



THE PROFESSIONAL BULLETIN
OF THE CHEMICAL CORPS

*We rule
the battlefield
through the
elements*



HEADQUARTERS, DEPARTMENT OF THE ARMY

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Back cover: BG Patricia L. Nilo and MG (Ret) Robert D. Orton stand at attention during her promotion ceremony.

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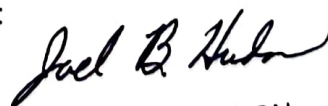
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Wow!! We are just finishing our second year at Fort Wood, Missouri, and what a year it has been. It certainly has been a year of challenge for all of us, but I am proud to say that the Chemical School and the Regimental Corps have met the challenge and continue to move forward with great initiative and momentum. We have been a key and essential player in many of the ongoing Transformation forums, and many more are planned in the near future. Also, we just completed our strategic plan for the Chemical School and have established a working team for the creation of the strategic plan for the Corps. As the Army undergoes Transformation, so will our school and Corps, and you can look with anticipation to those changes.



BG Patricia L. Nilo

going in near and midterm future capabilities and organizations.

Transformation involves all of us at Fort Wood and you in the field. Here at the schoolhouse, Transformation, training, and OPTEMPO are our daily bread as we strive to support the warfighters in the field, as well as the installation and first-responder support teams throughout the nation. This is the most significant Transformation of our Army since World War II. In moving forward to support our nation and Army, we must continue

to remember that the role of the Chemical Corps is to protect the force and maximize combat power. We accomplish this only through relentless preparation and proactive action. We cannot afford not to be ready!

This summer marked the 83d Anniversary of the Corps and the 18th annual Worldwide Chemical Conference. The highlight of this summer was the Worldwide Chemical Conference and Regimental Week activities that took place from 9-13 July followed directly by the Decontamination Platform Performance Demonstration, 16-20 July, at Fort Wood. I did not think it possible, but this year's conference was even bigger and better than last year's. This year's theme was "NBC Defense—Transforming the Chemical Corps" and was most appropriate to represent the many activities and programs our Corps is leading and partnering to meet the new Joint and Army visions. As always, this is the preeminent chemical and biological conference in the world, and it exposes and engages its attendees to some of the glimpses of where we are

Some of you have become very much engaged in preparing for our future. I call your attention to the articles that were submitted and some of which won our Chemical Corps writing competition. I challenge each and every one of you to get just as engaged and share your thoughts and ideas. We need each and every one of you to do your part. Challenge what does not make sense. If it is truly a good idea, it will stand the test of debate.

As a Corps, we have a lot to look forward to in the coming months and years. Army Transformation presents a great opportunity and potential in support of our nation and Army. We must leverage this opportunity to provide the best protection possible for our force.



ELEMENTIS REGAMUS PROELIUM!

Dragon Soldiers . . . Rule the Battle

Regimental Command Sergeant Major

Meet the new Regimental Command Sergeant Major.

In a ceremony on 4 June 2001, Command Sergeant Major James A. Barkley became the eighth Regimental Command Sergeant Major of the U.S. Army Chemical School now located at Fort Leonard Wood, Missouri.

Command Sergeant Major Barkley was born in Columbus, Ohio, on 28 May 1958. He enlisted in the U.S. Army in September 1976.

He has held numerous leadership positions in the U.S. Army. Most recently he served as the commandant of the III Corps Noncommissioned Officer Academy, Fort Hood, Texas. His previous assignments include command sergeant major, 2d Chemical Battalion, Fort Hood, Texas; faculty advisor, United States Army First Sergeant Course; NCOIC, V Corps, NBC Course; first sergeant, 44th Chemical Company, 4th Infantry Division, Fort Hood, Texas; first sergeant, 54th Chemical Troop, 11th Armored Cavalry Regiment and first sergeant, Maintenance Troop, 11th Armored Cavalry Regiment, Fulda, Germany; first sergeant, 89th Chemical Company, 3d Armored Cavalry Regiment, Fort Bliss, Texas; smoke platoon sergeant, 89th Chemical Company, 3d Armored Cavalry Regiment, Fort Bliss, Texas; recon platoon sergeant, 89th Chemical



CSM James A. Barkley

Company, 3d Armored Cavalry Regiment, Fort Bliss, Texas; decon platoon sergeant, 89th Chemical Company, 3d Armored Cavalry Regiment, Fort Bliss, Texas; NCOIC, 503d Chemical Detachment (JB); drill sergeant, 2d Basic Training Battalion, and senior drill sergeant, 2d Basic Training Battalion, Fort McClellan, Alabama.

His awards and decorations include the Bronze Star Medal, Meritorious Service Medal with four Oak Leaf Clusters, Army Commendation Medal with two Oak Leaf Clusters, Army Achievement Medal with six Oak Leaf Clusters, National Defense Service Medal, Kuwait Liberation Medal, Southwest Asia Medal, Drill Sergeant Identification Badge, and the Order of Saint George and the Order of the Dragon.

His military education includes the Primary Leadership Course, Basic Noncommissioned Officer Course, Advanced Noncommissioned Officer Course, Jungle Warfare Course, Master Fitness Course, Drill Sergeant School, Air Assault School, NBC Recon Course, Battle Staff Course, First Sergeants Course, the Sergeants Major Academy, and the Command Sergeants Major Course.

Regimental Command Sergeant Major Barkley is married to the former Barbara Moreno and has one daughter, Alexa Jolee.



Past Regimental Command Sergeants Major

CSM Bobby M. Weston	June 1986 – July 1988
CSM Wayne E. Bricker	July 1988 – August 1990
CSM John Roberts	August 1990 – June 1991
CSM Larry Nettles	June 1991 – October 1992
CSM Carl A. Lyons	November 1992 – July 1994
CSM Richard G. Garrett	July 1994 – October 1997

A Farewell From CSM James E. VanPatten III

The Chemical Corps is better today than ever. Our soldiers and civilians have done everything we have asked of them and have made a difference in every type of unit and assignment throughout the Army—from the Chemical School in the institutional Army to the modification table of organization and equipment and table of distribution and allowances units in the operational Army. During my 3 1/2 years as Regimental Command Sergeant Major (RCSM), many changes, improvements, and advancements have been made. To name a few—

- Four chemical companies (heavy decon) were activated in Korea.
- The 7th Chemical Company (BIDS) was activated.
- The Chemical School moved to Fort Leonard Wood, Missouri.
- Fort McClellan, Alabama, closed.
- The Maneuver Support Center (MANSCEN) stood up.
- The 11th Chemical Company relocated and was reorganized to dual purpose.
- The 83d Chemical Battalion was relocated.
- The 4th Infantry Division (Heavy Division) moved/reorganized its chemical company under the 2d Chemical Battalion.
- The mission at the U.S. Army Chemical Activity Pacific (USACAP) Johnston Atoll was finished.
- The 3d and 455th Chemical Brigades were activated.
- The Chief of Chemical, Major General Wooten, retired.
- A new Chief of Chemical, then Colonel (P) Nilo, was appointed.
- The Soldier and Biological Chemical Command (SBCCOM) was reorganized.
- Several systems and new NBC defense equipment were fielded, providing us with better capabilities.

Our nation and Army have asked our people to perform in every environment—home stations; hardship/unaccompanied tours; peacemaking- and peacekeeping-operation deployments; possible enemy-action responses; combat training center rotations; training exercises; evaluations; humanitarian-assistance, disaster relief, and civil support operations; various special assignments; and equipment fielding and testing. Our people performed well in everything that has been asked of them, often with great sacrifices by families and loved ones. What more can we ask of Dragon Soldiers besides what we normally expect of them—to push their chosen profession of NBC defense and obscurants. Every one of you has made a difference in upholding the traditions and improving the reputation of the Chemical Corps.

When I assumed my duties as the RCSM, I had several goals that I hoped to achieve. I wanted to improve communications with the field, build the reputation of the RCSM position, capitalize on the proud heritage of our Corps,

sustain all the great missions we accomplish as chemical professionals, share the great work that Dragon Soldiers do everyday with others, and improve identified weaknesses where possible. I wanted to visit every chemical company in the Active Component and every unit in the Reserve Component. I took on the responsibilities of the RCSM, aware of the many challenges we had to overcome and the personal sacrifices that my family would be asked to make. I wanted to give something back to our Corps. The Chemical Corps has given me the opportunity to excel and serve as RCSM.

My success is directly attributed to the success of all the soldiers and civilians who have worked with me during the past 27 years. I believe that I have accomplished most of the goals I established for myself, but the true measure and report card are what the Corps thinks. I feel a sense of accomplishment and know that I have made a difference. I have—

- Visited almost every unit.
- Assisted in the publication of our monthly enlisted newsletter.
- Communicated with every sergeant major routinely.
- Established the rites of passage ceremony for all new Dragon Soldiers.
- Persuaded almost everyone to learn the words to the Corps song.
- Ensured that we had the right NCOs at Fort McClellan and Fort Leonard Wood to move the Chemical School.
- Pushed for new training strategy for the skill level 10 soldiers we place in NBC NCO positions.
- Published an enlisted professional development guide.

Of course I couldn't have accomplished any of these things alone. I had the expert help of the many soldiers and civilians at the school and in the field. So, as my time as your RCSM comes to an end, I want to thank those soldiers and civilians for helping me achieve success in my many positions here at the Chemical School and out in the field. You cannot imagine all the talent, expertise, dedication, and concern of the folks we have here at MANSCEN and in the other organizations, like SBCCOM, that support the Chemical Corps. Everywhere I have gone, on the technical side of support to our Corps, I have been educated on what happens in research, development, testing, and acquisition of equipment to help soldiers in the field.

The future of the Chemical Corps is not only in the hands of the soldiers in the field but in our training development and combat development sections in the MANSCEN directorates. It's great soldiers, civilians, and even contractors



who want to make a difference in the improvement of our Corps. I proudly boast that the largest and best NCO Academy in the Army is located here and is made up of the best hand-selected NCOs we call small-group leaders and drill sergeant leaders. Although the Chemical School and the 3d Chemical Brigade are shorthanded and operating on limited resources, we have the best leaders, staff members, instructors, drill sergeants, and civilians working hard on issues to better coach, teach, train, and mentor the future soldiers of the Corps. Their hard work and dedication enabled me to travel throughout the Army telling our story, making others aware of the proud and excellent heritage of the Chemical Corps and School. I have not spent as much time as I would have liked with our school cadre, but because of the dedication of the leaders we have in our organizations, I know that they are being taken care of.

Finally, I cannot thank the soldiers we have in every unit in the Army enough—they are the reason we exist. Our Dragon Soldiers, officers, and enlisted in those one-deep positions on staffs, in our chemical units, and in the Active and Reserve Components have committed themselves to the

profession of NBC defense because they care about their Corps and Army and our nation. The part of our Army with which I am most comfortable and to which I have dedicated my life is the operational Army—training to be combat ready, performing any mission asked of them, willing to place their life on the line for our flag.

As much as I have enjoyed my tour as the Chemical Corps RCSM, I have to close out my career as a soldier doing what I know best—being directly involved in the training and well-being of soldiers and taking care of them and their families. I am confident that CSM James Barkley and his wife, Bobbie, will continue to build on the reputation of the Corps and serve you in a professional manner as the eighth Chemical Corps RCSM. Thank you all for your help and your continued support to me and the Chemical Corps. You all have made a difference in my life, and I'm confident you will continue to remember the great heritage and build upon the reputation of the Chemical Corps. Carmen and I wish you all continued success. Hooah!

“ELEMENTIS REGAMUS PROELIUM”

USACMLS Doctrine Publications (8 May 2001)

By Captain Erinn Hardaway

JP 3-11, *Joint Doctrine For NBC Defense Environments*, published 11 July 2000.

FM 3-11 (**formerly 3-100**), *NBC Defense Operations*. Final coordinating draft, joint working group conducted March 2001, final coordinating draft staffing 1 June 2001.

FM 3-11.85 (**formerly 3-100-1**), *Digital Division and Corps NBC Operations*. Revised final draft 5 January 2000, looking at lessons learned from division capstone exercises. Will publish after Corps Army Warfighters Experiment.

FM 3-11.3 (**formerly 3-3**), *NBC Contamination Avoidance*, 16 November 1992, C1 29 September 1994. Under revision, first draft working group conducted October 2000. Writer's draft staffing 1 July 2001.

FM 3-3-1, *Nuclear Contamination Avoidance*, 9 September 1994. To be rescinded, data added to FM 3-11.3.

FM 3-11.4 (**formerly 3-4**), *NBC Protection*, 29 May 1992, C1 28 October 1992, C2 21 February 1996. Writer's draft working group conducted April 2001. First draft staffing 22 June 2001.

FM 3-11.34 (**formerly 3-4-1**), *MTTP for NBC Defense of Theater Fixed Sites, Ports, and Airfields*, published 29 September 2000.

FM 3-11.5 (**formerly 3-5**), *NBC Decontamination*, published 28 July 2000. C1 working summer FY01.

FM 3-11.6 (**formerly 3-6**), *Field Behavior of NBC Agents (Including Smoke and Incendiaries)* 3 November 1986. Initiate revision in FY03.

FM 3-11.7 (**formerly 3-7**), *NBC Handbook*, 29 September 1994.

FM 3-11.9 (**formerly 3-9**), *Potential Military Chemical/Biological Agents and Compounds*, 12 December 1990. Writer's draft of front-end analysis completed 27 April 2001. Writer's draft comments 7 June 2001.

FM 3-11.11 (**formerly 3-11**), *Flame, Riot Control Agents and Herbicide Operations*, 19 August 1996.

FM 3-11.14 (**formerly 3-14**), *NBC Vulnerability Analysis*, 12 November 1997. Initiate revision in FY02.

FM 3-11.18 (**formerly 3-18**), *Special NBC Reconnaissance (LB Team)*, 7 May 1993.

FM 3-11.19 (**formerly 3-19**), *NBC Reconnaissance*, 19 November 1993. Program statement staffed 1 May 2001.

FM 3-11.21 (**formerly 3-21**), *Chemical Accident Contamination Control*, 23 February 1978. Manual retitled *MTTP for NBC Aspects of Consequence Management*. Signature draft available 1 June 2001. To be published fourth quarter FY01.

FM 3-11.50 (**formerly 3-50**), *Smoke Operations*, 4 December 1990, C1 11 September 1996. C2 due in fourth quarter FY01.

FM 3-11.100 (**formerly 3-101**), *Chemical Staffs and Units*, 19 November 1993.

FM 3-11.101 (**formerly 3-101-1**), *Smoke Squad/Platoon Operations TTP*, 20 September 1994.

FM 3-101-2, *NBC Reconnaissance Squad/Platoon Operations TTP*, 10 August 1994. Scheduled to be rescinded. Being consolidated with FM 3-11.19.

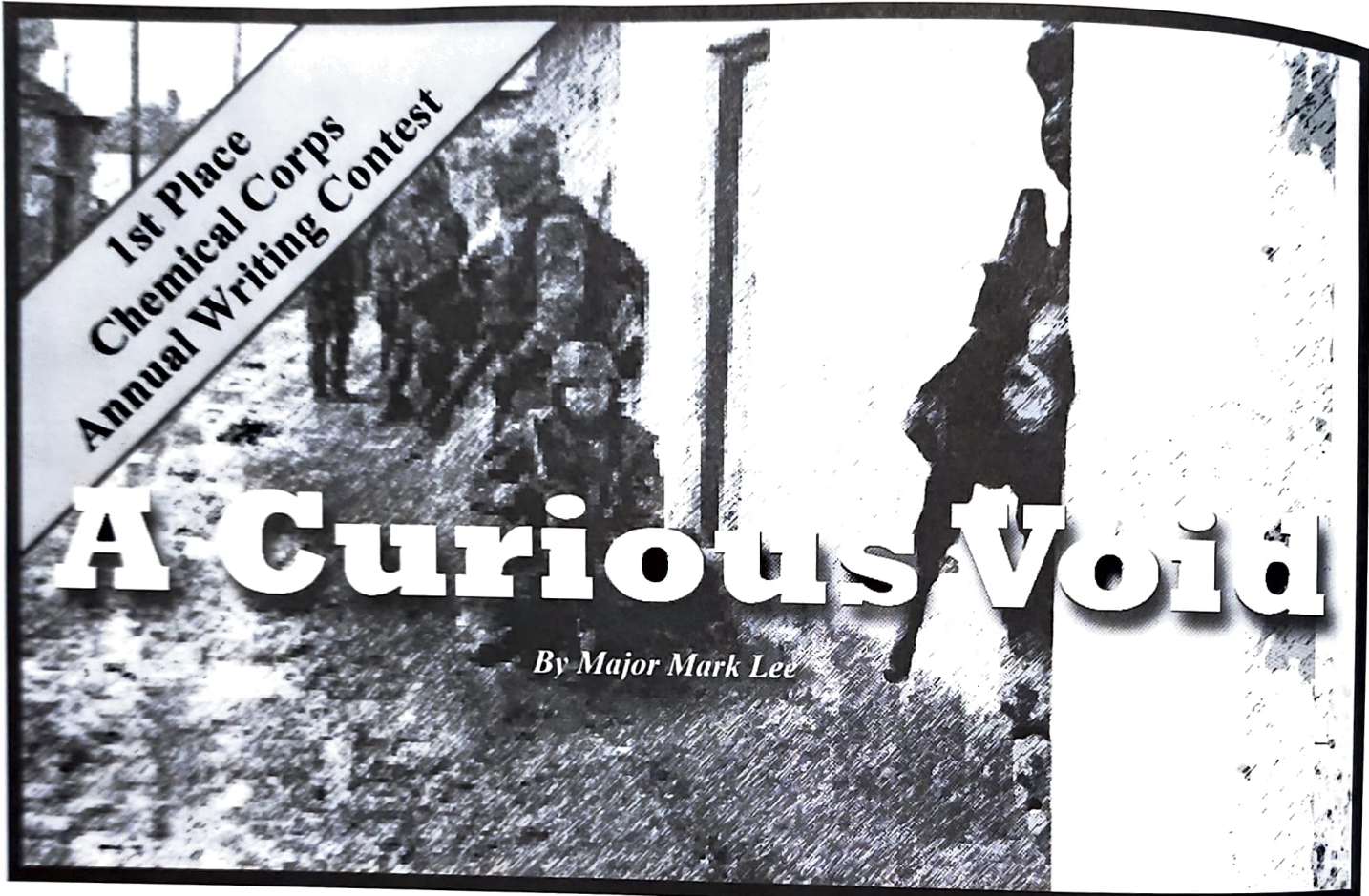
FM 3-11.112 (**formerly 3-101-4**), *Biological Detection Platoon Operations TTP*, 9 Jun 97, C1 15 August 97, C2 September 00.

