combination. The information shows a hypothetical coverage of 50 percent caused by a single vector munition.

The hypothetical estimates represent a battalion-sized target, but may require layering munitions in areas with high population densities. The persistence is the length of time that the vector effect will continue to inflict casualties before replenishment is required to maintain a barrier. Without the use of some clearance mechanism (pesticide), the target would not be safe for friendly occupation for about a week (with fleas) or a month (with mosquitoes). The minimum safe distances would be in the order of miles (due to the uncertainties of vector migration).

Conclusions

The vector effect offers biological warfare with extended options not available with the more traditional aerosol weaponry—diversifying the arsenal with additional agents and employment methods, circumventing respiratory protective means, and offering persistence to deny the utility of terrain and facilities. However, in the end, agent-vector combinations are labor-intensive, prove to be unreliable with the uncertainties of complex animal behavior, and infect limited areas (in comparison to other aerosol weapon options).

Many assume biological warfare is limited to strategic applications. The vector effect allows biological warfare to transcend through the operational phase and into tactical situations. The drawback, like any biological weapon, is the community health consequences that may persist after a conflict is resolved.

The vector effect has had its place in augmenting other weapons in a comprehensive biological arsenal (as with the United States) or as a stopgap measure when there is insufficient technology for an aerosol effect (as with Japan). Nonetheless, on its own, it represents a minor curiosity with imaginative possibilities that time and ability have passed by.

Agent-Vector Combination	Persistance (days)	Carrier					
		Sponges		Loop Tubes		Aircomb Waffles	
		Area	Density	Area	Density	Area	Density
Plague flea	1	90	35	40	180	NA	NA
Virus mosquito	15	NA	NA	40	290	90	110

Area = hectares covered
Density = maximum target of people per hectare in the target area

Endnotes:

[1]Brendan Lehane, *The Complete Flea: A Light-Hearted Chronicle, Personal and Historical, of One of Man's Oldest Enemies*, Murry Publishers, 1969.

[2]Thomas G. Hull, *Diseases Transmitted from Animals to Man*, Charles C. Thomas Publishers, Springfield, Illinois, 1930.

[3]Thomas Butler, *Plague and Other Yersinia Infections, Current Topics in Infectious Disease*, Plenum Press, New York, New York, 1983.

[4]Dr. Alexandre Yersin settled in Nha Trang, Vietnam, after leaving France and established the Pasteur Institute. Dr. Yersin remains a celebrated local hero in his adopted country well after his demise. Thomas Butler's book, ibid, describes what the United States experienced during the VietnamWar.

[5]Vincent J. Derbes, "De Mussis and the Great Plague of 1348: A Forgotten Episode of Bacteriological Warfare" *Journal of the American Medical Association*, Vol. 19, No. 1, 4 April 1966, p. 180.

[6]Peter Williams, David Wallace, *Unit 731: Japan's Secret Biological Warfare in World War II*, The Free Press, New York, New York, 1989.

[7]Lieutenant Colonel Arvo T. Thompson, "Report on Japanese Biological Warfare (BW) Activities" Army Service Forces, Camp Detrick, Frederick, Maryland, 31 May 1946. This document contains descriptions of the biological weapons Japan investigated, along with a technical drawing based on interviews with Lieutenant General Shiro Ishii. The report is devoid of descriptions of human experiments and the use of plague fleas (revealed in US investigations in 1946 and 1947).

[8]Sheldon Harris, *Factories of Death: Japanese Biological Warfare 1932–45 and the American Cover-Up*, Routledge, New York, New York, 1994.

[9]Peter Williams, David Wallace, *Unit 731: Japan's Secret Biological Warfare in World War II*, The Free Press, New York, New York, 1989, p. 81.

[10]"The Transpacific Voyage of H.I.J.M.S. I-400, Tom Paine's Journal: July 1945 to January 1946," 1991, <*http://www.pacerfarm.org/i-400/*>, accessed on 1 August 2005.

[11]Hawiian Undersea Research Laboratory, "I-401 Submarine Found Off of Barbers Point," 2005, <*http://www.soest.hawaii.edu/HURL/I-401.html*>, accessed on 1 August 2005.

[12]John Bryden, *Deadly Allies: Canada's Secret War 1937–1947*, McClelland & Stewart Inc., Toronto, Canada, 1989, p. 111.

[13]The Sino-Soviet allegations remain the stated historical policy of North Korea and China, but they have been rather explained away by most scholars. Central to the allegations is the fact that the United States granted Japanese Biological Warfare researchers immunity from war crimes prosecution at the end of the World War II.

[14]Kathryn Weathersby and Milton Leitenberg, "New Evidence on the Korean War," *Cold War International History Project Bulletin 11*, George Washington University, 1999, pp. 176–199.

[15]Biological Warfare Assessment Laboratories, "Suitability Test of E-14 and E-23 Munitions as Disseminators of Arthropod Vectors. BW 1-55, Operation Big Itch," BWALR 6-A, US Army Dugway Proving Ground, Utah, 17 November 1954.

[16]William Rose, "An Evaluation of Entomological Warfare as a Potential Danger to the United States and European NATO Nations," DPG-S-445A, US Army Dugway Proving Ground, Utah, March 1981, pp. 33–34.

[17]Chemical Corps Board, "Insect-Borne Antipersonnel BW," Army Chemical Center, Maryland, 1 May 1959.

[18]Frank Prince, "Tularemia, Attempted Transmission by Each of Two Species of Fleas: Xenopsylla cheopis (Rotts) and Diamanus montanus (Baker)," Government Printing Office, Washington, D.C., 1946.

Mr. Kirby is a project manager for TALX Corporation. He holds a bachelor's degree in valuation science from Lindenwood College, with a minor in biology and special studies in behavioral toxicology and biotechnology.

Repair of the Chemical-Agent Monitor Simulator (CAMSIM)

Ahtna Development Corporation, through the Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI) in Orlando, Florida, has been awarded the contract for maintenance of the CAMSIM. For additional information on CAMSIM repair, contact Ron Richards at e-mail <*Ronald.Richards@peostri.army.mil*> or Milton Cates at <*Milton.Cates@peostri.army.mil*>, or call (407) 384-3613/3717.

CORPS HONORS TOP ENLISTED SOLDIERS

By Master Sergeant Joseph Baker

The 2005 Green Dragon Ball was the setting for the inception of a new program to honor the top noncommissioned officer (NCO) and junior enlisted Soldier in the Chemical Corps. The winners were recognized and presented the first Command Sergeant Major George L. Murray Award. The presentation marked a foundation for an award that will become a tradition for years to come. The competition, named *Dragon's Peak*, separates the competitors and identifies the true "king of the hill."

The Dragon's Peak, a weeklong event, was designed to bring representatives from chemical units to Fort Leonard Wood, Missouri, to compete in events that test their skills and knowledge. Because of the cost involved and the ongoing operations in Iraq, the competition was modified this year to allow Soldiers to compete in events at their home stations.

The Chemical Corps Regimental Association, in conjunction with the Regimental Command Sergeant Major, commissioned an artist to design a bust of Command Sergeant Major Murray (Retired) befitting to the significance Murray played in the history of the Corps. George Murray entered the military in 1937. He served in missions at Pearl Harbor and the Battle of the Bulge. He was the first honorary regimental command sergeant major, and today, he serves in an emeritus capacity. Command Sergeant Major Murray played an integral part in establishing the Chemical Corps Museum and continues to mentor chemical Soldiers of all ranks with his knowledge and experience.

Participating units nominated one NCO and one junior enlisted Soldier to represent their unit in the competition. The competitors were required to submit a letter of recommendation from their chain of command; a letter of endorsement from a sergeant major or higher; and an entrance packet containing their common task test (CTT) performance sheet, Army physical fitness test score card, weapons qualification score, and biography. The last requirement was an online examination that tested the competitor's knowledge in areas from basic Soldier skills to chemical expertise (tailored to the Soldier's rank). Failure

Command Sergeant Major (Retired) George L. Murray (center) presented the first Command Sergeant Major George L. Murray Chemical Corps NCO and Soldier of the Year Awards to Staff Sergeant Travis Dauer (left) and Specialist Marcos Silva (right).

in any one event eliminated Soldiers from the competition. Packets for Soldiers failing to meet the minimum standards were returned to the units without additional review. More than 30 packets were reviewed by US Army Chemical School personnel before a final decision was reached.

The recipient of the first Command Sergeant Major George L. Murray NCO of the Year Award was Staff Sergeant Travis Dauer, 21st Chemical Company (Airborne), Division Support Command, 82d Airborne Division, Fort Bragg, North Carolina. The first recipient of the junior enlisted Soldier of the Year Award was Specialist Marcos Silva, Headquarters and Headquarters Detachment, 84th Chemical Battalion, Fort Leonard Wood. Command Sergeant Major Murray presented the awards at Fort Leonard Wood on 29 June during the Green Dragon Ball (the traditional culmination of Regimental Week). In addition to the Murray bust, the winners received coins of excellence from the Chemical School Commandant, Brigadier General Stanley H. Lillie, and Regimental Command Sergeant Major, Patrick Z. Alston; an Army Commendation Medal; a set of dress blues; and a lifetime membership in the Chemical Corps Regimental Association.

Master Sergeant Baker is the Chemical School Operations Noncommissioned Officer. His past assignments include instructor for the Headquarters, Training Command; tactical noncommissioned officer for the chemical Officer Basic Course; platoon sergeant for chemical reconnaissance; and division chemical noncommissioned officer for the 1st Infantry Division. Master Sergeant Baker is the author of Looking Out From Under the Hat.

