ARMY CHEMICAL REVIEW

THE PROFESSIONAL BULLETIN
OF THE CHEMICAL CORPS

Building the Capabilities of DOD First Responders

HEADQUARTERS, DEPARTMENT OF THE ARMY
This publication is approved for public release;
distribution is unlimited

PB 3-03-1
January 2003

USACMLS/MANSCEN
573-XXX-XXXX/DSN 676-XXXX

COMMANDANT
BG Patricia L. Nilo 563-8053
nilop@wood.army.mil

ASSISTANT COMMANDANT
COL Gary Wallace 563-8054
wallaceg@wood.army.mil

COMMAND SERGEANT MAJOR
CSM Peter Hiltner 563-5081
hiltnerp@wood.army.mil

3d CHEMICAL BRIGADE/DSN 581-XXXX
COL Thomas S. Spoehr 596-0016
spoehrt@wood.army.mil

82d CHEMICAL BATTALION
LTC John Kulifay 596-4835
kulifayj@wood.army.mil

84th CHEMICAL BATTALION
LTC Peggy Combs 596-2414
combspe@wood.army.mil

58th TRANSPORTATION BATTALION
LTC David Nelson 596-0991
nelsonda@wood.army.mil

USACMLS Directors

JOINT SERVICE INTEGRATION GROUP
LTC Frank Kohout 563-7754
kohoutf@wood.army.mil

DOCTRINE TRAINING LEADER DEVELOPMENT ORGANIZATION MATERIEL & SOLDIERS
COL Robert Dalessandro 563-6652
dalessandror@wood.army.mil

CHEMICAL DEFENSE TRAINING FACILITY
LTC Christina Flanagan 596-0608
flanagac@wood.army.mil

MANSCEN

DIRECTORATE of TRAINING DEVELOPMENT
COL Kevin T. LaMar 563-4111
lamark@wood.army.mil

DIRECTORATE of COMBAT DEVELOPMENTS
Chemical Division Chief
MAJ Lary Chinowsky 563-4078
chinowskyl@wood.army.mil

Managing Editor, Lynne M. Sparks 573-563-4104
Editor, Mattie E. Kirby 573-596-0131, 35267
Graphic Designer, Kathryn M. Troxell 573-596-0131, 35267
troxellk@wood.army.mil

CML, Army Chemical Review is published twice a year by the U.S. Army Chemical School, Fort Leonard Wood, Missouri. *CML* presents professional information about Chemical Corps functions related to nuclear, biological, chemical, smoke, flame field expedients, and NBC reconnaissance in combat support. Objectives of *CML* are to inform, motivate, increase knowledge, improve performance, and provide a forum for exchange of ideas. This publication presents professional information, but the views expressed herein are those of the authors, not the Department of Defense or its elements. The content does not necessarily reflect the official U.S. Army position and does not change or supersede any information in other U.S. Army publications. Use of news items constitutes neither affirmation of their accuracy or product endorsement.

Articles may be reprinted if credit is given to *CML* and its authors. All photographs are official U.S. Army photos unless otherwise noted. *CML* reserves the right to edit material.

PERSONAL SUBSCRIPTIONS: Available through the Superintendent of Documents, PO Box 371954, Pittsburgh, PA 15250-7954.

POSTMASTER: Send address changes to Army Chemical Review, 320 MANSCEN Loop, Suite 210, Fort Leonard Wood, Missouri 65473-8929.

By Order of the Secretary of the Army:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0231311

Front cover, background: Clockwise from top left—entrance to the Sibert Wing in Thurman Hall; exterior of Thurman Hall; aerial view of the Chemical Defense Training Facility (CDTF)
Front cover, foreground: Training vignettes from the Chemical School and the Coast Guard Gulf Strike Force (GSF); see article on page 5. GST photos courtesy of Petty Office Jaime Bigelow.
Back cover: Aerial view and training vignettes of the Fort Leonard Wood CDTF.

ARMY CHEMICAL REVIEW

THE PROFESSIONAL BULLETIN OF THE CHEMICAL CORPS

PB 3-03-1
January 2003

Articles

Departments

Chief of Chemical

BG Patricia L. Nilo

The Chemical Corps was born out of the need to protect soldiers from the effects of new and devastating weapons used in the trenches of the Western front during World War I. Although chemical warfare provided a battlefield advantage, it did not prove to be a decisive weapon in the outcome of the Great War. The Chemical Warfare Service (as it was then called) equipped and trained the forces with a fierce resolve. Consequently, the protective equipment and training provided by the first chemical soldiers proved sufficient to contain the threat posed by the chemical agents employed.

Today, the threat is much broader than the chlorine and phosgene used in the early 1900s. Chemical, biological, radiological, and nuclear (CBRN) warfare is less well defined, more likely in a variety of geographic scenarios, and can be the decisive factor in the outcome of any conflict. CBRN offensive technologies continue to advance and proliferate into the hands of terrorists and rogue nation states, who are more prone to employ CBRN weapons as a means to tip the balance of power than at any point in recent history. However, one thing has not changed—that fierce resolve of the Dragon Warrior to protect the forces. In the past year and a half, as we recover from the devastation of 9-11 and anthrax letters, I have witnessed tremendous achievements by our Regiment. I continue to be in awe of the talent of the chemical community and the determination with which every mission is accomplished. Let me tell you about a few of our great success stories.

Recently, we gained approval of the Installation Force Protection Operational and Organizational Plan, which further defines the Chemical Corps's new and expanding role in force protection and homeland security. This plan delineates the Army's force protection operational capabilities, requirements, and organizational structure required to prevent, deter, defend, and respond to a terrorist threat against Army installations.

Chemical doctrine has been even more fully engaged ever since Transformation made its debut, and doubly so since 9-11. More than 75 percent of our current doctrine is under revision. As the list of potential operational environments changes, we must continually adapt our doctrinal procedures to deliver responsive support to the maneuver forces and the homeland security mission. This year's doctrine continues to work with the joint staff and sister services to develop publications at the joint, multiservice, and Army levels.

Within the coming months, you will see our new capstone Army field manual—FM 3-11, *NBC Defense Operations*; the latest avoidance and protection doctrine—FMs 3-11.3, *NBC Contamination Avoidance*, and 3-11.4, *NBC Protection*; and new comprehensive manuals covering NBC reconnaissance and biological defense—FMs 3-11.19, *NBC Reconnaissance*, and 3-11.86, *Biological Defense Tactics, Techniques, and Procedures*. We have worked hard to incorporate doctrinal changes, emerging issues, and technologies into these manuals. Additionally, we are moving toward a Web-based doctrine system where you'll have quick access to the latest available doctrine. Web-basing will also allow doctrinal changes to keep pace with the changing operational environment and threats. I challenge each of you to continue to provide input to these publications and ensure that we are sending the best information to our soldiers in the field.

One of our training challenges today is to adapt our Cold-War training management to meet today's world environment. As the Army transitions to a lighter and more lethal force, we must be able to adapt our training systems. Our training developers are constantly updating and refining this process in a job where we never get ahead. This is a critical mission to ensure that chemical soldiers meet the challenges of the contemporary operational environment. Several areas were added to the training of our newest Dragon Soldiers. These include NBC room operations, consequence management, and mass casualty decontamination training. This new and forward-looking training will produce Dragon Soldiers capable of succeeding in any operational environment.

A few more successes in the training arena are the addition of several courses in support of homeland defense. The Installation Emergency Responder Trainers Course is designed to provide installation law enforcement, emergency medical services, medical, fire fighting, emergency operations center, and emergency rescue personnel the basic skills and knowledge needed to react to a terrorist chemical, biological, or radiological attack. The Installation Planner's Course is a one-week course designed to familiarize installation planners, installation operations center personnel, emergency disaster planning officers, and emergency response working group members with the procedures for preparing an installation to respond

(Continued on page 4)

CML

Regimental Command Sergeant Major

CSM Peter Hiltner

This is my first article for the *Army Chemical Review* as your ninth Regimental Command Sergeant Major (RCSM). To begin, I would like to share a little of my background with you. First, I am a soldier, an NCO with more than 25 years of active duty service. I am honored to be your RCSM and happy to be here at the Chemical School. I did not accomplish all this on my own. I have been blessed with great role models and leaders—my fellow soldiers, officers, NCOs, and civilians.

I joined the Minnesota National Guard in 1969 and completed Basic and Advanced Infantry Training at Fort Lewis, Washington. I completed my tour of duty with the National Guard in 1975, and in 1978, I reenlisted and became an active-duty military police (MP).

I attended one-station unit training (OSUT) at Fort McClellan, Alabama, and afterwards was assigned to the 55th MP Company in Korea. My roommate was the Brigade Soldier of the Year, and he was the first of many role models I would encounter. He taught me about the Soldier of the Month Boards and correspondence courses. I heeded his advice and, after two years, won a few boards, scored high on my skill qualification test, graduated from the Primary Leadership Development Course (PLDC), and was an E4 (P). I thought becoming a PLDC graduate was a great achievement, but I refocused my priorities when I saw others receiving awards. I decided then to never take a nonchalant approach to any military school or to my military career again.

At Fort McCoy, Wisconsin, I served as a game warden and an MP desk sergeant. I gained some experience as a supply sergeant and competed for the Post NCO of the Year Board, but lost. I also completed some college courses and finished several correspondence courses.

In 1982, I changed my MOS to chemical. I went to the transition course and was the Distinguished Honor Graduate; that was the pivotal point in my career. Upon graduation, I was assigned to the 82d Engineer Battalion in Germany. I continued taking correspondence courses, was promoted to E6, and became the 7th Engineer Brigade NCO of the Quarter.

In 1985, I returned to Korea and spent 12 months with the 4th Chemical Company, 2d Infantry Division. I was the smoke platoon sergeant. I took 23 (54E) soldiers and turned them into a platoon of highly motivated smoke soldiers. Later, I made the E7 promotion list and became the 2d Infantry Division and the 8th U.S. Army NCO of the Quarter.

As a sergeant first class, I continued taking correspondence courses, finished my bachelor's degree, and graduated as the honor graduate from both the Technical Escort Course and the Advanced NCO Course. I was an instructor at the Technical Escort Course for about two years and served at the EOD School. I completed another tour in Germany in the Inspector General's Office at VII Corps and deployed to Desert Storm. When I returned, I moved to Fort Rucker, Alabama, assigned to the 46th Engineer Battalion (Combat)(Heavy).

In 1993, I attended the first sergeant's course and became the first sergeant for the Chemical NCO Academy at Fort McClellan. In 1996, I moved to the 11th Chemical Company, which was tasked to provide decontamination support to the 1996 Olympic games in Atlanta, Georgia. In 1997, I returned to Korea as first sergeant for the 4th Chemical Company.

In 1998, I attended the U.S. Army Sergeants Major Academy. Upon graduation in 1999, I was assigned as the CSM for the 82d Chemical Battalion. In 2000, I returned to Korea as the CSM of the 23d Chemical Battalion; in 2001, I became the brigade sergeant major of the 23d Area Support Group, Camp Humphreys, Korea. And now I am your RCSM.

As you can see, my story is not all that unusual. As I stated before, I did not make it on my own; I had the support and guidance of many. I looked good because the soldiers around me were good. Likewise, I was never satisfied with just passing scores or with just meeting the standard. I wanted to be all that I could be and give the Army my best.

Does this sound like something you want to do? If it is, then my advice to you, regardless of where you are in your military career, is the following:

- Enroll in correspondence and college courses. You will gain knowledge and obtain promotion points.
- Commit yourself to the Army. It is not a job; we are not in it for the money. Give the Army 110 percent every day.
- Become the next Soldier of the Quarter; get involved in something positive.
- Try to earn membership in the Audie Murphy or Sergeant Morales Club.
- Graduate from every class you attend, and with honors, if possible.

(Continued on page 4)

(Chief of Chemical, continued from page 2)

to a CBRN incident. Finally, the Emergency Assessment and Detection Course deals with the fundamental concepts important to National Guard civil support team members who support the Incident Command System.

Our best defense against CBRN warfare remains our ability to prepare for and protect ourselves against the toxic effects of these weapons. By defeating the effects of CBRN weapons, we in effect make them obsolete. Our combat development folks are making great strides in our ability to defeat the effects of CBRN agents. Developments in the area of decontamination are particularly noteworthy. A two-step approach has been used to define requirements for future decontamination systems, the first of which was a decontamination performance demonstration (DPD) held in July 2001. The DPD was a market survey in which companies from the world over were invited to the Chemical School to showcase their decontamination technologies. The equipment was operated by our chemical soldiers, which fostered a direct two-way exchange of ideas between the customer (you) and the industry professionals. A great deal was accomplished during the DPD, and our combat developers took the lessons learned from the soldiers and industry and went back to work defining the key performance parameters (KPPs) for future decontamination systems.

These KPPs were the yardstick by which performance of prototype systems chosen to participate in the April 2002 decontamination limited objective experiment (LOE) were measured against. During the LOE, we experimented with promising equipment to see if it not only fixed our historical problem areas but further enhanced capability while reducing workload and logistical support requirements. Several pieces of equipment were identified that possess the ability to greatly improve our capability with little or no modification. These systems represent real-time solutions that are available for acquisition now. We are taking everything we learned throughout this two-step approach and writing the requirements for the next generation of decontamination systems. This approach underpins requirements definition, thereby ensuring we take maximum advantage of state-of-the-art technology available. We are focusing our effort on getting the systems developed and proven out through testing to get enhanced capability into your hands as soon as possible.

Additionally, there has been a tremendous amount of effort to provide the most efficient and versatile chemical force structure to combat commanders of the future. Work in support of Total Army Analysis 11 changes will potentially restructure chemical units to be capable of executing a wider variety of tasks from homeland security to major contingency operations.

Our nation is counting on us, the Chemical Corps and our partners in CBRN Defense, to protect our forces and our homeland from the deleterious effects of CBRN assaults. We must maintain our fierce resolve to support our combat commanders with the best-trained soldiers and leaders, the best doctrine, the best equipment, and our finest intellectual effort for the challenges of tomorrow. You're doing tremendous things Dragon Soldiers! Drive on.

ELEMENTIS REGAMUS PROELIUM!
Dragon Soldiers . . . Rule the Battle

(Regimental Command Sergeant Major, continued from page 3)

When you become an NCO, "take care of your soldiers." This means that you are responsible for someone besides yourself. You will learn when to say yes and when to say no. Respect your soldiers and listen to what they have to say. Your soldiers are a reflection of you. Without them, you cannot succeed. Just as important, take care of your family. Find the balance.

As your RCSM, I want to continue to improve the communication with the units in the field and the soldiers and civilians throughout the chemical community, support the heritage of the Corps, be a role model to all, share the great work we do as chemical soldiers, and improve identified weaknesses, where possible. I intend to share DA's vision of people, readiness, and transformation with everyone:

- People/soldiers, not equipment, are the centerpieces of our formation. We will take care of soldiers, civilians, and leaders. I always keep in mind that we have been trusted with our nation's greatest asset—its sons and daughters.
- Readiness is our mission. The Army has a non-negotiable contract with the American people to fight and win our nation's wars. We must maintain near-term training and readiness to ensure that we are prepared at all times to carry out our obligations. This is our daily mission; we will continue to work hard and improve our readiness. As NCOs and leaders, we are the standard bearers for readiness.
- Transformation is an imperative. Army Transformation represents the strategic transition we will have to undergo to shed our Cold-War designs to prepare ourselves for the crises and wars of the twenty-first century.

In closing, this is a very critical time for our country. We will encounter many challenges that we will conquer by working together. This includes everyone.

CML

The Chemical Corps and the Coast Guard— Interoperability in Action

By Lieutenant Commander Dennis E. Branson and Petty Officer Jaime Bigelow

As the first U.S. Coast Guard (USCG) officer assigned to the U.S. Army Chemical School, Fort Leonard Wood, Missouri, this past year has been an exceptional journey down paths less traveled for a U.S. Coast Guardsman. I am also becoming accustomed to being asked why the USCG would station a guardsman almost 500 miles from the nearest coast. The answer is simple. I represent the USCG's National Strike Force (NSF)—a specialized organization designed to facilitate preparedness and response to oil and hazardous-substance incidents to protect public health, welfare, and the environment.

Established in 1973 under the Federal Water Pollution Control Act of 1972 (primarily as a pollution response team), the NSF has evolved into a rapidly deployable resource for hazardous material (HAZMAT), petroleum, and biochemical response. Its extensive training and experience with a wide spectrum of cases has propelled the NSF into new areas of responsibilities (such as weapons of mass destruction/chemical, biological, radiological, and nuclear [WMD/CBRN] responses). By building a bond between the NSF and the Chemical Corps, we hope to become better equipped to meet the new responsibilities.

National Strike Force

The NSF consists of three regionally based "strike teams": the Atlantic Strike Team (AST) in Fort Dix, New Jersey; the Gulf Strike Team (GST) in Mobile, Alabama; and the Pacific Strike Team (PST) on Fort Hamilton in Novato, California. The NSF Coordination Center (NSFCC) in Elizabeth City, North Carolina, supports each of these teams and is also home to the Preparedness for Response Exercise Program (PREP) staff, the Public Information Assist Team (PIAT), and the National Inventory of Oil Spill Removal organizations. The NSF employs nearly 200 active-duty, civilian, and reserve USCG personnel.

The NSF is on call 24 hours a day, 7 days a week, and can deploy by land, sea, or air. During a recent House subcommittee hearing, the NSF Commander, Captain Scott Hartley, said:

"As the name implies, we are a national asset equipped and trained to conduct hazard assessment, source control, contamination reduction, release countermeasures, mitigation, decontamination, and response management activities, in support of a federal on-scene coordinator (FOSC), during oil and HAZMAT releases occurring here in the United States."

National Response System (NRS)

The NSF is an integral part of the existing NRS—a network of numerous federal, state, and local agencies that prepare for and respond to oil and hazardous substance releases, including chemical and biological terrorism incidents. The NRS activates immediately upon notification from the National Response Center or any agency involved in an incident.

Federal On-Scene Coordinator

The FOSC is the central figure in the NRS. Under the National Contingency Plan (NCP), the FOSC leads local preparedness efforts (in coordination with state and local agencies and private industry) and provides the federal lead during an actual response. Through the area committee process, response protocols are developed, joint priorities are established, and response resources are identified through an interagency collaborative process. In the event of an actual incident, the FOSC would establish a response organization using the Incident Command System (ICS) while incorporating federal, state, local, and private resources into a single response structure. As part of a Unified Command System (UCS), the USCG's FOSC works closely with local officials (for example, the cognizant fire chief) and representatives from the state to aggressively respond to an incident. If necessary, the FOSC has access to the Oil Spill Liability Trust Fund (for oil spills) or the Superfund (for HAZMAT releases).