FM 3-11.86 (**formerly 3-101-6**), *Biological Defense Company and Corps Staff TTP*, 19 March 1999, C1 September 2000.

FM 3-11.X, *Battalion and Brigade NBC Tactics, Techniques, and Procedures (TTP)*. New field manual in FY02.

TC 3-11.8 (**formerly 3-8**), *Chemical Training*, 29 September 1994.

TC 3-11.10 (**formerly 3-10**), *Commander's Tactical NBC Handbook*, 29 September 1994.



1st Place
Chemical Corps
Annual Writing Contest

A Curious Void

By Major Mark Lee

*"We run into a curious void in the literature of warfare. Most practitioners of the Art who are also its ablest theorists, scholars, and writers dwelt on its varied aspects to the limits of their imagination. One thing, however, they did not touch upon—combat, where life is centered. Run through the list of writers and their works—Frederick, de Saxe, Clausewitz, Jomini, Kuropatkin, Bernhardt, Henderson, Foch, Fuller, Hart, et al. Not one has anything to say about military operations within or against the city. The subject was too sticky, too little understood, or it was dismissed as unimportant."*¹ — S.L.A. Marshall

This curious void exists despite the long history of combat in cities. Thucydides wrote of city combat thousands of years ago. His account of the battle in the streets of Plataea described many of the contemporary urban combat challenges.² Sun Tzu, an ancient philosopher, strongly counseled avoiding city combat altogether. "This tactic of attacking cities is adopted only when unavoidable."³

Warfare has changed in many ways since then, but surprisingly military doctrine has remained the same—avoid combat in cities if possible. Current urban operational doctrine is FM 90-10, *Military Operations on Urbanized Terrain*, published in 1979. Written to guide fighting on the urban battlefield of a Cold War Europe, the relevance of the manual for current operations is questionable. This doctrine has not changed in spite of the Army's capstone doctrine—FM 100-5, *Operations*—undergoing four revisions. The 1993 version devotes only 75 words to the challenge of

urban operations and refers the reader to the then 14-year-old FM 90-10. It appears that Sun Tzu's advice was a heavy influence in that urban terrain was to be avoided whenever possible.

FM 90-10-1, *An Infantryman's Guide to Combat in Built-Up Areas* (written in 1995), attempts to address some of the shortcomings of FM 90-10, but its focus is a "how-to-fight" manual. FM 90-10-1 provides the "infantryman with guidelines and techniques for fighting against an organized enemy in built-up areas who may or may not be separated from the civilian population."⁴ The organized enemy is one that is fighting a conventional fight, head-to-head against U.S. forces. The manual does not address the interaction of the civilian population within the city. It is designed for a World War II-type battle where collateral damage is not an operational concern. Rubbling entire blocks remains a viable course of action.

"As anybody who has had experience with the Chetniks in Serbia, 'technicals' in Somalia, Tontons Macoutes in Haiti, or soldiers in Sierra Leone can tell you ... where there has always been mass poverty, people find liberation in violence."

Robert D. Kaplan, *The Coming of Anarchy*

Disregarding this doctrinal void, the world's population continues to migrate into larger urban complexes. In 1990, a fundamental change took place in the world demographics. For the first time in history, more people lived in urban areas than outside of them. The size and complexity of existing cities have grown accordingly. A new term, megacity, is reserved for large urban complexes with a population of more than 1 million.⁵ Today, 20 percent of the world's population lives in a megacity. By 2020, that figure will rise to almost 30 percent.⁶ Megacities are becoming more common in underdeveloped nations. Unfortunately, the poorer citizens, who are more dependent on the inadequate infrastructure of the urban complex, are populating these cities. The population requires a level of support beyond what the local governments can supply. Most new city dwellers live in slums or shantytowns around the periphery of the city. Frequently, these living conditions are worse than the ones they left.

These megacities are an incredible drain on the environment, and they frequently disregard international borders. Along the Ivory Coast of Africa, the continuous megacity that is visible from satellite imagery straddles five struggling nations.⁷ The infrastructure of the megacity cannot keep up with the explosive growth of the population. Overpopulation creates sanitation hazards, and pollution runs unabated. These urban complexes defoliate the countryside in a feeble sustaining effort. In essence, megacities are consuming the countryside to feed an insatiable hunger that eventually will leave a barren landscape incapable of supporting life, even in the shantytowns. As the overcrowding increases, the urban complex divides more on ethnic and economic lines rather than on geopolitical ones.

As more and more people migrate into the larger cities, so do the insurgent forces and criminal elements. Insurgent forces, used to drawing their support from the rural society, now have followed the rural population into the city. Cities are unable to exert any influence in these shantytowns, and the insurgent forces and criminal elements quickly fill that void.⁸ The destitute living conditions produce a large population of inactive males who are ripe for recruitment. Additionally, just as the drug culture offers quick riches for disenfranchised urban American youths, insurgent forces in the megacity present the promise of a better way of life than the day-to-day existence offered by the government. "As anybody who has had experience with the Chetniks in Serbia, 'technicals' in Somalia, Tontons Macoutes in Haiti, or soldiers in Sierra Leone can tell you ... where there has

always been mass poverty, people find liberation in violence."⁹ To quote Chairman Mao, "Their lifestyle comes from the barrel of a gun." This liberation has created a different type of warrior. These killers are motivated by the short-term riches and intoxicated by their newfound power. We will face these forces in the future.

Facing the Future

The future antagonist of a U.S. involvement cannot match us conventionally—head-to-head battle. Given the advanced capabilities of precision fires, future antagonists must look to cities as safe havens from precision-guided munitions and other advanced weaponry. "An enemy seeking asymmetric advantages will be hard-pressed to find an alternative more likely to neutralize the U.S. superiority than urban operations."¹⁰ The division and isolation of U.S. forces caused by the urban terrain present a tremendous opportunity to apply asymmetrical attacks against the U.S. forces. As witnessed in the past decade in Somalia and Chechnya, the urban environment neutralizes the standoff advantage of many advanced weapons.

Planners for the Army Transformation process have realized the significant challenges in military urban operations and have focused a large amount of research on this topic. War games, Army warfighting experiments, advanced-concept technology demonstrations, and other methods have identified some requirements for operations on urban terrain and highlighted Army current doctrinal, force structure, and training shortcomings. All of these efforts represent the U.S. Army's attempts to fill the "curious void" in the study of urban operations. Most of these efforts focus on advancements for the individual soldier. However, if this shortcoming in urban doctrine is just a void, then the gap in doctrine for recognizing and mitigating the many urban hazards represents a gaping abyss.

An Unseen Hazard

In the famous chemical attack at the battle of Ypres in 1914, German forces released 168 tons of chlorine gas against an Allied force void of any protective equipment. The attack caused 5,900 casualties.¹¹ The chemical weapons used in World War I were, with the exception of phosgene, casualty makers and not killers. They were used to reduce the efficiency of the opposing force and the increased burden placed on the medical and logistical systems. As Heller pointed out, 31 percent of all wounded treated in the Allied Expeditionary Force facilities were for gas wounds.¹²

A New Danger

In addition to the conventional chemical weapons, the future antagonists will have access to toxic industrial chemicals (TICs) and toxic industrial materials (TIMs), as well as the historically regarded weapons of mass destruction (WMD) agents. The operational significance of these materials was doctrinally recognized in the new Joint Publication (JP) 3-11, *Joint Doctrine for Operations in Nuclear, Biological, and Chemical (NBC) Environments*. It defined an NBC environment as one that "includes the deliberate or accidental employment or threat of NBC weapons and attacks with other chemical, biological, or radiological materials or TIMs."¹³

The asymmetrical advantage offered by these agents is sobering. U.S. forces currently do not have the means to detect them.¹⁴ For the most part, they don't require a delivery system; they are just as lethal as the "traditional" chemical warfare agents, and they have worldwide availability. These combinations of agents and materials present a wide range of employment options against the U.S. forces and the civilian population. The complexities of the urban environment and the current U.S. lack of understanding of the hazards provide the foe an opportunity to use these hazardous materials. Use of these materials would influence the U.S. mission significantly. Even an accidental release of a hazard source in the city would present a serious operational challenge that we are not prepared to face.

The effects of TICs can be just as lethal. In 1983, 40 tons of methyl isocyanate were released in Bhopal, India; 8,000 people died overnight, over 20,000 died in the ensuing months, and about 500,000 remain affected today.¹⁵ In many cases, the lethality of these TICs¹⁶ can be greater than those traditionally considered chemical warfare agents. As cities modernize, the presence of the TICs throughout the urban complex grows exponentially. No longer confined to an industrial park, TICs represent a hazard everywhere. The hazard in underdeveloped megacities is even more profound. Without the resources or time available to provide basic sanitation needs, local governments are incapable of enforcing an effective hazardous material control program. Even our country has difficulty controlling hazardous materials properly all of the time.¹⁷ Their presence in today's sprawling urban environments represents an operationally significant challenge to the U.S. force.

Mission Responsibility

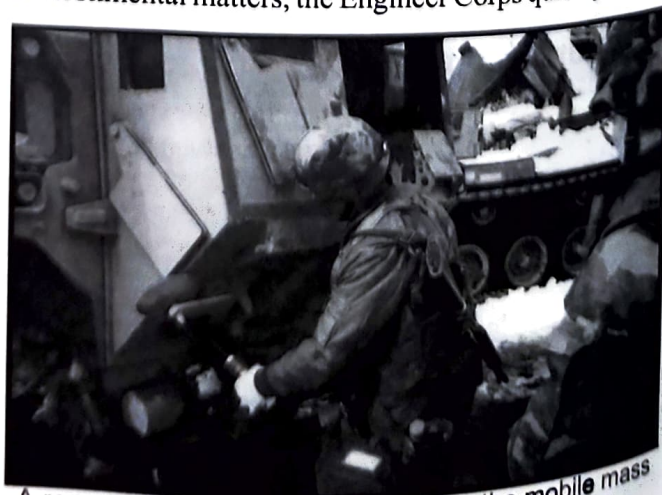
JP 3-11 establishes TICs as operationally significant hazards in the battlespace. While this is a good first step in identifying the problem, there is still some confusion over the implications of this new mission. Although Joint doctrine is prescriptive in nature, JP 3-11 fails to designate a single proponent. This approach leverages the expertise available in the different proponents but violates the principle of unity of effort. The division of labor fails to leverage the

expertise—distribution of the appropriate knowledge and equipment during an operation. While this technique does ensure participation by all parties, it does not reflect the operational realities facing a commander today.

Three essential players in the mission to protect the force from TICs are health services, as the preventive medicine (PVTNEMED) team; the engineers, as the Army's environmental stewards; and the Chemical Corps, as the NBC experts. Rather than dissect a mission statement from these proponents, it would be more useful to review their missions in support of Operation Joint Endeavor (OJE) in Bosnia-Herzegovina.

The PVNTMED effort for OJE was unique and very successful. Faced with an operationally challenging mission with a large area of responsibility, the scope of the PVNTMED effort required a comprehensive plan. Most of the effort focused on the many disease risks the OJE soldiers faced. The mission of the deployed PVNTMED team was to "preserve the health of deployed U.S. forces and establish countermeasures to the risk of disease and injury."¹⁸ The main effort was to prevent deployed soldiers from contracting serious and fatal diseases prevalent in the Balkans. Protection of the force in the base camps was a critical task, and the PVNTMED teams eventually came up with quantifiable standards to measure the protection of the various facilities.¹⁹ Their environmental-sampling procedures focused primarily on the base camps. Concerned about the air quality in the Tuzla Valley, the teams began comprehensive air monitoring. They also found time to collect 2,300 environmental samples of soil and water during the first year. Although a theater-support medical laboratory later deployed to Bosnia, most of the samples went to facilities in the continental United States.²⁰ Despite the large number of samples taken, the PVNTMED team focus remained inside the wire of the base camp.

The engineer effort for OJE began with the bridging of the Sava River. Yet, as the Army proponent for environmental matters, the Engineer Corps quickly moved



A reconnaissance squad leader uses the mobile mass spectrometer to identify an environmental sample.

into that portion of its mission to ensure environmental compliance of the OJE forces. The purpose of these efforts was two-pronged: to keep the force from creating a hazard that would adversely affect mission accomplishment and to comply with established hazardous material handling procedures.²¹ All of these efforts were very effective in the protection of the force and the environment. In fact, the United States often found itself cleaning up hazardous materials left in the base camps from previous occupants.²²

Thanks to the efforts of the PVNTMED and engineer teams, the base camps occupied by U.S. personnel were the healthiest grounds in the Balkans. The deployed force showed a disease and non-battle-injury rate much lower than expected.²³ It rightly focused all of its efforts inside the wire.

The Chemical Corps units deployed to OJE focused their efforts **outside** the wire. The 1st Armored Division chemical section recognized early in the planning process that there were operationally significant hazards in the area. Its efforts led to numerous intelligence requests. These efforts culminated in the execution of several command-post exercises for the division and chemical battle staffs to work out the difficulties presented by toxic substances in the battlespace.²⁴ While it took time to convince the command of the importance of this aspect of mission analysis, the operationally significant impact a TIC release could have on the OJE mission became clear. Once the forces entered the Balkans, chemical soldiers began their environmental reconnaissance mission. Taking advantage of the environmental chip in the M93 Fox, they were able to move quickly throughout the area of operations and confirm or deny the presence of toxic materials.²⁵

Several important lessons evolved from these operations. First, it demonstrated that commanders in the field routinely look to the chemical battle staff to be their advisor for these matters.²⁶ From division level and down, the chemical soldier was the one with the commander's finger in his chest. Chemical soldiers are expected to offer the same mission-oriented advice to the commanders for toxic chemicals as well as traditional NBC matters. For once, Joint doctrine reflects reality. Second, the hazards are out there; recon teams found both chemical and radiological hazards during their surveys. Third, these missions also validated the capability and responsiveness of the M93 mass spectrometer.²⁷

Filling the Void—A New Mission—A New Future

As we move into the next century, our Army is transforming. The road map for Chemical Corps transition remains unseen. One capability we must retain for the future is the ability to protect the force from the effects of TIMs. The Chemical Corps needs to establish itself as the doctrinal and operational leader for our armed forces in this important



An environmental reconnaissance being conducted at a U.S. site in Northern Bosnia

field. We must have this mission for four simple reasons: First, we already have the battle staff and chemical units in place. Second, experience demonstrates that chemical soldiers are the assets the commanders are sure to go to when faced with a difficult situation. Third, increasing our knowledge base to include TIMs is an incremental, not exponential step. Last, we consider the vision statement from Chemical Vision 2010—"The ability to protect the force throughout the depth of the battlespace and across the full spectrum of operation environments."²⁸

This is our curious void. It's time to step up to the plate and take our best swing at this important new mission for our Army. We must be the experts outside the wire, for no one else can.

Endnotes

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¹⁶Industrial chemicals, as defined in JP 3-11, "industrial chemicals: chemicals developed or manufactured for use in industrial operations or research by industry, government, or academia. These chemicals are not primarily manufactured for the specific purpose of producing human casualties or rendering equipment, facilities, or areas dangerous for human use. Hydrogen cyanide, cyanogen chloride, phosgene, and chloropicrin are industrial chemicals that also can be military chemical agents." (This term and definition are approved for inclusion in the next edition of JP 1-02.)

¹⁷Peter Stuebe, "Hydrofluoric Acid Causes Death of Sanitation Worker," *Fire Engineering*, June 1999.

¹⁸Lieutenant Colonel Kenneth J Tannen, Lieutenant Colonel John J. Ciesla, and Major Mustapha Debboun, "Military Preventive Medicine Support: The Balkan Experience," *Center For Army Lessons Learned (CALL) Newsletter*, Fort Leavenworth, Kansas, <http://call.army.mil/products/trngqtr/tq1-00/medicine.htm>.

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²⁸Commandant, U.S. Army Chemical School, *Chemical Vision 2010*, Fort Leonard Wood, Missouri, 3 February 1999.