Submitting an Article to *Army Chemical Review*

Articles may range from 2,000 to 4,000 words. Send a paper copy along with an electronic copy in Microsoft Word on a 3 1/2-inch or compact disk to *Army Chemical Review*, 464 MANSCEN Loop, Suite 2661, Fort Leonard Word, Missouri 65473-8926 or e-mail <*acr@wood.army.mil*> with "Submit an Article" in the subject line.

Contributors are encouraged to include black-and-white or color photographs, artwork, and/or line diagrams that illustrate information in the article. Include captions for any photographs submitted. If possible, include photographs of soldiers performing their missions. Hard-copy photographs are preferred, but we will accept digital images in TIF or JPG format originally saved at a resolution no lower than 200 dpi. Please do not include them in the text. If you use PowerPoint, save each illustration as a separate file and avoid excessive use of color and shading in graphics and slides. Please do not send photographs embedded in PowerPoint or Microsoft Word documents.

Articles should come from contributors with firsthand experience of the subject being presented. Articles should be concise, straightforward, and in the active voice. Any article containing information or quotations not referenced in the text should carry appropriate endnotes.

Include your full name, rank, current unit, and job title. Also include a list of your past assignments, experience, and education and your mailing address, fax number, and commercial daytime telephone number.

Include a statement from your local security office stating that the information contained in the article is unclassified, nonsensitive, and releasable to the public.

All submissions are subject to editing.

The 86th Chemical Mortar Battalion: Devotion to Duty

By Captain Joanne A. Medina

In the archives at the US Army Chemical School, we have located documents and photographs detailing the extraordinary service of the men in the 86th Chemical Mortar Battalion during World War II. The history of the 86th deserves recognition. The commander of the 86th, Lieutenant Colonel Wesley B. Hamilton, said that "the history of this battalion contains many deeds of valor on the part of individual members of this organization, yet standing high is the record of the entire battalion of 672 officers and men, together with all former members and reinforcements, who have performed all duties and tasks as a 'team' in an unsurpassed manner."

Originally, the 86th was designated to fire chemical shells, but Allied and Axis forces in World War II observed policies against the first use of chemical weapons, so the battalion served in their secondary role—providing conventional indirect fire support to front line infantry troops. The 86th Chemical Mortar Battalion used its 4.2-inch mortars to deliver white phosphorous (WP) shells (for smoke screening and casualty effect) and high-explosive (HE) shells.

In May of 1943, the 86th Chemical Mortar Battalion (Motorized) consisted of cadre from the 1st Separate Chemical Company at Camp Swift, Texas.[1] The basic training program consisted of short, intense, and rigorous missions to prepare the battalion for close support to infantry forces (conditions that the unit would face during combat operations).

Under the command of Lieutenant Colonel Hamilton, the 86th departed Camp Swift, Texas, on 11 April 1944. Traveling by rail and ship, the battalion made stops in Greenock, Scotland; Port Sunlight, England; and Stonehenge, England, before arriving in France on 29 June. Bravo Company ran into trouble en route when their ship either struck a mine or was torpedoed. Company commander, Captain Edward M. Overbeck, and his men immediately went into action to save Soldiers from the sinking ship. The explosion on the ship tore apart loose hatches and dumped Soldiers below deck. This was extremely dangerous because the lower level held many

A gunner from the 86th Chemical Mortar Battalion

motor vehicles, some loaded with HEs. The ship was rapidly filling with water and oil. Captain Overbeck immediately took control of all other units on deck. Disregarding his own personal safety, he went to the lower level and instructed the safe removal of more than 50 wounded personnel and ensured that every man was safely aboard the landing ship, tank (LST) that came to the rescue. Bravo Company went back to England to reorganize, while the rest of the battalion continued on to France to participate in missions leading up to D-Day. Captain Overbeck and several of his men received Bronze Stars for their actions, bravery, and heroism.

The battalion's first mission was to provide combat support to the 8th Corps. During this time, the battalion fired more than 11,500 rounds of mortar ammunition for

close support of five divisions. Although they were created for combat support, chemical mortar battalions often found themselves in other supporting roles. The experience of Alpha Company on 6 and 7 July of 1944 is a great example. On D+25, Alpha Company docked in the man-made harbor of Beachhead Utah, surrounded by the floating hulks of other ships that never made it to the shore. The company was attached to the 90th Infantry Division in support of the 358th and 359th Regiments.

The 90th began its attack in the early morning of 3 July. All through the day, the mortar crews of Alpha Company persisted in the battle and created an opening for the infantry troops. The 86th fired seven smoke screens while the 90th was forcing a bridgehead across the Seves River. An eyewitness at the scene reported that "machine guns and rifles were blasting all over the place, and you couldn't begin to count the dead . . . ." But the best gauge for measuring the accuracy of the mortar fire was the speed of the advance of the 90th—a half mile in a half hour. Later, many captured Germans wanted to see this "automatic artillery" that was so deadly in its speed and accuracy. Two infantry division commanders later recommended Alpha Company for commendation for its superior battle performance and devotion to duty during the counter-offensive.

The battalion went on to Northern France and contributed immensely to the captures of Saint Malo, Dinard, and Cap Frehal in August of 1944. The battle plan called for the mortar companies to fire WP on the fort at Saint Malo. On 16 August, Charlie Company fired hundreds of WP rounds on the citadel. A communications wire that ran from the fort to the outside was cut with the assistance of the 86th. A day later, the enemy capitulated. In his surrender, the German commander, Colonel Andreas von Aulock, cited the WP barrage as his reason. Two officers and two enlisted men from the battalion were among a group of American officials who accepted the surrender of Colonel von Aulock at the citadel at Saint Malo.

During the period of 24 August to 19 September 1944, the extremely high volume of accurate, close support fire provided by the 86th played a huge part in the fall of Brest and the capture of the Crozon peninsula. It was there that the German prisoners of war nicknamed the WP shell *Whispering Death*, because it could not be heard in flight. The assault on Brest began on 15 September, and the city surrendered the following day. Personnel from the 2d Infantry Division cited the effectiveness and accuracy of the 4.2-inch mortar in street fighting situations. Personnel from the 86th were able to fire the mortar over tall buildings and provide support to within 100 yards of the front lines.

The 86th Chemical Mortar Battalion supported the 28th Infantry Division in the Battle of Hurtgen Forest (November and December of 1944). This was the only time in the battalion's history that it was committed to the support of just one division. The battalion received a commendation from the commanding general of the 28th for its exemplary and heroic work during the attack on the town of Schmidt, Germany. On 1 December 1944, the battalion completed its 150th day of combat by firing the 100,000th round of ammunition.

Troops fighting through a street in Brest

During the Battle of Ardennes (the Battle of the Bulge, 17 December 1944 through 16 February 1945), the battalion proved its fighting capabilities and strength by assisting with the enemy hold on the left flank. As forces of German tanks and infantry rolled toward our lines, the 86th fired mortars repeatedly. WP blinded and burned the enemy Soldiers—tank drivers lost their sense of direction and drove off roads into ditches, into men, and into other

tanks. The enemy lost momentum and began retreating. At times, division artillery, armor, and infantry withdrew under Charlie Company's protective fire—fire that was largely responsible for holding up the enemy advance. After the enemy was pushed back, the battalion was relieved of duty and designated for reorganization. The newly redesignated 86th Chemical Mortar Battalion consisted of a headquarters company and three weapons companies.

The Rhineland and Central European campaigns were the last World War II missions for the 86th Chemical Mortar Battalion. The 86th supported V Corps in the final assault on the Roer River and the advance to the Rhine River. When the Remagen bridgehead was established, Alpha and Bravo Companies were attached to the Seventh Corps to assist in holding and expanding the bridgehead while preparations for the breakthrough were made. Units from the battalion assisted in closing the Ruhr pocket, while the remaining unit assisted V Corps with the drive across Germany.

Alpha Company was providing support to the 69th Infantry Division when it made contact with elements of the Russian infantry (which eventually cut Germany in half and virtually ended the war). On 28 April 1945, all companies in the 86th Chemical Mortar Battalion were relieved from the line; on 1 May, the entire battalion moved to Eschebach, Germany, and assumed a role that was new to them—security details responsible for protecting installations and enemy materiel and contraband. It was in Eschebach that the unit celebrated *Victory in Europe (VE) Day*.

Soldiers crossing a footbridge across the Roer River

In eleven months of combat, the 86th Chemical Mortar Battalion expended 152,257 rounds of HE and WP ammunition; engaged in 315 days of combat; traveled across France, Belgium, Germany, and Czechoslovakia; and participated in all five major battles in the European theater of operations. They were attached to three Allied armies, seven US Army corps, and 27 US Army divisions. Of the 817 men that saw service with the unit, 40 were killed in action and 336 were wounded. A total of 198 decorations were awarded for bravery.

The men of the 86th were initially authorized the shoulder sleeve insignia of the First Army and later the Third Army. But it was Private First Class Robert Schnell (1st Platoon, Alpha Company) who created an unauthorized version. He stated, "We never had an official 86th Mortar patch, so I designed the skunk patch. I added the mortar shell and 4.2 inch to it. I had them distributed. We weren't supposed to wear them, but I think some of the boys did." Several designs for a distinctive insignia were proposed after the war, including some suggested by the mortarmen themselves, but none were officially produced.

The story of the 86th Chemical Mortar Battalion is important for all to remember. The sacrifices and devotion that these men exemplified—these Dragon Soldiers—illustrate the proud tradition of the US Army Chemical Corps. They are heroes—men who were willing to pay the ultimate price so that future generations could breathe the air of freedom.