Special Teams

Beyond the local response community, the FOSC also has access to special federal teams, which include the

NSF; the Environmental Protection Agency's (EPA's) emergency response team; the Department of Energy's radiological emergency response team; the National Oceanic and Atmospheric Administration's scientific support coordinators; and Department of Defense (DOD) resources, including the Navy's supervisor of salvage, to support a local response. For planning, coordination, and interoperability, the FOSC is supported by representatives from more than 15 federal agencies at the regional level through the regional response teams, which in turn have a mirror organization for national coordination, planning, policies, and interagency coordination known as the National Response Team (NRT). The EPA is the chair and the USCG is the vice chair of the NRT. All of these relationships, roles, capabilities, and responsibilities are extensively outlined in the NCP.

If the Federal Response Plan (FRP) is activated for an incident, the NRS folds into Emergency Support Function #10 (for HAZMATs) for further coordination of federal resources to assist the local municipalities and states. Upon activation of the FRP, the USCG also supports Emergency Support Function #1 (concerning transportation). The NSF activated to support Emergency Support Function #1 during the World Trade Center attacks when USCG assets coordinated and participated in the evacuation of more than one million people from lower Manhattan following the collapse of the Twin Towers.

All the NRS authorities are predesignated and preauthorized and are consistent with Presidential Decision Directives 39 and 62. These executive directives mandated that the federal government use existing systems for WMD rather than create new ones. Accordingly, the NRS should be a key component of the new Department of Homeland Security's Emergency Preparedness and Response Directorate.

NSF Capabilities and Emergent Skill Sets

Incident Management Organization Sustainability

As subject-matter experts in the ICS, NSF personnel provide highly trained, multicontingency incident management teams (12 to 16 people) to support OSCs for nationally significant incidents (for example, the World Trade Center) and/or locally significant incidents. Incident management support includes qualified personnel to support staffing of the emergency operations center, disaster field office (DFO), and regional operations center (ROC) during FRP responses and ICS technical expertise to support national and regional incident command teams. The inherent expertise and experience in working and training the ICS/UCS model is something that the Chemical School could gain immediate benefit from in the new cooperative interservice relationship.

Response and Consequence Management

During the World Trade Center cleanup and the Washington, D.C./Boca Raton, Flordia, biological remediation, members of the NSF proved they have the technical expertise and specialized response skills necessary to support OSCs from the earliest "assessment phase" through disposal and case closure. NSF teams possess equipment not readily available in the private or public sector (for example, stainless steel HAZMAT transfer pumps and high-capacity oil pumps, new oil-skimming systems or containment boom which industry now has an adequate inventory). Other response and on-scene support capabilities include—

- HAZMAT teams that provide oil/HAZMAT source control, bulk liquid lightering, environmental assessment, and removal/oversight in a hazardous-atmosphere environment. Currently, the NSF has three Level A teams with the ability to conduct Occupational Safety and Health Administration-compliant Level A and B entries. Also, efforts are now underway to expand the current fielding strength for additional entry teams.
- Oil response teams with the capability to support bulk oil removal operations. The NSF currently has three Level B/C teams (environmental assessment team, communications group, and logistics group).

CWO Leon, Atlantic Strike Team member, near Ground Zero of the World Trade Center, September 2001

CML

- Incident management teams whose knowledge and experience include ICS positions throughout the continuum of ICS staffing for FRP responses. They have a limited ability to support OSCs during consequence management operations under the FRP and NCP responses and to support USCG incident commanders during non-NCP/FRP response operations.
- Public information assist teams made up of specially trained personnel who provide mobile crisis media relations and crisis communications assistance.
- Environmental assessment teams that provide technical expertise in air monitoring; special-monitoring, applied-response technology sampling; and shoreline assessment evaluation.
- Removal oversight teams that monitor material removal operations according to the FRP mission assignment or direction from the OSC.

Interoperability

A key strength that has clearly contributed to the success of the NSF is that the teams are trained, manned, and equipped so the personnel on each team are essentially interchangeable. On virtually every major event in which a strike team deploys, personnel from the other teams come in to assist and augment operations. Everybody assigned to a team is sent to the annual NSF training drawdown (affectionately referred to as NSF "boot camp") that is held in the late summer/early fall. Other training opportunities are offered jointly so training is consistent and the teams remain interoperable. Looking to the future, the NSF and the Office of Marine Safety Response are leading a multiagency review of the NRS's special teams to enhance their interoperability. The Federal Bureau of Investigation's (FBI's) HAZMAT Response Unit, the Federal Emergency Management Agency, the Office of Homeland Security, and the Centers for Disease Control have accepted invitations to participate. This review will—

- Assess the special teams' individual and collective response assets and capabilities.
- Project the role the teams will play in future operations.
- Identify gaps that may currently exist and a strategy for filling in those gaps.

Internal Training and Professional Development

Through the formal relationship bridge provided by the USCG liaison position, the NSF now has an on-the-ground "conduit" into DOD training and professional development. This information bridge has already yielded results as evidenced in the just-in-time training conducted in January 2002. (See inset article, "The Way Ahead Is A Two-Way Street.") The NSF is capable of providing limited technical training to USCG and other NRT-member agencies in support of preparedness and consequence management activities, specifically in relation to the ICS.

Exercise Coordination

The NSF facilitates the planning, coordination, execution, and participation of players in response-preparedness exercises to strengthen local, state, federal, and industrial coordination (about six to eight exercises per year). For years, the focus of these drills, conducted by the NSF coordination center's PREP staff, has been on oil and accidental HAZMAT spills/releases. With the new threat environment, the need for multiagency WMD exercises (see inset article, "Port Rio Grande," page 8) is another excellent example of how the NSF can partner with the organic exercise capabilities and contacts.

Conclusion

Many paradigms have clearly shifted within the NSF and federal response community as a whole. Overall, the NSF strike teams have made dramatic leaps forward in adding to their response capabilities as proven at the World Trade Center cleanup and during the biological remediation

The Way Ahead Is A Two-Way Street

In the wake of the 11 September attacks (and the resultant high-threat environment), the USCG has an even greater need to partner with its sister services within DOD, especially in the WMD/CBRN arena. The corporate resources and joint environment of the Chemical School and the U.S. Army Maneuver Support Center (MANSCEN) at Fort Leonard Wood affords the USCG the opportunity to interface and exchange information regarding WMD/CBRN and consequence management with each of the services. Not only can the USCG benefit from the equipment, training, and doctrinal resources, but it can do so in a highly cost-effective manner (for example, low, local per diem; lodging; and airfares). From the USCG's perspective, our forces could be involved in a WMD or NBC event in a variety of scenarios, primarily under our mission as part of the FRP, but also in executing defense operations and port security. The USCG has traditionally had outstanding response capabilities to address toxic industrial chemicals through the NSTs, but it must be understood that military chemical and biological agents are different in a variety of ways and must be addressed as such. Under the continually emerging National Security Strategy, it will become even more critical for the USCG to interface with the joint services and participate in a like manner to exchange information and coordinate responses to accomplish its goals.

incidents in Boca Raton and Washington. Despite these advances, there are clearly many hurdles ahead. The critical (and most likely immediate) WMD/CBRN shortfall would appear to be in the training arena. As the primary training resource for all DOD NBC personnel, the Chemical School, in conjunction with MANSCEN, has the capability of developing programs of instruction for training the NSF and other team USCG personnel. In January 2002, MANSCEN's Directorate of Training Development worked directly with the 84th Chemical Battalion/Chemical School to conduct a just-in-time training course for more than 30 NSF personnel. The three-day training gave NSF response personnel hands-on experience with chemical, biological, and radiological equipment and classroom instruction on military agents and included informational briefings from the National Guard's 7th CST and the FBI. "They have an expertise in hazardous material that we don't have," said BG Nilo, "and we have expertise in warfare agents that they don't have."

BG Nilo further expressed that the USCG already knew how to handle spills involving industrial chemicals. "They work with these materials all the time in ports," Nilo said. "They're already well-grounded, more so than many of our young Army students just starting out."

For more information on the NSF, please visit our Web site at *www.uscg.mil/hq/nsfcc/nsfweb/*

Lieutenant Commander Branson is the Coast Guard liaison officer to the U.S. Army Chemical School. He has more than 13 years experience in the marine safety field.

Petty Officer Bigelow is a public affairs specialist with the Public Assistance and Information Team in Elizabeth City, North Carolina.

Port Rio Grande

It looked like a scene from a Hollywood movie as emergency responders worked to curb the effects of a simulated chemical terrorist attack during a drill on USCG Island, Alameda, California. The joint service exercise, dubbed "Port Rio Grande," was sponsored by the USCG Integrated Support Command (ISC) Alameda and was one of the largest WMD drills ever held on a USCG installation. Participating units included the ISC Alameda, USCG Cutter *Munro*, the PST, Training Centers Yorktown and Petaluma, Western Region Auxiliary, USCG Investigative Service, and staff from the Pacific Area and Eleventh District. One thing that made the exercise unique was the involvement of DOD assets from the U.S. Army's 464th Chemical Brigade and the California National Guard's 9th Civil Support Team (CST). Delegates from the FBI, EPA, Red Cross, Alameda City Fire Department, and Alameda County HAZMAT represented federal and local agencies.

About 300 personnel participated in Port Rio Grande, which had been in the works for more than three months. Lieutenant Commander Dennis Branson, the exercise director and WMD liaison to the Chemical School, explained, "Our main exercise objective was to provide a shipboard environment to test agency interoperability in responding to a WMD attack." Petty Officer First Class Martha Sturm, an ISC participant, said that the exercise provided a great learning opportunity. She added, "This is all new to us, but we need to be aware of situations like this and learn how to handle them." In addition to their roles as first responders, ISC personnel operated the command and control of the incident and provided security as the CG Cutter *Munro* was "hit" with a simulated nerve gas explosion. Immediately after the incident onboard the *Munro*, a second scenario erupted involving a toxic industrial chemical device in a building on the island. Throughout both events, ISC personnel also stood by with their own organic mass decontamination and medical-treatment equipment as back up to the responding DOD/USCG decontamination and medical teams caring for the simulated casualties. As the island was sealed off and the terrorists (played by team USCG personnel) were taken out by ISC force protection personnel, responders from the 464th, 9th CST, and PST moved in to identify the agents, bring out the "victims," and perform decontamination/medical care. All this was accomplished under the direction of the incident commander, Captain Jim Hass, commanding officer of ISC Alameda. "This was new ground for many Coast Guard men and women, as the Coast Guard works on how to best address and respond to the nation's WMD threat," concluded Hass. The exercise, which used the ICS, provided valuable insight into each agency's role and the capabilities that could be brought to the table. Brigadier General Patricia Nilo (commandant, U.S. Army Chemical School, Fort Leonard Wood) summed up her observations of the day's events. "We're in kind of the crawling phase with all this. The only way you get better is to practice at it." Even though Port Rio Grande yielded important insights, honed skills, and improved doctrine, the nation's road to adequate WMD response is still a long one.

Note: *This article was written in April 2002 and does not reflect events which have occurred since that time.*

The Chemical Corps and Its Emerging Role in Homeland Security

By Lieutenant Colonel Jon Pool

The tragic reality of terrorism has brutally shown our nation that we no longer live in a secure world. The U.S. Army Chemical Corps has insistently voiced the possibility of chemical, biological, radiological, and nuclear (CBRN) threats to the homeland for some time now. Unfortunately, the recent events within our homeland are now making our voices heard. As our nation and the Army continue to look to the future, the Chemical Corps must continue to be a key and essential player in Army Transformation.

The U.S. Army Chemical School (USACMLS) was and is the Department of Defense (DOD) nuclear, biological, and chemical (NBC) focal point for training and doctrine. The school is moving toward becoming the DOD CBRN full-spectrum defense and response center of excellence. To this end, USACMLS would become the nation's recognized leader in CBRN responder training and development of doctrine, training methods, organizational structure, and equipment requirements.

The Army's role in homeland security (HLS) is still being defined. However, USACMLS is proactively moving toward a full-spectrum Chemical Corps that can respond to threats against our national security both on the battlefield and within the homeland. This includes a full spectrum of protection for U.S. forces that Brigadier General (BG) Patricia L. Nilo, commandant, USACMLS, calls "fort-to-port" support.

The idea of full spectrum is a must for the future architecture of the Chemical Corps. The current size of the Corps does not allow for dedicated troops to support a homeland defense role. The Army's role in supporting other federal agencies in defense of our homeland will present much of the same dilemmas faced on the modern battlefield. The Chemical Corps's vision of full spectrum can be seen in Figure 1.

The modernization of the Chemical Corps cannot be just a restructuring of current assets; it must be a complete redesign of the Corps. We must look at concepts that ask the following questions: Do we incorporate hazardous-material (HAZMAT) training into the program of instruction for all chemical soldiers? Do we go to structured battalions with numbered companies and a robust battalion support section? Do we give reconnaissance companies their own organic decontamination? Despite the hardships of such a restructure, we must continue advancing or face becoming irrelevant to the Army and our nation.

Vigilant Warriors 2002

In April 2002, USACMLS participated in Vigilant Warriors 2002 (Army Transformation War Game) at

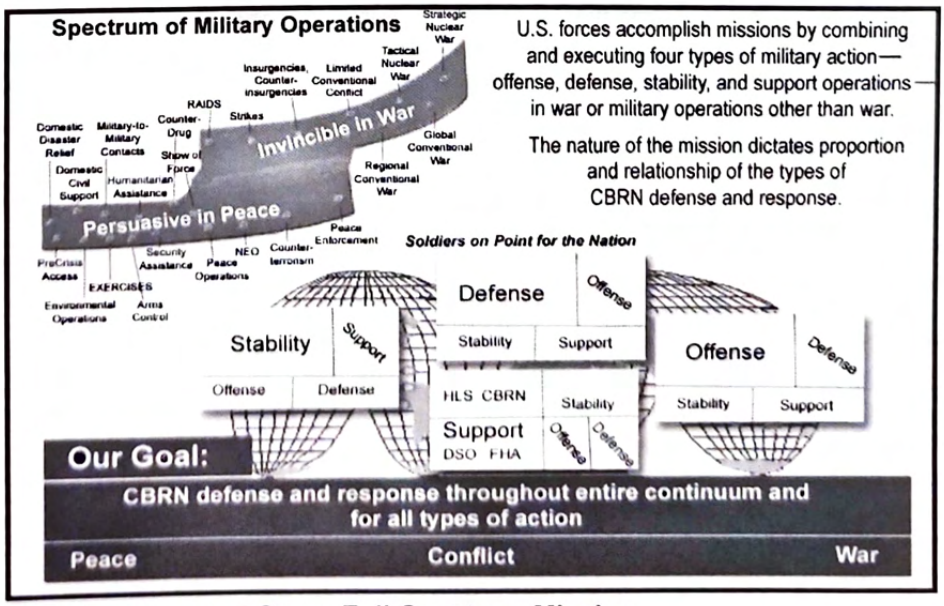


Figure 1. Chemical Corps Full-Spectrum Mission

the Army War College. Past Army transformation war games focused on two major theater scenarios. However, this year, a third scenario was added—HLS. The objectives of Vigilant Warrior 2002 were to—

1) Inform senior leaders of future conflicts in the context of multiple crises; demonstrate the strategic contribution of the Objective Force.
2) Illustrate the need to maintain a strategically responsive, full-spectrum joint force.
3) Recommend force projection and sustainment concepts and capabilities suitable for a multiple-crises, global environment.
4) Refine strategic theater, operational, and tactical concepts and capabilities in a joint and combined context.
5) Examine command and control/leadership and campaign planning challenges in the context of a multiple-crises, global environment.
6) Explore Army capabilities, roles, missions, and organization for HLS.
7) Examine the role of the Army strategic Reserve and the mobilization base.

The sixth Objective has particular relevance for the nation and our Corps. During exercise Vigilant Warriors, I was a member of the HLS panel. The panel was comprised of representatives from the U.S. Army Training and Doctrine Command (TRADOC) schools of the various branches of the Army, Department of the Army staff, Office of the Chief of the Army Reserve, the National Guard (NG) Bureau, sister services including the Coast Guard, a former ambassador, and a former FBI special agent-in-charge. The panel was chaired by MG Anders Aadland, then commander of the U.S. Army Maneuver Support Center, and supported by BG Edgar Stanton, commander of the U.S. Army Soldier Support Institute, and BG Edwin Roberts, deputy commanding general/Army National Guard, Headquarters TRADOC.

Vigilant Warriors 2002 started with the Army deploying to various conflicts around the world. From a HLS standpoint, the panel had to address the needs of the Army to support both deployment and HLS missions. The initial situation, set in the year 2019, presented to the HLS panel was—

- Worldwide crises requiring Reserve Component (RC) call-up, Civil Reserve Air Fleet/Voluntary Intermodal Sealift Agreement activation, mobilization base ramp-up, and placing significant demands on the U.S. industrial base.
- Viable threats against critical infrastructure terrorists, criminals, and others.
- DOD being responsible for defending the United States against land, air, and sea attacks.
- DOD augmenting other U.S. government elements for infrastructure security and support to civil authorities.

Mission End State

A strategy for protecting the U.S. homeland is to deter aggression and, if deterrence fails, to defend against attacks by responding rapidly to minimize effects and by maintaining essential capabilities.

During the month before the attack, a smaller representative group met at a war game staff exercise (STAFFEX) to set a starting point for the exercise. We did three things during the STAFFEX that are important to note. The first was to decide to play the current concept for Northern Command (NORTHCOM). This unified command was to have DOD responsibility for support to HLS. While the current concept for NORTHCOM does not show assigned forces, the game allocated forces at the start of the exercise. Those forces caused considerable discussion and included the following chemical forces:

- Three chemical brigades—one as a chemical command in direct support to NORTHCOM and two as regional response commands dividing the country into east and west regions along the same lines as the current continental U.S. Armies (First and Fifth Army).
- Ten chemical battalions to provide chemical response capabilities within the ten federal regions; eight CBRN rapid-response teams (RRTs) (new Chemical Force Structure, TAA 09) to provide regional response to military installations.
- A chemical biological (CB) RRT to provide technical medical and nonmedical advice to federal and state agencies.