At the time this article was written, Major Lee was a student at the School of Advanced Military Studies, Fort Leavenworth, Kansas. His previous assignments include combat in Operations Just Cause and Desert Shield/Storm with the 82d Airborne Division, CDTF lab officer, aide-de-camp to the commandant, and commander of the 11th Chemical Company, all at the U.S. Army Chemical School, Fort McClellan, Alabama. Prior to attending the Command and General Staff College, Major Lee served in the U.S. Army Pacific, Fort Shafter, Hawaii.

Chemical Corps Annual Writing Contest Rules

Each article should be submitted as a double-spaced manuscript in paper copy accompanied with a disc in Microsoft® Word format. The article should be between 500 and 2,500 words in length and supported by appropriate footnotes, bibliography, and graphics/photos. Hard-copy photos are preferred; however, if digital photos are submitted, they should be saved at a dpi/ppi of 200 or more and at 100 percent of actual size. In addition to the manuscript, submissions should include a cover sheet with the author's name, title, organization, complete address, e-mail address, and a short biography.

To ensure anonymity in the selection process, the author's name should not appear in the manuscript itself. The panel will rank submissions on a 100-point scale with up to 40 points assigned for writing clarity, 30 points for relevance to chemical soldiers of the twenty-first century, 20 points for general accuracy, and 10 points for originality.

See page 16 for this year's themes and submission date. Select one theme to write on. Send article to:

Command Historian
U.S. Army Chemical School
320 MANSCEN Loop, Suite 44
Fort Leonard Wood, MO 65473-5267
Or e-mail: wrightb@wood.army.mil

2nd Place
Chemical Corps
Annual Writing Contest

Smoke Units Viable to IBCT and Objective Force—

Informational Dominance Denial Through Use of Advance Obscurants

By Mr. Frank D. Chapman

Introduction

Army Vision 2010, Joint Vision 2010, Joint Vision 2020, National Security Strategy for New Century, December 1999: National Military Strategy, 1997 Force XXI Division Organizations and Operations, and the Initial Brigade Combat Team (IBCT) Operation and Organization are based on informational superiority/dominance.

There are two components of informational superiority that are required for the Army of Today and the Future to operate and win on the battlefield. These components are gain situational awareness and deny threat/adversary situational awareness, which provide information for answering the following questions:

Gain Situational Awareness

- Where am I?
- Where are friendly forces?
- Where is the threat/adversary?
- What is the environment (weather, terrain)?—
Often left out of conversations and planning

Deny Threat/Adversary Situational Awareness

- Where am I?
- Where are friendly forces?
- Where is the threat/adversary?
- What is the environment (weather, terrain)?

The deny threat/adversary situational awareness part of the information superiority capability is especially important in defeating the adversary's ability for situational awareness though informational dominance. This is accomplished through an integrated multidiscipline (chemical, engineer, armor, infantry, intelligence, signal, air defense, and aviation) effort that degrades/limits the adversary's informational/situational awareness capabilities across a broad spectrum of missions and situations. The need to degrade the ability of other nations and groups to gather and process data for political and military requirements has been demonstrated repeatedly in recent years. Examples of this ability to gain informational awareness includes, but is not limited to, (1) a private company buying satellite photographs of key military bases and missile sites of the United States and other nations with a resolution of 3 meters and (2) the ability of adversaries during Operation Desert Storm and the air campaign in Kosovo to gather and process information on the status of the combat operations by accessing international news organizations cable satellite systems.

Army General Wesley Clark recently stated, "...escalation strategies, unloved by Air Force leadership, may be the wave of the future. The Air Force shouldn't assume it will be given free rein to target all the sites it deems necessary unless allied survival is at stake, because operations such as Desert Storm are likely to be anomalies in the future. 'Desert Storm was a clean battlefield.' Operation Allied Force may be more indicative of what combat will be like in the

future, complete with noncombatants, a capital city rife with strategic complications, and targets such as bridges that serve both military and civilian purposes," he cautioned. These types of missions are tailored for the commander to limit damages and loss of life.

With the development and fielding of the IBCT and Division, the need to deny the adversary situational awareness takes on new meaning and importance. With the rapid proliferation of information technology systems and advance weapons across national boundaries, now more than ever, the commander must be cognizant of not only his situational informational awareness but also that of the adversary's. This is becoming increasingly harder as missions go from combating organized national armies to rebel, drug, or terrorist groups. These groups are well financed and ably led by fanatics.

Background

Information dominance is and has been one of the most important missions of the Chemical Corps's smoke and obscurant operations. Until recently, the Corps has been effective in the visual arena of operations only. During the last 20 years, the Chemical Corps and the research and development community have been actively seeking and developing advanced materials to provide warfighters with the edge in the informational dominance battle. One of the elusive goals of the obscurant community has been to provide our nation's warfighters with a single obscurant material that provides protection in multiple energy bands. Several factors that contribute to making this an elusive goal to achieve are that—

- The ideal material from the standpoint of operational capability is within the respiratory range and is suspect for toxicity.
- The ideal material is fibrous and conductive, which is a concern from the environmental aspects.
- Traditional manufacturing methods for particles within the ideal size range are expensive.
- Traditional materials generally fall into the category of finely divided metals and are flammable, particularly when dispersed in air.
- Traditional materials have very low yields on dissemination and are logistically impractical.

Another goal is to produce an obscurant that is tailored for a specific sensor wavelength range. Several factors make this even more elusive to achieve:

- The ideal material from the standpoint of operational capability is within the respiratory range and is suspect for toxicity.
- Other nations' systems currently operate in the same sensor ranges.
- Current materials are broad-banded in the desired wavelength ranges.
- Materiel system developers do not share

information on system wavelengths with others in the research and development community.

Current Capabilities

Currently, obscurants have only a limited ability to perform informational-dominance missions. This ability has been successful in limiting visual informational gathering for more than 200 years. In the 1990s, with the introduction of infrared obscurants, forward-looking and passive infrared systems have been defeated or severely limited in effectiveness when such obscurants are employed. In 2005, the ability to defeat selected (wavelength) radar systems will become a reality. Some unique aspects of obscurant operational use consist of the ability to select the size of the area to be denied and the system's ability to continue operating effectively unless you are located inside or behind the obscurant cloud. There is no effective countermeasure to defeat obscurant effects (not including wind and weather) unless you move out of the cloud (if inside) or from behind it. Obscurants are a cheap and effective force multiplier to the commander while using small numbers of personnel and equipment.

Future Capabilities

Leap-ahead technologies are being explored. This will be the foundation for the next-generation obscurant systems required by the Army and as envisioned by the Army Chief of Staff to achieve his concept of a rapidly deployed, precision-strike capability force. Critical drivers for this type of operations are the reduction of the logistics tail and development of new delivery platforms. For obscurants, this means higher-performance materials that reduce quantities required to achieve success. With the research and development of new, advanced obscurant materiel and delivery systems—such as an unmanned ground vehicle (UGV) with a rapid obscuration system and/or an unmanned aerial vehicle (UAV)—the commander will gain new flexibility in the deployment of and the capability to integrate obscurants across the battlefield and/or peacekeeping operations. No longer will high-value targets be placed off limits because of their locations (near hospitals, religious shrines, and buildings). These targets can and will be attacked without producing unacceptable collateral damage through the use of advanced obscurants.

We are on track to produce particles, which are designed to defeat a specific sensor, that screen more efficiently at millimeter and other wavelengths. As each particle is described and produced, our goal is to provide a measurement of ever-increasing efficiencies. Polyacrylonitrile-based carbon fibers, our present standard millimeter wave obscurant, have an extinction coefficient of about 2 m²/gm. Fibers have been measured with extinction coefficient in an order of magnitude above

that. Within 2 years, we hope to advance another order of magnitude. This increased coefficient lowers the logistical requirement (amount disseminated) needed to provide the same or increased capability.

New materials being developed show promise with their ability to defeat systems operating in the ultraviolet through digital communication spectrum. Natick and Army research laboratories have been investigating electrospun nanofibers (Figure 1) for applications in various aspects of protection and advanced materials design. The fibers produced by this process are morphologically ideal for applications in obscuration, particularly as multispectral screeners. Natick has developed an approach that provides electrospun fibers of polymers with conductivities on the order of graphite. This gives us a novel class of tailorable, multispectral obscurants that are environmentally and toxicologically benign. Additional materiel under research includes, but is not limited to, dendrimer and bioorganic fibers that may lead the U.S. Army throughout the twenty-first century.

What We Can Do for the Warfighter

Current Operations

Five concepts of operation found within the Chemical Corps Vision—sense, shape, shield, attack, and deceive—provide the basic start point for support to the warfighter today and beyond 2010. Within these five pillars, obscurants support the warfighter by providing him with a weapon that is a force multiplier of unparalleled capability and effectiveness when used in combination with all units on the battlefield or in a peacekeeping mission. Take a look at these pillars in context of supporting the medium-weight force.

Sense is the identification of reconnaissance, intelligence, sensors, and target acquisition (RISTA) and units through all-source intelligence assets by requiring the use of husband assets. With the limited ability to fight in a direct head-to-head matchup, high priority must be given to identifying and locating the adversary's situational/informational awareness systems and combat forces.

Shape is the control and management of obscurants on the battlefield. This management is paramount for the IBCT in determining whether it must employ obscurants to defeat the RISTA and adversary formations or provide protection to friendly elements based on identification and location of these threats. A major attribute of

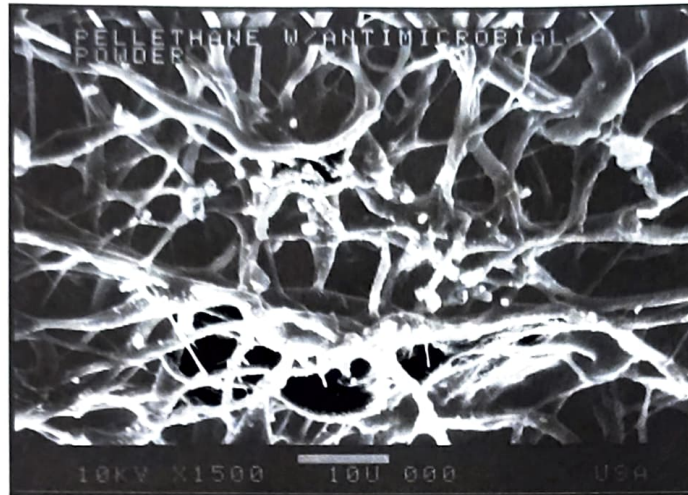


Figure 1. Nanofibers

obscurant management is assuring that obscurant operations are planned and integrated throughout the battle staff and that they support the commander's intent of operation at the tactical and operational level.

Shield provides protection against attacks from conventional and advance munitions by adversary forces. It also denies the adversary situational/informational awareness and/or dominance by RISTA elements. This

becomes more critical for the IBCT because of the nature of survivability, given the lack of armor and numbers of vehicles on the battlefield. Onboard vehicle obscurants can provide limited protection in an attack, but survivability is limited because of the number of obscurant munitions onboard and the length of time that vehicles operate in a killing zone. This creates an increased unacceptable risk without other effective obscurant protection.

Attack is the most overlooked aspect of obscuration operations today. Attack has two distinctive areas of operation unique to obscurants—counter-RISTA and fight. Counter-RISTA is a synergistic approach that denies the adversary any information on friendly elements, location, size, and activity. This informational dominance gives the commander greater latitude in developing the situation and ensuring that friendly forces have the element of surprise. Because of the size and duration of large-area obscurant systems, intelligence only has to identify that there is a likely threat in a general area without having to pinpoint its exact location. This ensures that the commander has situational dominance though denying the adversary informational awareness.

In a fight, obscurants are placed directly on the adversary or between it and friendly forces. This limits the adversary's ability to decisively target and thus engage friendly forces. Also, friendly forces can maneuver through or around choke points, killing zones, and barriers without the adversary knowing the exact location of the friendly forces and being able to adjust to the attack. Because of the limited number of artillery/mortar systems available for delivery of obscurant munitions, large-area obscuration becomes the best available method to provide this valuable weapon.

Deceive conceals the true size, actions, location, or intent of friendly forces from the adversary to fix threat forces in one location, causes redirection and movement to cover different axes, uses hoarded assets to penetrate

deception, or spreads threat forces thin over a larger area. This operation, when used with other medium-force assets, allows friendly forces to deny the adversary situational awareness and causes its forces to be employed improperly to prevent decisive engagement of friendly forces.

Future Concept of Operations

From 2010 through 2020 and beyond, future obscurant missions will be conducted under five doctrinal concepts of operation and will provide the commander with new, unparalleled capabilities. This is accomplished across the full spectrum by increasing survivability, sustainability, mobility, and deployability while balancing force protection. The ability to select the windows of opportunity through new, advanced obscurants provides the commander with the unique capabilities to select not only the time and location of the obscurant but what windows to open to allow friendly systems to penetrate the obscurant cloud while inhibiting adversaries.

Informational dominance is the ability to deny information that supports the adversary's efforts to either collect RISTA or provide command and control operations. Missions that give the commander this capability are—

- Placing selected UAV as an obscurant over a target area that uses digital communication wavelengths, thus creating a communication blackout for a specific time. The target could be in an area that normal weapons could not hit, due to location.
- Placing selected UAV as an obscurant over a long front, which defeats ground surveillance radar systems without knowing exact locations of systems.
- Emplacing selected obscurants along an aerial insertion or exit route to defeat air defense early warning systems.
- Countering battery fire protection by putting obscurants in front of or over the adversary's artillery counterfire detection systems.

Immediate protection (on demand) consists of onboard vehicle systems, hand-controlled munitions, artillery/mortar munitions, manned large-area systems, and UGV and UAV systems for rapid employment. This type of obscurant mission's employment time frame consists of an operational duration of 30 seconds to 25 minutes. The primary mission is to provide immediate on-demand obscurant from direct/indirect fire and smart munitions and observation to individual vehicles/personnel. Missions that give the commander and soldier this capability are—

- Urban operations for mounted and dismounted soldiers.
- Breaching and obstacle emplacement operations.
- Force on force (vehicle versus vehicle or emplaced soldiers).

- Smart-weapon attack from indirect fire or infrared/millimeter wave/acoustic minefields.
- Special operations.
- Direct fire.
- Soldiers ambushed by advanced and conventional weapons and combatants.
- Stealth vehicle penetration of friendly forces protection through defeating its special capabilities (tagging/highlighting).
- On-demand delivery to deny the adversary short-term observation.

Long-term protection (on call) consists of large-area obscurant with a duration of more than 15 minutes over an area of a minimum of 1 by 5 kilometers. Missions that give the commander and soldier this capability are—

- Employing obscurants directly on, or in front of, the adversary to deny RISTA and/or target engagement.
- Providing overhead protection from UAVs, aircraft, and space-based sensors from RISTA through "canopy obscurants."
- Providing overhead protection from direct and indirect or smart weapons through canopy obscurants.
- Providing protection for river and choke points from all types of adversary RISTA and target-acquisition systems.
- Protecting high-value targets from all types of adversary RISTA and engagement systems (aerial ports of debarkation, seaports of debarkation, ammunition, and resupply points).

Deception provides new capabilities while keeping the overall intent to deceive, which has stayed the same as currently employed by the warfighter. This technique of informational dominance of the battlefield will deny the adversary the data required to assess or act promptly to the situation leading to total success of the operation. With the ability of the UAV/UVG to employ advance obscurants, the commander can—

- Selectively cover far-ranging and in-close ground-surveillance systems that would compromise the mission.
- Defeat the adversary's radio communications located near and far away from the deception mission.
- Affect selected command, control, communications, computers, and intelligence systems as part of the operation.
- Degrade the command-and-control network and limit the adversary's ability to grasp and/or process all the information required.
- Increase the ability of the commander to force the adversary into making the wrong judgment on who, what, or where when employed with other theater/service assets.

Integration matrix

(Figure 2) shows the interaction between the five concepts of operation and the four types of missions envisioned to take obscurants into 2010 and beyond. Each mission has a direct link to one of the five concepts (sense, shape, shield, attack, and deceive) but also supports the key elements of the others.

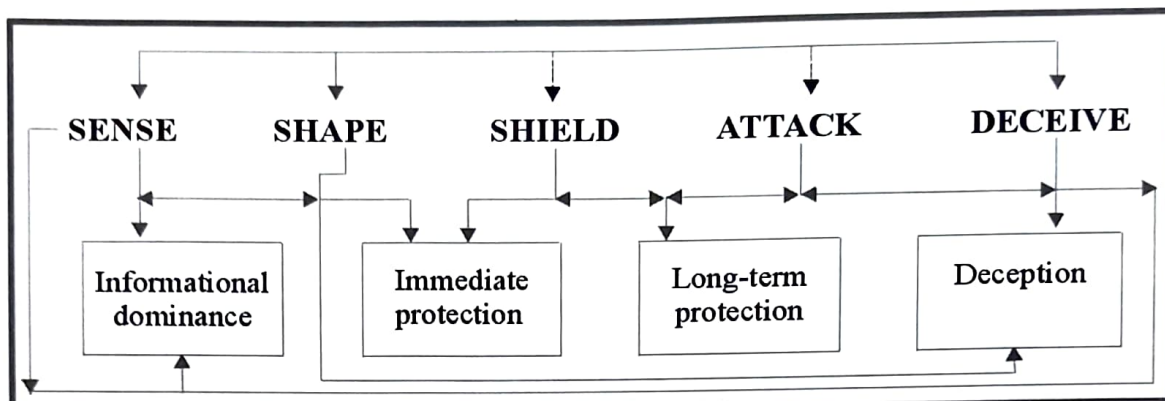


Figure 2. Integration matrix

Sense is a critical part of each and every mission. It is the key aspect of “the know” for informational dominance which, in turn, leads to the who, what, when, and where of the adversary at all times. With this information, the effectiveness of the adversary’s plans and operations is limited, but the friendly forces’ ability to accomplish the mission rapidly while minimizing the loss of personnel and/or equipment is increased. In immediate and long-term protection, the key is to know the who, when, and—in some cases but not in all—where, which increases overall survivability without increased manpower or other types of assets when used effectively. For deception to be effective on the battlefield, you must know the who, what, or when to conduct the mission to allow friendly forces to accomplish their other missions. Additionally, you must know where the most effective location is to conduct the mission. This ensures that the adversary is fooled into either moving assets or employing reserved assets to determine if the threat is real or not.