Endnote

[1] The battalion name changed from the 86th Chemical Battalion (Motorized) to the 86th Chemical Battalion on 14 May 1944. The battalion was redesignated the 86th Chemical Mortar Battalion on 15 February 1945.

Captain Medina is a recent graduate of the Chemical Captains Career Course at Fort Leonard Wood, Missouri. She is currently stationed at Fort Jackson, South Carolina.

US Army Chemical Corps Hall of Fame Inductees

Compiled by Ms. Kimberly Whitacre

The Chemical Corps Hall of Fame award is the highest form of recognition that the Regiment offers. This coveted award honors those who have made a legacy of landmark contributions and significant actions to the overall history and traditions of the Chemical Corps. These individuals have distinguished themselves through superior achievements in the advancement of science, demonstrated great gallantry in battle, or given their lives in combat while serving the Corps. The following Dragon Soldiers were inducted into the 2005 Chemical Corps Hall of Fame during the Green Dragon Ball held at Fort Leonard Wood, Missouri, in June 2005: General Anthony McAuliffe (posthumous induction), Dr. Irving Langmuir (posthumous induction), and Mr. James Bacon. The Chief of Chemical, Brigadier General Stanley H. Lillie, presented each inductee with a certificate and a medallion.

General Anthony McAuliffe

General Anthony McAuliffe had a distinguished career that spanned almost fifty years and took him from the ravaged battlefields of Europe following World War I to the command of US Army, Europe, in the 1950s. He was awarded the Distinguished Service Cross in 1944 for his inspirational leadership in the defense of Bastogne, Belgium.

General McAuliffe was the commander of division artillery for the 101st Airborne Division when he parachuted into Normandy on 6 June 1944 (D-Day) and when he entered Holland by glider later that same year. In December of 1944, during the absence of General Maxwell Taylor, he acted as commander of the 101st and attached troops to forces besieged in Bastogne during the Battle of the Bulge. When American forces were surrounded and the Germans demanded their surrender, he sent back a one-word reply—"Nuts!" His reply strengthened the troops' resolve to deny this vital crossroads town to the Nazis. General McAuliffe's leadership was instrumental to the American victory. Following the Battle of the Bulge, he took command of the 103d Infantry Division.

When General McAuliffe returned to the United States, he was appointed the ground forces advisor to the commander of Joint Army-Navy Task Force One during Operation Crossroads (the testing of atomic bombs at Bikini Atoll). He was then appointed the Army Secretary of the Joint Research and Development Board at Army Headquarters, Pentagon. Subsequently, he was designated Deputy Director for Research and Development of the Logistics Division, Army General Staff. General McAuliffe's record with the Joint Research and Development Board and the Army Logistics Division, coupled with his knowledge of new weapons (particularly in bacteriological and atomic warfare) made him President Truman's choice for Chief of Chemical. He served in this position for two years.

General McAuliffe's leadership represented the flexibility and broad knowledge base a successful officer should possess. While his direct service with the Chemical Corps was brief, General McAuliffe's career-long connection with all areas of the Corps merits his rightful place in the Chemical Corps Hall of Fame.

Major General Gerald Watson (Retired), a fellow member of the Chemical Corps Hall of Fame and former Chief of Chemical, accepted the certificate and medallion on behalf of General McAuliffe.

Dr. Irving Langmuir

Dr. Irving Langmuir was a physical chemist whose studies of molecular films on solid and liquid surfaces opened new fields in colloid research and biochemistry. In 1906, he completed his doctorate work in Germany under the mentorship of Professor Walter H. Nernst, a chemical weapons inventor for Germany during World War I. After completing his work, Dr. Langmuir returned to the United States to develop listening devices for detecting submarines.

In 1940, the National Defense Research Committee established a project on smoke and filters. Dr. Langmuir studied the size and color of particles in artificial fogs to find the properties essential for maximum screening capability. He learned that the effect of a smoke screen on the eye was a mix of physiological, optical, and psychological reactions. In his experiments, he found that white particles with a 0.3-micron radius produced the best scattering effect. Dr. Langmuir worked to produce a smoke generator capable of producing fog particles of the right size for use by the Army and the Navy. The Chemical Warfare Service (which was later renamed the Chemical Corps) was so impressed with the new generator that it bypassed normal procedures and rushed the generator into production. In 1942, it was adopted as the M1 mechanical smoke generator. Within two years, the M1 was used extensively by US troops to screen hostile artillery fire.

After the war, Dr. Langmuir worked on combating ice buildup on airplanes and with forms of weather control, to include cloud seeding. While at General Electric, his work resulted in improved vacuum techniques, gas-filled lamps, the atomic hydrogen torch, improved x-ray tubes, new electronic devices, and many other inventions and discoveries.

Dr. Langmuir's lasting contribution to the Chemical Corps was reflected in the Soldiers' extensive use of the M1. His lifelong quest for better technology has helped to strengthen the Corps. It is with great honor that the Corps welcomes Dr. Langmuir to the Chemical Corps Hall of Fame.

Mr. David Chuber, Chemical Corps Historian, accepted the Hall of Fame certificate and medallion on behalf of Dr. Langmuir.

Mr. James Bacon

Mr. James Bacon served the Chemical Corps as an engineer and manager and retired from the position of Program Manager of Chemical Demilitarization in Aberdeen, Maryland. As the program manager, he was responsible for projects ranging from chemical stockpile disposal (involving older chemical weapons) to cooperative threat reduction (which supported the effort of the Department of Defense to aid the Russian Federation's chemical weapons destruction program).

In his capacity as Executive Assistant of Pine Bluff Arsenal, he improved the working relationship with the state of Arkansas to strengthen their chemical emergency-response program—a program now recognized as the best in the business. Under Mr. Bacon's guidance, Pine Bluff Arsenal completed site remediation programs, constructed new state-of-the-art disposal facilities, and established Environmental Protection Agency-qualified laboratories.

In 1985, Mr. Bacon received the prestigious Meritorious Civilian Service Award for his contribution to the Army's Binary Chemical Munitions Program. This program proved invaluable to the United States and the free world when it led to Russian participation in chemical treaty negotiations. Through Mr. Bacon's efforts, Pine Bluff Arsenal became a world leader in the chemical weapons treaty arena and hosted the first treaty inspection. Pine Bluff Arsenal emerged as the preferred site for training in international treaty inspections.

Serving as the Deputy On-Scene Coordinator for the removal of World War I era munitions from the Spring Valley area of Washington, D.C., Mr. Bacon organized the efforts of more than 400 personnel in the first National Service Response Force. His expertise, dedication, and hard work in the Spring Valley Project earned him a second Meritorious Civilian Service Award.

Responding to the Army's need for the accelerated certification of protective masks in the early 1980s, Mr. Bacon established the foundation for the Rock Ready Program. Pine Bluff Arsenal became the Department of Defense's center of expertise and the Army's sole facility for rebuilding protective masks. During Operations Desert Storm and Desert Shield, Mr. Bacon managed Pine Bluff Arsenal's accelerated delivery of conventional ammunition items, tripled the output of chemical protective masks, and orchestrated the establishment of a protective mask inspection facility in Saudi Arabia.

Mr. Bacon is a leading expert in chemical matters, a prominent community leader, and a man of integrity and high moral value. It is with great honor that the Chemical Corps welcomes Mr. Bacon to the Hall of Fame.

Distinguished Members of the US Army Chemical Corps

Compiled by Ms. Kimberly Whitacre

Four new names were added to the roster of outstanding individuals serving with the Chemical Corps. The award of the title of *Distinguished Member of the Chemical Corps* means that these individuals have given a lifetime of service to the Corps and continue to provide support to implement the vision of the Chief of Chemical to move the Corps into the future. These Distinguished Members of the Corps (DMCs) deserve recognition for electing to serve their country and regiment in this fashion. The following individuals were inducted into the 2005 DMC during the Green Dragon Ball held at Fort Leonard Wood, Missouri, in June 2005: Colonel Richard Weiner (Retired), Colonel Richard Smith (Retired), Colonel Richard Jackson (Retired), and Command Sergeant Major Billy Lewis, Jr. (Retired). The Chief of Chemical, Brigadier General Stanley H. Lillie, presented each inductee with a certificate.

Colonel Richard Weiner (Retired)

Colonel Richard Weiner has served the Chemical Corps for more than thirty years. Colonel Weiner assisted with the transition of the US Army Chemical School from Edgewood, Maryland, to Fort McClellan, Alabama. As Chief of the Radiological Training Division, he assisted in the design and construction of radiological laboratories and the redesign of the Officer Basic Course.

Colonel Weiner served as the Force Integration Officer for the Deputy Chief of Staff for Operations and Plans. He was responsible for completing the requirements analysis for the M40 protective mask, fielding the chemical-agent monitor and M8A1 alarm, and obtaining approval for the Fox vehicle. He also served as the project officer for Operation Rock Ready.

During Operations Desert Shield and Desert Storm, Colonel Weiner served as the Chief of Chemical Assignments, where he met the challenge of balancing the requirements with the extreme shortage of officers. As Director of Training at the US Army Chemical School, he orchestrated training at Fort McClellan and planned the move from Fort McClellan to Fort Leonard Wood, Missouri. As Commander of the US Army Environmental Center, Colonel Weiner began a program to interface with the Army acquisition community to integrate environmental concerns for pollution prevention, operational impact, and disposal.