The decision to designate certain units as HLS units was not without argument. Tasking the NG in part or parcel with the HLS mission was not without a majority of opponents. The most important question addressed command and control of the NG in support of HLS. NORTHCOM would seem the likely headquarters, but should the NG be activated or remain in Title 32 status to facilitate possible missions of a law enforcement nature? The only prevailing view was that a dual headquarters arrangement (NORTHCOM and a state adjutant general) would not be a functional working relationship, especially if the event was outside the geographic location of the state.

The second decision was to play an office of HLS. This cabinet-level

office managed the HLS interagency process. The office controlled the Coast Guard, Immigration and Naturalization Service, Border Patrol, Customs Service, Critical Infrastructure Assurance Office, National Domestic Preparedness Office, National Intelligence Fusion Center, and other HLS offices. The model was Senate Bill-S 1534 IS, Department of Homeland Security Act, introduced by Senators Lieberman and Specter.

The third decision was to play the suggested Army TAA 09 Chemical Force Structure. This force structure would be the full-spectrum concept and would include the three chemical brigades for HLS. These three brigades would be full spectrum and capable of contributing to the war fight, if called on. The structure of the full-spectrum brigade will be discussed later.

War Game Issues/Insights

During the war game, the HLS team addressed scenarios that included threats to the infrastructure, cyber attacks, numerous attacks involving explosives, and one biological attack. These scenarios raised several issues and insights that the HLS panel had sent to a senior seminar group for discussion. Several of these issues/insights are important to the Army's support of HLS and the Chemical Corps's future concept.

Currently, all federal agencies are responsible for protecting their critical infrastructure. However, there are thousands of facilities that can be listed as critical infrastructure for the United States. It became very evident to the group that DOD currently would be called on to assist in the protection of this infrastructure. The problem was that even with divisions of troops, only hundreds of structures could be protected. The group identified a need for prioritizing critical infrastructure and the need for federal agencies to look at a surge capability, possibly contracted, to protect this infrastructure.

When terrorist events unfolded in the game, it was evident that governors would call on their NG for assistance. As the game expanded and RC (U.S. Army Reserve and NG) units were mobilized for support of the overseas conflicts, high-demand, low-density specialties (particularly medical, CBRN response, and military police) were soon an issue, not only because they were not available within the military or to the governors, but because they were also taken from their corresponding jobs within the civilian community. This could be an issue for the HLS chemical brigades if they are all in the RC. If they are in the NG, then the dual command and control issue is once again raised.

Linked, widescale terrorist attacks against the homeland prompted requests for military assistance. A military presence was desired to reassure the public and deter terrorists. The *posse comitatus* law was an issue. The group suggested that the President should issue an exemption of *posse comitatus* (which normally prevents federal troops from enforcing civilian domestic laws). The exemption can be issued in the event states are no longer capable (or willing) to protect their citizens. One insight was that prior agreement by executive and congressional leaders where circumstances might justify exemption, and possibly even some legal changes, would facilitate military and civilian planning and execution.

The issue was raised that a review of the desired Army end strength must take place if the Army is to be a major supporter of HLS. Vigilant Warriors 2002 resulted in partial mobilization of the RC, but still resulted in a shortage of personnel to support all missions worldwide. A valid concern was that the U.S. population would find homeland protection more important than foreign peacekeeping abroad despite our commitments to other countries. The question will only be answered with an agreed upon definition of the Army's role in HLS.

In *Foreign Affairs,* volume 81, no. 3, Secretary of Defense Donald H. Rumsfeld states, "The Department of Defense has known for some time that it does not have...enough chemical and biological defense units.... But in spite of these shortages, the department postponed the needed investments, while continuing to fund what were, in retrospect, less valuable programs. That needs to change." The Chemical Corps's strength played in Vigilant Warriors 2002 was about 6,000 more chemical troops than currently exist.

Future Chemical Corps Structure

The concept of the Chemical Corps used during the war game was a full-spectrum chemical brigade. This concept brigade will have the forces to conduct its mission in any environment. Technology will be a cornerstone of the creation of these units. Figures 2 and 3 (page 12) are conceptual designs of the full-spectrum brigade and battalion.

A new chemical force structure for TAA 09 used in Vigilant Warriors was the CBRN-RRT. These 26-soldier teams will be pre-positioned or deployed to support/augment the installation's response to a CBRN attack. TRADOC has approved the operational and organizational (O&O) concept of the unit (see Figure 4, page 12), which will have the necessary equipment to respond to all four hazards, to include HAZMATs such as toxic industrial chemicals and materials. The specific equipment will be technology-driven. An Army special medical-augmentation response team would assist the CBRN-RRT. These teams already exist at the Army regional medical centers.

The other chemical unit allocated to NORTHCOM was the CB-RRT. It is a TDA organization the Army created in 1998, as directed by Public Law 104-201. The 18 soldiers with

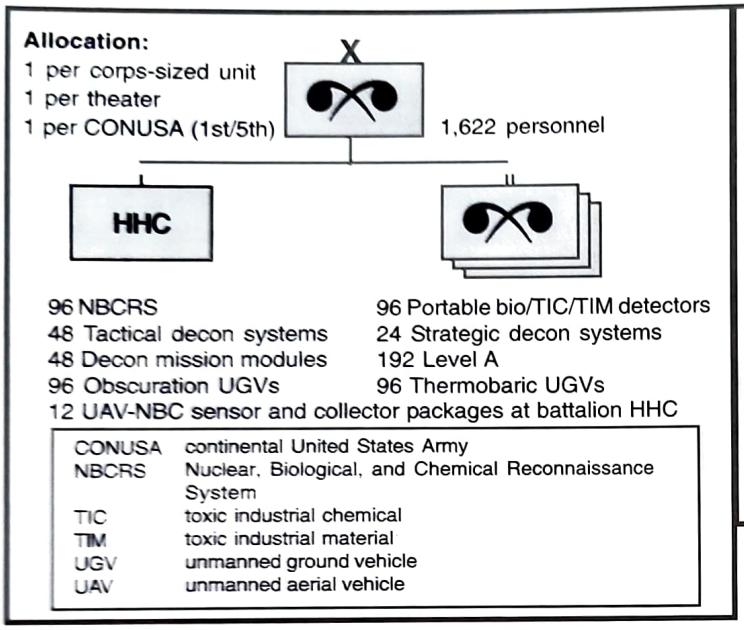


Figure 2. Draft Proposal for a Full-Spectrum Brigade

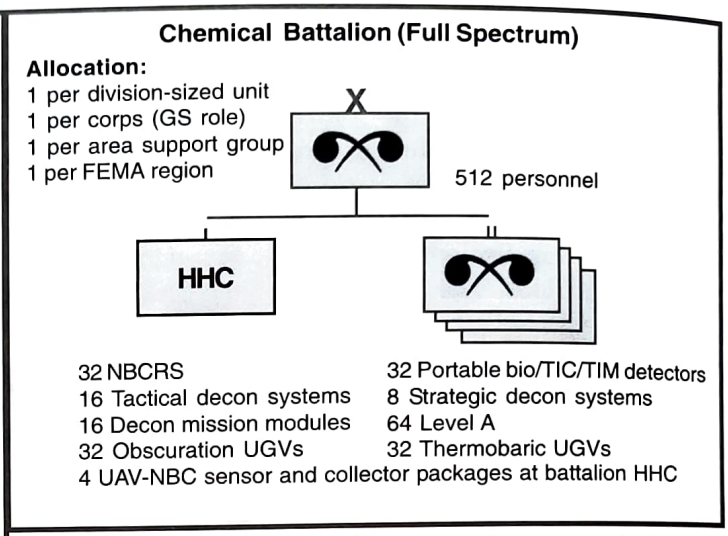


Figure 3. Draft Proposal for a Full-Spectrum Battalion

civilian and contractor augmentation have standing memorandums of understanding and memorandums of agreement with Army and Navy organizations to augment the staff of the CB-RRT based on deployment needs. The mission of the CB-RRT is, on order, to deploy and establish a robust and integrated capability to coordinate and synchronize DOD's technical assistance (medical and nonmedical) to respond in both crisis and consequence management to a weapons of mass destruction incident or designated national security special event.

Conclusion

The U.S. Army Chemical Corps is headed in the direction that it must take to be viable for the future. Our structure cannot be rigidly focused at one threat or one theater of operation or only on military warfare agents. Our Corps must be, in every sense, a full-spectrum corps. We must be able to conduct the missions that we might be asked to perform.

To that end, we need to be able to detect, identify, survey, monitor, mark, sample, warn/report, and hazard predict/model all forms of CBRN material that pose a threat on the battlespace or at home. We also need to be able to conduct decontamination of terrain; fixed sites; equipment; and personnel, to include casualties.

We must not wait on technology to begin our transformation. New technology may well determine the equipment of the future. However, the Corps must start to restructure with current technology, which may include items currently under development by program managers or commercial off-the-shelf items. The future of the Corps begins now!

Lieutenant Colonel Pool is the Total Force integrator for homeland security at the U.S. Army Chemical School, Fort Leonard Wood, Missouri. His previous assignments include brigade chemical officer, 420th Engineer Brigade; plans officer, 464th Chemical Brigade; adjutant, 490th Chemical Battalion; S3, 468th Chemical Battalion; and operations officer, 460th Chemical Brigade. LTC Pool has worked homeland security issues since 1997, including serving as an interagency city training coordinator for the Domestic Preparedness Program. He was the first operations officer for the "one-of-a-kind" CB-RRT, where he had numerous domestic and overseas deployments.

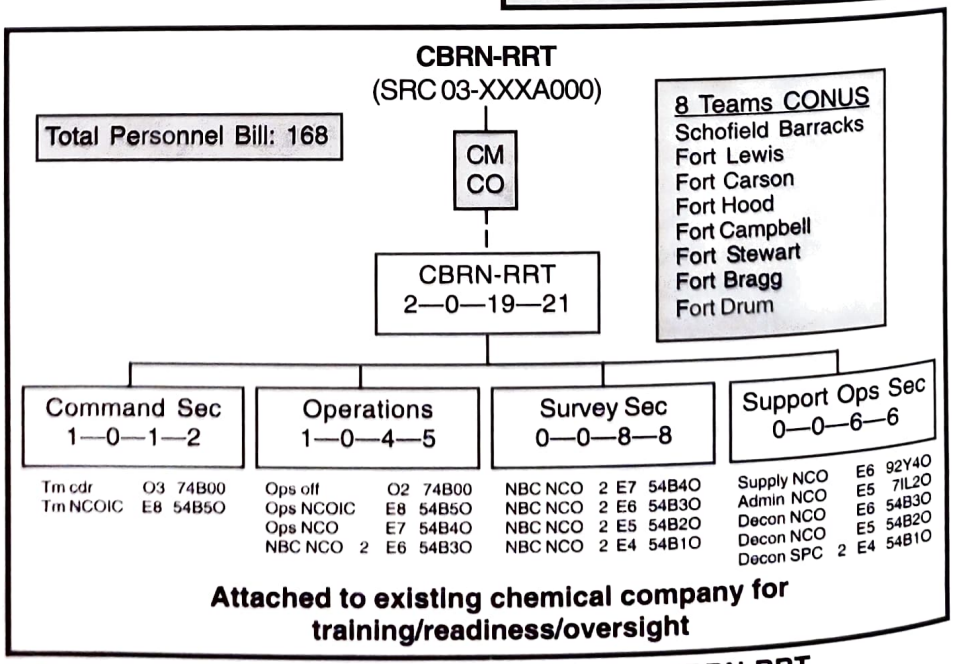


Figure 4. Force Protection O&O Concept for the CBRN-RRT

CML

The Stryker Nuclear, Biological, and Chemical Reconnaissance Vehicle (NBCRV)

Vanguard for NBC Transformation

By Lieutenant Colonel Bryan J. McVeigh

In wake of the 11 September 2001 terrorist attacks, the Army's ability to detect and identify NBC hazards became the center stage of Army Transformation. A key element in this transformation is the Army's Stryker Brigade Combat Team (SBCT) NBC reconnaissance force. The mission profile for the SBCT NBC forces is to—

- Sense the battlefield through reconnaissance and detection of radiological, chemical, biological, and toxic industrial chemicals/toxic industrial materials (TICs/TIMs) hazards.
- Shape the battlefield by developing and providing NBC situational awareness and contributing to the common operational picture specifically to NBC contamination and indicators of NBC use.
- Shield and sustain the forces by providing force protection and retaining dominant maneuver.

The NBCRV will transform the way we defend against NBC attacks in the future.

The NBCRV is one of 10 Stryker configurations. It is powered by a 350-horsepower diesel engine, has eight run-flat wheels with a central tire inflation system, and incorporates a vehicle height management system and a climate-control overpressure system. The NBCRV is equipped with a remote weapons station that supports the M2 .50-caliber machine gun, M6 smoke grenade launcher, and an integrated thermal weapons sight. It hosts the common Stryker communications suite that integrates the Single-Channel Ground-to-Air Radio System, the Enhanced Position Location Reporting System, the Force XXI Battle Command Brigade and Below System, and the Global Positioning System. The NBCRV provides 14.5-millimeter ballistic protection and is manned by a crew of four—a driver, a vehicle commander, and two surveyors.

As a system of systems, the NBCRV represents a significant improvement to existing NBC reconnaissance and surveillance systems within the Army. The NBCRV builds on the battle-proven Fox M93A1, integrating many of its proven capabilities and providing increased state-of-the-art technological capabilities to detect and identify NBC hazards. Legacy systems integrated into the NBCRV include the Double-Wheel Sampling System, the Automated Chemical Agent Alarm, the AN/UDR-2 Radiac, and the Fox "tail" assembly used to collect solid samples. The NBCRV also integrates several evolutionary NBC systems not found in the Army today. These systems include the—

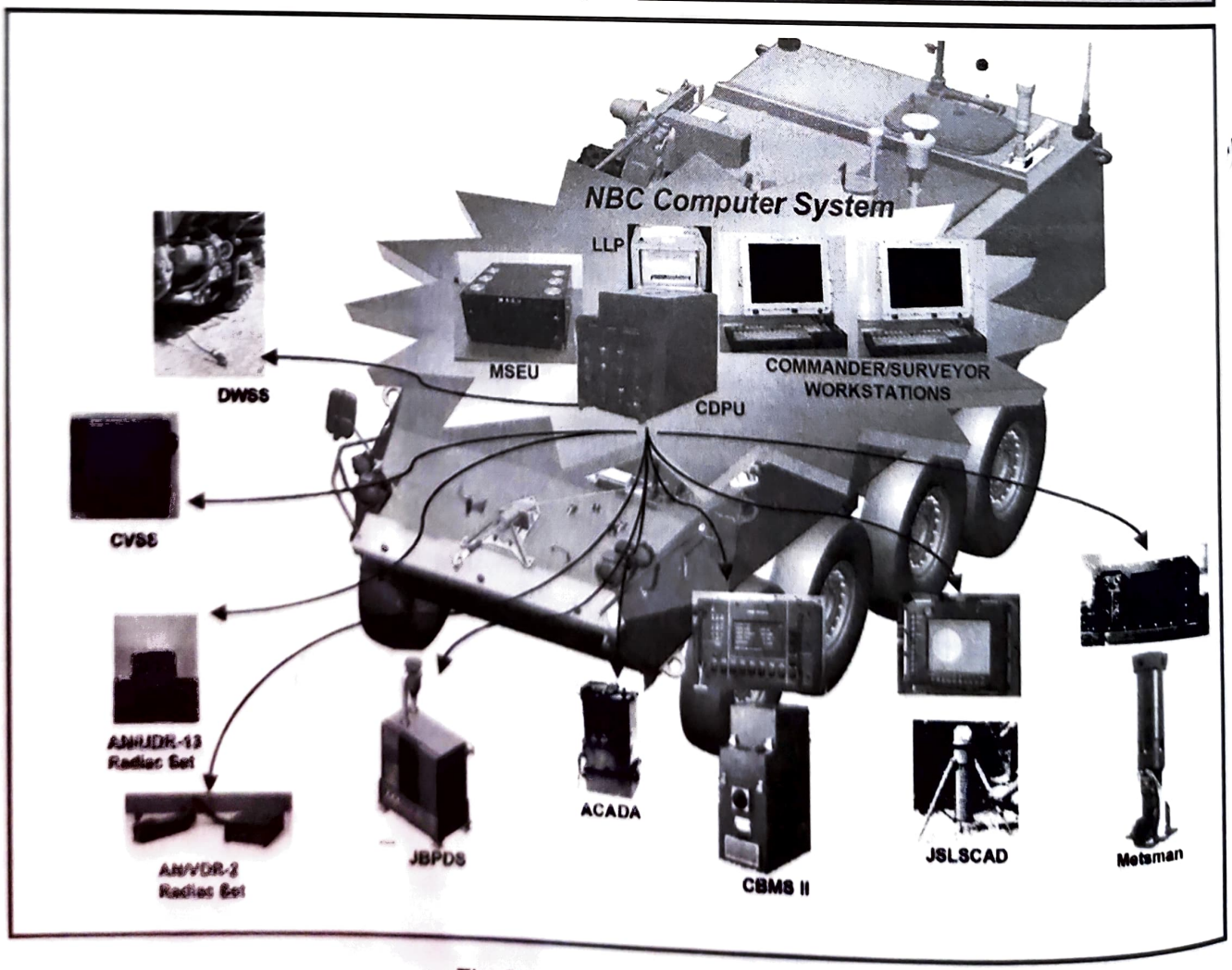
- Chemical Biological Mass Spectrometer (CBMS), Block II. The CBMS II will provide the capability to concurrently detect and identify chemical and biological agents and TICs/TIMs. This system identifies all significant chemical agents in either a liquid or vapor state.
- Joint Biological Point Detection System (JBPDS). The JBPDS will provide the capability to detect and identify biological warfare agents. It will also collect and store suspect samples for laboratory confirmation.
- Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD). The JSLSCAD will provide the capability to scan the surrounding atmosphere for chemical warfare agent vapors. It is a lightweight, passive, and fully automatic detection system that furnishes the NBCRV with on-the-move, 360-degree coverage from a variety of tactical and reconnaissance platforms at distances up to 5 kilometers while moving.
- Chemical Vapor Sampling System (CVSS). The CVSS will automatically capture chemical vapor samples for theater Army medical labs and the continental U.S. "Gold Seal" encounter verifications.
- Metsman Meteorological System. The Metsman will measure relative wind speed and direction, air temperature, barometric pressure, relative humidity, and ground temperatures.