Shape is used to force the adversary to react to your actions, not for you to react to its. This requires situational awareness of friendly and adversary forces. To accomplish this, informational dominance is not only critical but also required, and when used with the deception mission, it provides an overlapping and continuous operational superiority across all spectrums.

Shield provides protection at all levels of operation for personnel, equipment, and facilities from RISTA and direct or indirect fires. This protection is found primarily in immediate and long-term protection by obscurants. The key for shield is to know the who, what, when, and where. Deception also can play a decisive role in providing protection by causing misdirection of RISTA activities and direct or indirect fire from actual targets.

Attack places obscurants directly on the adversary or between it and friendly forces. This is accomplished through informational dominance and requires the commander to know the who, what, when, where, and how. Immediate and long-term protection work hand in hand with attack, because of the adversary’s reaction to

the obscurants being placed directly on or between it and friendly positions. Immediate protection is the most important of the two protection missions.

Deceive is an integral part of full spectrum dominance throughout the battlefield. This mission requires the commander to know the who, what, where, and when not only of the adversary forces but also of friendly forces. Therefore, informational dominance plays a critical role in assuring that the adversary is fooled and reacts according to the users’ wants and needs.

Conclusion

Smoke and obscurants have come a long way in a short time. The challenges for the U.S. Army Chemical Corps are far-reaching and have many pitfalls along the path through the twenty-first century. These challenges start with new doctrine that is responsive and updated continually to exploit the advances in obscurants and technology. This doctrine must alleviate the fear of obscurants defeating both friendly and adversary systems. This is a true statement in its purest form, but a sad excuse for poor planning and execution by both the chemical officer in the planning stage and the unit in its operation. Another challenge is that when planning obscurant operations, we look primarily for obscurants in the defense—such as a shield for immediate protection—and more.

Obscurants are weapons in the truest sense. A weapon is “any instrument or device for attack or defense.” Obscurants can be used to attack as well as defend, so they complete both missions. As an attack weapon, they defeat or incapacitate the adversary’s capabilities (just like a bullet or active jammer) to operate other weapons and intelligence platforms that use the visual, infrared, and—in the near future—millimeter wave portions of the electro-optical spectrum. The chemical officer and NCO must be taught how to plan and implement these capabilities. Then they must show commanders and other officers that obscurants on the battlefield are inexpensive weapons with outstanding overmatch capabilities per the number of platforms required.

In the future, obscurants should allow us to operate our systems, without degradation from the ultraviolet through the digital communication spectrum. To ensure that we need to dominate the electro-optical spectrum now and in the future, we must be forward thinkers. We should not support the idea that if our forces do not ask for a certain capability, then it is not needed or required. To do this would be a dereliction of our responsibilities in a world developing and exporting advanced technology at a rate never imagined just 20 years ago.

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General Wesley Clark. Comments were from an article published by AP news service after his retirement as overall commander of the forces used to force Serbs from Kosovo.

Figure 1. Conductive Nanofibers for Multispectral Obscuration: This research was proposed for S&T support and initially conducted by Erica R. Valdes, ECBC, and Heidi L. Schreuder-Gibson, U.S. Army Natick Soldier Center.

Chemical Vision 2010, dated July 1999, is the basis for the Five Concepts of Operation on pages 13 and 14.

Mr. Chapman is a military analyst, Directorate of Combat Developments, Chemical Division Concepts Section, at the Maneuver Support Center, Fort Leonard Wood, Missouri. His previous positions include acting chief of the Materiel Section for the transfer from Fort McClellan to Fort Leonard Wood and smoke and obscurants combat developer. He retired from the U.S. Army and Chemical Corps with more than 20 years of service.

The Chemical Corps Regimental Association Writing Contest

Each year, the CCRA sponsors a writing contest. The contest is open to military personnel in all branches and services, including allied nations, and to civilian personnel of any nationality. The purpose of the contest is to stimulate thinking and writing on issues of concern to the Chemical Corps.

The winners of the 2000 writing contest are the following: Major Mark Lee, currently a School of Advanced Military Studies student, won the first place award of \$500 with his essay entitled, *A Curious Void*. He discussed the lack of interest in and work on weapons of mass destruction defense. The second place winner of \$300, Mr. Frank Chapman, is a member of the Maneuver Support Center's Directorate of Combat Development. His article is a detailed appreciation of the use of smoke in tactical situations. The third place winner, Lieutenant Colonel James Smith, received \$150 for his essay on the chemical and biological considerations for the U.S. Army during contingency operations, which was based on his personal experiences in the Balkans.

The Commandant of the Chemical School, BG Patricia Nilo, awarded Mr. Chapman and LTC Smith their checks, certificates of appreciation, and commandant's coins in a ceremony at the Chemical School. Major Lee received his check, certificate, and coin from the senior personnel at the Command and General Staff College.

The themes for the 2001 writing contest are—

- **Concepts for Decontamination and Reconnaissance Support to Civil Authorities When WMD Events Occur.**
- **How Will the Chemical Corps Be Organized for the Next Millennium?**
- **Restructuring the Training Army Support Element. . . How Can Schools More Effectively and Efficiently Train Chemical Soldiers?**

The deadline for submissions to the 2001 Writing Contest is 31 October 2001. See page 10 for contest rules and mailing address.

3rd Place
Chemical Corps
Annual Writing Contest

NATO

and the Expanding NBC/WMD Threat During Contingency Operations

By Lieutenant Colonel James E. Smith

The factors of proliferation; international and domestic nuclear, biological, and chemical (NBC) terrorism; low-level toxic industrial hazards; and modern technology now leave us with the prospect of attack by briefcase-sized nuclear weapons, or even smaller chemical or biological weapons, and delivery by a person or vehicle (as opposed to missiles). Such an attack could come with little or no warning. The spontaneity of such attacks as those in Dhahran, Oklahoma, and the Tokyo and Paris undergrounds suggests that NATO and U.S. military units could be targets in peacetime as well as during contingency operations.

Time to think ahead

Now is the time to think ahead and anticipate future NBC operations, antiterrorism/force protection (AT/FP) operations, and the role of NBC specialists and NBC units. This is particularly true if we see the evolution of future wars moving away from (or adding to) the "Industrial Age War" to the "Post-Industrial Age War," with its emphasis on warfare without "rules."



Spanish soldiers of the NATO force on patrol

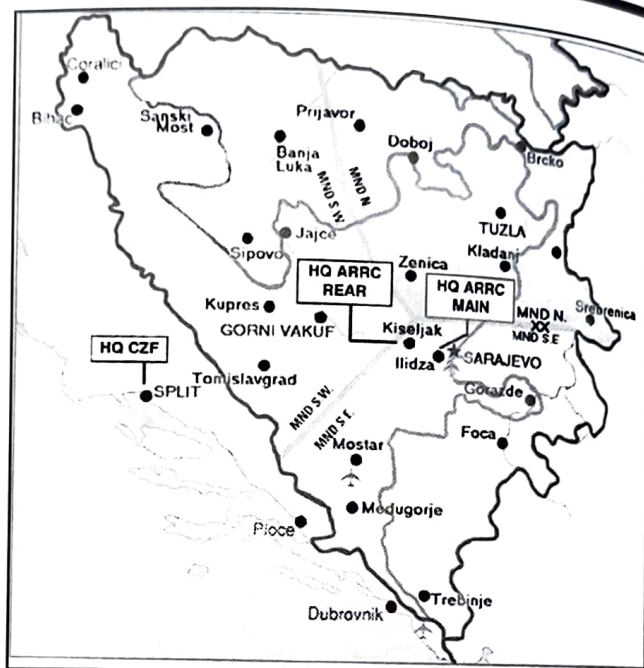
This article proposes a broadening of how we look at and approach the NBC function in these times of increasing multinational, coalition, and peace-oriented operations aimed at preventing or de-escalating future wars or conflicts. I believe global access to information, modern media reporting (which can be broadcast instantly around the world, merging strategic, operational, and tactical impacts), the Gulf War Syndrome controversy, and the threat of international domestic NBC terrorism has changed the nature of NBC operations to the point that force protection against hazards from the lowest levels of chemical, biological, and radiological exposure (to include industrial compounds) is more of a necessity than ever, because of the increasing awareness or sensitivity towards these weapons of mass destruction (WMD).

Operation Joint Endeavor

During Operation Joint Endeavor in Bosnia-Herzegovina, chemical/NBC officers and NCOs in NATO's Allied Command Europe Rapid Reaction Corps (ARRC) and Peace Implementation Force had to find and identify NBC/industrial hazards, protect their soldiers from exposure, determine possible

dangers, and plot potential downwind hazards. As the ARRC chemical officer, I referred to the NBC threat as the NBC&E (environmental) threat. Additionally, division-level NBC officers and I coordinated numerous chemical weapons convention-type verification inspections of suspected chemical production storage facilities and suspected chemical-filled ammunition in a tactical environment. In the future, tactical operational-level NBC officers also could be expected to perform/coordinate highly technical NBC missions (Chemical Weapons Convention-type verification and destruction operations, low-level detection, artillery round analysis, industrial/environmental assessments, and inspection of chemical production/industrial facilities), which are usually of operational/strategic importance.

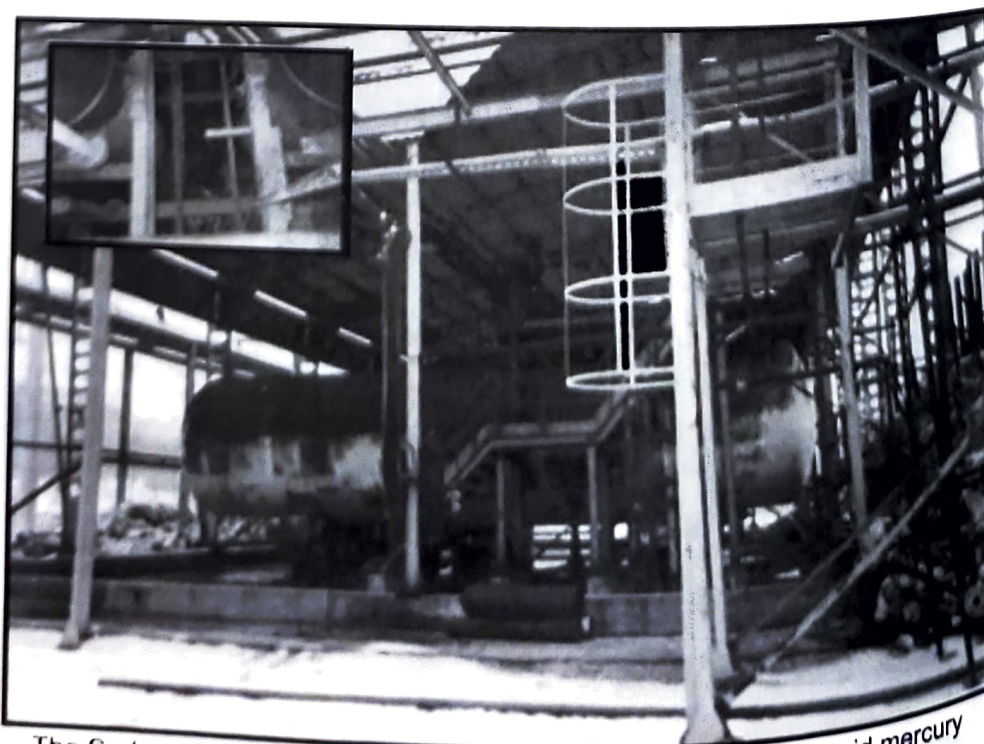
In Bosnia, I saw the extreme sensitivity that higher-level U.S. commanders exhibited toward NBC/industrial hazards during the operation that could be the template for future contingency and combat operations. I believe this new sensitivity in NBC operations could lead NATO adversaries or its members' adversaries to direct the threat of use, or actual use, of NBC weapons toward strategic and political-level command-and-control (C2) capabilities in lieu of tactical or operational C2 capabilities. This could involve the specific targeting of C2 capabilities to attack operational effectiveness, as well as the targeting of other sources to attack political willpower. This does not minimize the effects of NBC at the tactical/operational levels, but the real battlefield could be at the strategic/political level centers of gravity. This would be especially true if our adversaries learned anything from the allies' (particularly the United States and the United Kingdom) experiences in the Persian Gulf War and the U.S. sensitivities concerning force protection in Bosnia and decide to attack NATO and the U.S. weaknesses rather than trying to match their strengths. An effective adversary information campaign and media reporting can only make it worse in the future. The following, I believe, are some reasons to target NATO's strategic- and political-level C2 capabilities:



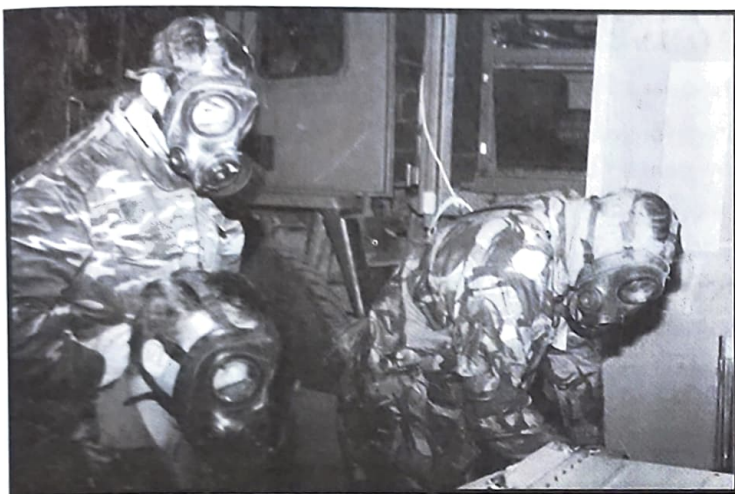
Deployment/operations map for HQs ARRC in Bosnia-Herzegovina from Dec 95 to Nov 96

Threat to Civilians

First, the proliferation of ballistic missiles as well as covert/terrorist attacks has returned the NBC threat back to its original target—the civilian population. A good example is the sarin attacks in Tokyo and Matsumoto (Japan) by Aum Shinriyoko. Additionally, North Korea's



The Sudaso Chemical Plant near Tuzla; inset shows a spill of liquid mercury inside the plant.



HQs ARRC soldiers react to a "simulated" SCUD attack during a corp-level BCTP Warfighter exercise.

development and possible export of extended-range ballistic missiles may allow long-range ballistic missiles and WMDs to reach European and/or American cities in the future. Our political leaders and commanders could either back down, explain the targeting of enemy NBC weapons (if they can), or allow exposure of our civilian population if they are faced with—

- The possibility of NBC use.
- The lack of NBC expertise in NATO and Joint headquarters and units and the current state of NBC use.
- The lack of NBC expertise in NATO units and the current state of NBC detection.
- The lack of protective equipment among the military and civilian population.

Low-Level Hazards

Second, low-level chemical and radiological hazards (such as burning oil wells and damaged chemical/nuclear facilities), normally considered insignificant, have become more important because of the strategic/political sensitivity associated with their discovery and possible exposure. Damaged nuclear power plants and industrial chemical and agricultural facilities may require temporary or permanent maintenance support. As a result, strategic and political decision makers may require an ad hoc NBC, medical, and environmental cell be deployed to provide coordination and control for toxic industrial incidents and situations, particularly in Partnership for Peace countries.

Third, because of the sensitivities of the Gulf War Syndrome and the recent Khobar Tower attack against U.S. forces in Saudi Arabia, current and future ground commanders/commanders in chief from the United States (as well as their political leaders) may have to show that they have done all that they can do to mitigate the effects/

exposure to NBC/industrial hazards. In other words, what will be the U.S. public's/Congress's perception of a U.S. commander's responsibility or his culpability in future conflicts or terrorist incidents? If our political leaders and NATO commanders in chief are potentially vulnerable targets, we then would expect U.S. Joint headquarters and NATO higher-level headquarters to be staffed with sufficient NBC specialists (rank and number of NBC personnel). The current authorization at Supreme Headquarters Allied Powers Europe (SHAPE) is two lieutenant colonels and an additional nuclear policy duty officer at Supreme Allied Commander, Atlantic. It is even worse in the NATO multinational theater and corps-level headquarters. If U.S. and NATO theater and corps-level headquarters deploy for contingency and/or combat operations in the southern periphery of Europe, then resourcing needs to be above the current minimal levels and not dependent on contributing nations to provide augmentees to fill shortages after a crisis has developed.