Colonel Weiner continues to act as an asset to the chemical community in his civilian status, serving as the primary contact for the Chemical School Strategic Plan after the school settled at Fort Leonard Wood. He continues to support the Pentagon Force Protection Agency, providing technical and operational support. In his position with the Battelle Corporation, he leads the Gallant Fox exercises, incorporating all aspects of weapons of mass destruction into a series of exercises at the Pentagon and surrounding areas. Colonel Weiner is an example of the positive impact retired Dragon Soldiers can make in their communities and the Corps. His contributions to training, research, and environmental concerns deem him worthy of selection as a Distinguished Member of the Corps.

Colonel Richard Jackson (Retired)

Colonel Richard Jackson's distinguished career spanned over three decades. He activated and commanded the first chemical company in a division in Germany during the late 1970s. Colonel Jackson applied lessons learned and his field experience to facilitate major changes to Army doctrine for decontamination operations.

Colonel Jackson performed an operational analysis that provided the justification for the Fox Nuclear, Biological, and Chemical Reconnaissance System. As a major, he briefed the analysis to the Under Secretary of the Army and the Vice Chief of Staff of the Army to

obtain approval for the Army's first modern Nuclear, Biological, and Chemical Reconnaissance System.

As the Commander of A Company, 84th Chemical Battalion, Colonel Jackson made major changes to the Chemical Officer Basic Course program of instruction. In Operations Desert Shield and Desert Storm, Colonel Jackson served as division chemical officer for the 82d Airborne Division. He was responsible for the nuclear, biological, and chemical defense of 14,000 Soldiers. He also supervised the operational control of the 21st Chemical Company (Airborne) and an attached Fox platoon during an 8 1/2-month deployment to Saudi Arabia and Iraq.

While serving as Commander of the Blue Grass Army Depot, Colonel Jackson made major improvements in the safety and security of chemical weapons stored at the depot and greatly improved community relations on chemical demilitarization issues.

Colonel Jackson authored *Nuclear, Biological, and Chemical Defense in the 21st Century,* published by the Center for Strategic Leadership, US Army War College. This publication outlined operational concepts for NBC defense in the 21st century that reflected the lessons learned from Operation Desert Storm and the opportunities presented by advances in information technology. The book was used as a reference document for combat developers for many years.

Currently, the program manager at LMI Corporation, Colonel Jackson embodies the quality and dedication to which all Dragon Soldiers should aspire. His varied commands demonstrated leadership, ingenuity, and dedication to the Chemical Corps. It is fitting that we should honor Colonel Jackson for his service to the Corps by his inclusion as a Distinguished Member of the Corps.

Command Sergeant Major Billy Lewis, Jr. (Retired)

Command Sergeant Major Billy Lewis retired from the Army after thirty years of selfless service to the Chemical Corps. While most of the work Command Sergeant Major Lewis performed during his military career was of a sensitive nature and cannot be discussed, his first priority has always been to act in the best interest of Dragon Soldiers.

A key assignment for Command Sergeant Major Lewis was the battalion command sergeant major for the US Army Technical Escort Unit at Aberdeen Proving Ground, Maryland. During this assignment, Command Sergeant Major Lewis was the noncommissioned officer in charge for the Spring Valley remediation and cleanup, where he demonstrated his ability to work with local communities to foster goodwill and understanding. Some of his other major duty stations included the division chemical sergeant major for the 25th Infantry Division; sergeant major for the XVIII Airborne Corps; chemical operations noncommissioned officer in charge at Fort Bragg, North Carolina; and the brigade nuclear, biological, and chemical noncommissioned officer in Korea.

Command Sergeant Major Lewis epitomizes the standards by which all others should be measured, in his military service and in his civilian life. His intense dedication and devotion to the Chemical Corps are invaluable for moving the Chemical Corps forward. Command Sergeant Major Lewis promotes membership in the Chemical Corps Regimental Association and leads by the example shown in his lifetime membership. He is also a member of the Retired Enlisted Member Association, the 82d Airborne Association, the Noncommissioned Officer Association, and the Association of the United States Army.

Command Sergeant Major Lewis currently works for the Pentagon Force Protection Agency as the acting chief of the Hazardous Material Response Division. His commitment and dedication to the Chemical Corps and the US Army exemplify the spirit of the Dragon Soldier. His support and devotion to the integrity of the Corps make him a worthy candidate for induction as a Distinguished Member of the Corps.

Colonel Richard Smith (Retired)

Colonel Richard Smith's contribution to the Corps has spanned over forty years, both in and out of uniform. He commanded the 636th Ordnance Company (EOD), with the responsibility for the safe and secure storage of chemical weapons for US Army, Europe, during the Cold War era. As Commander of the US Army Technical Escort Unit, Colonel Smith supervised the secure movement of chemical surety material and conducted emergency-response missions for chemical accidents in the United States and at military bases worldwide.

Colonel Smith participated in Operation Rocky Mountain Transfer—the first mission in the United States where nerve-gas bombs were flown over a major metropolitan area. During this operation, approximately 900 bombs were safely moved by air from Colorado to Dugway Proving Ground, Utah, and then transported by three ground convoys to Tooele Army Depot. Operation Rocky Mountain Transfer was completed on time and without incident.

As Commander of Rocky Mountain Arsenal, Colonel Smith was responsible for implementing the Chemical Agent Identification Program. The program was so successful that almost 20,000 potentially hazardous munitions sets were located and destroyed. His actions as the Rocky Mountain Arsenal commander helped to reduce, by millions of dollars, the total amount that the Army may have to spend to clean up Rocky Mountain Arsenal and contain the spread of pollutants on the arsenal.

While commanding Pine Bluff Arsenal, Colonel Smith was directly accountable for the safe and secure storage of 3,850 tons of chemical agents (approximately 12 percent of the US chemical weapons stockpile). He was also responsible for the operation of the free world's only active binary chemical weapons production plant for 155-millimeter artillery projectiles and the Army's demilitarization facility for Agent BZ.

Since his retirement, Colonel Smith has been a consultant and director for many chemical and biological projects. He is currently a senior chemical demilitarization advisor to a Washington, D.C., demilitarization company. The outstanding and unique contribution Colonel Smith has made in each of his command and staff assignments and the leadership he has provided to the Chemical Corps, the Army, and our Nation clearly merit his selection as a Distinguished Member of the Corps.

CCRA Reduced Rate

Effective 7 April 2005, the Chemical Corps Regimental Association (CCRA) has reduced the lifetime membership fee from $300 to $99. This is an excellent opportunity to join the CCRA and show your support for all it does for the Corps.

US Army Chemical School Web Site

Do you need up-to-date information about chemical career management, courses, equipment, doctrine, and training development? All of this information and more is available at the US Army Chemical School Web site. Log on at <*http://www.wood.army.mil/usacmls/*> to check out this great resource.

New Protective Eyewear

By Mr. Larry T. Hasty

Soldiers engaged in combat operations and training exercises run a high risk of damaging their eyesight. Sixteen percent of coalition casualties are attributed to eye injuries. Flying shrapnel from enemy weapon blasts is the most dangerous threat to eyes, but many other hazards threaten eye safety—sand, dust, debris (from helicopters, high winds, or overpressure), flash fires, and lasers. But reports from coalition Soldiers indicate that the new Army protective eyewear has protected their eyes from shrapnel, time and time again.

During the past few years, the US Army has adopted several new types of commercial protective eyewear. Until recently, the choice was limited to the sun, wind, and dust goggles (SWDG); the ballistic/laser protective spectacles (BLPS); and the special protective eyewear, cylindrical system (SPECS) protection. But new eyewear choices are now available as commercial, off-the-shelf items that have passed the Army testing criteria. These items are issued to deploying Soldiers through the rapid fielding initiative (RFI) or can be ordered by a unit through the normal supply channels.

The new eyewear is broken into two categories—spectacles and goggles. According to test criteria, spectacles are required to stop a 5.8-grain fragment traveling at 640 feet per second and goggles are required to stop a 17-grain fragment traveling at 550 feet per second (approximately twice the energy impact as the spectacle). Although some approved spectacles may also meet the goggle requirement, armor troops performing platform missions should choose from the list of approved goggles to provide the appropriate level of protection from fragments, sun, wind, and dust. Refer to <*http://www.peosoldier.army.mil/index.php?section=product*> for an updated commercial-eyewear list. The list is published by the Program Manager–Clothing and Individual Equipment (PM-CIE) and provides information for ordering new eyewear.

Although these new items provide excellent ballistic protection, none of them provide eye protection from laser hazards. If a mission requires laser eye protection, you must wear the SWDG, BLPS, or SPECS (with laser lenses). For Soldiers requiring prescription spectacles, the Uvex XC™ with a prescription lens carrier (PLC), the ESS ICE 2™ with a PLC, and the Revision Sawfly II™ with a PLC are authorized for use as alternatives to the BLPS.

The ESS land operations goggle can be worn by Soldiers who require prescription eyeglasses and those who do not. This goggle will fit over Army-issued eyeglasses, and one size fits all. The kit includes a rubber frame with a foam backing to wick away moisture and provide increased comfort during long periods of use. Foam-covered vent holes allow for ventilation, reduce fogging, and keep dust particles out. The kit also includes an antireflective sleeve that reduces glint when the goggles are not in use.

The ESS low-profile, night vision goggle is for Soldiers who do not need prescription eyeglasses. This goggle fits closer to the face, is compatible with other night vision goggles, and one size fits all. The kit can be ordered in three frame colors—black, olive drab, or desert tan. The goggle backing is made of rubber, which makes a closer fit to the face. A thin fleece backing is currently being evaluated at Fort Knox, Kentucky, and may provide improved comfort when wearing the goggles in very cold weather. Foam-covered vent holes and an antireflective sleeve are also features on this goggle. Outrigger clips on the strap allow for helmet compatibility without breaking the face seal.