- Nuclear, Biological, Chemical Sensor Processing Group (NBCSPG). The NBCSPG will provide both the vehicle commander and the primary surveyor a dedicated workstation which monitors and controls all NBC sensors and devices. The NBCSPG software will automate the NBC reconnaissance mission from detection through reporting. It will interface with the Joint Warning and Reporting Network for NBC reporting using the vehicle's command, control, communications, computers, intelligence, surveillance, and reconnaissance systems. It also will provide an electronic record of all NBC-mission data to support mission playback and permanent archival.

The development of the NBCRV is a cooperative effort between the product manager for the interim armored vehicle combat support and the product manager for NBC defense systems. Together they are responsible for the system of systems integration of the NBCRV individual sensors. The Army's Program Acquisition Strategy supports procurement of 42 NBCRVs during the next six years to support the six SBCTs and the training base. The Army is scheduled to accept the first of four developmental NBCRVs in April 2003. The Army Test and Evaluation Command will conduct production qualification testing on these platforms ensuring that they meet the criteria to enter low-rate initial production, demonstrate effective integration of the sensor suite, and show the ability to maintain effective overpressure. The 2d Interim Combat Regiment (2ICR) is the first unit scheduled to field the NBCRV in May 2005.

The NBCRV will provide the Army with a system of systems that will effectively blend proven legacy systems and state-of-the-art technological capabilities to detect and identify NBC hazards. As an integral part of the Stryker family of vehicles, the NBCRV will provide an essential foundation for the Army's Transformation Campaign Plan to the Objective Force.

Lieutenant Colonel McVeigh is currently serving as the product manager for interim armored vehicle combat support. He holds a master's in systems acquisition management from the Naval Postgraduate School and is a graduate of the Command and General Staff College.



The Stryker's sensing systems

The Chemical Officer's Critical Role in the Targeting Process

By Major Pete Lofy

The "targeting process" may seem like just a means of destroying an enemy target. However, if you ask the intelligence officer (G2/S2), he or she knows it's much more. The targeting process, or targeting, according to FM 101-5-1, *Operational Terms and Graphics*, is "the analysis of enemy situations relative to the commander's mission objectives, and capabilities at the commander's disposal, to identify and nominate specific vulnerabilities that, if exploited, will accomplish the commander's purpose...."

The staff chemical officer's (ChemO's) piece of the targeting process entails examining enemy courses of action (COAs) and friendly vulnerabilities to nuclear, biological, and chemical (NBC) attacks to identify areas of interest. The staff, including you, the ChemO, will use the results of the targeting and intelligence preparation of the battlefield (IPB) process to help analyze friendly COAs during the military decision-making process (MDMP). (See Captain John F. Fennell's article in the February 2002 issue of *CML Review*.) For the ChemO, the results of the targeting process will help focus the NBC reconnaissance, decontamination, and smoke efforts for the commander. The ChemO's ability to become part of this process (at all echelons) could make or break a unit on the battlefield.

In this article, I will explain the targeting process from the perspective of the ChemO and provide techniques for the officer to become an integral part of this critical process. Even though much of this article deals with the MDMP, I will focus on the aspects of targeting as it falls within the framework of the MDMP.

FM 6-20-10, *Tactics, Techniques, and Procedures for the Targeting Process*, describes targeting as a "...complex and multidisciplined effort that requires coordinated interaction among many groups. These groups working together are referred to as the targeting team and include, but are not limited to, the fire support, intelligence, operations, and plans cells." This manual goes on to say that targeting "...must focus assets on enemy capabilities that could interfere with the achievement of friendly objectives."

Analyzing Intelligence Information

Though the ChemO and NBC-defense assets are not mentioned here specifically, the input of NBC personnel and factors into this process is vital—not only to the mission of destroying the enemy but also to the mission of surviving the conditions of the battlefield. FMs 101-5-1 and 6-20-10 address mainly destroying enemy targets, once identified. The portion of the targeting process the ChemO is concerned with comes within the framework of the IPB and collection management process, as described in FM 34-130, *Intelligence Preparation of the Battlefield.*

FM 34-130 (pages 1-5, 9) describes the targeting process as it applies to target identification and collection management. The word "target" is not necessarily (for the ChemO's purpose) something to be destroyed, but rather it is something or some area to be observed and reported on. The presence or lack of a target will help drive the commander's decision-making process. The result of the targeting process is the election of named areas of interest (NAIs). The ChemO can use these NAIs to focus NBC defense and smoke operations.

Another by-product of the IPB and targeting process is the collection plan. This plan assigns NAIs to specific units for observation. These NAIs are monitored and reported on as instructed in the reconnaissance and security (R&S) plan.

A more focused guide to the IPB process, for the ChemO, is FM 3-14, *Nuclear, Biological, and Chemical (NBC) Vulnerability Analysis*. Chapter 1 further defines the ChemO's role in IPB, and it discusses NAIs and IPB products.

Thus far, I have focused on the doctrinal basis of the targeting process. Now I will show the targeting process using a scenario. This scenario will explore targeting from the ChemO's perspective and give some techniques on how to get you, the ChemO, involved in the overall MDMP.

At 0200 on 15 December, an NCO awakes you from a deep slumber and tells you the S2 is holding a targeting team meeting and the executive officer (XO) wants you there. The results of this meeting will support the defensive mission your unit is conducting in two days. As you walk into the tactical operations center (TOC) to the S2's area, you notice the S2, the fire support officer (FSO), and the supporting engineer officer are already there.

The S2 gives the targeting cell a quick update on the enemy situation and orients the group to the map he's using to build the intelligence picture. He elaborates on possible threat COAs. Then he identifies the NAIs that he's developed, based on some key terrain and road intersections. He says he thinks that these areas will be critical to the enemy's attack. His assistant is taking notes and assigns unit responsibility for NAIs, based on the location of the NAIs and the current array of friendly forces. This will become the basis for the collection or R&S plan. When the S2 completes his briefing, an engineer officer steps to the map and details current friendly mobility and countermobility operations and where he thinks the enemy will employ his mobility assets to defeat us. He then elects many of these areas for NAIs. This will ensure that someone is watching all of our obstacles and possible enemy breach points.

Now you give the group a quick update on the enemy's NBC capabilities. Putting yourself in the enemy's shoes, based on the S2's possible threat COAs, you visualize and vocalize where NBC strikes may occur. You know the disposition of friendly forces and basically how the unit will operate to defend the area. Both you and the S2 agree that for the enemy to be successful, he must locate and make the tank reserve ineffective. The enemy doesn't have to destroy the reserve, just take it out of the fight. You predict that he'll use persistent chemical agents on top of the reserve and along the reserve's ingress routes to neutralize the unit's combat effectiveness. You also surmise that the enemy may use nonpersistent agents along the front lines to disrupt our defensive synchronization.

Based on these assessments, you nominate several NAIs to be added to the list. You nominate critical road intersections along the reserve routes. You know that if these intersections get "slimed," the tankers will have to use other routes to support the defense. You also nominate the reserve assembly area and critical battle positions located forward. Finally, you nominate the unit's support area, knowing that any attack in or around that area will disrupt sustainment operations.

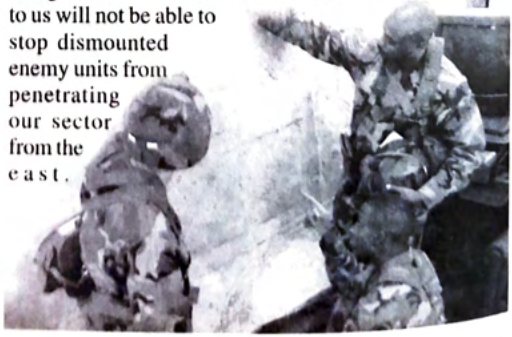
By the end of the meeting, the team has successfully identified and recorded the critical NAIs. The meeting breaks up and the staff officers go their separate ways. The S2 will use these critical NAIs to develop other IPB products, namely the event template. The FSO will take the NAIs (eventually targeted areas of interest [TAIs]) and begin developing artillery targets. Soon the staff will assemble to analyze friendly COAs, as proposed by the operations officer (S3). Your input to the IPB process and development of the NAIs and event template will be critical for this analysis.

Before the COA analysis meeting, you return to your area to war-game use of the NBC assets available to you. You verify the unit's task organization and that you have an NBC reconnaissance squad (Fox), a decontamination platoon, and a smoke platoon available for your unit's use. You will now use the NAIs identified at the targeting meeting to mission these units.

You start with the reconnaissance squad. Since no organic unit is near NAI 14 (possible persistent chemical strike), you place the Foxes where they can observe and report on this NAI. This also allows them the freedom of maneuver to conduct reconnaissance missions elsewhere in your area of operations. You will soon develop specific instructions for them and place those instructions in the R&S plan and the operations order (OPORD).

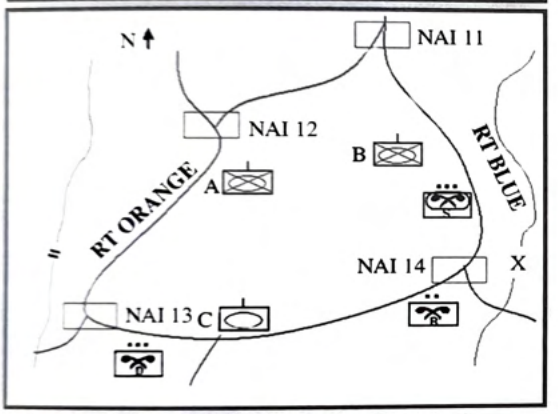
Since the three most likely locations for a persistent chemical strike seem to be near or on the reserve, you decide to place the decontamination platoon near the locations. If the tank company is unable to have "eyes" on NAI 13, you could task the decontamination platoon to cover it. Your analysis of your COAs and war gaming should bring that out later. You will also mission them to establish decontamination sites and man-associated linkup locations. Specifically, you tell them to be prepared to conduct terrain decontamination at NAIs 13 and 14, the likely persistent strike locations (see figure).

Finally, you will task your smoke assets. The commander's guidance stated that we had to provide some force protection for resupply assets that will be using RT BLUE. He is concerned that the unit adjacent to us will not be able to stop dismounted enemy units from penetrating our sector from the east.



CML

R & S Plan (extract)			
NAI	Assigned	Monitor	Trigger
		T-72s	FSE
11	B Company	Low-detonation artillery strike	Possible nonpersistent chemical
12	A Company	Low-detonation artillery strike	Possible nonpersistent chemical
13	C Company	Low-detonation artillery strike	Possible persistent chemical
14	1/1/53 CM (Fox)	Low-detonation artillery strike	Possible persistent chemical



Example of an R & S plan and associated operational "sketch"

Using your assessment of the enemy's capabilities and knowing friendly unit dispositions, you begin to plan smoke targets along RT BLUE. You will write into the OPORD, in the NBC Annex, that the smoke platoon will smoke along RT BLUE, from 0.5 kilometer forward of NAI 14 to the north for 1 kilometer. Limiting the advance of the smoke will ensure that B Company is not hampered in its observation efforts.

Following the MDMP, you are ready to give your input to the OPORD. You use the NAIs to write specific instructions for the subunits, to include supporting NBC assets. When the NBC leaders arrive for the OPORD brief, you provide them copies of the operational graphics, the OPORD, and the R&S plan. You elaborate on their responsibilities, as described in the NBC Annex. Finally, you ask each element's leader to conduct reconnaissance of the area and return for a brief back. It's then that you will finalize the locations of the NBC units, the smoke plan, the locations of decontamination sites, etc.

Early in the morning on the day of the defensive battle, an artillery strike occurs on NAI 13. C Company (tank) reports the strike, as they were tasked in the R&S matrix with watching the area. The report states,"Several artillery rounds impacted, with little or no explosions. No one was near the intersection, so no damage was done to any friendly forces." This report goes to the TOC via the operations and intelligence (O&I) net. The S2, who operates that net, immediately summons you, the ChemO. "Hey, ChemO, what do you make of this?" You immediately recognize this as the anticipated persistent nerve-agent attack. You inform the battle captain of your analysis and the S2 concurs. You immediately inform your NCO to contact the supporting NBC units and tell them to send one Fox to NAI 13 to verify the attack. Though this is not how Foxes are doctrinally employed, you decide to accept some risk so that one Fox can still monitor NAI 14. You also instruct the NCO to tell the decontamination platoon to prepare a squad for terrain decontamination of NAI 13 and vehicle decontamination of one Fox and possibly more vehicles. At the same time, the battle captain is informing units of the possible strike and telling them to stay clear. An MP squad moves forward to assist with traffic control. The battle captain also declares RT BLUE the primary route for resupply and movement forward of the reserve.

Sometime after dawn, the remaining Fox reports another "low-detonation" strike at NAI 14. Your war gaming tells you that the enemy wouldn't slime both routes with persistent chemical (p-chem), as this would take routes away from his attack. You know that the enemy will use p-chem strikes to shape the battlefield and is not likely to attack through his own p-chem strike. You immediately move the remaining Fox (near NAI 14) forward to investigate. You also inform the smoke platoon and B Company that a possible nonpersistent strike has occurred to their rear and that they should go to mission-oriented protective posture (MOPP) 4 gear. The Fox vehicle at NAI 14 confirms traces of GB nerve agent, validating your assessment.

When the enemy hits your unit's battle positions at 0800, your battalion is ready for the fight. All units are back to MOPP2 gear, except the decontamination and reconnaissance units cleaning up the p-chem strike at NAI 13. RT ORANGE should be open for business in about two hours. Your planning and assessment have paid off. You were able to focus friendly NBC assets using the NAIs established during the targeting meeting. Their placement on the battlefield led to quick responses and minimal time at elevated MOPP levels. The unit's mission is a success, and the enemy is defeated in detail.

Does this scenario seem impractical? It shouldn't be. The ChemO [you] must be an integral part of the staff MDMP and targeting process. Missing out on the MDMP, specifically the targeting process, means missing out on the opportunity to aid the commander in identifying his or her vulnerabilities and focusing NBC assets to support success on the battlefield. Is it always possible for you to be present at the targeting meeting? No, but synchronizing your efforts with the S2 early in the MDMP will accomplish nearly the same task. The targeting process does not have to be a stand-alone process. It can be, and is, rolled up in the overall MDMP. Where/when in the MDMP targeting occurs is up to your staff and MDMP facilitator.

To summarize, you should lend your expertise in matters dealing with NBC operations during the early stages of the MDMP. Specifically, your input to the targeting process will aid the commander in identifying unit weaknesses and arraying friendly forces to compensate for those weaknesses. Your input to targeting should be—

- An assessment of the enemy's NBC capabilities.
- An assessment of friendly units' vulnerabilities to an NBC attack, based on the current array of forces.
- COAs for enemy use of NBC capabilities.
- Specific locations for the employment of enemy NBC weapons.
- A nomination of NAIs based on the previous four items.

Upon completion of the targeting process and during the analysis of friendly COAs, you should be able to—

- Anticipate enemy COAs.
- Task-organize and array friendly NBC defense assets (reconnaissance/decontamination/smoke) to counter the threat COA.
- Give missions (task and purpose) to the friendly NBC defense assets, using the developed NAIs and other IPB products (like the R&S plan and the event template) as a basis for the plan.

At the completion of the MDMP, the staff produces an OPORD (or in some cases an OPLAN). You should provide appropriate products of the MDMP to the supporting NBC defense assets. They should be, at a minimum the—

- OPORD, or at least critical portions thereof. The critical portions must include the mission, commander's intent, subordinate unit tasks, support, and NBC annex.
- Operations overlay, including NAIs and critical routes.
- R&S plan, if NBC assets are involved (may be part of the OPORD).
- NBC reconnaissance, decontamination, and smoke plan and associated overlays (if not in the NBC Annex already).

A critical note to make here is that nowhere have we discussed chemical NAIs. Only the NAIs of the supported unit exist. There is no need to burden the executor of the R&S plan (often a high-speed cavalry scout) with several sets of NAIs. Chemical NAIs will almost always become lost in the fog of war. To talk to the combat soldier, you must be on his or her "net."

You now have (if you didn't before) a basis for your place, as the ChemO, in the targeting process. How involved you get in the process is often up to you or your boss. You should now know how to use the products of targeting to focus the assets available to you and influence the battle. If you are having doubts about how you fit in, see the S2 and XO. They should get you started in the direction to becoming an integral part of the combat staff.

Major Lofy is the chemical plans officer for III (U.S.) Corps at Fort Hood, Texas. His previous assignments include squadron ChemO, 2/2 ACR, 3-4 CAV; regimental ChemO, 3d ACR; NBC reconnaissance platoon leader and company XO, 92d Chemical Company; and commander, 89th Chemical Company, 3d ACR. He served on the faculty of the Chemistry Department (United States Military Academy, West Point) after receiving his master's in physical/analytical chemistry from the University of Utah.

CML

CBRN Defense in the Objective Force:

Insights From Army Transformation War Game 2002

By Major Neal Dorroh

On 20 April 2002, approximately 600 personnel from across the Army and the Department of Defense assembled at Carlisle Barracks, Pennsylvania, to participate in Army Transformation War Game 2002. This year's war game focused on the Army's missions, tasks, and capabilities within a joint context in the year 2020. Participants were divided among four major working groups: Caspian Basin, Sumesia (fictional state), homeland security, and the rest of the world. This article provides insights gained from the Caspian Basin (see map) with regard to the Objective Force; chemical, biological, radiological, and nuclear (CBRN) defense; and their implications on doctrine organizations, training, materiel, leadership and education, personnel, and facilities (DOTMLPF).

Scenario: *In January 2020, a fictional state, Anfar, invades Azerbaijan to seize a number of oil fields and a pipeline. The Azeri government requests support from the United Nations (UN), which in turn passes a UN Security Council Resolution. This resolution authorizes the formation of a combined joint task force (CJTF). Despite technological advances, the United States still depends heavily on foreign oil. Therefore, the CJTF is formed around an American Army corps and Azeri forces. The Russians and Turks, though members of the coalition, are not contributing forces but have agreed to allow the United States to utilize their ports, railways, and other critical infrastructure. Iran, an ally of Anfar, is poised along the Azeri border to intervene if necessary.*

In February 2020, elements of an Iranian mechanized division, disguised as peacekeeping troops, cross the border into Azerbaijan. The 23d Armored Cavalry Regiment (ACR), conducting a screen along the Azeri-Iranian border, engages the Iranian division and forces the Iranians to withdraw. Several hours after the initial attack, soldiers from the 23d ACR begin complaining of flu-like symptoms—high fever, chills, and headaches. Other soldiers are vomiting and have diarrhea. At the same time, the Iranian government announces that Iranian soldiers along the Azeri-Iranian border are exhibiting symptoms consistent with a biological attack and accuses the CJTF of violating the Biological Weapons Convention (BWC).