Consider this, the first theater-level headquarters in Bosnia, Headquarters Implementation Force (AFSOUTH), was not authorized a peacetime NBC specialist; this function is only performed as an additional duty. The NATO corps headquarters (ARRC) that was in command of the land component of the NATO-led Peace Implementation Force for Operation Joint Endeavor and ran the ground operation in Bosnia is only assigned one peacetime chemical officer—a U.S. Army major. The successor headquarters to headquarters Implementation Force (IFOR), headquarters Stabilization Force (SFOR) was initially assigned one U.S. Army lieutenant colonel and an NCO; now the NBC function is done as an additional duty. Even with a lieutenant colonel, this rank represents little more than desk officer-level visibility in a theater-level headquarters; the same could be said of a major at a corps-level headquarters. My experiences in Bosnia have shown that the high-level intelligence agencies tend to integrate sensitive NBC information considerably higher than the major- and lieutenant colonel-level desk officer. If this were to happen in the future, it is possible that desk-level NBC officers could be left out of the loop in receiving and actioning time-sensitive and crucial NBC related information.

In summary, the nature of the NBC threat and NBC operations has expanded. The question now at hand is how do we address these changes, anticipate the future, and prepare to adapt to these changes? As a minimum, I believe there should be a critical examination of the rank structure, manning, and role of chemical/NBC officers in higher-level U.S. Joint and NATO headquarters to include U.S. Joint Command Headquarters; Headquarters SHAPE; and NATO theater-level, corps-level, and division-level headquarters.

ARRC NBC OPERATIONAL SUMMARY (DEC 95- NOV 96)

Date	Situation/Action
Nov 95 - Feb 96	ARRC NBC IPB disseminated to divisions; NBC reconnaissance directed to verify the NBC IPB upon deployment to Bosnia.
Dec 95 - Feb 96	ARRC requirement for all assigned and supporting multinational units to report their NBC equipment status to the G3 NBC.
Jan 96	Begin NBC recon of Sudaso Chemical Plant, vicinity Tuzla, in Multinational Division North (U.S. sector): follow-on inspection in July 96.
Jan 96	Begin NBC reconnaissance of base camps in Multinational Division North.
Jan 96	Radiological source found at Jaice in Multinational Division Southwest (UK sector).
Jan - Feb 96	Identification of suspected radiological site, vicinity Kostainic, in Northwest Bosnia (Multinational Division Southwest).
Feb 96	Ammonium hydroxide found at Hadzici in Multinational Division Southeast (French sector).
Feb 96	NBC meeting with all corps and divisional NBC officers at HQ ARRC in Sarajevo, Bosnia.
Apr 96	Discovery of six 120-mm mortar rounds with yellow markings at Brcko in Multinational Division North; destroyed on recommendation of U.S. and ARRC chemical officers after assessment that they were not chemical rounds.
Jul 96	Second NBC reconnaissance of Sudaso Chemical Plant, vicinity Tuzla, in Multinational Division North (U.S. Sector) directed by the U.S. division chain of command.
Jul - Sep 96	Thiodiglycol, precursor for mustard agent, found in Potoci Chemical Site, vicinity Mostar (Multinational Division Southeast).
Aug - Sep 96	U.S. government-directed chemical reconnaissance of seven former JNA CW sites (this verified ARRC chemical officer's initial NBC IPB in Nov-Feb).
Sep 96	ARRC Chemical Officer conducted CWC-type inspection of the Vitez Chemical Plant in Multinational Division Southwest.
Oct 96	Execution of Operation Nebula ("secret" verification operation) at Zenica (Multinational Division North) and Sarajevo (Multinational Division Southeast).
Oct - Nov 96	120-mm mortar rounds with liquid fill discovered in Multinational Division North; U.S. Tech Escort Team deployed from the United States at requirement of the United States division commander to have 100 percent verification that they are not chemical rounds before destruction can begin despite assessment by U.S. and ARRC chemical officers that they are not chemical rounds.

Lieutenant Colonel Smith, currently director, Chemical Defense Training Facility, recently served 5 years in Europe with 3 years as the Corps chemical officer, ARRC, and 2 years as battalion commander, 415th Base Support Battalion and Army community commander, Kaiserslautern military community, Kaiserslautern, Germany. During Operation Joint Endeavor in Bosnia-Herzegovina, LTC Smith served as the ARRC chemical officer, as a G3 operations officer (Corps battle captain), and the executive officer, U.S. National Support Element (ARRC). He has served as commander of Company A, 84th Chemical Battalion; as Corps chemical officer for the 2d Corps during the U.S. Army's Advanced Warfighting Exercise "Prairie Warrior 1995" and the U.S. Army Command and the 197th Separate Mechanized Infantry Brigade (24th Infantry Division) before, during, and after the Persian Gulf War; and as the 45th Chemical Company commander, a separate divisional chemical company in the 5th Infantry Division.

The MANSCEN Construct

By Mark T. Premont

Overview

The Maneuver Support Center (MANSCEN) has been officially activated since 1 October 1999, and the organizational design is proving to be a workable structure. The design is different from the typical U.S. Army Training and Doctrine Command (TRADOC) school organization because it not only places more than one school on the same installation, but those schools also share some organizational structure in a grid matrix management arrangement. This structure yields some unique opportunities and poses some interesting challenges. The dynamics of this restructuring will take years to fully unfold and develop, but the key characteristics are evident today. Like every new organizational structure, it is a work in progress. The structure is sound, in full operation, and learning new efficiencies every day. The organization is more complex in its conceptional form than many typical military organizations because the chain of command and the chain of responsibility are not aligned as simply as many tactical units. They are, however, set to provide the best capability with the least overhead.

The Genesis of MANSCEN

To understand MANSCEN, you must know how its organizational structure developed. The organization is the direct result of the Base Realignment and Closure (BRAC) Act of 1995. Through legislation, Congress approved the BRAC Commission's recommendation to close Fort McClellan, Alabama, and relocate the Chemical and Military Police (MP) Schools to Fort Leonard Wood, Missouri. Fort Leonard Wood was a somewhat typical TRADOC installation with one school—Engineer; a basic-training brigade; the Noncommissioned Officer Academy (NCOA) with the Drill Sergeant School (DSS); an advanced individual training course—Motor Transport Operator Course (driver's training)—from the Transportation School; affiliated courses for the Marines, Air Force, and Navy; several U.S. Army Forces Command units; and the usual support units that are typical on U.S. military installations.

Once the BRAC decision was official, serious discussion took place on how to organize once the Chemical and MP Schools moved to Fort Leonard Wood. The spectrum ranged from each of the three schools being totally independent with no shared resources to the full integration of the Chemical, Engineer, and MP schools into one large school, sharing all resources. The totally independent

end of the spectrum was too costly in personnel. Even at Fort McClellan, the Chemical and MP Schools had shared one training brigade. The full integration end did not allow the schools to maintain and foster their own branch identity. Therefore, a careful study was made to determine which areas could be shared without significantly affecting the branch-identity aspect of school regimental operations. Another consideration was that each school's commandant was chartered as the proponent for his or her branch area of expertise. The new organization had to facilitate the commandants carrying out their proponent responsibilities. The decision was to create the organization as shown in the figure.

The Organization of MANSCEN

The commander of MANSCEN, a major general billet, is also the installation commander and the Engineer School Commandant. The Engineer brigadier general billet remained the Engineer School Assistant Commandant. Two traditional Reserve Component brigadier general billets were added to the MANSCEN command group, one for the Army Reserve and one for the Army National Guard. The MANSCEN command sergeant major completes the command group.

The MANSCEN staff organizations share responsibility with all three schools. Each of these organizations reports to the MANSCEN commander but has responsibilities to each of the school commandants for execution of its mission. The NCO Academy expanded to conduct the Noncommissioned Officer Education System for all their branches. Each school has its own training brigade. The interservice training presence increased; the Marine Corps presence grew to be the largest Marine Corps unit not on a Marine base, and the Air Force presence grew to be the largest Air Force unit not on an Air Force Base.

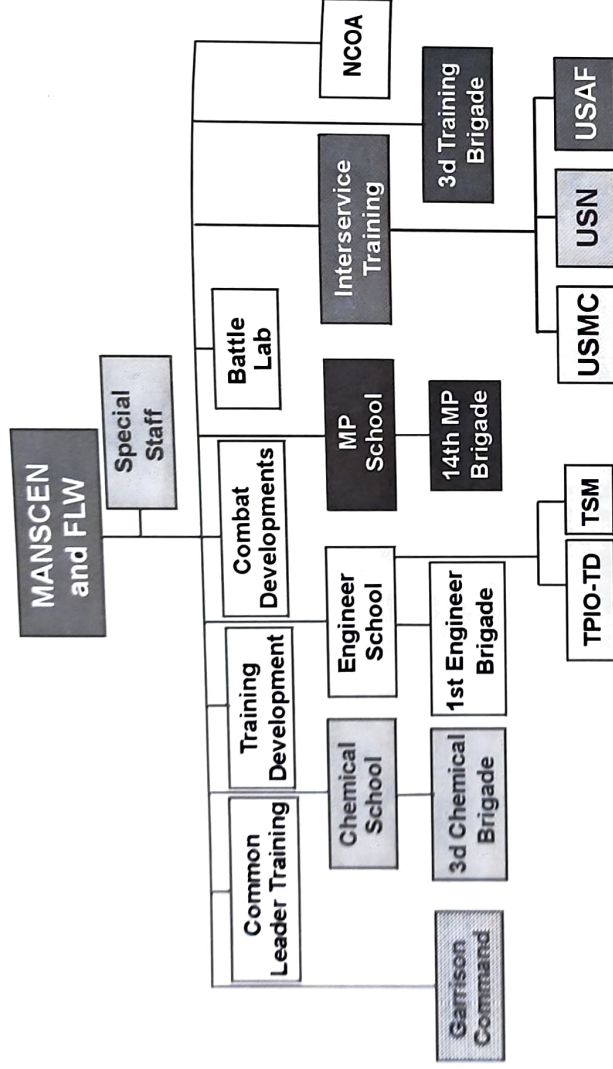
The Shared Organizations

Directorate of Common Leader Training (DCLT)

DCLT is responsible for MANSCEN-level instruction and instructional support. It—

- Teaches the common-core and shared tactical instruction to the officer and warrant officer professional development courses for the three schools.
- Operates the Single-Channel Ground-to-Air Radio System Communications Lab and the Fire Support Center as well as the Training Technology and Information Center.

MANSCEN Organization



- Manages the installation's library program, which includes the academic and community libraries.
- Conducts the Interservice Staff and Faculty Development Program, which certifies the instructors for the installation.
- Owns the Battle Simulation Center, which supports all constructive training simulations within MANSCEN and the Reserve Component, regionally.

Directorate of Training Development (DOTD)

DOTD develops training products and provides editorial support of doctrinal products for the three MANSCEN schools. It has four departments: Warrior, WARMOD, Warfighter, and Development Support.

- Warrior (Individual Training) develops and maintains the commanders' training strategies and provides analysis, design, and development of technically and doctrinally correct instructional courses and support materials for resident, nonresident, and distance-learning initiatives.
- WARMOD synchronizes and links Army modernization training with chemical, engineer, and MP force modernization. This includes ensuring development and procurement of system Training Support Packages concurrently with the materiel system.

- Warfighter (Collective Training) programs, manages, analyzes, and develops proponent unit/collective training products and training-support products; coordinates proponent Standards in Training Commission; and interfaces with internal and external organizations to ensure integration into the collective-training efforts for accuracy and completeness of products.

- Development Support provides technical and administrative services, support, and guidance on development of all MANSCEN and service schools' training and doctrinal products, including contractor-produced publications. It develops and assists other training developers with TRADOC-funded and contingency-based multimedia products—including instructors in their multimedia efforts—by assisting with embedded multimedia elements, to include recording and editing audio/video into various formats and delivery methods. This department also produces official publications and bulletins for worldwide distribution.

Directorate of Combat Developments (DCD)

DCD serves as the architect of the future for the MANSCEN schools. It—

- Integrates all combat-developments activities for the three schools not specifically assigned elsewhere. In this capacity,

DCD develops operational concepts, validates operational capability requirements, conducts the systemic analysis of requirements, and carries out all organizational development and force-design processes and materiel-development processes, including life-cycle management.

- Develops and defends modernization strategies and plans and integrates the budget process for the President's Objective Memorandum.
- Conducts modeling, simulations, and analysis for all MANSCEN organizations, including developing modeling and simulations requirements.
- Conducts ground-robotics test-bed activities to assess technology for the three schools.

Maneuver Support Battle Lab

The Battle Lab was the first shared organization formed in the stand-up of MANSCEN and is led by the MANSCEN commander. It tests and verifies, through experimentation, all aspects of doctrine, training, and organization for the three schools and works closely with DCD and DOTD in support of the schools.

Noncommissioned Officers Academy

This organization includes NCOA and DSS. The MANSCEN NCOA/DSS is the Army's largest NCO academy. It trains and educates selected NCOs to become effective leaders, trainers, role models, standard bearers, and drill sergeants. The academy is responsible for training soldiers for the three MANSCEN schools. Instruction includes basic and advanced NCO courses. The academy also trains a variety of different

military occupational specialties (MOSSs) in the Primary Leadership Development Course.

The DSS conducts a Drill Sergeant Preparation Course for all drill sergeant candidates assigned to Fort Leonard Wood, and it trains soldiers in a variety of MOSSs to become drill sergeants. It also trains selected leaders, support cadre, and installation staff and contractors—who work in the initial-entry-training environment—in three different courses through its Initial Entry Cadre Training Course.

Summary

MANSCEN is still developing, but it has already demonstrated the power and efficiency that can be gained by integrating three related branches into one organization, each providing unique propensity capabilities, while sharing common ground across the doctrine, training, leader development, organization, materiel, and soldiers (DTLOMS) spectrum. MANSCEN proves that a single installation can support three Army branch schools, maintain the vitality of each school, yet achieve synergy among them where common issues and concepts exist. This design could be a model for the way TRADOC will reorganize through its own transformation effort.

Mr. Premont is the executive officer in the Strategic Planning, Analysis and Realignment Office at Fort Leonard Wood, Missouri. Previously, he was the deputy director in the Base Realignment and Closure Office at Fort Leonard Wood. He has a bachelor's from the U. S. Military Academy and a master's from the University of Missouri-Rolla and is a graduate of the U.S. Army Command and General Staff College.



Congratulations 2000 Sibert Award Winners

The 2000 Sibert Award Committee has selected the following companies for the William L. Sibert Award:

Regular/Active Army
21st Chemical Company
82d Airborne Division
Fort Bragg, North Carolina (two consecutive years)

Guard/Reserve

360th Chemical Company
460th Chemical Brigade
Little Rock, Arkansas

Each year chemical companies of the 8th Army, Europe, TRADOC, Reserve Command, and others compete for the Sibert Award. Companies prepare and submit packets highlighting outstanding accomplishments for that year through their chain. The major commands then select the best packets and submit them to the Sibert Award Committee at the Chemical School. The committee judges the prepared packets on their visual appeal and preparation. The winners are selected based on their tests and physical training (the human side of the company) scores, the military occupational specialty, other scores, and the awards the company has received during the year.

These units are commended for not only the quality of their submission but also the excellence of their scores.



Operations at the U.S. Army Chemical School

By Major Amy Ehmann

NOTE: Recommend that you read "The MANSZEN Construct" on page 21 prior to reading this article.

Overview

The U.S. Army Chemical School (USACMLS) is part of a triad of schools called the Maneuver Support Center (MANSZEN). MANSZEN falls under the U.S. Army Training and Doctrine Command (TRADOC) and includes the U.S. Army's Chemical, Engineer, and Military Police Schools. By merging the sovereign schools at Fort Leonard Wood, Missouri, MANSZEN has pooled many resources and combined many of the functions previously conducted by each school. However, each school continues to produce branch-specific products in the form of doctrine, training, leader development, organization, materiel, and soldiers (DTLOMS). The MANSZEN commanding general provides command and control for the triad of schools as well as Fort Leonard Wood, while the school commandants provide the strategic direction for their individual Regiments and are responsible for individual school operations.

The U.S. Army Chemical School Mission and Organization

The mission of USACMLS is to provide the nation with values-based soldiers, leaders, and teams trained in basic combat skills and chemical disciplines that are prepared for success in any future operational environment. The school also develops concepts, doctrine, force structure, materiel requirements, and technologies to ensure the vitality of U.S. forces on the battlefield of the future. Additionally, Congress has directed the consolidation of all Department of Defense (DOD) NBC training at the Chemical School. Thus, this one institution has an Army mission; a joint mission for the Air Force, Navy, and Marines; and an international advisory mission. The figure on page 25 depicts the organization that allows the school to accomplish its missions.

Commandant

The commandant provides the chemical proponent of the MANSZEN triad. Proponency—

- Provides quality chemical-specific training.
- Develops leaders qualified to ensure mission achievement.
- Designs chemical organizations consistent with the

Army's needs.

- Identifies and articulates chemical materiel requirements.
- Ensures the recruitment and retention of chemical soldiers of the quality and quantity required by the Chemical Branch.

Regimental Command Sergeant Major (CSM)

The school CSM is also the Chemical Regimental CSM. He serves as the principal enlisted assistant and advisor to the commandant and assistant commandant (AC) on all enlisted matters and manages the enlisted personnel within the school. He has direct oversight of chemical noncommissioned officer (NCO) courses taught at the MANSZEN NCO Academy.