The ESS vehicle operations goggle has a filtration system that provides protection against excessive airborne debris (dust) for Soldiers in vehicles traveling at high speeds. The vehicle operations goggle is designed to fit over most eyeglasses, and one size fits all. The frame has a foam backing that wicks away moisture and an antireflective sleeve to reduce glint.

The Arena FlakJak™ goggle is designed for Soldiers who do not wear eyeglasses. The frame has a foam backing that fits to the face and wicks away moisture. This goggle consists of a molded frame with ventilation to allow air to flow through, minimizing fogging. It also has an antireflective sleeve to reduce glint, and one size fits all.

All goggle kits come with two ballistic protective lenses—one clear and one tinted. These lenses are made with antiscratch and antifogging coatings. Both lenses protect the eyes from ultraviolet rays.

Protecting a Soldier's eyesight is a powerful argument for wearing protective eyewear during combat operations and training exercises. Units may order authorized commercial eyewear by using the national stock number (NSN) and submitting a funded military standard requisitioning and issue procedures (MILSTRIP) request through normal supply channels to the Defense Logistics Agency, Defense Supply Center Philadelphia. If you need additional information on protective eyewear, contact Mr. Larry Hasty by e-mail at <*larry.hasty@knox.army.mil*> or call DSN 464-3662 or commercial (502) 624-3662; Mr. Myron Pross (PM-CIE) by e-mail at <*MyronPross@dla.mil*> or call DSN 444-2510 or commercial (215) 737-2510; or Mr. Frank Cole at e-mail <*frank.cole@logsa.redstone.army.mil*> or call DSN 645-9907 or commercial (256) 955-9907.

Authorized Spectacles	NSN
Wiley-X SG-1 Spectacle Kit	4240-01-504-0994
Clear-Ballistic Replacement Lens	4240-01-504-5326
Green Smoke-Ballistic (Sunglass) Replacement Lens	4240-01-504-5312
Elastic Strap Replacement	4240-01-504-5754
Replacement Frame (includes temples and strap)	4240-01-504-6524
Replacement Temples	4240-01-504-6474
Uvex XC Spectacle Kit	4240-01-516-5361
Uvex XC Spectacle Clear Assembly	4240-01-516-3460
Uvex XC Spectacle Gray Assembly	4240-01-516-3452
Uvex XC Spectacle Clear Replacement Lens, Antifog Coating (pack of 10 each)	4240-01-516-3469
Uvex XC Spectacle Gray Replacement Lens, Antifog Coating (pack of 10 each)	4240-01-516-3473
Uvex XC Spectacle Replacement Carrying Case (Black)	4240-01-516-3444
Uvex XC Spectacle Prescription Lens Carrier	4240-01-516-5342
Pyramex Venture I I Clear Spectacles	4240-01-500-6174
Pyramex Venture I I Gray Spectacles	4240-01-500-6173

Authorized Spectacles	NSN
Oakley SI M Frame Kit (Faceshield, Industrial)	4240-01-525-3095
Oakley SI M Frame Strike Clear Replacement Lens	4240-01-525-7555
Oakley SI M Frame Strike Gray Replacement Lens	4240-01-525-7554
Oakley SI M Frame Replacement Storage Case	4240-01-525-7561
Oakley SI M Frame Micro Bags	4240-01-525-3109
Eye Safety Systems (ESS) Interchangeable Component Eyeshield (ICE) 2 Kit	4240-01-525-5085
ESS ICE2 Clear Replacement Lens	4240-01-525-4819
ESS ICE2 Smoke Gray Replacement Lens	4240-01-525-5098
ESS ICE2 Replacement Frame	4240-01-525-5095
ESS ICE2 Replacement Carrying Pouch	4240-01-518-9838
ESS ICE2 Replacement Fog Repellent Cloth	4240-01-525-5107
ESS ICE2 Replacement Snap-On Neck Leash	4240-01-525-4777
ESS ICE 2 Prescription Insert	4240-01-525-4784

Authorized Spectacles	NSN
Wiley X PT-1 Spectacles Kit	4240-01-510-7853
Wiley X PT-1 Single Lens System (Clear)	4240-01-510-7848
Wiley X PT-1 Single Lens System (Smoke Green)	4240-01-510-7847
Revision Sawfly USA Military Kit, Size Regular Kit	4240-01-527-4051
Revision Sawfly USA Military Kit, Size Large Kit	4240-01-527-4018
Clear Replacement Shield with Nosepiece Size Regular	4240-01-527-4052
Clear Replacement Shield with Nosepiece Size Large	4240-01-527-4061
Solar Replacement Shield with Nosepiece Size Regular	4240-01-527-4053
Solar Replacement Shield with Nosepiece Size Large	4240-01-527-4063
Retention Head Strap Replacement	4240-01-527-4067
Prescription Carrier Insert	4240-01-527-4056
Anti-Fog, Anti-Static Lens Cleaning Spray – 1 Fluid Ounce Bottle	4240-01-527-4068
Body Specs PISTOL Kit	4240-01-526-9637
Body Specs PISTOL Clear Replacement Lens	4240-01-526-9642
Body Specs PISTOL Body Specs PISTOL Neutral Slate Replacement Lens	4240-01-526-9645
Body Specs PISTOL Replacement Frame (includes temples and strap)	4240-01-526-9653
Body Specs PISTOL Replacement Elastic Strap	4240-01-526-9656
Body Specs PISTOL Replacement Nosepiece	4240-01-526-9714
Body Specs PISTOL Replacement Case	4240-01-526-9663

Authorized Goggles	NSN
ESS Land Operations Goggles Kit (with antireflective sleeve)	4240-01-504-0052
ESS Land Operations Goggles Clear Ballistic Replacement Lens	4210-01-492-5722
ESS Land Operations Goggles Smoke Gray Ballistic Replacement Lens	4210-01-492-5725
ESS Vehicle Operations Goggles Kit (with antireflective sleeve)	4240-01-525-5101
ESS Vehicle Operations Goggles Clear Ballistic Replacement Lens (same as for ESS Land Ops Goggles)	4210-01-492-5722
ESS Vehicle Operations Goggles Smoke Gray Ballistic Replacement Lens (same as for ESS Land Ops Goggles)	4210-01-492-5725
ESS Profile NVG Goggles (Black Frame) Kit	4240-01-504-6222
ESS Profile NVG Goggles (Olive Drab Frame) Kit	4240-01-504-5706
ESS Profile NVG Goggles (Desert Tan Frame) Kit	4240-01-504-5727
ESS Profile NVG Goggles Clear Ballistic Replacement Lens	4240-01-504-5641
ESS Profile NVG Goggles Smoke Gray Ballistic Replacement Lens	4240-01-504-6143
Arena FlakJak Goggle Kit	4240-01-527-4076
Arena Goggle Kit Clear Ballistic Replacement Lenses	4240-01-527-4079
Arena Goggle Kit Smoke Gray Ballistic Replacement Lens	4240-01-527-4082
Arena Goggle Kit Replacement Pouch, Goggle/Universal/With One Lens Cloth Carrier/Khaki	4240-01-527-4078
Arena Goggle Kit Replacement Strap, FlakJak/Desert Tan	4240-01-527-4085

Mr. Hasty is the Soldier project officer assigned to the Science and Technology Division, Unit of Action Maneuver Battle Lab, US Army Armor Center, Fort Knox, Kentucky.

A special thanks to Mr. Cole for his contribution to this article.

Personal Protective Equipment Survey

The Army has launched a study on the effectiveness of personal protective equipment (PPE). To gather information, the US Army Infantry Center at Fort Benning, Georgia, has developed a helmet and body armor survey to gather information on incidents involving PPE. The data collected in the survey will be used by the Department of Defense to develop improved Soldier PPE. The survey, located at <*https://www.infantry.army.mil/surveys/ppe/ppe.htm*>, should take less than 10 minutes to complete.

Soldier, Machinist, Inventor, Patriot—

The Legacy of Colonel Lewis McBride

By Mr. Kip Lindberg

Captain McBride is shown with his tear gas gun, Edgewood Arsenal, 1924.

Colonel Lewis McBride was, without a doubt, one of the most interesting and industrious officers in the history of the US Army Chemical Corps. In the formative years of the Corps, then known as the Chemical Warfare Service (CWS), McBride battled his way through red tape to emerge as a central figure on the cutting edge of chemical weapons research and development.

Born in Iowa on 6 August 1879, Lewis Mitchell McBride quickly developed a lifelong fascination with all things mechanical. He began a successful career in electrical engineering, despite the fact that he was largely self-taught. In 1904, McBride accepted a commission in the Colorado National Guard; but after the outbreak of World War I, he transferred to the Corps of Engineers. In 1920, McBride, then a captain, transferred to the fledgling CWS, where his interest in chemistry and knack for invention played a decisive role in weapons development.