At the end of the day, CJTF and threat representatives meet to discuss what really happened and to assess the results. On 6 February 2020 at 0300,

the Iranians released approximately 50 pounds of staphylococcal enterotoxin B (SEB) from two unmanned aerial vehicles loitering over the Azeri-Iranian border. SEB is an incapacitating toxin that has no human vaccine for treatment. Symptoms persist for three to ten days. The Iranians employed the toxin in their effort to break contact with the 23d ACR. The Iranians accused the CJTF of violating the BWC to shift blame, gain international support, and potentially disintegrate the coalition. Representatives from the CJTF and the threat assessed that the 23d ACR was degraded to 60 percent combat effectiveness for ten days, after which, the soldiers returned to duty.

Although the above scenario occurred during a war game, there are several insights that can be gained from the vignette. First, sensors will be just as important in 2020 as they are today. However, future sensors must be more capable than current sensors in the number and types of hazards they can detect, the time required to detect a hazard, and the ability to detect hazards from stand-off distances.

Additionally, sensors must be integrated into the future combat system (FCS) during the system's engineering process to effectively preserve combat power, sustain operational tempo, and minimize casualties. They cannot be added as an afterthought. Sensor integration not only contributes to effective warning and reporting, but it also ensures that hazard information is directly inputted into the common operational picture via the command, control, computers, communications, intelligence, surveillance, and reconnaissance system. As situational awareness increases, survivability increases as well.

Finally, sensors must be lightweight. The FCS is constrained by weight and cubic meters because of transporting requirements. Currently, the FCS is constrained to 20 short tons or less to be C-130 transportable, thus supporting the needs of the combatant commanders.

Also, individual and collective protection is vital to protecting the force. In the past, protection has exclusively focused on countering the effects of chemical warfare agents (for example, nerve, blister, and blood). However, chemical warfare agents represent only a small fraction of the potential hazards a soldier may face. Toxic industrial chemicals, radiological material, toxins, materiel-eating microbes, and naturally occurring diseases pose a threat to U.S. troops as well.

Filters are not the panacea for Objective Force CBRN survivability. Many chemical compounds (for example, ammonia) can defeat carbon-based filters. Some environments, particularly subterranean, are oxygen deficient. Therefore, a combination of filters, overpressure, and rebreathers is necessary to protect soldiers and preserve combat power.

Decontamination has always been a labor- and resource-intensive operation. In the Objective Force, decontamination must be multifunctional and user friendly. For example, a Legacy Force heavy decontamination platoon consists of 20 personnel and 10 vehicles. Despite its size, the platoon is designed to perform vehicle and equipment decontamination only, not personnel, casualty, terrain, or fixed site. Additionally, the platoon requires significant augmentation.

In the future, a decontamination unit must be capable of multiple decontamination missions with fewer personnel. Initially, this concept would require a materiel solution. However, this concept impacts all DOTMLPF domains. For example, in the past, personnel decontamination was a unit's responsibility; however, Objective Force units will be much leaner than their Cold War predecessors and may not be able to decontaminate themselves.

In conclusion, the principles of CBRN defense-contamination avoidance, protection, and decontamination have endured and will endure until the Objective Force is fielded. Regardless of which technologies are incorporated into the FCS, the requirement to detect hazards, protect soldiers, neutralize hazards, and maintain situational understanding will persist. The fielding of the Objective Force will not eliminate the unseen hazards that populate the battlespace but will drive the Chemical Corps and the Army to seek out and harness new technologies that are more effective and more efficient than today's capabilities.

Major Dorroh is the commander of A Company, 84th Chemical Battalion, Fort Leonard Wood, Missouri. He has served in numerous stateside and overseas assignments. Major Dorroh is a graduate of the Chemical Officer Basic and Advanced Courses, the Combined Arms and Services Staff School, the Defense Language Institute, and the Canadian Command and Staff College. He holds a bachelor's in biology from the University of North Alabama, Florence, Alabama, and a master's in West European studies from Indiana University, Bloomington, Indiana.

A New Decontamination Training Aid

By Ms. Jocelyn Morris and Mr. James M. Cress

The Maneuver Support Battle Lab (MSBL), working with the Edgewood Chemical Biological Center (ECBC), has been investigating the concept of an individual decontamination training aid to enhance the nuclear, biological, and chemical (NBC) survivability training of service members. Service members who have reacted to an NBC event are typically in mission-oriented protective posture (MOPP) gear. They are eager to reduce their MOPP status as soon as possible, and the individual skin decontamination kit is a tool that allows them to do it.

The services—Army, Navy, Air Force, and Marine Corps—use the M291 decontamination kit to decontaminate skin through physical removal, absorption, and neutralization of toxic agents. The *Soldier's Manual of Common Tasks* lists a step-by-step procedure for self-decontamination using the kit. This task, 031-503-1013 (Decontaminate Yourself and Individual Equipment Using Chemical Decontamination Kits), is taught in initial-entry training and is included in the annual sustainment training conducted by the unit.

The M291 was fielded without a training aid, so the operational kits are used for training. Recently, various units and training activities have expressed the desire for a kit to offset the need to use operational kits for training. The ECBC began a project to see if an effective training aid could be developed using safe, environmentally friendly materials. The contents of the training aid would have to be approved by the U.S. Food and Drug Administration (FDA), reasonably representative, and less expensive than the operational decontamination kit.

The ECBC developed the XM90 to solve this training-aid problem. This skin decontaminating simulation-training packet is packaged in blue packets and has "Training Aid" stamped on the packet to prevent it from being confused with the M291. The kit uses FDA-approved talc and charcoal, and service members find it better to train with than the black powder that is in the operational kit.

Dragon soldiers conduct simulated decontamination with prototype training kit.

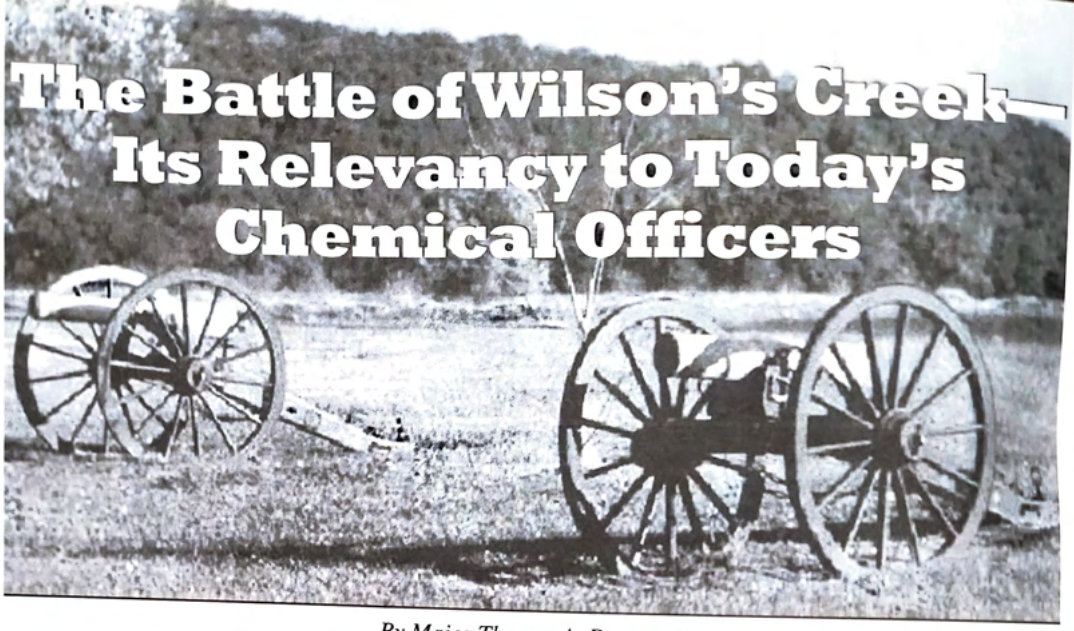
On 26 August 2002, the last in a series of limited objective experiments was conducted at Fort Leonard Wood, Missouri, on Range 290. The MSBL conducted comparison trials over three days with the soldiers alternating between the M291 and XM90 kits. Their comments included, "The XM90 is not as messy or abrasive as the M291 decon kit."

The M291 with the charcoal particulate material is essential if you get contaminated and you only have a few minutes to remove the toxic agents before they become life threatening. However, for training purposes—to learn how to don your MOPP gear mask and apply the decon kit contents to your hands, face, and neck—the XM90 can be used at half the cost to the units. Once approved, units will be able to order the training aids through unit supply.

Ms. Morris is a combat development experimentation analyst, Maneuver Support Battle Lab. She was previously a training specialist, Doctrine, Training, Leader Development, Organization, Materiel, and Soldiers Integration Branch, U.S. Army Chemical School, Fort Leonard Wood, Missouri.

Mr. Cress is a liaison officer from the Soldier, Biological, and Chemical Command, Natick Soldier Center, serving at the Maneuver Support Battle Lab. He previously worked as a project officer, Directorate of Combat Developments, U.S. Army Chemical School, Fort McClellan, Alabama.

The Battle of Wilson's Creek—Its Relevancy to Today's Chemical Officers



By Major Thomas A. Duncan II

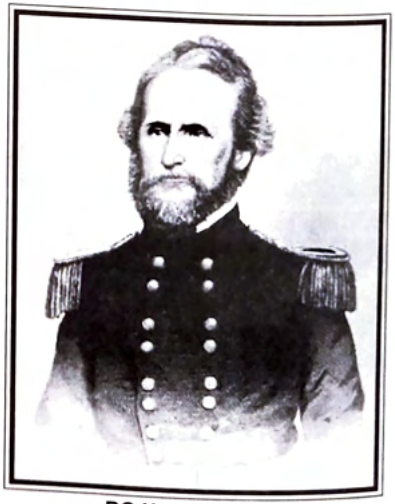
The days of staff rides to the Civil War battlefields of Chickamauga and Kennesaw Mountain are history for the Chemical Corps since its move from Fort McClellan, Alabama, to Fort Leonard Wood, Missouri. The question now is how can we achieve, in Missouri, the training value that a staff ride offers?

There are Civil War battlefields near Fort Leonard Wood that offer Chemical Corps officers the chance to study the art and science of warfare. Only Virginia and Tennessee had more Civil War battles, skirmishes, and raids than Missouri.[1] The Battle of Wilson's Creek (also known as the Battle of Oak Hills) is one of Missouri's most historically relevant battles. It was the second battle of the Civil War and was fought only two weeks after the first Battle of Bull Run (also known as the first Battle of Manassas). During this battle, the federal army lost 24 percent of its combat power (258 dead, 873 wounded, 186 missing or captured) while the southern forces had a 12 percent casualty rate (279 dead, 951 wounded).

Union Brigadier General (BG) Nathaniel Lyon was the first general to die in the Civil War. Five Union men were awarded the Medal of Honor. This battle played a significant role in Missouri remaining under Union control for the rest of the Civil War because it kept President Lincoln focused on maintaining control of the state. But the outcome of the battle is not the only thing that makes it relevant for soldiers to study. This article explains how the Battle of Wilson's Creek can be used as a tool to professionally develop officers on the strategic, operational, and tactical levels of war; elements of combat power; principles of war; tenets of Army operations; and battle command.

Strategic, Operational, and Tactical Levels of War

FM 3-0, *Operations*, defines the levels of war as "doctrinal perspectives that clarify the links between strategic objectives and tactical actions."[2] The Battle of Wilson's Creek was a direct result of the Union's leadership defining its strategic objectives and then refining them into operational and tactical actions. "Strategy is the art and science of developing and employing armed forces and other instruments of national power in a synchronized fashion to secure national or multinational objectives."[3]



BG Nathaniel Lyon

To answer how the national strategy relates to Wilson's Creek, we must examine why the state of Missouri was important in 1861.

One reason Missouri was strategically important was that the Mississippi and Missouri Rivers flowed through the center of the state and its eastern border. Control of the Mississippi was critical to Winfield Scott's Anaconda Plan. The plan was "a strategy by which the U.S. military chief [Scott] sought to slowly strangle the Confederacy by blockading, or otherwise dominating, the ocean and river ports."[4] If the Union controlled the state of Missouri, it would have a significant advantage in the struggle for control of the Mississippi River Valley. Seizing it would split the Confederacy in half.

Comparative areas of Northern and Southern states, circa 1861, showing the strategic position of Missouri.

Missouri was also relevant because of its production of corn (third in the nation), hemp (second in the nation), lead (first in the nation), livestock (second in the nation), and 2 million pounds of wool (annually).[5] Clearly, Missouri was a strategic location and a major source of the materials needed to fight a war. This led to operational and tactical actions taken by strategic planners on both sides in Missouri.

The operational level of war is defined as a major operation that is a "series of tactical actions (battles, engagements, strikes, and others) conducted by various combat forces of a single, or several services, coordinated in time and place to accomplish operational and sometimes strategic objectives in an operational area."[6]

In June 1861, both sides in the conflict began major operations that resulted in a series of battles as each sought to gain the advantage over the other. Claibourne Jackson, governor of Missouri, and Major General (MG) Sterling Price were the key leaders of Missourians with undeclared southern sympathies. BG Lyon's Union forces, moving from Saint Louis, forced Jackson and Price from the official seat of state power—the state capital at Jefferson City. Federal operations attempted to prevent Jackson's State Guard from joining reinforcements coming north from Texas, Louisiana, and Arkansas. These operations resulted in battles and engagements at Booneville, Carthage, Dug Springs, and Wilson's Creek.

Teaching our officers the strategic and operational reasoning behind the actions that led to Wilson's Creek is a fantastic example of how these thought processes shaped where and how battles are fought to achieve our national objectives.

"Tactics is the employment of units in combat."[7] Examining the tactics used during the Battle of Wilson's Creek allows us to develop an understanding of the fundamentals of the science and art of war. Chapter 4 of FM 3-0 begins with the following quote from Frederick the Great: "The art of war owns certain elements and fixed principles. We must acquire that theory and lodge it in our heads—otherwise, we will never get far." He understood that there are underlying tenets and principles in warfare and a leader must study and understand these concepts to be successful on future battlefields.

Elements of Combat Power

"Maneuver, firepower, information, protection, and leadership comprise the elements of combat power."[8] "Information enhances leadership and magnifies the effects of maneuver, firepower, and protection."[9] I will examine the element of information to demonstrate how it can be applied during a Wilson's Creek staff ride.

On 9 August 1861, Confederate BG McCulloch, southern commander at Wilson's Creek, received inaccurate information, which led him to make decisions that put his army at risk. He was told that BG Lyon was getting ready to abandon the city of Springfield. That information combined with the possibility of a storm caused McCulloch to decide to stay at his campsite on the creek instead of advancing to Springfield that night.[10]

At the same time, BG Lyon received accurate information from his scouts. His patrol of federal Dragoons encountered an enemy element within 5 miles of Springfield. The patrol not only confirmed the approximate location of the confederate army, but it also determined that members of the element it encountered were from a Texas unit. This confirmed the presence of the Missouri State Guard and reinforced the suspicion that elements from Texas, Arkansas, and Louisiana had linked up. Lyon then realized he could not withdraw from Springfield with his predominantly infantry force; the nearest rail station was a 120-mile march to Rolla, Missouri; and the enemy possessed a large number of cavalrymen. This critical information was a key factor in Lyon's decision to attack. He hoped to seize the initiative and attempt to defeat McCulloch and Price's forces.[11] To understand Lyon's logic, we must understand the principles of war and how they were applied at Wilson's Creek.

Principles of War

The principles of war are objective, offensive, mass, economy of force, maneuver, unity of command, security, surprise, and simplicity. FM 3-0 defines offensive as "seize, retain, and exploit the initiative."[12] It also states, "Commanders use offensive actions to impose their will on the enemy." I will use the offensive principle of war to demonstrate how these foundations "of army operational doctrine"[13] can be taught using this particular battle.

BG Lyon's informational advantage allowed him an opportunity to seize the initiative on 10 August 1861. One of his commanders, Colonel Franz Sigel, came up with a plan that relied on surprise and audacity (two characteristics of offensive operations). Sigel proposed that the Union forces split into two elements: Lyon

Colonel Franz Sigel

would move across the plains to make contact with McCulloch's forces while Sigel attempted to envelop him, "interdicting the enemies withdrawal routes."[14] Lyon agreed to Sigel's plan and ordered the attack at daybreak on 10 August.

At about 0500, Lyon's forces attacked. They completely surprised the enemy and quickly seized the most prominent terrain feature on their axis of advance—the hill that later became known as *Bloody Hill*. This hill overlooked the encampment of the Missouri State Guard (under the command of MG Price) and McCulloch's southern forces. When Sigel heard Lyon's attack at the northern end of the enemy's camp, he began firing his cannons into the southern end. At this point in the battle, Lyon and Sigel had the initiative. Even though they were outnumbered 10,125 (southern) to 5,400 (federal), accurate and timely information allowed Lyon to undertake offensive operations and seize the initiative early in the fight.[15]

Tenets of Army Operations

"The tenets of Army operations—initiative, agility, depth, synchronization, and versatility—build on the principles of war. They further describe the characteristics of successful operations. These tenets are essential to victory but do not guarantee success; however, without them the risk of failure increases."[16]

I have mentioned *initiative* several times in this article. "Initiative is setting or dictating the terms of action throughout the battle or operation."[17] McCulloch's forces awoke and began eating breakfast only to be attacked from the north and the south simultaneously and without warning. This certainly set the "terms of action" early in the battle. Lyon's ability to seize and exploit the initiative at the outset of the battle probably led to the federal forces' initial success.

Battle Command

General George S. Patton wrote, "You can never have too much reconnaissance."[18] That was true in Patton's time and is still true today. "Battle command is the exercise of command in operations against a thinking, hostile enemy."[19] Each commander's ability to see himself, the enemy, and the terrain must be studied to maximize the use of a staff ride. There are many aspects of battle command that can be discussed, but this article focuses only on the visualization aspect.