Assistant Commandant

The AC directs the daily operations of the Chemical School and supervises all elements assigned or attached to the school. His functions include—

- Exercising responsibilities as the branch and personnel proponent to ensure the relevance of the Chemical Regiment.
- Providing leadership, focus, and direction for NBC doctrinal, training, leader development, organizational, and materiel requirements.
- Supporting joint, national, and international program initiatives in NBC defense, arms control, and counterproliferation.
- Conducting the training of more than 5,000 chemical and transportation students per year.
- Managing over 40 combat development items.
- Coordinating joint NBC doctrine.
- Supporting chemical and biological domestic preparedness and other protection initiatives.
- Coordinating between USACMLS and MANSZEN and other TRADOC schools and agencies.

NBC Joint Service Integration Group (JSIG)

The NBC JSIG coordinates and integrates the NBC defense requirements across DOD. The group ensures that all services operate with common NBC doctrine, training, and equipment, which ensures the wisest use of

limited resources and enables uniformed personnel to conduct joint NBC operations.

DTLOMS Integration

The DTLOMS Integration Office provides a focal point for the school's effort in the areas of doctrine, training, leader development, organization, materiel, and soldiers. Under the DTLOMS director are the departments responsible for doctrine and personnel pronency, as well as combat and training development.

Operations Branch

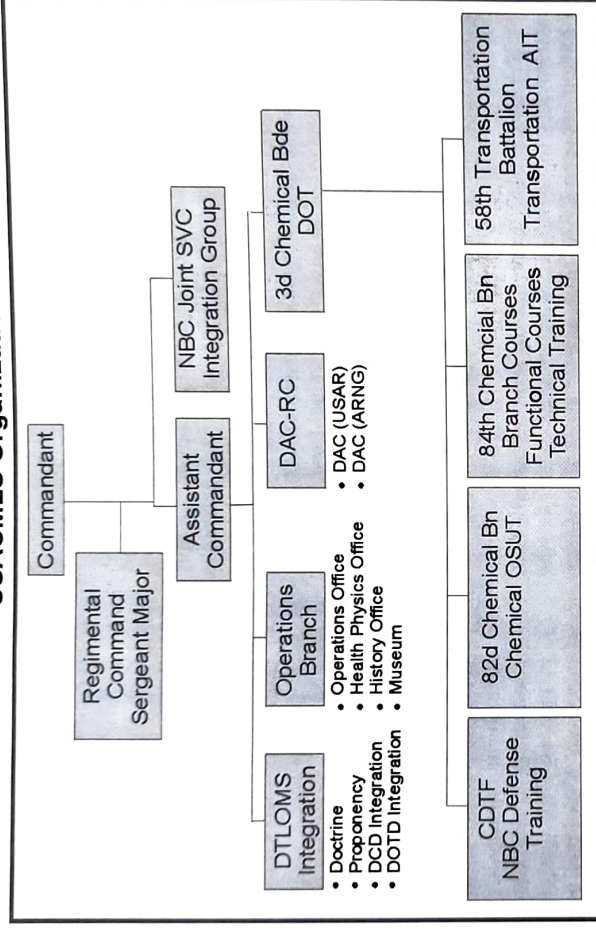
- **Operations Office.** This office coordinates the school's

administrative functions and advises the leadership on personnel, administrative, and policy matters. The staff serves as the school's interface with MANSCEN agencies, including the Public Affairs Office; Directorate of Resource Management; Directorate of Public Works; Directorate of Information Management; and Directorate of Plans, Training, and Mobilization. The Operations Office is the primary liaison between MANSCEN Executive Services and the Chemical School for all visitors, foreign and domestic.

- **Health Physics Office.** This office operates the Edwin R. Bradley Radiological Laboratory, a unique training facility licensed by the U.S. Nuclear Regulatory Agency. This laboratory is the only Army facility that qualifies individuals in Installation Radiological Protection, Control, and Safety. The program teaches maintenance, storage, and calibration of radiac instruments and radioactive material in installation shops and warehouses. Other courses taught by the laboratory include the Calibrator Custodian Course, the Operational Radiation Safety Course, and the Radiological Safety Course. These courses encompass radiation monitoring, decontamination, depleted uranium instruction, X-ray and laser instruction, radiological safety standards, and radiac calibrator safety.

- **History Office.** This office serves as the proponent for historical activities of the Chemical Branch and acts as the point of reference for the history of the branch. The

USACMLS Organization



historian advises the commandant on Army and TRADOC historical program responsibilities and represents the commandant on matters relating to military history. He prepares periodic documented histories of the branch dealing with significant mission-related activities. He develops and administers the historical source-document collection—including significant, unique, and rare printed and nonprinted material—as the corporate memory of the branch. He serves as a consultant and adviser for inclusion of military history into the curricula.

- **Museum.** The director, Chemical Museum, strives to foster an appreciation for the history and tradition of the Chemical Corps and the U.S. armed forces. He collects, preserves, documents, exhibits, and interprets objects of historical interest pertaining to the history of the Corps. He develops and conducts historical education and training programs for initial-entry training soldiers, students, and permanent party military personnel. Finally, he works with the museum counsel to collect, preserve, document, exhibit, and interpret objects of historical interest pertaining to the history of Fort Leonard Wood, 1940 to present.

Deputy Assistant Commandant (DAC)- U.S. Army Reserve (USAR)

The DAC-USAR oversees total force integration. He ensures that Reserve Component (RC) needs are addressed by the school and MANSCEN by participating in policy development and programs influencing RC matters. He

reviews chemical training and doctrinal materials for RC applicability and adequacy and assists in verifying training materials with RC units. He provides liaison between the Chemical School and TRADOC, Combined Arms Center, Chief of Army Reserves, Army Reserve Personnel Center, National Guard Bureau, U.S. Army Reserve Command, U.S. Forces Command, and RC units. Further, he advises Active Component officers separating from active duty about RC programs and requirements, provides instruction on the roles and missions of the RC to classes conducted at the school, and advises Reserve students attending training. Additionally, he administers the Joint Senior Leaders Course and the Chemical Pre-Command Course, participates in Homeland Security planning and policy development (to include WMD consequence management doctrine and training development) and represents the commandant and/or AC in his absence.

Deputy Assistant Commandant (DAC)- Army National Guard (ARNG)

The DAC-ARNG serves as the senior National Guard representative to USACMLS with duties that include serving as liaison between USACMLS and the staffs of the Chief, National Guard Bureau, and the Director, Army National Guard; counseling and advising ARNG students attending USACMLS; answering inquiries from the field; serving as liaison with ARNG chemical units and state adjutant general offices; and providing input on programs of instruction, force-structure documentation, doctrine, publications, regulations, and any other documents which may impact the ARNG. In addition, the DAC-ARNG serves as USACMLS's point of contact for issues concerning National Guard Weapons of Mass Destruction Civil Support Teams.

3d Chemical Brigade and Directorate of Training (DOT)

All training functions fall under the control of the brigade commander making him dual-hatted as both the commander and the director of training. Under the 3d Chemical Brigade are four separate battalion-level command organizations, each unit with its own unique and separate mission.

- **Chemical Defense Training Facility (CDTF).** The CDTF exposes military, civilian, and foreign NBC specialists to operations in a toxic chemical agent (VX and GB) environment. This training allows NBC specialists to overcome their fear of conducting missions in a chemically contaminated environment.

- **82d Chemical Battalion.** The 82d is the Chemical Corps's one station unit training (OSUT) battalion. This battalion is charged with taking new civilians and transforming them into the newest chemical soldiers. New chemical soldiers spend 20 weeks at Fort Leonard Wood attending both basic and advanced individual

warfighting and chemical operations training. Upon graduation, these soldiers are given the military occupational specialty (MOS) code of 54B and become members of the Chemical Corps, following in the footsteps of thousands of Dragon Soldiers before them.

- **84th Chemical Battalion.** The 84th is a unique and diverse organization. Within the 84th are the Chemical School staff, all of the instructors for the different Chemical School courses, as well as the officers and NCOs attending basic, advanced, and specialty NBC training.

The Contingency Support Detachment helps fulfill the joint and combined responsibilities of the Chemical School established by Congress. The detachment provides NBC defense training to DOD and other governmental agencies and advises and assists supported agencies in the selection and acquisition of NBC defense equipment. In addition, it performs primary instruction duties for the people conducting chemical weapons treaty verification programs. The detachment provides support to numerous high-level agencies including the White House and the Secret Service.

- **58th Transportation Battalion.** The 58th provides consolidated interservice advanced individual training (AIT) to new basic training graduates in the area of heavy equipment transportation. Soldiers in MOSs 88M and 77F are all trained on how to safely operate and maintain our heavy equipment transport systems from a 5-ton truck to heavy equipment transport trailers capable of carrying our M1 battle tanks.

Summary

The Chemical School strives to meet the needs of the Chemical Regiment, the Army, and the nation through resources directly under its control and resources consolidated under MANSCEN. The commandant has direct responsibility for branch-specific doctrine, training execution, leadership development, and personnel pronency. She relies on the chemical soldiers and civilians within MANSCEN to focus on organizational design, materiel development, and training development. The leadership of the Chemical School continues to provide the strategic vision and the approval authority for all chemical-specific efforts within the school and MANSCEN. Chemical products are developed by and approved by soldiers and civilians who have a vested interest in the future of the Chemical Corps.

Major Ehmman recently graduated from the Command and General Staff College at Fort Leavenworth, Kansas, and is currently assigned as the operations officer for the United States Army Chemical School at Fort Leonard Wood, Missouri.

Professional Development Training A New Century—A New Focus

By Mike Sheheane

As I look back over the past 30 years and my experiences as a student and, subsequently, as a trainer and training developer for the Army, I can't help but ponder how the pendulum has swung from one instructional concept to where we are today. It would be easy, but probably inappropriate, for me to reminisce about what many of us consider the good old days when the emphasis was on "task-based, performance-oriented, hands-on training."

Downsizing, automation, and monetary constraints have impacted on the change in focus and training of the future Army. The emphasis today is on shorter, more job-specific training courses supported by either Web-based or other forms of computer-based distributed training material. At the same time, the Reserve Component (RC) makes up increasingly significant percentages of the overall force structure and require quality training programs suited to the limited training time and equipment available. And finally, the junior officers of today's Army are required to possess the characteristics and competencies needed to lead combined arms units composed of multiskilled soldiers. The skills, knowledge, and abilities required to function in this environment require a broader educational experience than our current branch-focused approach to professional development. To accommodate this requirement, the branch proponent schools—as they currently exist—will have to undergo a transformation.

This article describes the ongoing actions that are a result of this new focus. Perhaps it is best to start with the "change" which will be the first to occur and, in fact, is being implemented as this is being written—the conversion to The Army Training System (TATS). For several years, we have had separate training strategies for Active Component (AC) and RC soldiers. The norm was lengthy resident courses for the AC soldier and some alternative training program incorporating a variety of training media (correspondence courses; multiple-phased, short resident courses; inactive duty training) for RC soldiers. These Reserve Component Configured Courseware (RC3) training programs were more structured to provide training to a minimum standard rather than the same standards required in the institutional courses. This statement is not meant to detract or cast dispersion in anyway on my fellow RC soldiers; it is simply the way

the program had to be structured because of training time and equipment constraints.

The Army Training System course is defined in TRADOC Regulation 350-70, *Systems Approach to Training Management, Processes, and Products*, as "A single course designed to train the same military occupational specialty (MOS). It also includes... MOS Qualification (MOSQ, i.e., reclassification), Army leadership, functional, professional development, and civilian courses. The course ensures standardization by training all soldiers (regardless of component) to task standard." More simply stated, train the same tasks to the same standards for both AC and RC soldiers.

In the latter part of 1996, the U.S. Army Chemical School (USACMLS) selected four courses to transition to TATS format: the 54B10 Reclassification Course, the 54B20/30 Basic Noncommissioned Officer Course (BNCOC), the 54B40 Advanced Noncommissioned Officer Course (ANCOC), and the Chemical Captain's Career Course. All initial-entry officers, both AC and RC, are required to attend the resident Chemical Officer Basic Course to become branch-qualified; so, technically, it already fits TATS's definition. These other professional development courses existed in two program-of-instruction (POI) configurations for each course—RC3 and institutional training.

One basic foundation on which TATS is built is the elimination of redundant training. Historically, training institutions have allotted considerable training time to "refresher training." TRADOC has established the position that once a task has been trained, little or no training time should be expended for retraining that task. As a result, significant reductions have been realized in several institutional courses. Conversely, because of the requirement to train the "same tasks to the same standards," course lengths for the RC-configured version have increased. Figures 1, 2, and 3

depict the course lengths for the three enlisted professional development courses currently undergoing transition to the TATS format.

Recently, TRADOC directed all branch schools to remove the U.S. Army Sergeants Major Academy- (USASMA) managed Common Core from their proponent POIs. Courses where common-core instruction is a prerequisite requirement will be designated in the Army Training Requirements and Resource System as two distinct requirements.

The 54B10 Reclassification Course is the primary means of reclassifying RC soldiers into the 54B MOS. This course has been revised to provide better training for those soldiers converting to chemical operations specialists. The course is now a two-phase program, consisting of 76 hours of inactive duty training (IDT) status and 120 hours of active duty training (ADT) status (Figure 1). This course has no institutional course equivalent.

The RC-configured version of the 54B20 30 BNCOC is a three-phase course with completion of a USASMA common core being a prerequisite requirement (Figure 2). After completing the BNCOC common core, students will attend a 2-week ADT followed by an 85-hour IDT phase and a final 2-week ADT phase. These three phases are designed to be completed within two training years. The USACMLS-taught institutional version of this course has been reduced from 15 weeks 3 days to its current 2-week common-core prerequisite phase and a 9-week 2-day Chemical Branch-specific phase.

The RC-configured 54B40 ANCOC is a two-phase course with USASMA common core a prerequisite. It is designed to be completed in one training year (Figure 3). The 79-hour IDT phase includes approximately 40 hours of Web-based distributed learning material. The 2-week ADT phase includes a comprehensive field training exercise. The institutional ANCOC taught at the Chemical School was formerly a 13-week course but has been reduced to a 2-week common core followed by a 7-week 2-day branch phase.

I am a product of the "old school" and have a genuine appreciation for *hands-on, performance-oriented* (HOPO) training programs. I have frequently expressed my belief that if distance learning (DL) is such a great thing, then why isn't "Jump School" being trained via DL. Obviously the answer is that some things just don't lend themselves to

54B10—Reclassification

Prerequisite	Phase 1	Phase 2	Total
MOSQ (other)	79 hours IDT	120 hours ADT	199 academic hours

Figure 1

being trained in any format other than HOPO training. Even I must accept the fact that the time students spend in a classroom in the future will be significantly less than in the past.

USACMLS is in a somewhat unique situation in that the opportunities for using DL technologies are lessened by the considerable technology/equipment-based training in our courses. The training of tasks associated with operating and maintaining equipment is extremely difficult, unless done in a "virtual training" environment. In most cases, the technology doesn't exist yet or the costs are so prohibitive that equipment

54B BNCOC

Comp	Prerequisite	Phase 1	Phase 2	Phase 3	Total
AC	Common Core 2 weeks 3 days	9 weeks 2 days -----			12 weeks
TASS	Common Core 85 hours IDT	120 hours ADT	77 hours IDT/DL	134 hours ADT	331 academic hours

Figure 2

training is done in a hands-on format. That is not to say that progress is not being made because considerable resources are, in fact, dedicated to the design and development of DL products to support individual training requirements as well as self-development efforts. In the next few months, students will be able to enroll in and complete the entire Operational Radiation Safety Course via a Web-based course. A significant piece of the NBC defense course will be DL. Blocks of instruction within the 54B BNCOC course will be self-paced via computer-based instruction as well as the previously mentioned 40 hours of DL in the ANCOC. Additionally, an assortment of

54B ANCOC

Comp	Prerequisite	Phase 1	Phase 2	Total
AC	Common Core 2 weeks 3 days	7 weeks 2 days	10 weeks -----	
TASS	Common Core 83 hours IDT	79 hours IDT/DL	128 hours ADT	207 academic hours

Figure 3

training materials and job aids are available on CD-ROM to support unit and self-development requirements in the field. A list of these products and how they may be obtained can be found on pages 33 and 34.

Earlier I mentioned a term that is frequently heard these days in relation to many actions and initiatives—*Transformation*. Suffice it to say that the traditional branch schoolhouses, as we know them now, will be transformed. Besides the changes that are happening as TATS is implemented and DL products are developed, other changes will take place that are designed to enhance the educational experiences of the students. All courses will be revised to ensure that they are challenging, developmental (provide new information), and relevant (current and technically valid).

Besides eliminating redundancy from the curriculum, all POIs will be reviewed diligently and frequently to ensure the training received fits the job the student is preparing to perform. Perhaps the first visible example of this transformation is the “pilot” program now being conducted at the Infantry School. The term “Officer Basic Course” has been around as long as I have, but it appears that newly commissioned officers will begin attending the Basic Officer Leader Course (BOLC). It also is very likely that this course will be a two-phase course, with the first phase the same for all initial-entry officers regardless of branch assignment. This new concept in officer training is still being designed and will no doubt see numerous changes in format and structure. The concept itself, however, will most likely become the way new lieutenants will begin their careers. Without going into lengthy details and keeping in mind that the final product must receive approval at the highest levels, it is probably safe to say that Phase 1 of the BOLC will be 6 to 7 weeks of leadership development training with emphasis on physical fitness, combat skills, and field crafts.