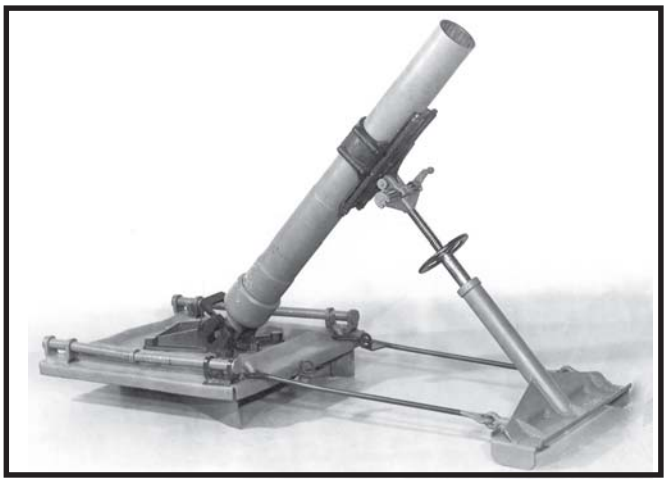
Upon his arrival at Edgewood Arsenal, Maryland, Captain McBride was tasked with redesigning the 4-inch Stokes mortar. Named for English inventor, Frederick W.S. Stokes, the 4-inch Stokes mortar was an effective short-range weapon capable of firing chemical-filled shells at ranges up to 1,000 yards. Adopted by the US Army in 1917, the Stokes was the primary close-support and gas delivery system. However, smoothbore-barrel and cylindrical-shaped projectiles limited the firing range and accuracy of the mortar.

Weapons design normally fell under the auspices of the Ordnance Corps; however, in the opinion of the Chief of Chemical, Brigadier General Amos Fries, the progress of the Ordnance Corps in refining the Stokes was not proceeding at an acceptable pace. "After much debate," wrote Major General John Apple, who preceded Fries as Chief of Chemical, "it was finally decided to let the CWS develop its own delivery system, and the 4.2 [inch chemical] mortar was the result." It was Captain McBride's task to improve the weapon, a feat that would become his greatest achievement.

Using the Stokes as a starting point, McBride devised a process to rifle the mortar tube, thus increasing the range and accuracy. He strengthened the breech to withstand

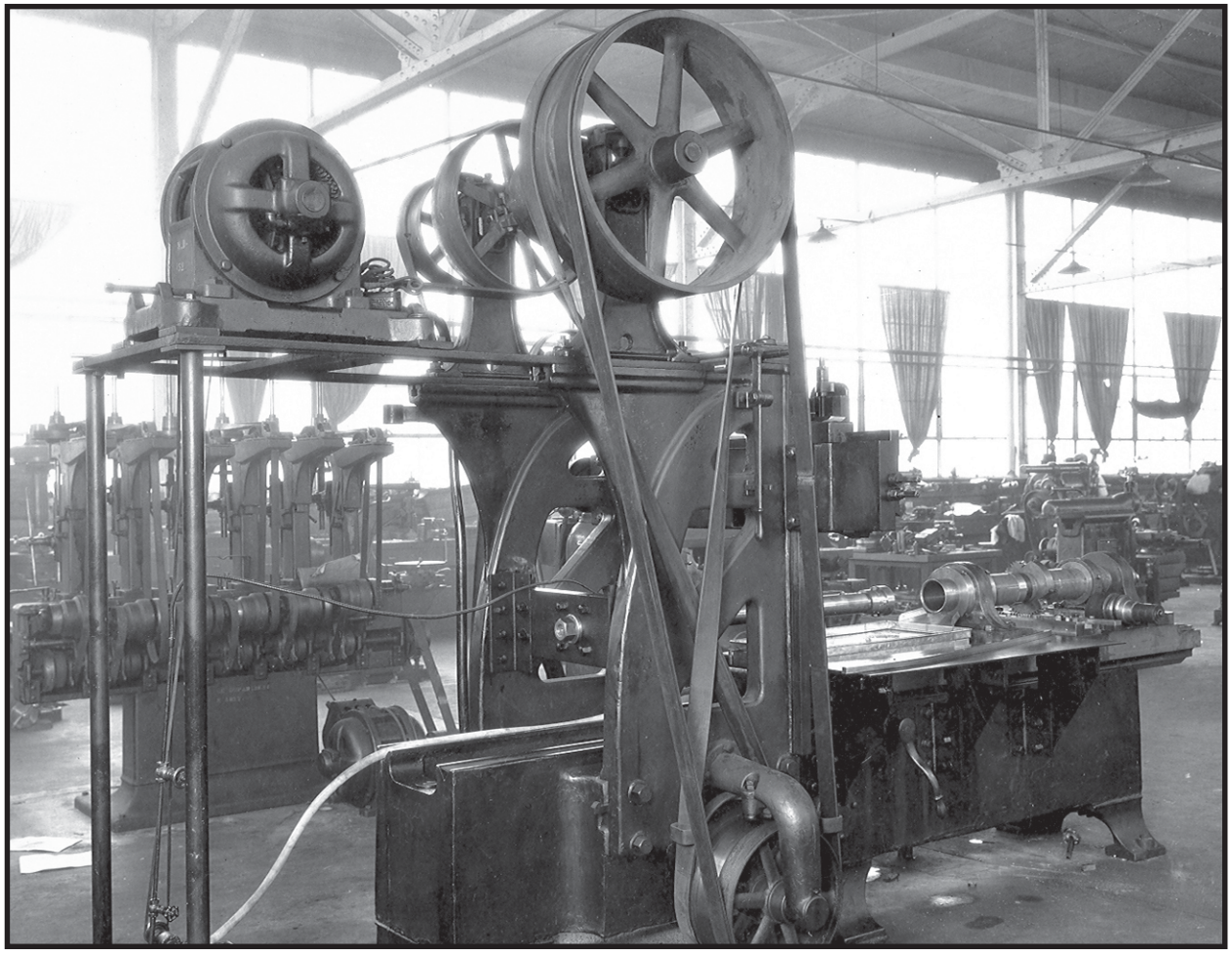
the higher pressure of a larger propelling charge and devised a stronger baseplate. He also designed an aerodynamic mortar round with an integral driving band to grip the rifling and maximize the use of propellant gases. Additionally, McBride made improvements to the liquid containment in the mortar rounds. Previous designs caused the gas shells to miss their targets as the centrifugal force placed on the liquid chemical agents made the flight trajectory erratic and unpredictable. After several years of development and testing, McBride unveiled the 4.2-inch M1 chemical mortar, and it proved to be a triumphal improvement over the 4-inch Stokes. The maximum range of the M1 was 3,000 yards, triple that of the Stokes. At that distance, rounds could routinely be placed within a 50-foot circle.

Further improvements to the M1 (later known as the M1A1 and M2) provided additional range capability and operational flexibility. The M2 saw extensive use in combat during World War II and Korea, providing rapid and accurate support fire with white phosphorous, smoke, and high explosive munitions at ranges up to 5,000 yards.

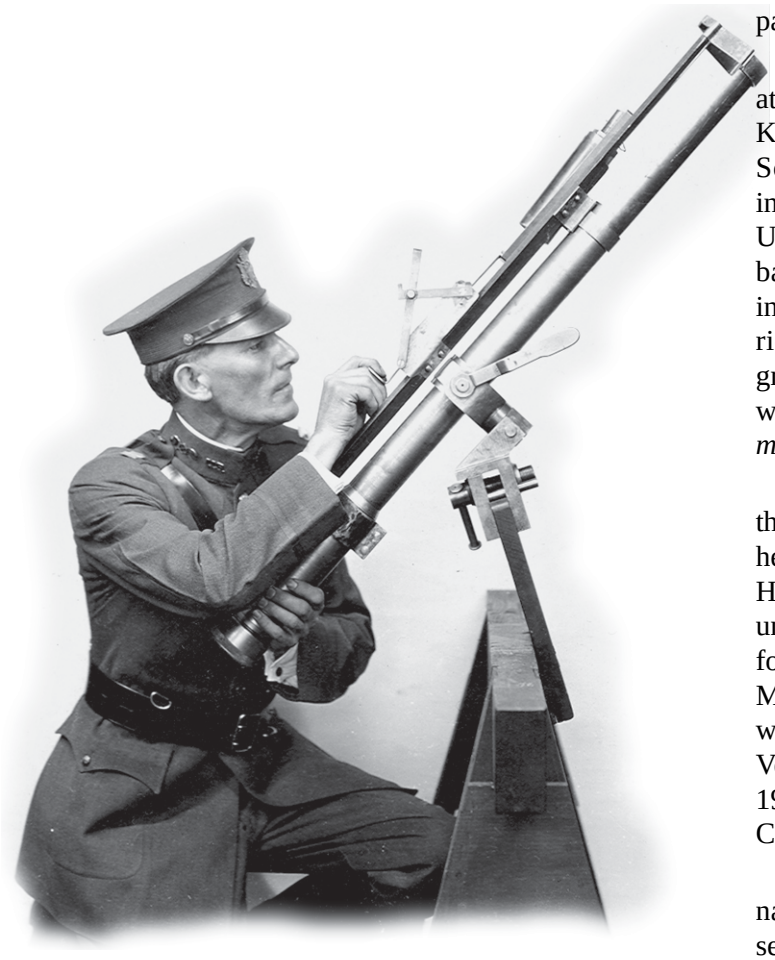


The success of the M2 4.2-inch chemical mortar was due to the ingenuity of Colonel Lewis McBride.

But McBride's efforts were not limited to the M1. Throughout his Army career, McBride packed his personal machine shop, along with his wife and children, to assignments at Edgewood Arsenal; Fort Sill, Oklahoma; and Fort Clayton, Canal Zone, Panama. He was an



Mortar barrels are rifled in McBride's machine shop, Edgewood Arsenal, 1924.



Captain McBride demonstrates his portable 2-inch mortar, 1926.

enthusiastic and industrious inventor who was awarded a dozen patents for chemical and electrical devices. In nearly all of his patent applications, he specified that his inventions ". . . may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon."