The key to conducting a staff ride and the reason it cannot be replaced with a PowerPoint® presentation is that it allows the students to see how the terrain helped shape the outcome of the battle. Mission, enemy, terrain, troops—time available, and civil considerations (METT-TC) help lead commanders through a thought process that enables them to better *see* the battlefield.

Doctrinally, leaders use METT-TC to assist in visualizing the battlefield. To demonstrate how METT-TC is used for training, I will briefly describe how each area relates to Wilson's Creek, using the staff ride as the training tool. For the sake of

General Lyon leads his men into action in this illustration from *Harpers Weekly*.

simplicity. I will use Lyon's perspective as the example.

Mission. Lyon believed his mission was to hold Springfield. "The general [Lyon] appreciated the great calamity that would befall the people of the Union proclivities residing in southwestern Missouri if the Union army were to evacuate the area. Besides, he observed that Springfield was the place to defend Saint Louis."[20] Being outnumbered almost two to one, Lyon knew he could not hold Springfield without maneuvering to gain the advantage.

Enemy. Lyon knew the enemy was poorly equipped, inexperienced, and at the end of its supplies. A quick strike might force the army to withdraw from southwestern Missouri.

Terrain. Bloody Hill and Wilson's Creek dominated the battlefield. Lyon immediately realized this and took appropriate actions. He ensured control of the high ground (Bloody Hill), anchoring his left flank against the creek. Although he failed, Lyon ordered Captain Plummer's 1st Infantry across the creek to ensure that McCulloch's forces could not use it to screen the enemy's movement and flank its army. He also used his army's knowledge of the terrain to facilitate Sigel's envelopment of McCulloch's southern forces.

Weather shaped the outcome of the battle. The chance of rain the night of 9 August delayed the Confederate and State Guard advance on Springfield. Exhaustion caused by the August heat also contributed to Price and McCulloch not pursuing the federal forces when they withdrew from the battlefield.

Troops. Lyon had several elements in his command whose enlistments were about to expire. The first was the 1st Iowa, whose enlistment expired on 14 August 1861.[21] He knew that—

- The numerical odds against him would increase every day he delayed an attack and that his force was predominantly infantry.
- Withdrawal from Springfield involved marching to Rolla, Jefferson City, or Kansas City with a large enemy-mounted force potentially cutting off his route of march.
- There were no reinforcements coming and his supply line relied on maintaining a clear route to Rolla.

Time Available. The timing of the battle was driven by Lyon's desire to avoid withdrawing to Rolla in the face of a strong enemy, McCulloch's proximity to Springfield, and the impending enlistment expiration for much of his force. He also used darkness to screen his movement and dawn as a time to attack to surprise the enemy.

Civil Considerations. McCulloch's forces had camped at Wilson's Creek because of the civilian population located there. He learned from his scouts that there were a number of *ripening cornfields* at that location.[22] Lyon's concern for the citizens who supported the Union caused

him to not give up southwestern Missouri. Local inhabitants also played a role in providing intelligence to both sides. Civilians on the battlefield informed Lyon's scouts that Texans were located with MG Price's Missouri State Guard. This indicated to BG Lyon that BG McCulloch's forces had linked up with MG Price. These examples demonstrate that the Battle of Wilson's Creek is an excellent case study for understanding how an army's involvement with civilians can actually shape why, where, and when battles are fought.

Medals of Honor

There are many reasons to study and conduct staff rides at Wilson's Creek National Battlefield besides these doctrinal applications. The Medal of Honor was established during the Civil War. There were five recipients in this battle: Nicholas S. Bouquet, Lorenzo D. Immell, John M. Schofield, William M. Wherry, and Henry Clay Wood. All received the Medal of Honor for various acts of bravery during the battle.[23] I believe it is useful to remind ourselves that the reason we have one nation today and the freedoms we enjoy is because of the heroism and self-sacrifice of those who served before us. Many heroes from our past discovered their true strength on a battlefield in Missouri. This fact is often not discussed, and many dismiss it as being irrelevant.

While I have focused on the Union Medal of Honor recipients, let there be no doubt there was heroism on both sides of the battle. Several Confederates were recognized for honor in the official dispatches of the battle. The Confederate "Dispatches" served the same purpose as medals awarded by the Union.

Conclusion

Why is the Battle of Wilson's Creek relevant to today's chemical officers? The answer to this question has many pieces. This article just scratched the surface of what can be gained by an in-depth study of any battle, past or present. Wilson's Creek can be used as a vehicle to professionally develop officers on the strategic, operational, and tactical levels of war; elements of combat power; principles of war; tenets of Army operations; and battle command. These lessons can be learned if an individual is willing to analyze the battle and walk the battlefield. A study of this or any other battle is never wasted time for a leader or commander.

Authors Note: I must give credit where credit is due. I was inspired to write this article because of Dr. Burton Wright III (Doc). He was the first to teach me about the Battle of Wilson's Creek. He also assisted me the first time I took students to the battlefield. Although he is no longer with us, he lives on in those of us who were his students.

Endnotes:

[1] Vincent Tyndall and Jewell Smith, *The Battle of Wilson's Creek 130th Anniversary Reenactment Guide*, Wilson Creek National Battlefield Foundation, Springfield, Missouri, Vincent Tyndall, Jewell Smith, 1991, p. 32.

[2] Department of the Army, Field Manual 3-0, *Operations*, Washington, D.C.: Government Printing Office, June 2001, p.2-2.

[3] Ibid.

[4] James M. McPherson, (ed), Bruce Catton, (nar), *The American Heritage New History of the Civil War*, Viking, Penguin Group Publishing, 1996, p. 102.

[5] "The Political and Strategic Situation in Missouri, 1861," notes compiled for instruction in the Chemical Captain's Career Course by Dr. Burton Wright, slides 2-5.

[6] FM 3-0, p. 2-3.

[7] Ibid, p. 2-5.

[8] Ibid, p. 4-3.

[9] Ibid, p. 4-10.

[10] Edwin C. Bearss, *The Battle of Wilson's Creek*, LITHO Printers and Bindery, Cassville, Missouri, 1992, p. 38.

[11] Ibid, p. 47.

[12] FM 3-0, p. 4-13.

[13] Ibid, p. 4-11.

[14] Ibid, p. 7-11.

[15] Bearss, p. 60.

[16] FM 3-0, p. 4-15.

[17] Ibid.

[18] Department of the Army, Field Manual 3-0, *Operations*, Washington, D.C.: Government Printing Office, July 2001, p.13-0.

[19] FM 3-0, p. 5-1.

[20] Bearss, p. 46.

[21] Ibid, p. 28.

[22] Ibid, p. 34.

[23] Tyndall, pp. 24-25.

Cannon and Bloody Hill photograph (page 22) and portraits courtesy of The National Park Service and Wilson's Creek National Battlefield, *http://www.nps.gov/wicr/yrvisit.html*

Map and engraving from *The Battle of Wilson's Creek*, Christopher Phillips, National Park Civil War Series, Eastern National, 2001.

Major Duncan is a small-group instructor/leader for the Chemical Captain's Career Course at the U.S. Army Chemical School, Fort Leonard Wood, Missouri. His previous assignments include numerous stateside and overseas leadership positions. He is a graduate of the Chemical Officer Basic and Advanced Courses; Combined Arms Services and Staff School; Ranger, Airborne, and Air Assault Schools; and the Total Instructor Training Course. Major Duncan has a bachelor's in general studies with emphasis in business and communications from the University of Northern Iowa and a master's in environmental management from Webster University.

The History of Military Mask Filters

Canisters: left, World War I; center, World War II; right, present-day

By Lieutenant Colonel Robert D. Walk

The purpose of the protective mask is to form a seal around the face and force the wearer to breathe through one particular hole in the facepiece. To protect the user, the air flowing through the hole must be either supplied or filtered. Since it is difficult to supply clean air in a field environment, the military generally uses filters to clean the air before the user inhales it.

The desire for new and better media for the soldier's mask filter has long been the topic of research. As research found new and better media, filters became smaller and easier to breathe through. In this article, I will discuss the basic theory of air filtration and the history of the U.S. military filters. From copying the idea behind the British small box respirator filter to the latest improvements in filter technology, this article identifies the advances made.

Air Filtration Theory Simplified

Air flowing into the mask has both gaseous and particle components, and the mask filter must clean both. The filtering of gas was the first major concern in gas filtration, so I will discuss it first.

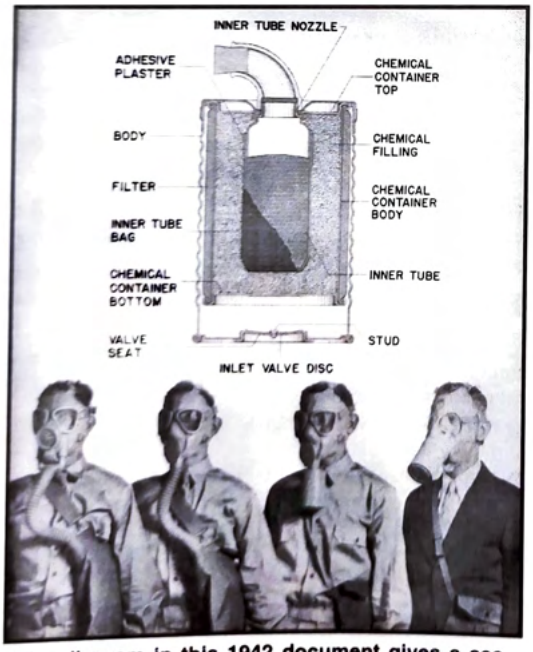
Carbon is one of the first medias used in filters. It, with a large surface area of its volume, is packed in a bed that cleans the toxic gas components of the air flowing through the filter. Carbon filters clean the air similar to the way that sand filters clean water for public consumption. Contaminated air enters from the outside, the contaminants absorb on the charcoal, and the cleaned air passes through. Simple? No. The technology to get the carbon to efficiently clean the air of the maximum amount of contaminants was long in coming. First, simple charcoal was used, but it was not efficient enough, so it was activated through one of several processes to eliminate any volatile compounds filling pores in the carbon's surface. This maximized the surface area of the carbon particle, therefore, maximizing the capacity of the carbon. This process worked for the organic chemicals encountered, but many of the first agents released were inorganic chemicals.

Inorganic chemicals—like chlorine, the first agent used on a large scale in war—were not absorbed to a large extent on the charcoal and required a reactive filter. Overall, the first masks used in war, like the "black veil respirator," used reactive filters. The first inorganic and

organic filters used a combination of carbon (for the organics) and soda lime (for the inorganics). Soda lime is a mixture of hydrated lime, cement, kieselguhr, sodium hydroxide, and water. This combination worked well for a time, until the toxic smokes were released.

Toxic smokes released fine particles as fumes and required a different defensive measure—particle filters. Early efforts to stop particles used felt for filtering. This worked acceptably well but was not perfect, so experimentation continued. A good, thick filter paper would filter all particles, but it would increase breathing resistance to an unacceptable level. Later efforts included carbon-impregnated filter paper and then asbestos-impregnated filter paper. After World War II, the asbestos—for health reasons—was replaced.

As time passed, additives were found to enhance the removal and destruction of the inorganics and some highly volatile organics. During World War I, the various types of copper-impregnated carbon were called rankinite, copper carbonite, and whetlerite. Whetlerite was carbon that was activated and then impregnated with copper through a chemical process. Whetlerite was named after J.C. Whetzel and E. W. Fuller, the scientists instrumental in its development. Tests showed that copper-impregnated charcoal provided twice the protection of regular charcoal against phosgene (CG), triple the protection against hydrogen cyanide (AC), and ten times the protection against arsine (SA). Whetlerite was the most effective impregnated charcoal, and the United States began putting it into some canisters at the end of World War I. By World War II, whetlerite A was the standard filter material—used in an 80 percent whetlerite A and 20 percent soda-lime mixture (called the Type D mixture). By 1942, whetlerite AS was in use with added copper and silver, improving protection against SA. By 1943, chromium VI had been added to make whetlerite ASC, with even better protection against AC and cyanogen chloride (CK). This superior carbon was used until the 1980s when it was determined that whetlerite ASC was hazardous waste. Note that when used properly, it is ok. But, if whetlerite ASC was not disposed of properly, chromium VI pollution resulted. By 1993, the Army had found a suitable nonhazardous replacement—whetlerite AZC—containing zinc. This is the current filling for the protective mask canisters.



The diagram in this 1942 document gives a sectional view of the gas mask canister. The principal standard types of early masks shown are, left to right, the diaphragm mask, combat mask, training mask, and noncombatant mask.

World War I

The first U.S. filter canisters in World War I were copies of the British small box respirator filter. Without looking at an actual filter, the United States copied the idea and created the black-painted training filter. The Type A canister was made like the British small box respirator canister, but it was one inch longer due to possibly poor charcoal. It was filled with a mixture of charcoal (60 percent) and green soda lime (40 percent) held in place by terry cloth and gray flannel with two heavy wire screens on the top fastened by two wire springs. The adsorbents were placed in the can in five equal layers, alternating charcoal and soda lime. The canisters were never used at the front and became the so-called training canister.

The Type B canister mixed the two absorbents before filling the canister and provided better protection. This simplified the canister packing. This canister was painted yellow. As time passed, additional changes were made to subsequent models:

- The valve was changed to a removable type.
- Two cotton pads separated the charcoal mixture.
- The color of the soda lime was changed from green to pink.
- The size of the granules changed from 6 to 14 mesh to 8 to 14 mesh.

The Type J canister, painted green, reduced the volume of absorbent by one-third, cut the life expectancy of the canister in half, but provided at least equal protection during its life. The Type L canister, also painted green, increased the absorbent volume by 25 cubic centimeters to eliminate leakage around an internal cotton pad. The final canister developed during the war, the 1919 canister, was painted blue and used felt to filter the irritant smokes. It was later termed the Mark I (MI) canister. It had two inlet valves on top of the filter protected by a rain shield.

Between the Wars

The MI was followed by the MII and MIII; both had similar dimensions and inlet valves on top. As each model was adopted, each improved the capability and lessened the breathing resistance of previous models. The similar MIIR and MIIIR were identical to the MII and MIII except that the inlet valve was moved to the bottom of the canister.

In 1932, the MIV was the standard filter produced. It had a "sucked-on" cotton linter particulate filter and a mixture of charcoal and soda lime for the media. To make a "sucked-on" particulate filter, air was drawn through the filter's outlet to draw the cotton fibers to a mesh screen, much like a lint trap in a clothes dryer. There was also a pad at the bottom of the absorbents, follower, spring, yoke, and lugs on the chemical container. A similar filter, the MV, substituted a felt particulate filter for the sucked-on particulate filter. It was considered "substitute standard" and was not produced.

A radical design change resulted in the MVI. This filter used a sucked-on sleeve-type filter with a metal bottom. It contained no pad at the bottom of the

The M1919 (MI) canister and its components

The following is from an unsigned document in the collection of the National Archives. It is a reminder to World War I soldiers to carry their mask with them at all times.

THE SOLDIER'S FRIEND

There are occasions when the best of us are indiscreet, and make mistakes. Sometimes we get away with it, but seldom in France. There is one thing, and only one thing, that can save us our present and future health, the health of our descendants, and in many cases, our own lives. This is not a new thing I am to tell you of; all of you know of it, and many of you have already used it. A great many of our first troops over here thought it unnecessary, and completely neglected to use it, or used it improperly, with the result that hundreds of them are in hospitals, suffering terribly, many of them totally disabled for future service; causing the government much trouble and expense, when it should and could have been avoided. It was not because they did not know of the necessary precaution, but because they did not realize its value.

Soldiers, inexperienced in its proper use, have neglected this vital protection, hoping to "get away with it," or to get immediate medical treatment. "An ounce of prevention is worth a pound of cure," but in this case the cure may be of little assistance.

You have undoubtedly been warned that there are certain things to be carefully guarded against "over there." I now want to emphasize one of these. It is impossible to exaggerate its danger. Every man, temporarily or permanently, unable to "carry on" is aiding the enemy.

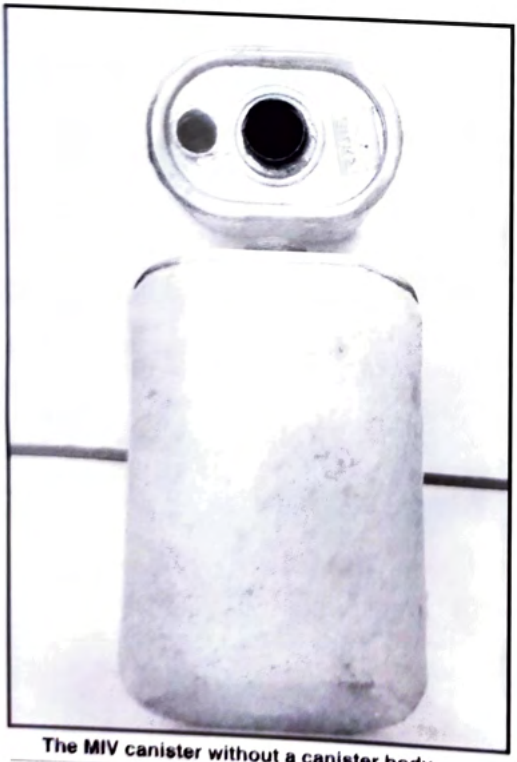
There is one, and only one sure protection, and that is—The Soldier's Friend. You have heard of the Soldier's Friend. It is well known to the soldiers in America, but it is far more popular here. This little precaution may cause slight inconvenience, but you get full, free movement when it is properly adjusted. It is slightly difficult to wear but practice makes one very efficient in its use. Examine it frequently to be sure there are no holes in it. Stretch it to see that the rubber has not rotted. Try it on. Make sure that it fits. If there is anything wrong with it, get another.

And men, never misplace it. It may be dangerous to be without it, so, when you promenade with Madamoiselle, take it along. Inspect it regularly. Be sure that it is always in good condition, ready for immediate use. You can never tell when you will have to use it. Never be without your Soldier's Friend.

The Soldier's Friend is his Small Box Respirator.

absorbents, follower, spring, yoke, or lugs on the chemical container. The bottom of the canister actually contacted the absorbents and was supported by lugs in its body. The MVII was similar to the MVI but used a cup filter and an integral bottom for the container. Both proved effective in experiments; however, neither was produced. The MVIII was the next major filter canister produced.