Basic Officer Leader Course			
Phase 1	6-7 weeks	(Fort Benning)	
	> Physical Fitness		
	> Combat Skills		
	> Field Crafts		
Phase 2	12-13 weeks	(Fort Leonard Wood)	
	> Nuclear		
	> Biological		
	> Chemical		
	> Smoke		

Figure 4

Upon completion of Phase 1, lieutenants would move to their assigned branch school for the proponent phase of BOLC. For chemical lieutenants, that would be 12 weeks 4 days of training at Fort Leonard Wood, Missouri (Figure 4). Remember, this new course for lieutenants is still being worked and will probably change several times before the final product is implemented.

Hopefully this article will shed some light on the rapidly changing manner in which soldiers will train in the near future. So many radically new proposals are being initiated that even those of us who work with them everyday have trouble keeping things straight. I hope to write more articles in future issues to keep the chemical community up to date on changes as they develop and occur. At this time, the best advice I can give is *be patient—be flexible*.

At the time this article was written, Mr. Sheheane was serving as the Chief, Chemical Warrior Division, Warrior Department, DOTD, MANSCEN. He is a career civil servant and a retired U.S. Army Reserve officer. Mr. Sheheane is a graduate of the Army Command and General Staff College and the Senior Training Manager's Course. He holds a master's in both education and criminal justice.

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Joint Readiness Training Center: The Final Test

By Major Sergio M. Dickerson

After spending 3 years immersed in a myriad of staff jobs, it strikes me that what attracted me most to the military—leadership, command, and soldiers—are the hallmarks of training at the Joint Readiness Training Center (JRTC). With one exception, command. I cannot recall a more demanding, rewarding, and purposeful job. As I savored the experience, I found myself taking special notice of the chemical observer controllers (O/Cs) who were gracious enough to allow me to peer into their jobs. This article is a brief look into the critical, yet exciting, job of the JRTC chemical O/C.

On a monthly average (2 weeks between rotations), a new unit from Hawaii to New York arrives at JRTC for the chance to battle the notorious Opposing Force (OPFOR), the 1st Battalion (Airborne), 509th Infantry. The chemical O/C team is on-site from the initial introduction to the final after-action report, shadowing their Blue Force (BLUEFOR) counterparts from the platoon to brigade levels. Their functions, as outlined in Edition 6 of the O/C Handbook, are to "control and observe training, teach and coach, provide feedback and conduct after-action reviews, and monitor safety." The result of these primary duties trains, refines, and challenges our soldiers to meet their final test. Their job importance, given their purpose and end state, is hard to refute!

To perform these functions, each O/C must be intimately familiar with applicable regulations—a subject-matter expert within his/her specialty. The O/Cs must endure rotation after rotation in the field, maintaining 24-hour coverage on BLUEFOR. They must adhere to uniform and equipment standards as they are continually in view of and scrutinized by BLUEFOR. They are often called to adjudicate tough engagements between OPFOR and BLUEFOR, 24-hours a day. Even so, if questioned, any chemical O/C will tell you with great pride that he has the best job in the Army. For these reasons, O/Cs pride themselves on forging the chemical side of the "Warrior Spirit."

The chemical O/C team ensures that nuclear, biological, and chemical scenarios are played out to standard—witnessing and adjudicating chemical-related activity such as a thorough decontamination, a Fox reconnaissance of a contaminated area, and smoke obscuration of a MOUT site during a mechanized assault. Every effort is given to ensure realism and near-combat conditions. Even the smallest details in a chemical attack, such as air/ground delivery systems and a visible agent (look-alike), are used to involve all five senses in the action. BLUEFOR units are challenged to follow correct procedures before they can return to combat effectiveness. The level of detail and involvement in this process, as some find out, can be painfully realistic—hence, they have endured the thrill of a JRTC experience.

It is no surprise then, that these officers and NCOs are selected from the best the Chemical Corps has to offer, given their past experiences and accomplishments. This allows Major Tim Fisher, chemical team chief, the latitude to synchronize realistic chemical scenarios all over the battlefield with a combined effect that coincides directly with the intelligence picture—in effect, a well-coordinated, decentralized execution by professional soldiers. These Dragon Soldiers are among the best!

As I look back at my experience at JRTC, I would like to thank Major Fisher, his fine officers, and the NCOs for the privilege of working with them. Witnessing the impact that capable officers and NCOs working in concert have on our chemical institution gives me a renewed sense of pride. As a proud Dragon Soldier, I salute your team for bringing our chemical mission to the forefront of the battlefield.

Major Dickerson is currently attending the Command and General Staff College at Fort Leavenworth, Kansas. Previously he was chief of accreditation for The Army School System (TASS) assigned to the U.S. Army Chemical School, Fort Leonard Wood, Missouri. He provided accreditation, assessment, and assistance to seven TASS chemical battalions throughout the continental United States.

The Cutting Edge of Technology

In Transition From OSHA to STEPO— The Mission of the Technical Escort Division

By Staff Sergeant Aaron D. Glad

With the varying missions of the units trained at the Ordnance Missile Munitions Center and School Technical Escort Course, the Technical Escort Division's mission continues to transition with evolving technology and enhancement to training methods to better support the personnel trained.

The mission of the Technical Escort Division is to train U.S. military, Department of Defense civilians, and international students, providing them the capability to perform worldwide, no-notice missions. These missions involve field sampling, detection, identification, decontamination, mitigation, and remediation of hazards associated with chemical and biological materials in compliance with international, federal, state, and local laws.

The following supported organizations or agencies are currently trained at the Technical Escort Course:

- U.S. Army Chemical School.
- Army Technical Escort Unit (TEU).
- Army Special Operations.
- Army Reserves.
- Army National Guard (WMD CST).
- Forces Command units.
- Joint Component Services (Marine Corps, U.S. Navy).
- Defense Threat Reduction Agency.

Evolving technology has increased the protection and stay time in "Level A" protection by developing the self-contained toxic-environment protective outfit (STEPO). In June 2001, the Technical Escort School began training students on the STEPO system.

The components of the STEPO system are modified commercial off-the-shelf items. The chemical protective suit is a one-piece, totally encapsulating garment that is designed to remain serviceable for five 4-hour missions involving the contamination and decontamination process. The chemical protective suit is available in four sizes (small, medium, large, and extra large) to fit the 5th percentile Army female to the 95th percentile Army male and civilian users. It is constructed from a multilaminated material and incorporates a large visor to provide a wide field of vision.

The system also comes with a rebreather—a positive-pressure closed-circuit system that filters and recirculates

the user's exhaled air—approved by the National Institute of Occupational Safety and Health (NIOSH). The rebreather is worn under the protective suit and provides up to 4 hours of breathing air to the user. The system can incorporate a self-contained breathing apparatus (SCBA) that is also NIOSH-approved and can be worn under the protective suit. The SCBA incorporates a 60-minute air bottle. The system also has the capability of using a supplied air system (cascade), via a hose line, which would provide more air time versus the SCBA. However, the hose encumbers the user.

The Technical Escort Division has a 7-acre compound at Redstone Arsenal, Alabama, to conduct 3 weeks 3 days (131.5 academic hours) of technical training for students with the following curriculum:



Instructors demonstrate sealing and overpacking a leaking chemical munition, wearing STEPO, during training at the Technical Escort Course.

Nuclear, Biological, and Chemical Operations—provides students with the knowledge and capability to perform chemical accident incident response-and-assistance missions, as a part of the U.S. Army Technical Escort Unit, in the following areas:

- Military chemicals identification and detection.
- Personal protective equipment.
- Chemical munitions identification.
- Chemical munitions leaking, sealing, and packaging.
- Personnel and equipment decontamination.

Hazardous-Waste Operations—provides students with the knowledge and capability to perform hazardous-materials incident response operations that meet the 40-hour course requirement, according to 29 Code of Federal Regulations (CFR) 1910.120, in the following areas:

- Regulations, rights, and responsibilities.
- Control of hazardous energy.
- Permit required for confined space.
- Commercial chemicals.
- Field survey instruments.
- Site safety plan.
- Site characterization.

Environmental Sampling—provides students with the knowledge and capability to perform operations, according to the Environmental Protection Agency's standard protocols, in the following areas:

- Soil, sediment, and sludge sampling.
- Water sampling.
- Drum sampling.
- Field screening.
- Chip, wipe, and sweep sampling.
- Environmental quality assurance and quality-control procedures.
- Field sampling plans.

To provide the most up-to-date training, the following classes will be integrated into the curriculum this year:

- Summer 2001, Biopak 240 rebreather, to be used with the STEPO system.
- Fall 2001, Confined Space Training Facility, provides students hands-on training.

As future technology and techniques change, the Technical Escort Division also will change to stay on the cutting edge.

Elementis Regamus Proclium!

Staff Sergeant Glad is an instructor at the Technical Escort School, Redstone Arsenal, Alabama. His previous assignments include the 793d Military Police Battalion, Germany; 69th Chemical Company, Germany; the Technical Escort Unit, 2d Armored Cavalry Regiment, Fort Polk, Louisiana; and Johnston Island. SSG Glad is JS and instructor qualified. He is a graduate of the U.S. Army Chemical School's Basic Noncommissioned Officer Course and has completed more than 2 years of college.

Submitting an Article to CML

Articles may range from 2,000 to 4,000 words. Send a paper copy along with a disc in Microsoft® Word to *CML Army Chemical Review*, 320 MANSCEN Loop, Suite 210, Fort Leonard Wood, Missouri 65473-8929 or e-mail to kirbyrn@wood.army.mil.

Any article containing information or quotations not referenced in the story should carry appropriate endnotes.

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

Articles should generally come from contributors with firsthand experience of the subject being presented. Articles should be concise, straightforward, and in the active voice.

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

Include a statement with your article stating that your local security office has determined that the information contained in the article is unclassified, nonsensitive, and releasable to the public. We do not require a hard copy of the clearance.

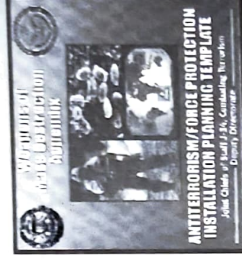
All submissions are subject to editing.

Chemical Distributed Learning Products

Compiled by Alicia Stockdale

Weapons of Mass Destruction (WMD) Appendix to the Antiterrorism/Force Protection Installation Planning Template

This CD, developed by the Joint Chiefs of Staff J-34, Combating Terrorism Directorate, contains an interactive template to guide installation staff through developing a WMD appendix to the installation's antiterrorism/force protection plan.



Weapons of Mass Destruction (WMD) Force Protection Joint Service Training, Levels I & II

This CD, developed by USACMLS and the Joint Chiefs of Staff J-34, Combating Terrorism Directorate, contains Level I and Level II of the WMD force protection joint service training. Level I contains general awareness training designed for personnel assigned overseas, to include military, DOD civilians, and family members. The Level I presentation consists of PowerPoint® slides with notes. Level II is geared toward officers and NCOs who will advise unit commanders on force protection. Level II is an interactive multimedia program developed using Authorware®.



Level III Weapons of Mass Destruction Antiterrorism Training

This CD contains Level III of the WMD force protection joint service training as developed by USACMLS and the Joint Chiefs of Staff J-34, Combating Terrorism Directorate. Level III is part of the O5/O6 precommand course. This training is geared toward the O5/O6 commander so that he is aware of the program, has a staff officer responsible for the program, and knows what actions to take during the first 180 days of command.



Tier I: Depleted Uranium (DU) General Awareness Training

This CD contains the DU Tier I, general awareness training designed for all soldiers to enable them to recognize DU hazards and take appropriate precautions. The CD includes a general awareness video, the DU Tier I training support package, and the general training aid (GTA) 3-4-1A.

Tactical Nuclear, Biological, and Chemical (NBC) Information Tool

The Tactical NBC Information Tool, also known as the NBC toolbox, is a CD reference tool that allows users to find and retrieve information about NBC operations. Users can search for information about decontamination, protection, hazard prediction, chemical properties, field behavior of NBC agents, and military-specific and Joint Services NBC information.



Weapons of Mass Destruction/Force Protection (WMD/FP) Advanced Interactive Multimedia (AIM) Training Application

These four interactive multimedia CDs, developed by the Joint Chiefs of Staff J-34, Combating Terrorism Directorate, are designed to meet the needs of four audiences. A description of each disk follows:

- **WMD/FP AIM Training Application Disk 1: Commander & Staff**
Disk 1 contains information for training the installation commander and installation staff to respond to WMD terrorist incidents and addresses installation-level training requirements. The application is divided into six main



training sections: WMD agent properties and use, planning procedures, control procedures, protection procedures. WMD review library, and testing.

- **WMD/FP AIM Training Application Disk 2: HAZMAT—First Responder**

Disk 2 contains information for training installation and civilian emergency responders to respond to WMD terrorist incidents and addresses installation-level training requirements. The application is divided into seven main training areas: terrorism, WMD agent properties, treatment procedures, protection procedures, hazardous-material first-responder skills, WMD review library, and testing.

- **WMD/FP AIM Training Application Disk 3: Hospital and Emergency Medical Service(s) (EMS)—First Responder**

Disk 3 contains information for training installation and civilian emergency responders to respond to WMD terrorist incidents and addresses installation-level training requirements. The application is divided into seven main training areas: terrorism, WMD agent properties, treatment procedures, hospital and EMS responder skills, protection procedures, WMD review library, and testing.

- **WMD/FP AIM Training Application Disk 4: General Education**

Disk 4 contains instruction on WMD antiterrorism/force protection that can be used in conjunction with the other three CDs. The application is divided into six main training areas: terrorism, WMD agent properties, protection procedures, response actions, WMD review library, and testing.

For more information on these products or to inquire about obtaining a copy of one of these products, contact SSG Englerth at the Directorate of Training Development, Chemical Warrior Division, 464 MANSCEN Loop, Suite 2617, Fort Leonard Wood, Missouri 65473-8926; phone: DSN 676-7172, commercial (573) 596-0131 extension 37172.

Pending Products for Chemical Distributed Learning

Joint Service Lightweight Integrated Suit Technology (JSLIST) Video

This will be a two-part video covering the JSLIST chemical protective ensemble. The video will cover the components, capabilities, employment, use, care, and sizing of the JSLIST ensemble. Part 1 will cover donning and doffing in an uncontaminated environment. Part 2 will cover mission-oriented protective posture (MOPP) gear exchange.

Joint Service Lightweight Integrated Suit Technology (JSLIST) CD

This CD will contain computer-based training for the JSLIST chemical protective ensemble developed to help all soldiers learn to use the JSLIST ensemble properly. This application will be divided into five training sections: JSLIST components, preventive maintenance checks and services (PMCS), JSLIST operations, the buddy system MOPP gear exchange, and testing.

Joint Service Lightweight Integrated Suit Technology (JSLIST) Trainers Guide

This product is a paper-based trainer's guide for the JSLIST chemical protective ensemble. This pamphlet was developed to provide instruction regarding the use,

maintenance, and proper storage of the JSLIST ensemble. This trainer's guide covers the JSLIST description, wear limitations, donning and doffing instructions, maintenance inspection, and storage requirements.

NBC Reconnaissance Systems—Fox Operational Maintenance

This is an interactive CD designed to support unit chemical military personnel on specified organizational maintenance aspects of the Fox vehicle. It will focus on the PMCS and troubleshooting procedures of selected common problems and provide sustainment and reenforcement organizational maintenance training to unit personnel.

NBC NCO Job Aid

This is an interactive information tool designed to guide company-level NBC NCOs through the procedures necessary for them to meet their responsibilities. Based on the 35 responsibilities of the company NBC NCO found in FM 3-11, *Flame, Riot Control Agents and Herbicide Operations* (formerly known as FM 3-100), the job aid provides step-by-step procedures, sample format, interactive forms, references, points of contact, sample lesson plans, and much more.

Seneca Enclave Stores Army DS2

By Mr. Francis X. Murphy
and Major Donna E. Rutten

In July 2000, the Army published Permanent Order 312-2 establishing the Seneca Enclave at Romulus, New York, under the Soldier and Biological Chemical Command (SBCCOM), effective 1 October 2000. The mission of the enclave is to store, maintain, ship, and dispose of the stocks of DS2 located at the decommissioned Seneca Army Depot Activity (SEDA) that had been operated by the Operations Support Command (OSC). Command oversight of the enclave is assigned to the commander of SBCCOM's Edgewood Chemical Activity (ECA). Reading this, you might ask, "What is a Seneca Enclave?" Rest assured, you wouldn't be the first to ask. Another often asked question is, "What is happening with DS2 these days?" This article answers such questions.

First There Is Seneca

Seneca Lake is one of the still pristine Finger Lakes in rural central New York State. It is the west boundary and namesake to the former SEDA—one of the Army's finest Class V storage depots. That depot's flag was lowered in a decommissioning ceremony on 24 August 2000.

The depot was identified for closure in the 1995 Base Realignment and Closure (BRAC) Act and, in the years that followed, depot employees emptied about 800 ammunition-storage igloos and 40 general-supply warehouses down to almost the last square foot. In early 1999, the OSC's commanding general, Major General Joseph Arbuckle, concluded that there were no good alternatives for storing the Army's DS2 stockpile at SEDA, which could jeopardize his plans to meet the depot's closure deadline. Two circumstances quickly came into play to rescue the closure plan: First, item management of DS2 had been given to SBCCOM when the command was formed in 1996. Second, the BRAC law contained a provision for the Army to retain an enclave for storing hazardous material, if required.