The Army used McBride's products to control prisoners at the US Disciplinary Barracks at Fort Leavenworth, Kansas, and as offensive weapons to disorient enemy Soldiers on the battlefield. McBride also designed incendiary grenades and light, portable mortars to give US Soldiers the weapons and mobility necessary to achieve battlefield superiority. But his greatest body of work involved nonlethal agents and their delivery systems. His riot control products (including gas guns, cartridges, grenades, and spray tanks) assisted police departments with combating the scourge of organized crime and the *motor bandits* of the 1920s and 1930s.

In 1936, McBride was assigned as an instructor at the Chemical Warfare School at Edgewood Arsenal, where he remained until his retirement from the Army in 1942. However, wartime necessities brought him back into uniform to resume his work in research and development for the CWS. After retiring for a second time in 1944, McBride continued to experiment and invent at his home workshop. Colonel Lewis McBride passed away at the Veterans Hospital in Long Beach, California, on 30 June 1956. He was buried with honors at Arlington National Cemetery.

Colonel McBride devoted his life to the service of his nation. In recognition of his many years of dedicated service, he was posthumously inducted into the Chemical Corps Hall of Fame in 1990.

Mr. Lindberg is the curator of collections at the US Army Chemical Corps Museum.

Army CHEMICAL REVIEW Online

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Remembering Baseball Hall of Famers Who Served in the Chemical Corps

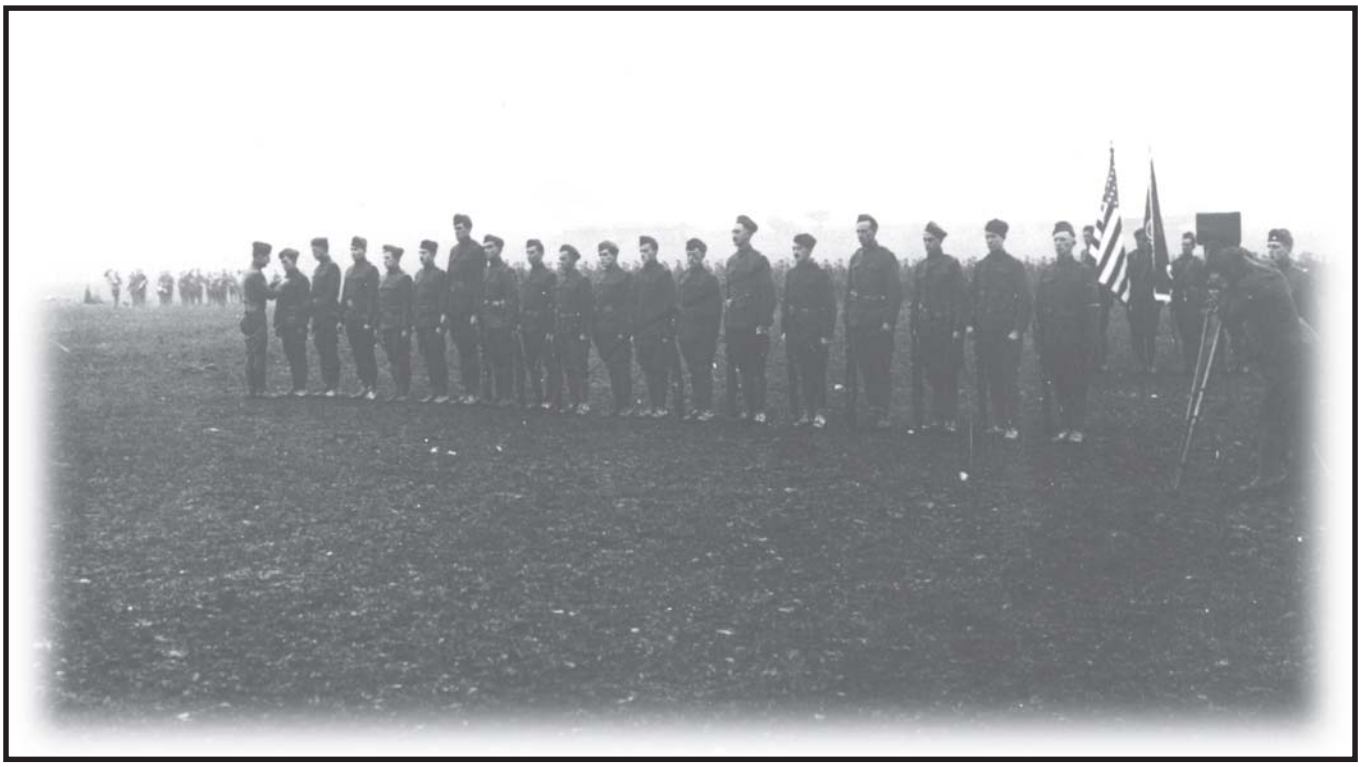
By Mr. Richard Gurtowski

It is widely known throughout the nostalgic baseball world that New York Giants pitcher Christy Mathewson, "the Big Six," suffered from chlorine gas exposure as a Chemical Corps officer during World War I and later died of tuberculosis. But did you know that other legendary baseball Hall of Fame stars such as Branch Rickey, Ty Cobb, and George Sisler also served in the Chemical Corps (known at that time as the Chemical Warfare Service [CWS]) during World War I? Branch Rickey, the president of the St. Louis Cardinals and the former University of Michigan baseball coach, obtained the rank of major in the CWS and commanded a unit that eventually included Captain Ty Cobb, Captain Christy Mathewson, and Lieutenant George Sisler. Mathewson and Rickey, at 38, were too old for military service; but Rickey was encouraged to join the CWS by Harvard's former football coach and president of the Boston Braves, Perry Haughton (who was also a member of the CWS). Through the auspices of Major Rickey, St. Louis first baseman George Sisler (a player under Rickey at the University of Michigan) was also enticed to join the CWS.

Ty Cobb requested duty with the CWS. And it is puzzling as to why. With his expert eye for distance and his experience with hunting and guns, he would have been better-suited for the Field Artillery Corps. Many native Georgians urged him to enlist elsewhere. But Cobb, well aware of the risks of chemicals, offered only one explanation: "Christy Mathewson and Branch Rickey are in Chemical—they are guys I like and are friends." Cobb reported to the CWS in October of 1918 and was sent to the Allied Expeditionary Forces Headquarters in Chaumont, France.

The most accurate and personal information on Cobb's warfare experience is referenced in his autobiography entitled My Life in Baseball: The True Record.[1] In the autobiography, Cobb states, "I saw Christy Mathewson doomed to die. None of us who were with him realized that the rider of the pale horse had passed his way. Nor did Matty, the greatest National League pitcher of them all. . . . We were at Hanlon Field near Chaumont, France, when it happened."[2] Cobb goes on to say, "Along with other sports figures, I enlisted in the Chemical Warfare Service in 1918, was given accelerated training in defense against the use of poison gas, and was shipped overseas, pronto. George Sisler, Branch Rickey, Matty, myself, and athletes from the gridiron, polo fields, and race tracks were assigned to the 'Gas and Flame Division' as instructors. I wore Captain's bars. We had hundreds of soldiers to train. We wound up drilling the damndest bunch of culls that World War I ever grouped in one outfit. The doughboys who came our way largely were hard cases and rejects from other services. The theory was that they would listen to well-known sports personalities—and to some extent it was effective. Those that gave us trouble and didn't heed orders didn't last long, for we weren't fooling around with simulated death when we entered the gas chambers. The stuff we turned loose was the McCoy and meant to train a man to be on *qui vive*—or else."

In April of 1915, the Germans lobbed chlorine gas cylinders into the Ypres Salient (Second Battle of Ypres). The use of the chemical weapons horrified neutral nations and set the United States to seek countermeasures. Chlorine-based mustard gas seared lungs and often asphyxiated victims. Phosgene gas was just as bad (if not



Medal presentation at Hanlon Field, France, on 4 December 1918

worse), causing victims to turn a livid purple in the face before death. And rank did not deter the use of the poisonous gas. Six weeks after Colonel Douglas McArthur reached combat, his eyesight was threatened by gas exposure, forcing him to remain blindfolded for a week.

In his autobiography, Cobb also speaks of the heavy allied casualties: "Then came mustard and sneeze gases, frightfully successful. Protective masks that were rushed into use were a joke at first. They were cumbersome affairs consisting of a mask that was fitted around the face, attached by a tube to a canister suspended around the soldier's neck and hanging in front of his body. He breathed air through a tube held in his mouth, from which the poison gases were filtered through charcoal and soda lime contained in the canister. A nose clip was supposed to prevent breathing through the nostrils. But men forgot the procedure or panicked. What's more, all that gear impeded a soldier's movements, especially his ability to burrow into the ground when under machine gun fire.

"By 1918, we had improved masks and a growing knowledge of the Kaiser's laboratories. One of our training exercises involved marching men into an airtight chamber in which gas was released almost without warning. At a hand signal, everyone was supposed to snap his mask into position. Alertness and speed were the keys to success. I'll never be able to forget the day when some of the men—myself included—missed the signal. Men screamed to be let out when they suddenly got a whiff of the sweet death in the air. They went crazy with fear and in the fight to get out got jammed up in a hopeless tangle.

"As soon as I realized what had happened, but only after inhaling some gas, I fixed my mask, groped my way to the wall, and worked through the thrashing bodies to the door. Trying to lead the men out was hopeless. It was each one of us in there for himself. When I staggered out and gulped in fresh air, I didn't know how badly my lungs had been damaged. For weeks, a colorless discharge drained from my chest and I had a hacking cough. When the draining stopped, I felt that Divine Providence had touched me. When it was over there were sixteen bodies stretched out on the ground. Eight men died of lung damage within hours, others were crippled in a few days. I remember Mathewson telling me, 'Ty, I got a good dose of the stuff. I feel terrible.' He was wheezing and blowing out congested matter."