The MVIII was similar to the MVI but had a multilayer particulate filter. The MIX was designed to facilitate mass production. It was slightly shorter than the MVIII and had smooth sides. It was filled with Type D filling and had a cotton particulate filter impregnated with lamp black. The MIXA1 used a larger (2-inch diameter) inlet and had a corrugated canister. The particulate filter was upgraded to a cellulose filter with asbestos. The MIXA2 used Type ASC charcoal and was identified by its yellow top. Tests showed that adding soda lime was unnecessary, so it was deleted. The MIXA2's defense against CK was the best ever of any U.S. filter, and because of concerns that the enemy might use CK, more than 1.2 million canisters in gas masks were changed out with the forces in the field.



The MIV canister without a canister body

Adopting the lightweight protective mask early in World War II was partially the result of adopting an effective lightweight canister. Lightweight mask and canister experiments in the 1930s ultimately resulted in the design and adoption of the M10 canister. The M10 was designed as a radial flow canister, which meant that while the air was drawn in through a hole in the bottom, the air flowed up the sides of the can and flowed in from the sides to the center along the radius of the cylinder. Through the adoption of the ASC charcoal, the filter could be constructed smaller and still have sufficient protection for field use, so it was adopted in 1942. The M10A1 was similar but contained more charcoal.

World War II

During World War II, the M2 training mask was actually issued as an emergency measure for soldiers to use as a service mask before issuing the M5 assault mask. It was particularly popular with jungle fighters in the Southwest Pacific area and with many of the airborne units. The M2 training mask used the MI training filter, containing whetlerite A. When whetlerite ASC charcoal was developed, the MIA1 training filter, containing whetlerite ASC, was issued to replace the MI training filter for use in combat.

In World War II, along with the development of the M5 assault gas mask, the Army developed the E3 combat canister. This was an axial flow filter—air flowed through the can along the axis of the cylinder. It was originally made of steel components and weighed 350 grams. Subsequent to standardization as the M11 canister, the canister was redesigned with aluminum components. All originally produced steel canisters were not shipped overseas with M5 masks because of concerns about peripheral air leakage, but the steel cans were held for issue to the M8 snout-type mask. At least 1,388,246 canisters were held

Comparison of the M11 canister (left) to the standard C2 canister (right)

in storage into the 1950s. Many of the steel canisters were issued to the Office of Civil Defense for use with the snout-type M16 (CD-V800) mask.

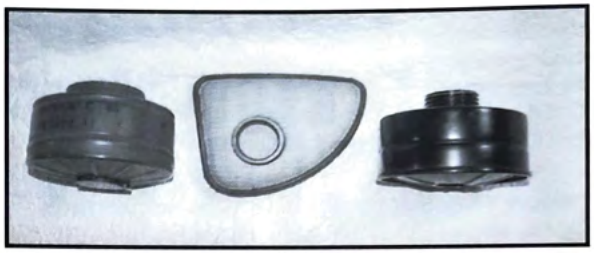
After World War II

At the end of World War II, the Army had three standard filter canisters for general use—the MIXA2, the M10A1, and the M11. In 1948, the M2-series masks were declared obsolete and the MIXA2 was removed from the inventory. This left the M10A1 and M11 as standard, and they remained standard for the next 40 years. The canister of the 1980s was pretty much the same as the 1940s, except for the minor addition of a charcoal filter to prevent media leakage.

In the 1950s, the Army experimented with a variety of masks testing various filter technologies. The E13-series masks tested various configurations. The E13R4 mask had integral cheek-mounted filters, so it did not require a separate filter. The final mask, adopted as the M17, was a slightly modified E13R10, with the soon-to-be-famous M13 filters mounted in the cheeks. These filters were not usable in any other mask and were famed as the so-called "pork-chop-shaped" filters using a lightweight gas-aerosol filter material. The filters could only be changed from the inside, and even then with difficulty. The original M13 filters had a problem with contamination ruining the charcoal media and were quickly replaced by the M13A1. The M13A1 was replaced in 1968 by the M13A2 filters. Thereafter, the M13 and M13A1 filters were known as so-called "training filters" and were recognized by either a black (M13 and early M13A1) or gold (M13A1) inlet ring. The M13A2 has a green inlet ring.

With the initiation of the XM29 mask program, by international agreement, the Americans were to develop the mask and the Canadians were to develop the filter. The Canadians quickly developed the C2 filter as their part of the bargain. It was a filter roughly similar in size to the M11 but with a NATO standard 40-millimeter filter thread to screw into the facepiece. Like the M11, the air passed first through a pleated or accordion-style particulate filter and then through a layer of impregnated charcoal before passing to the user. This filter was used in all mask programs in the 1970s and afterwards until the Joint Services General Protective Mask (JSGPM) Program.

When whetlerite ASC charcoal was required to be disposed of as hazardous waste, the Army developed the C2A1 canister using whetlerite AZC charcoal. The C2A1 canister had fewer disposal restrictions than the C2 canister.



M11 (left), C2 (right), and the M13 "pork-chop-shaped" filter (center)

As noted, the JSGPM is attempting to push filter technology to new levels of effectiveness. Filters are being designed to maximize effectiveness while minimizing interference with the user. Much more on this exciting program will follow.

The Future

As we have not yet developed the ultimate filter, more will come. An interesting technological development would be the creation of a filter that causes the catalytic destruction of the contaminant instead of adsorption. When this is successfully militarized and fielded, our soldiers would have a filter that never needs replacing. Who knows what technology will bring for the transformed force?

Conclusion

The Army's filter canister program has provided much of the impetus to the Army's protective gas mask program. Through the development of improved filter media, the filters gradually became lighter with similar protection to their predecessors. As the filters became lighter, the masks became lighter as well. The JSGPM is again pushing technology to ensure the best protection for our soldiers in the years to come.

References:

Fries, Amos A. and Clarence J. West, *Chemical Warfare*, McGraw-Hill Book Company: New York, 1921.

Grabenstetter, R.J. and F.E. Blacet, "Impregnation of Charcoal," Chapter 4, *Military Problems with Aerosols and Nonpersistent Gases*, Division 10, Volume 1, Office of Scientific Research and Development, Washington, D.C., 1946.

Green, James, 1LT, and Stephen D. Noyes, 2LT, "Gas Mask Report," Prepared for the Chief, Chemical Warfare Service, 9 July 1944. Obtained from the National Archives, College Park, Maryland.

"Letter," Office of the Technical Director, Edgewood Arsenal, 14 April 1932, Subject: Structure and Status of Recently Developed Canisters.

(Continued on page 33)

Turning a Negative JRTC Chemical Trend Into a Positive

(A Simple Training Concept for the Chemical Officer Basic Course)

By Captain Carlos E. Gonzalez

One of the most significant trends of the Joint Readiness Training Center (JRTC) is the brigade/battalion chemical officer's (ChemO's) and noncommissioned officer's (NCO's) understanding of how and where the intelligence preparation of the battlefield (IPB) (FM 3-14, *Nuclear, Biological, and Chemical [NBC] Vulnerability Analysis*) fits into the military decision-making process (MDMP), coupled with no NBC cell to assist in managing and focusing on the NBC threat. Furthermore, this trend is also compounded by the lack of knowledge and understanding the unit commander, S2, and S3 have of what the ChemO brings to the fight. This negative trend can be reversed to a positive one with a simple training concept that ideally should begin at the Chemical Officer Basic Course (COBC).

This simple training concept will ensure that incoming ChemOs, arriving at their first assignments as staff officers, are prepared to conduct NBC duties. It also will enable them to smoothly integrate their own NBC battle-staff drills and analysis techniques within the tactical operations center (TOC) and its other Battlefield Operating System (BOS) cells. In general, this concept requires that the ChemOs build their NBC cell concept within the first four weeks in preparation for the last two weeks (practical exercise) of COBC.

This concept is based on the assumption that the Chemical Corps at Fort Leonard Wood, Missouri, strives to build proficient NBC staff officers versus platoon leaders at the COBC. It also assumes that the Chemical Corps will allocate the required funds to build NBC-related tools that the ChemO can take to the NBC cell. However, the lack of funds should not be the obstacle to halt this simple concept. Many will argue that an officer should not spend personal funds on training tools because the Army should provide him with everything he needs. I would argue that the true professional is willing to invest in his future as opposed to allowing the allocation of funds to halt the progress to "sell NBC" to his projected new assignments.

This concept requires the ChemO to build an NBC-cell portable map board (PMB) and prepare NBC tools (NBC status sheets, precut simplified downwind predictions) during personal time to minimize the impact on the current COBC teaching agenda. The PMB and NBC tools must be completed during the initial weeks where the Chemical Corps strives to instill the required knowledge to become a proficient NBC staff officer. This ensures that each ChemO would have the PMB and NBC tools status sheets in preparation for the practical exercise phase during the last two weeks of COBC.

The PMB and NBC tools will give the ChemO a few advantages when selling NBC to his first unit assignment. These advantages, in order of occurrence, are—

- The officer arrives at the new unit assignment with a custom-tailored PMB and NBC tool kit that he has become accustomed to working within the NBC IPB analysis (FM 3-14) during the practical exercise phase of COBC.
- The PMB introduces, up front, the concept of the NBC cell to the gaining unit with the understanding that it is an essential requirement for the ChemO and NCO to manage NBC-related information and foster NBC situational awareness for the unit commander, key staff (S3, executive officer), and

other BOS cells (engineer, fire support, air defense artillery, etc.).

- This concept ensures that the ChemO is able to conduct a continuous NBC IPB, produce the required NBC data, and make NBC force protection recommendations to present to the unit commander and staff so that feasible NBC guidance can be provided from the commander and staff.

The last two weeks should be dedicated to building and refining the ChemO's NBC analysis technique. This is accomplished by setting up a classroom to replicate a TOC with an S2 cell and an NBC cell with the ChemO's own PMB to complete the cell. The instructor would provide the required material for the ChemO's NBC IPB (operations order, brigade-level Annex J, maps with graphics, etc). The S2 cell will be manned by an actual S2 (preferably a captain) to add to the realism and assist the ChemO in the joint effort to complete the NBC IPB process (FM 3-14). The small-group leader (SGL) will serve as a battalion commander and ask the difficult questions to challenge the ChemO's ability to articulate the NBC environment.

The evaluated ChemO will conduct the NBC IPB and brief the SGL (battalion commander) on four scenarios within a period of two weeks. The scenarios should be based on one offensive operation, one defensive operation, one military operation other than war (toxic industrial material emphasis), and one joint operation. These four scenarios will ensure that the ChemO receives the opportunity to practice his analysis and presentation skills in four different operational environments. The criteria for feedback should focus on the ability to clearly articulate the friendly and enemy NBC capabilities and enemy NBC threat and make sound recommendations on NBC force protection measures to enable the battalion commander to visualize the NBC threat and give proper guidance (focused only on improving the officer's technique).

In conclusion, the goal of this article is to suggest how to reverse a negative JRTC trend into a positive one by focusing on the new ChemOs graduating from COBC. The creation of custom PMB and NBC tools, while providing feedback to each ChemO during a practical exercise phase, will ensure that all ChemOs arrive at their gaining unit prepared to be integrated as a chemical staff officer and an NBC cell inside the TOC (versus the current battle-captain trend) and conduct effective NBC IPB to give the unit commander, staff, and BOS cells the right data to establish a feasible NBC force protection plan and the correct doctrinal use of NBC assets (S/D platoons, NBCR Fox squads).

Captain Gonzalez is the chief of reconnaissance, U.S. Army Chemical School, Fort Leonard Wood, Missouri. He has served in numerous leadership positions here in the states and overseas. He is a graduate of the Chemical Officer Basic Course, the Infantry Officer Advanced Course, the Airborne Basic Course, the Air Assault Course, the USMC Boot Camp, the USMC School of Infantry, and the Special Forces Assessment and Selection Course. Captain Gonzalez has a bachelor's in criminal justice from the University of Texas Pan American, Edinburg, Texas.

(The History of Military Mask Filters, continued from page 31)

"New Mask Developed," *Armed Forces Chemical Journal*, Vol. XI, No. 5, Armed Forces Chemical Association, Washington, D.C., September-October 1959.

Office of the Chief Chemical Officer, Chemical Corps Technical Committee, Edgewood Arsenal, 3 April 1952, Subject: Status of the Steel-Bodied Canister, Combat, M11 (E3).

O'Hern, Michael R., Thomas R. Dashiell, and Mary F. Tracy, "Chemical Defense Equipment," Chapter 16, *Textbook of Military Medicine, Medical Aspects of Chemical and Biological Warfare*, Office of the Surgeon General at TMM Publications, Washington, D.C., 1997.

Prentiss, Augustin M., *Chemicals in War*, McGraw-Hill Book Company, New York, 1937.

Press Release 79-186, U.S. Army Armament R&D Command, 6 September 1979, Subject: Intensive Mask Development Program Underway.

Lieutenant Colonel Walk is an Active Reserve chemical officer currently attending the Army War College. He previously served as WMD training officer and executive officer in the G-3, United States Army Reserve Command. Other assignments included chemical officer positions in the 84th Ordnance Battalion and 60th Ordnance Group; acting battalion commander, 1st Battalion, 377th Regiment; commander, HHC, 59th Ordnance Brigade; and commander, 184th Chemical Detachment.

The Future of Decontamination Operations— An Analysis of Decontamination Foam 200

By Captain Michael C. Firmin

The use of bleach as a decontaminator dates back to 1917 (World War I) when the Germans discovered that bleaching powder neutralized mustard agent. Eventually, this evolved into a substance called supertropical bleach (STB), which is easier to spread and more stable in long-term storage than the old bleaching powder. In 1960, decontamination solution number 2 (DS2) was introduced. Both STB and DS2 are quite effective in decontamination operations and remain as the foundation from which the Army developed its doctrine for chemical decontamination. Unfortunately, there are significant problems with DS2 and STB that include training, environmental, and logistical concerns. A new solution called decontamination foam 200 (DF-200) has been developed for decontamination operations. This new decontaminating foam solution is superior to our current decontaminating solutions and could revolutionize the Army doctrine on decontamination operations.

The current threats to the United States are asymmetric means of attack on U.S. interests, both here and abroad. The 11 September 2001 events, the anthrax attacks, and recent captured documents from Afghanistan outlining the scope of terrorist chemical and biological (CB) weapons development are proof. Iraq used chemical weapons extensively during its war with Iran in the 1970s. There is also a great amount of credible evidence that Iraq stored chemical munitions in the bunkers along the allies' most likely avenue of approach in Operation Desert Storm. When the allies destroyed these bunkers, they inadvertently released chemical agents on themselves.

Most members of the U.S. Army Chemical Corps have never trained with the decontaminating solutions that we are supposed to use to counter these threats. Recently I talked to one of the rare soldiers who had trained with DS2, and he described the results this way: "I sprayed the DS2 on a small area of an armored personnel carrier (APC) with an M13 (a handheld pressurized liquid sprayer). After 15 minutes, the paint started peeling off. Then I rinsed the DS2 off and had to end the training." The Army's mantra is "Train as you fight," yet we cannot train with DS2 or STB. All chemical soldiers are required to go through the Chemical Defense Training Facility, which incorporates live nerve-agent training, allowing each soldier to gain complete confidence in his mission-orientated protective posture (MOPP) gear. However, no soldier has been able to gain this confidence while performing a decontamination operation.

The reason that soldiers do not train with DS2 is that it is dangerous to handle. DS2 is a suspected teratogen (causes birth defects). Both DS2 and STB can cause burns and respiratory hazards and may damage the nervous system and liver if exposed to them for long durations. When the two agents come in contact with each other, STB may ignite spontaneously. In a real-world situation, STB may also ignite with a liquid blister agent.

The reactions with DF-200 are significantly different because it essentially consists of the same ingredients that make up detergent and soap. The Environmental Protection Agency lists all ingredients that are either List 3 or 4 as "inert." Recent skin tests using DF-100 (a predecessor of DF-200) were performed on eleven people of varying ages and sexes. Four different tests were performed, with the longest allowing the foam to remain on the test subject's arm for 48 hours, unmolested. During these tests, four of the ten subjects experienced no side effects, while the other six experienced either slight or mild irritation. After 24 hours, all subjects had returned to normal. Environmental concerns involving DS2 and STB are just as extensive as the training and health concerns. While DF-200 resembles detergent, DS2 resembles paint remover, which explains the results that my friend received when he used DS2 on the APC.

Most members of the U.S. Army's Chemical Corps have never trained with the decontaminating solutions that we are supposed to use to counter these threats.

DS2 and STB are highly corrosive and incompatible with most metals, rubber sealants, plastics, fabrics, and electronics. They are also combustible in certain environments. During decontamination operations, gross amounts of hazardous waste from DS2 and STB are created. Additionally, since both agents will corrode rubber sealants and plastics, there is the possibility that various vehicle seals and hoses will deteriorate and spring leaks after contact with DS2 and STB. This increases the amount of waste and exacerbates the environmental damage. Both decontaminants have rigid storage restrictions and are prohibited for use on aircraft. The environmental considerations for DS2 are so great that most countries will not allow it inside their borders. The shelf life for DS2 is ten years and can be extended two more. DS2 has not been manufactured since 1992; therefore, by 2004 all existing DS2 will have passed its extended shelf life. In contrast, DF-200 is environmentally benign, meaning that it is nontoxic and noncorrosive. As with DS2, DF-200 has a ten-year shelf life, but it remains noncorrosive after the shelf life has expired. Because DS-200 is environmentally benign after it has exceeded its shelf life, it may be rotated into the training stock.

The logistics behind DS2 and STB are an S4's worst nightmare. Using FM 3-5 (*NBC Decontamination*) as a reference, a chemical unit that uses the M12 power-driven decontamination apparatus (PDDA) will use approximately 400 gallons of water at Station 1 (primary wash) for an M1 Abrams tank (this value is never stated, but may be extrapolated from planning values stated in the manual). Following in sequence, Station 2 (DS2 application) will require approximately 15 gallons of DS2 while Station 4 (rinse) will require 325 gallons of water. All together, this is 740 gallons of liquid weighing 6,100 pounds. (STB will be needed at the contact time and interior decontamination at Station 3, but not enough to greatly affect the weight.)

The other consideration with this setup is the engineer support needed. The current doctrine from FM 3-5 requires 35 cubic feet of space per 250 gallons of liquid runoff at Station 1. This would equate to 56 cubic feet per M1 tank. During training, chemical units rarely receive the engineer support they need because most nonchemical commanders do not understand the great amount of support needed to run a decontamination site to standard. Therefore, these commanders do not properly consider the chemical piece when they go through the military decision-making process.

A heavy decontamination company is equipped with nine tank and pump units for decontamination operations, giving the company a maximum water-carrying capacity of 10,800 gallons. This is enough water to decontaminate 15 tanks before needing to resupply. If an adequate water source is nearby, this may not be a problem. But in an arid environment, this becomes a critical issue.

A thorough decontamination site using the same equipment and DF-200 could operate in the following manner. The M12 PDDA already has a foaming apparatus; therefore, Station 1 and Station 2 would be combined. The chemical unit would wash down the vehicle at the same time that it applies the decontamination solution. The advantages of this method are threefold; it—

- Requires less manpower, as Station 2 is no longer needed.
- Needs no engineer support, as DF-200 is benign and does not create a hazardous runoff.
- Is less labor-intensive, as soldiers are no longer required to use mops to apply a decontamination solution.

At Station 3, DF-200 would replace STB but would be used in the same manner. Potentially, Station 4 would no longer be needed. DF-200 dries to a white powder within an hour and can simply be brushed off the vehicle. Knowing this fact, in arid environments, a vehicle rinse may not be necessary. However, it should be noted that DF-200 might give a false positive reading to an improved chemical agent monitor and an advanced chemical agent detection alarm. Therefore, not utilizing Station 4 becomes an assumed risk. In an environment where water is less of an issue, the vehicles may be rinsed.

Another advantage of DF-200 is that it is not corrosive. With DS2, all tarps are stripped off the vehicles and buried at Station 1 of the decontamination site. If they are contaminated, this process could include everything down to the vehicle's seats. Although the complete effectiveness of DF-200 is not known at this time, it is promising that the foam could decontaminate all surfaces it comes in contact with.

During training, chemical units rarely receive the engineer support they need because most nonchemical commanders do not understand the great amount of support needed to run a decontamination site to standard.

A real world test of its capability occurred last year with the decontamination of anthrax spores from the Hart Building in Washington, D.C. For this operation, EasyDECON™ foam (a version of DF-200) was successfully used to sanitize the stairwells and elevators. It has been stated that this decontamination foam could be used to "wash clothes."

Chemical Agent	Percentage Destruction of Chemical Agent at Time Interval		
	1 minute	15 minutes	60 minutes
GD	99.98 +/- 0.01	99.97 +/- 0.01	99.98 +/- 0.01
VX	91.20 +/- 8.56	99.80 +/- 0.08	99.88 +/- 0.04
HD	78.13 +/- 10.53	98.46 +/- 1.43	99.84 +/- 0.32

The effectiveness of DF-200 for military use was proven in October 2000 when it was tested on three different chemical agents—soman (GD), VX, and mustard (HD). The foam was also tested against one biological agent, anthrax, which was chosen because it is considered to be the hardest biological agent to kill. The table at right shows the test results of these agents.

This chart shows that after 15 minutes of contact, the GD and VX have been destroyed, while only traces of HD remain. Therefore, if the agent is known not to be mustard, the contact time required at Station 3 may be reduced in half. After one hour, all three agents were neutralized.

With anthrax, the results were just as impressive. After 15 minutes of exposure, a seven-log kill (99.99999 percent) of all anthrax spores was recorded. This is in contrast to DS2, which only recorded a one-log kill with anthrax.

The above facts are critical, especially when it comes to aviation decontamination procedures. Currently, the only decontaminating agents approved for use on aircraft are soap and water, JP8, kerosene, and diesel fuels (FM 3-5). None of these agents are as effective as STB or DS2. Each aircraft also has certain sensitive areas that cannot be sprayed with a high-pressured hose, which makes the current decontamination methods using the M12 PDDA or M17A3 lightweight decontamination apparatus ineffective. With the use of specialized equipment, DF-200 may be produced as a fog, which is extremely effective in decontaminating these sensitive areas. The rest of the aircraft will be decontaminated in the same way as the detailed equipment decontamination, providing the Army with something it has never had before—an effective way of decontaminating aircraft.

Although a great improvement over STB and DS2, DF-200 is not without limitations. The most significant is that it has a freezing point of -7 degrees Celsius. In contrast, DS2 is effective down to -32 degrees Celsius. With the current equipment in the Army's inventory, this issue may remain unresolved. However, since water freezes at 0 degrees Celsius, using DS2 at low temperatures has its problems. An advantage of DF-200 is that if it is dry, it may be brushed off the vehicle. Spraying water over DS2 may freeze the DS2 as well as any contaminant that has not been neutralized. This will create a hazard when the water melts and the contaminant starts to desorb.

The current means of performing decontamination operations is outdated and impractical. Soldiers need to be able to train as they fight, something that they cannot do when it comes to decontamination operations. With the development of DF-200, the Chemical Corps is heading in the right direction. This new solution for decontamination operations must be adopted now to enable the Corps to go forward and protect our troops at home and abroad.

References:

Department of the Army, Field Manual 3-5, *NBC Decontamination*, Washington, D.C.: Government Printing Office, 28 July 2000, pp. 4-18 to 4-23, 7-8 to 7-14.

Formulations for the Decontamination and Mitigation of CB Warfare Agents, Toxic Hazardous Materials, Viruses, Bacteria and Bacterial Spores, Abstract, Environmental Foam Technologies, 16 November 2001.

Khidhir Hamza, *Saddam's Bombermaker*, New York, Schribner, 2000.

SFC Bradley Hicks, U.S. Army Maneuver Support Center, Personal interview, 3 June 2002.

LTC Robert Serino, U.S. Army Maneuver Support Center, Personal interview, 3 June 2002.

Sandia Decontamination Foam may be Tomorrow's Best First Response in a Chem-Bio Attack, News release, Sandia National Laboratories, 1 March 1999.

Skin Tests of the Safety of the MDF-100, bench test results. Modec Incorporated, March 2000.

Vickie Uhland, "Modec Hitches Wagon to Fear of Bioterrorism," *Rocky Mountain News*, 2 January 2002, p. B-1.

Captain Firmin was a student in the Chemical Captain's Career Course at Fort Leonard Wood, Missouri, when he wrote this article. His previous assignments include chemical officer, 1/327th Infantry Battalion, and platoon leader and executive officer, 63d Chemical Company, 101st Airborne Division, Fort Campbell, Kentucky. CPT Firmin is a graduate of the University of Colorado at Boulder. He received his commission from the Officer Candidate School at Fort Benning, Georgia.

Anthrax Decontamination

By Captain Lindsey Nagtzaam

In October 2001, Washington, D.C., fell victim to the largest bioterrorist attack in the history of the United States, which resulted in its largest biohazard decontamination ever. The anthrax contamination caused closure of several facilities, one of which was the Hart Senate Building.[1] In response to the attacks, officials from the Centers for Disease Control and Prevention (CDC), the Environmental Protection Agency (EPA), and the U.S. Senate (the planning committee) began decontamination planning. Essential to the decontamination plan was the use of civilian decontaminants and the four doctrinal decontamination principles:

- Decontaminate as soon possible.
- Decontaminate only what is necessary.
- Decontaminate as far forward as possible.
- Decontaminate by priority.

The CDC, EPA, and Senate's plan required efficient decontaminants. They consulted private agencies for decontaminant products trying to find the most efficient anthrax decontaminant. Once the agencies possessing the best decontaminants were selected, the planning committee created the plan to decontaminate the buildings. In February 2002, four months after implementation, the plan to decontaminate the largest biohazard contamination ended successfully.

Can the biological decontaminants used in the Hart Senate Building work for the Chemical Corps? The answer is yes! This article establishes reasons why.

Various biological decontaminants are listed in FM 3-5, *NBC Decontamination*. Biological decontamination is possible using standard decontaminants such as decontamination solution number 2 (DS2) or nonstandard decontaminants like ethylene oxide.[2] The standard decontamination platoon only carries DS2 and supertropical bleach. It is feasible to argue that during wartime, decontamination platoons will find nonstandard decontaminants difficult to procure.

To solve this problem, the Army should incorporate the civilian decontaminant, Sandia foam—used in the decontamination of the Hart Senate Building—into its standard decontaminants listed in FM 3-5. The expansion of this list will increase the Chemical Corps's inventory of standard decontaminants. The expansion will also increase flexibility in decontaminant choices for decontamination platoons, ultimately increasing overall readiness.

Use of such an efficient decontaminant in the Chemical Corps is necessary in the event the Army faces anthrax contamination. Anthrax can cause black cutaneous eschars or dry scabbing crusts.[3] When used as an aerosol, anthrax causes inhalation fatalities; patients present signs and symptoms resembling the flu, but some die one to three days later. A sterile protein-based anthrax vaccine with an effectiveness of 88 percent at 100 weeks (as required for military personnel) has been produced.[4] Unfortunately, supplies are limited and are not available for civilian use.[5] Consequently, unvaccinated civilians lost their lives after inhaling anthrax on Capitol Hill during 17 to 22 October 2001.[6]

On 29 October 2001, following the deaths, Senate leaders agreed to begin decontamination of the Hart Senate Building. They inadvertently applied the first decontamination principle with their resolution—decontaminate as soon as possible.[7]

Standing nine stories tall and encompassing 10 million cubic feet, the Hart Senate Building required decontamination in specific anthrax-contaminated areas. Senate Majority Leader Tom Daschle, a recipient of an anthrax-ridden letter, acted as the spokesperson for the anthrax decontamination plan. He announced that the first plan to pump chlorine dioxide gas throughout the building would cause "too many dangers inherent with using gas throughout the complex." Chlorine dioxide gas was not chosen to decontaminate the entire building for the following reasons:

- It can seep into rugs, drapes, and anywhere anthrax may have landed.
- It can cause damage to expensive artwork and furniture.
- It is time-consuming.[8]

Instead, the planning committee suggested a combined use of an antibacterial foam (Sandia foam) in contaminated areas and chlorine dioxide gas in the heating, ventilating, and air-conditioning (HVAC) system.[9] By decontaminating affected rooms

and the HVAC system, the committee inadvertently applied the second decontamination principle—decontaminate only what is necessary.

Senate leaders chose the Hart Senate Building, by priority and need, to decontaminate first (fourth decontamination principle—decontaminate by priority). They chose this building over other contaminated civilian facilities so government officials could resume work. It remained closed for the duration of the cleanup so all forms of anthrax life could be eliminated.

Applying the third decontamination principle—decontaminate as far forward as possible—CDC workers selected areas of high versus low contamination. Upon selection of the areas to be decontaminated, the workers ran a ground-level pipe into the HVAC system for chlorine dioxide gas output. Crews kept the HVAC system filled with as much as 2,000 pounds of chlorine dioxide for 12-hour periods. After a 12-hour period, crews tested the HVAC system with test strips similar to the smart tickets used in the Biological Integrated Defense System (BIDS).[10] If contamination was found during the test, the decontamination process was repeated.

In February 2002, the decontamination process ended successfully. Although this decontamination procedure was practical for use in the Hart Senate Building, it would not be a practical decontaminant for the Army because the EPA has limited its sale, distribution, and use.[11] However, the use of Sandia foam in the decontamination of the Hart Senate Building was significant. It is a concoction of "ordinary household substances such as those found in hair conditioner and toothpaste."[12] It resembles shaving cream; can be applied as a liquid spray, mist, fog, or foam; and neutralizes a wide variety of chemical and biological agents in mere minutes. It is also similar to a fire retardant that can be sprayed from handheld canisters or trucks, which can be dispensed in an open area such as a runway.[13] It can also be incorporated into the fire sprinkler systems of high-profile government or military buildings. Environmentally friendly, nontoxic, and noncorrosive, the foam has proven to be effective against "viable anthrax spores and chemical warfare agents (VX, mustard, and soman)."[14]

Demonstration of the application of the new chemical-biological decontamination foam from a pressurized canister.

Sandia foam, Decontamination Foam 200, can cost as little as $0.15 per pound.[15] This is an enticing price for an efficient decontaminant to add to the Army's standard decontaminant inventory.

The efficient decontamination of the Hart Senate Building eased the fear of possible anthrax contamination for its users. However, the threat of similar attacks to high-visibility buildings and personnel remains possible. Anthrax mail attacks are not to be forgotten nor are they an event of the past only. Therefore, the military—particularly the Army—must stay abreast of developing biological decontaminants. Ethylene oxide and cold flame are two proposed decontaminants that were not used in the decontamination of the Hart Senate Building.

The CDC, the World Health Organization, and the American Public Association recognize ethylene oxide as a proven decontaminant. The Chemical Corps is also familiar with this nonstandard decontaminant from tests conducted at Fort Detrick, Maryland, more than 50 years ago. Ethylene oxide can be used to sterilize food, cosmetics, hospital surgical equipment, and plastic devices that cannot be sterilized by steam. Ethylene oxide can also be used to provide immediate decontamination via a mobile sterilization unit.[16] Although not chosen for assistance in the decontamination of the Hart Senate Building, this decontaminant is a feasible method for anthrax decontamination. The downfall of this decontaminant is its limited use in an airtight enclosure and its flammable quality.

The second proposed decontaminant not used in the

Hart Senate Building was cold flame. It is a dry decontamination device designed by a team at Los Alamos National Laboratory. This device ionizes a mix of helium and oxygen, emitting a cloud of charged particles.[17] The result is plasma, which looks similar to fire but is 70 degrees Celsius colder. Its content—a highly reactive form of oxygen—neutralizes pathogens such as anthrax. Cold flame was not used because the leader of the team wanted to "clean things up without destroying them."[18]

Devices neutralizing pathogens through ionization could cost the Army millions of dollars due to their intricate makeup. Although cost is one factor, another negative factor is their lack of production. These devices are not out of the developmental phase and have not been manufactured. There-fore, cold flame is not yet a worthy decontaminant for the Army.

In preparation for future bioterrorist attacks against the United States, the Chemical Corps could use Sandia foam, chlorine dioxide, and ethylene dioxide to expand its biological decontamination options. Of these decontaminants, the low-cost Sandia foam is the best alternative for the Army. Learning from the success of the civilian sector, there is no question as to whether the Army should incorporate it into the Chemical Corps's standard decontaminants. The foam will prove effective and change the world of decontamination as the Chemical Corps knows it today. Decontamination with ethylene oxide is feasible; however, because of its limited use in an airtight enclosure, it is best left as a non-standard decontaminant. The use of chlorine dioxide as a decontaminant is costly and consumes significant manpower. This particular method is only feasible for use in the civilian sector. Finally, cold flame has not proven to be an effective decontaminant method because it is still in development. To expand its biological decontamination readiness further, the Army could use cold flame once it has been tested.

The civilian sector is not alone in bioterrorism decontamination. The Army is also affected when government officials are targets. If Army officials and civilian agencies collaborate on current biological decontamination techniques and methods, biological readiness will improve for both.

Endnotes:

[1]K. Foerstel, "Decontaminating Capital Hill Is a Learning Experience," *CQ Weekly*, 59, retrieved May 10, 2002, from EBSCO Information Services, p. 2668.

[2]Department of the Army, Field Manual 3-5, *NBC Decontamination*, Government Printing Office, Washington, D.C., July 2000, p. B-6.

[3]E. Green, "Treating Pressure Ulcers," Potter, P.A. & Perry A.G. (eds.), *Fundamentals of Nursing*, Mosby, Missouri, p.1545.

[4]"The Vaccine," *Anthrax Vaccine Immunization Program*, 1, retrieved June 16, 2002, from LUKOL, p. 1.

[5]"Anthrax," *Johns Hopkins University Center for Biodefense Strategies*, 2, retrieved May 1, 2002, from EBSCO Information Services, p. 1-2.

[6]Washington and Virginia excerpt, *CNN*, retrieved May 1, 2002, from EBSCO Information Services, p. 1.

[7]Foerstel, p. 2669.

[8]J. Kluger, "Scrubbing Out the Spores," *Time*, 22,62-65, retrieved May 1, 2002, from EBSCO Information Services, p. 22.

[9]Foerstel, p. 2668.

[10]Department of the Army, Field Manual 3-101-4, *Biological Detection Platoon Operations Tactics, Techniques, and Procedures*, Government Printing Office, Washington, D.C., September 2000, p. N-7.

[11]"Chlorine Dioxide," *EPA Pesticide Programs*, 1, 1-6, retrieved May 1, 2002, from EBSCO Information Services, p. 5.

[12]A. Gernsback, "Anthrax-Scrubbing Bubbles," *Poptronics*, 3,11-13, retrieved May 1, 2002, from EBSCO Information Services, p. 11.

[13]J. German, "Sudsy Brew Neutralized Viral, Bacterial, Nerve Agents in Minutes," *Sandia*, 1, 1-6, retrieved May 1, 2002, from EBSCO Information Services, p. 4.

[14]Gernsback, p. 11.

[15]German, p. 1-6.

[16]NewsRx.com, "Vacudyne, Sterilization Services Offer Proven Method to Kill Anthrax," *TB & Outbreaks Week*, 11, 10, retrieved May 1, 2002, from EBSCO Information Services, p. 1.

[17]F. Clines, "Cold Flame," *Technology Review*, 1, retrieved May 1, 2002, from EBSCO Information Services, p. 17.

[18]Ibid, pp. 17-18.

References:

Costello, M.A., "Decontamination Planning Includes a Variety of Issues, Experts Advise," *AHA News*, 27, 45-47, retrieved May 1, 2002, from EBSCO Information Services.

Headquarters, Department of the Army, Field Manual 3-101-4, *Biological Defense Operation, Corps/Company Tactics, Techniques, and Procedures*, Government Printing Office, Washington, D.C., March 1999.

NewsRx.com, "Sandia Decontaminant Cleaning Up Anthrax Locations," *TB & Outbreaks Week*, 4, 20, retrieved May 1, 2002, from EBSCO Information Services.

Photo

http://www.sandia.gov/media/cbwfoam.htm

Captain Nagtzaam was a student in the Chemical Captain's Career Course (Class 3-02) at Fort Leonard Wood, Missouri, when she wrote this article. Her previous assignments include assistant brigade chemical officer, 2d Aviation Brigade, Korea; battalion chemical officer, 2-227th Aviation Battalion; platoon leader, 68th Chemical Company; and chemical logistics and plans officer for the 1st Cavalry Division. Captain Nagtzaam received her undergraduate degree from Widener University and her graduate degree from Webster University. In March 2003, she will be assigned as the chemical officer of the 101st Airborne Division Support Command.


PIN 080571