Mathewson had not only been in the chamber with Cobb, but had inspected trenches for gas residue earlier. Little did Mathewson know at the time, but he would live only seven more years.

In 1918, George Sisler was commissioned a second lieutenant and assigned to Camp Humphries, Virginia, and Rickey, Cobb, Mathewson, and Haughton were sent to France. Just as George Sisler was preparing to deploy overseas, the armistice was signed on 11 November. Sisler

Captain Christy Mathewson

was subsequently discharged from the CWS. Cobb served approximately 67 days overseas with the CWS before being shipped back stateside. Branch Rickey and Christy Mathewson returned stateside prior to 1919. All four men received honorable discharges and returned to their baseball careers. Perry Haughton was also honorably discharged and returned to his position as president of the Boston Braves.

Following illness and hospitalization, Christy Mathewson returned home to become John McGraw's right-hand man with the New York Giants and, in 1923, president of the Boston Braves. After developing tuberculosis in both lungs, Mathewson was sent to the Trudeau Sanatorium in Saranac Lake, New York, known worldwide for treatment of the *white plague*. He continued to serve as the team's president, spending the next two years traveling back and forth from Saranac Lake to Boston. On 7 October 1925, Christy Mathewson died at the age of forty-five. That day was also the opening day of the 1925 World Series between the Pittsburgh Pirates and the Washington Senators. On 8 October, during the second game of the series, the players wore black armbands to honor Mathewson, and 44,000 World Series fans stood as the flag was lowered to half-mast at Pittsburgh's Forbes Field and sang Nearer My God to Thee. Ty Cobb attended Christy Mathewson's funeral and later stated that "Big Six looked peaceful in that coffin, that damned gas got him and nearly got me."

As the *war to end all wars* culminated in 1918, future President Warren G. Harding said that it was time for the world to "return to normalcy." And for many Americans, it was a return to the peaceful confines of the ballpark.

Endnotes:

[1]Ty Cobb, with Al Stump, *My Life in Baseball: The True Record,* University of Nebraska, reprint edition, 1 March 1993.

[2]Hanlon Field was an experimental station and home of the Allied Expeditionary Force Gas School. It was named in honor of the first CWS officer killed in action, Second Lieutenant Joseph T. Hanlon, First Gas Regiment. Hanlon Field was an auxiliary field, not in the combat zone, but extremely vulnerable to night and enemy aircraft attack.

Title photograph: Captain Ty Cobb and Captain Christy Mathewson

Mr. Gurtowski is an acquisition analyst with the Joint Program Executive Office for Chemical Biological Defense (JPEOCBD). He is also a reserve officer with the 20th Support Command in Edgewood, Maryland, and has twenty-three years of combined active and reserve duty with the Chemical Corps. Mr. Gurtowski's last Active Army assignment was with the Division Chemical Office, 82d Airborne Division, Fort Bragg, North Carolina.

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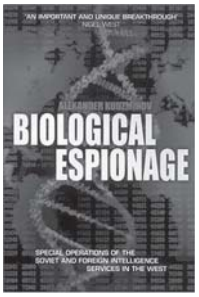
Book Reviews

By Mr. Reid Kirby



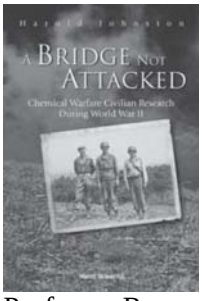
Biological Espionage: Special Operations of the Soviet and Russian Foreign Intelligence Services in the West, Alexander Kouzminov, Stackpole Books, 2005.

Biological Espionage is about the Soviet methods of Human Intelligence (HUMINT). The author contends that intelligence gathered by technological means, such as remote sensing, fails to provide the information needed for dealing with biological warfare. Without HUMINT, it is impossible to obtain and analyze test samples of the biological warfare agents and, therefore, impossible to determine intentions.

The forward, written by Nigel West, illuminates the opinion that the largest failing of Western intelligence is the lack of HUMINT, which was evidenced by the intelligence gathered regarding Iraq. Unlike books written by defectors, Mr. Kouzminov is a Russian émigré; and because of his patriotic character, the KGB is not vilified as a Byzantine bureaucracy of evil. He attacks incompetence, mismanagement, post-Soviet corruption, and the abuse of power by the KGB/SVR. Spy novel enthusiasts will enjoy the descriptions of HUMINT operations, the preparation needed for fielding illegal immigrants as spies, and how sleeper spy agents were tasked with the mission to attack the United States and NATO facilities with biological weapons in the event of a war. However, the author disappoints the reader by making several unsupported, one-line statements about biological warfare.

Soviet intelligence reported that the United States did not have a serious offensive or defensive biological weapons program; however, Mr. Kouzminov states that the United States maintained a secret offensive program until 1989. The author is clear about Russia maintaining a biological weapons program that consists of genetically engineered agents which incorporate biological regulators for added effect.

The author ends the book with a list of potential targets located worldwide and the recommendation that world intelligence agencies develop and collaborate on HUMINT in order to achieve biological security.



A Bridge Not Attacked: Chemical Warfare Civilian Research During World War II, Dr. Harold Johnston, World Scientific Publishing, 2003.

Unfortunately, this book escaped my attention when it was first published, but it is available in paperback now and well worth reading. Dr. Johnston writes of his personal involvement in World War II chemical warfare research with the National Defense Research Committee (NDRC) at the California Institute of Technology (Caltech) and Berkeley. Official histories are available, but *A Bridge Not Attacked* offers more of an oral history and adds depth to the people involved.

The title, *A Bridge Not Attacked*, is after the poetic reasoning of Dr. Johnston's mentor, Professor Roscoe G. Dickinson, who introduced the research mission to his graduate students at Caltech by saying, "We are guarding a bridge that may never be attacked; we hope it will not be. If it is not attacked, our work has succeeded."

The first part of the book is an autobiography of the author, and subsequent chapters have biographical sketches of the other researchers presented. Caltech researchers investigated sulfur decafluoride (Agent Z or S-10), cyanides, and monitoring equipment used in field trials. There is also a considerable presentation of micrometeorology investigations made by the group. Although not the focus of the book, the Chemical Warfare Service appears in several recollections of ironic situations. The search for a chemical proving ground and the experiences of researchers in the field trials at Mount Shasta, Dugway Proving Ground, Bushnell, and San Jose Island make up the later half of the book. One of the interesting facts that the author offers is the percentage of fatalities attributed to war research within the NDRC, which was comparable to the percentage of fatalities suffered by the military at large (1.7 percent and 1.8 percent, respectively).

Mr. Kirby is a project manager for TALX Corporation. He holds a bachelor's degree in valuation science from Lindenwood College, with a minor in biology and special studies in behavioral toxicology and biotechnology.

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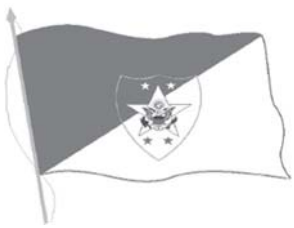

2005 ARMY BIRTHDAY MESSAGE

On June 14, 2005, we proudly celebrate the United States Army's 230th Birthday. For 230 years, the Nation has entrusted the Army with preserving its peace and freedom, and defending its democracy. Since 1775, American Soldiers have answered the call to duty. They are imbued with the ideals of the Warrior Ethos and motivated by an unwavering belief that they will be victorious. Our Soldiers have understood that our Constitution and the freedom it guarantees are worth fighting for. They sacrifice their personal comfort and safety to answer a higher calling: service in the cause of freedom, both at home and abroad.

America is at war, and the call to duty pierces the air once again. Our adversaries have declared war on our way of life, attacked our homeland, and vowed to attack us again. America is threatened, and it is our duty to serve. America's sons and daughters who are answering the call to duty are engaged in the noblest work of life, protecting our Nation and enabling others to live free.

Today, our Soldiers protect our national interests around the globe, serving in more than 120 countries. Recently, in joint, combined environments, Soldiers helped to rescue two nations from oppression, and liberated over 50 million people. Since then, more than 1 million Americans have served in Iraq and Afghanistan, and many are returning for a second or third time. Our Soldiers understand that this is a struggle we must win. We are humbled by their sacrifices in the service of our Nation. Despite the hardships, and the danger to life and limb, duty calls, and our Soldiers continue to answer.

Our Nation appreciates your courage, your sacrifice, and your selfless-service. This week the United States Postal Service is demonstrating support for our Soldiers with a special cancellation stamp that commemorates our Army's 230 years of service to the Nation. They are also assisting in the Freedom Team Salute, a program to send an Army Birthday card to every Soldier. We thank the US Postal Service for their role in recognizing the service of our troops. They are joined by a host of organizations around the country celebrating the Army Birthday.

To our Soldiers around the world, our thoughts and prayers are with you and your families on this 230th Army Birthday. You are volunteers, doing your difficult duty against an enemy who does not value life, is afraid of liberty, and desires to crush the individual pursuit of a democratic way of life. You are playing a crucial role in the War on Terrorism, and your dedication to this noble effort underscores your determined professionalism and tenacity. We are proud to serve with you, as you place the mission first and live the Warrior Ethos. You have made our Army the most respected institution in the United States and the preeminent land power on Earth. Thank you for answering the call to duty.

God bless each and every one of you and your families, and God bless America.

Kenneth O. Preston
Sergeant Major of the Army

Peter J. Schoomaker
General, United States Army
Chief of Staff

Francis J. Harvey
Secretary of the Army

Remember Their Sacrifice

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