Now There Is an Enclave

The SBCCOM commanding general, Major General John Doesburg, agreed to take on the Seneca Enclave with

provisions for transfer of four table of distribution and allowance spaces, warehousing equipment, and funding, with mission assignment to the ECA. The enclave consists of two 200,000-square-foot warehouses containing the decontaminating agent DS2 end items. In the final reduction of the depot workforce, the ECA gained four experienced, dedicated, and resourceful employees to operate the enclave. Their experience with the commodity and depot operations had proven critical to the successful transition that took place.

Also crucial to the successful standup of the enclave were support agreements established with the residual caretaker staff at the depot (now down to seven employees to oversee continuing depot remediation projects) and with SBCCOM's U.S. Army Garrison, Natick, for base support. Because enclaves come without infrastructure, arrangements were needed for everything from water and sewage, to electricity, to postal and telephone service.

In some of their final actions before closure, SEDA provided fencing for the warehouses and made repairs to roofs and doors. It also made provisions for repairs and improvements to the warehouse sprinkler system. Finally, since all but the enclave's two warehouses were transferred to local county authorities for commercial reuse, SEDA negotiated a no-cost lease of Building 114 to provide administrative work space for the four-person staff as well as for a shipment preparation area.



The DS2 Stockpile

The DS2 stockpile consists of four standard military issue items: the 5-gallon can, the M13 portable decontaminating apparatus, the 14-liter fluid-filled container, and the 1 1/3-quart can. Three significant mission challenges for the enclave included segregation and consolidation of field return stocks by lot and condition, disposal of unserviceable material, and the expiration of the stockpile's 2-year shelf life.

In fiscal year 2000, with decisions made to transfer responsibilities for the stockpile, SEDA and SBCCOM managers coordinated remedial plans. SEDA began a systematic inspection operation for field returns and coordinated with the Defense Reutilization and Marketing Office to find a contractor interested in using any unserviceable material, thereby avoiding significant disposal costs. Also in the process, rerehousing plans were developed to consolidate stocks into two warehouses to minimize the size of the enclave. Since the enclave's formation in October 2000, warehousing operations continued towards the objective of achieving 100 percent segregation by lot, stack, and condition. The reutilization effort for unserviceable material was a remarkable success, and similar efforts will be pursued to handle any large-scale disposal requirements.

In response to the reclassification of the stockpile for shelf-life expiration, enclave personnel collaborated with SBCCOM managers and quality engineers to develop an innovative retesting program. Faced with more than 1,600 individual lots requiring tests, criteria for grand lots were developed to reevaluate the chemical serviceability of the stockpile. As of this writing, testing on the 5-gallon pails

has been completed and serviceable lots have been identified. With indeterminate results on the other three configurations, additional sampling was required. At the time of this writing, most of this additional testing has been completed, and updated serviceable lot lists are anticipated for the balance of the stockpile.

The formation of the Seneca Enclave has presented new and unique challenges to the ECA over the past year, but its successful transition to SBCCOM proves consistent with the command's vision of consolidated management of Army chemical commodities from cradle to grave.

Mr. Murphy is the civilian executive assistant of the U.S. Army Edgewood Chemical Activity at Aberdeen Proving Ground, Maryland. He is a quality assurance specialist (ammunition surveillance). He has had a number of special weapons assignments in the continental United States and Germany along with more recent chemical staff assignments with the U.S. Army Soldier and Biological Command. Mr. Murphy holds a bachelor's in mathematics from Niagara University.

Major Rutten is the commander of the U.S. Army Edgewood Chemical Activity at Aberdeen Proving Ground, Maryland. Her previous assignments include battalion chemical officer, I-4 Aviation (Attack); platoon leader and company executive officer, 31st Chemical Company, 4th Infantry Division; special munitions instructor, battery commander, B Battery, 1-31st Field Artillery, Fort Sill, Oklahoma; and environmental program manager, operations officer, Army Environmental Center, Aberdeen Proving Ground, Maryland. Major Rutten is a graduate of the Chemical Officers Basic and Advanced Courses, Combined Arms Services and Staff School, and Airborne School. She holds a bachelor's in physical geography from the United States Military Academy and a master's in environmental systems engineering from Clemson University, South Carolina. Her next assignment will be at the Naval Command and Staff College, Newport, Rhode Island.

Author's Note: Since this article was submitted, the Seneca Enclave supervisor was tragically killed while returning from a DS2 inspection at Pine Bluff Arsenal. Mr. George "Mike" Windle was recognized by the SBCCOM commanding general, Major General John Doesburg, for his efforts to successfully transition the DS2 mission and ensure the continued availability of serviceable DS2 stocks to the field by nominating him as one of AMC's top 10 civilians of the year for 2000. Mike will be sorely missed.

NEW! 54B - Chemical Operations Specialist Career Degree Program

Degree Objective - Occupational

The Army's career degree program for MOS 54B was put on the *Service members Opportunity Colleges* Web site recently. The degree program can be used as the first two years of a bachelor's. It prepares individuals for careers in the environmental field, with an emphasis on management agencies and private industry.

<http://www.soc.aascu.org/socad/54B.html>

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Operational- and Strategic Theater-Level NBC Reconnaissance: Mapping Chemical Agents With High-Altitude Sensors

By Major Gerald (Neal) Dorroh, Jr.

Introduction

As late as 1990, U.S. Army nuclear, biological, and chemical (NBC) reconnaissance platoons, using armored personnel carriers, identified chemical hazards with detection paper, detection kits, and chemical agent alarms. The soldiers had to be in mission-oriented protective posture (MOPP) 4, which made the procedure time-consuming as well as labor-intensive. Consequently, the information that they collected was often of little tactical or operational value when it reached an NBC center (NBCC).

By the beginning of Operation Desert Storm, however, the U.S. Army had made significant progress in fielding tactical-level detection equipment. The United States realized the inventory of NBC defense equipment was inadequate to counter the Iraqi chemical threat, so it turned to its allies for assistance. Thanks to the Federal Republic of Germany, the U.S. Army fielded the XM93 Fox—a lightly armored reconnaissance vehicle equipped with a mobile mass spectrometer. Unlike the M113, the Fox can detect and identify chemical agents while moving.¹ This permitted the vehicle to keep up with maneuver units and provide timely information to the force commander. After Operation Desert Storm, a standoff-detection capability was added that enabled the Fox to detect and identify chemical agents at distances up to 5 kilometers.

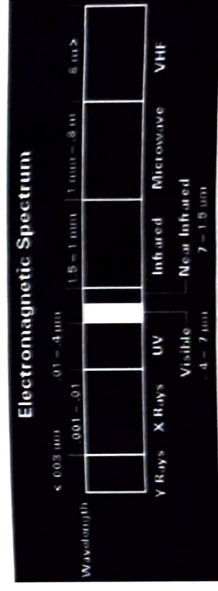
Although these developments and others have been important, their applications remain at the tactical level of war. While enemy intentions and capabilities are generated at the operational and strategic levels, most NBC intelligence is still acquired at the tactical level. The presence of a soldier equipped with a detector, including an M21 remote sensing chemical agent automatic alarm (RSCAAL), in close proximity to a chemical agent, is presently the only means to detect an NBC hazard. Consequently, operational-level and strategic theater-level commanders are reactive rather than proactive to NBC attacks. This article describes how operational-level and strategic theater-level commanders can assume an active role in NBC reconnaissance through high-altitude, hyperspectral technology, specifically reflectance

Detecting Outside the Visible Spectrum

Reflectance spectroscopy is a relatively new field, and it represents the next generation of remote-sensing technology. It is defined as “the study of light as a function of wavelength that has been reflected or scattered from a solid, liquid, or gas.”² This article does not focus on the chemistry and physics of this subject. However, to discuss reflectance spectroscopy and its military potential, several key concepts need to be reviewed: electromagnetic spectrum, vibrational absorption, and reflectance spectrometer.

Electromagnetic energy can be described in terms of its velocity (c), wavelength (λ), and frequency (ν). All electromagnetic energy moves at the speed of light (3×10^8 meters per second) and behaves like a wave and a particle simultaneously. It generates a magnetic as well as an electric field as it travels. It is commonly measured and recorded based on its wavelength, which is the distance from the crest on one wave to the next, and its frequency, which is in cycles per second. The relationship between velocity, wavelength, and frequency is $c = \lambda\nu$; whereas, the frequency of electromagnetic energy is inversely proportional to its wavelength.³

The continuum of the electromagnetic energy is the electromagnetic spectrum (see Figure 1). All energy in the electromagnetic spectrum falls within one of several regions, based on its wavelength. For this discussion, the two most important regions are the visible and the infrared (IR). Visible light consists of the electromagnetic energy with a



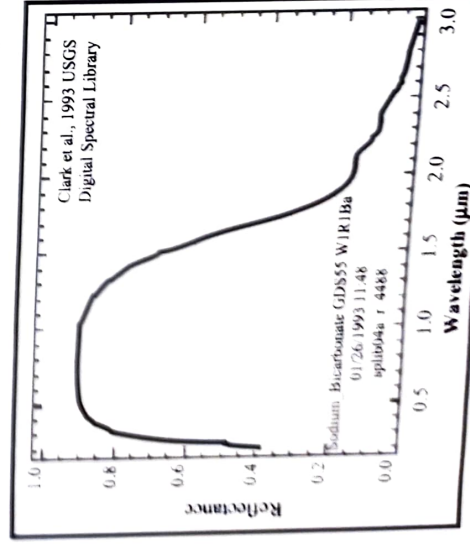
Source: <http://edcwww.cr.usgs.gov/glis/graphics/glossary/>
Figure 1.

wavelength between 0.4 and 0.7 micrometers (μm). The IR region is located between 0.7 μm and 1.0 mm. The regions can, in turn, be divided into bands. Blue, green, and red bands comprise the visible region; near, mid, and far bands make up the IR region.

Most molecules absorb electromagnetic energy because of their molecular bonds, which are like springs with attached weights; they can vibrate. The frequency at which a molecular bond vibrates is a function of the atomic masses of the atoms (weights) and the strength of the bond (spring). Because frequency and wavelength are interdependent, each vibration (frequency) can absorb a specific wavelength of electromagnetic energy. This phenomenon is called vibrational absorption.

The number of fundamental vibrations (frequencies) that a molecule has can be calculated based on the formula $3 \times (\text{number of atoms}) - 6$. For example, a water molecule consists of three atoms—one oxygen and two hydrogens. Using the formula, water has three fundamental vibrations that can absorb one wavelength each. In addition, the frequencies that a molecule absorbs may vary on the physical state of the substance. For example, water in its gaseous form (vapor) absorbs electromagnetic energy at 2.66 μm , 2.738 μm , and 6.270 μm . Liquid water absorbs energy at slightly different wavelengths: 2.903 μm , 3.106 μm , and 6.079 μm .⁴

Knowing which frequencies will be absorbed, a diagnostic absorption spectrum can be plotted for gaseous water and liquid water. The same principle also can be applied to any other substance whether solid, liquid, or gas. The plot in Figure 2 is sodium bicarbonate (NaHCO_3), commonly referred to as baking soda. Notice that as the



Source: <http://speclab.cr.usgs.gov/spectral.lib04/>
Figure 2. Sodium Bicarbonate

x-axis approaches 3.0 μm , the reflectance level decreases dramatically.

The final concept is reflectance spectrometer. To detect and measure electromagnetic energy, a remote sensor, such as a reflectance spectrometer, is required. The human eye is a type of reflectance spectrometer. It can detect emitted or reflected electromagnetic energy between 0.4 and 0.7 μm . The eye detects an object, a yellow flower for instance, because certain wavelengths within the visible region are not absorbed but reflected away from the flower. The flower appears yellow because the flower absorbs all the wavelengths except 0.580 μm , the wavelength of yellow.⁵

Civilian Applications

Currently, high-altitude sensors are identifying specific substances on the surface of the earth through reflectance spectroscopy. As electromagnetic energy generated by the sun interacts with the surface of the earth, certain wavelengths are absorbed while others are reflected. By recording which wavelengths are reflected and comparing that data with the plots of known substances, technicians can identify and "map" minerals, plants, and even man-made materials. Reflectance spectroscopy is being used extensively in mining and forestry to locate minerals and different species of trees.

The mineral map (Figure 3) is the Summitville, Colorado, Mining District. This map was created to study the environmental impact of mining on the rivers and creeks in the area. The U.S. National Aeronautics and Space Administration (NASA) acquired the data using the Airborne Visual and Infra-Red Imaging Spectrometer (AVIRIS). AVIRIS has a spectral range from 0.4 to 2.45 μm in 224 continuous spectral channels. It is mounted in an ER-2—a modified U-2 spy plane, which flies at 65,000 feet when AVIRIS is in operation. It has a swath width of 11 kilometers and a length of up to 1,000 kilometers.⁶

Military Applications

"A fundamental premise of Joint Vision 2010 is that operational commanders will enjoy information superiority—the ability to see and hear virtually everything of importance in any engagement. Informational superiority is vital to success, commandable should see and hear not only everything humanity as well but also everything beyond human perception as well. The military potential for reflectance spectroscopy is therefore, unlimited. If minerals and plants can be detected, identified, and mapped, so can chemical agents such as nerve and blister. A chemical agent, like any

other substance, absorbs and reflects electromagnetic energy. Once a reflectance spectrum is plotted, chemical agents can be detected, identified, and mapped just like the minerals in Figure 3.

There are several factors that would make chemical agent mapping possible. First, most chemical agents are large molecules in terms of the number of atoms. Large molecules have dozens, if not hundreds, of fundamental vibrations that equate to absorption wavelengths. For instance, VX ($C_{11}H_{26}NO_2PS$) has 42 atoms.⁸ According to the formula, VX has 120 fundamental vibrations, which equates to 120 different absorbed wavelengths of electromagnetic energy. Therefore, a VX spectrum plot would be easy to distinguish from other plots.

Second, all known chemical agents are organic; they contain carbon. All choking, nerve, blood, blister, and incapacitating agents have at least one carbon atom per molecule. The significance of carbon is the carbon-hydrogen bond. Researchers know that this particular bond absorbs electromagnetic energy at 3.4 μm .

Finally, some chemical agents contain phosphates and arsenates. All known nerve agents (GA, GB, GD, GF, and VX) contain phosphates. Arsine, a blood agent, and a few blister agents contain an arsenic atom. Both phosphorus and arsenic bonds are easy to distinguish.⁹ Exact absorption wavelengths are not available.

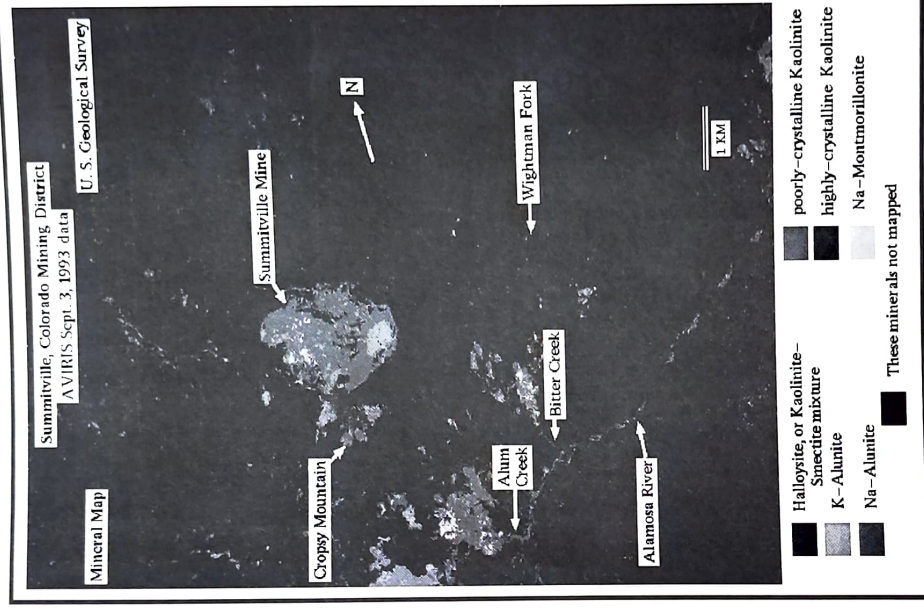
Unfortunately, reflectance spectroscopy is limited in military applications for several reasons. First and foremost are environmental conditions; reflectance spectroscopy can take place during daylight hours only. The sun is the only source of energy at this time that can simultaneously generate the electromagnetic energy required. In addition, heavy cloud cover can prevent much of the sun's radiation from reaching the earth's surface.

Second, all chemical agents are classified as persistent or nonpersistent. Some persistent agents like mustard can take days or even months to dissipate, depending on temperature and atmospheric conditions. Nonpersistent agents can evaporate in a few minutes. Therefore, the chances of detecting a nonpersistent agent would be somewhat low.

Finally, only substances that have been plotted previously can be mapped. If a new chemical agent were employed, initially it would appear as an unknown substance until a sample could be taken and analyzed. Technicians would then compare the plots of the new chemical to the plots of known substances.

Theater-Level Employment

Reflectance spectroscopic sensors could be employed in a variety of ways to support operational- and strategic theater-level commanders throughout the spectrum of military operations. First, commanders could



Source: http://speclab.cr.usgs.gov/PAPERS_summitv/summitv.htm

Figure 3.

use high-altitude sensors to conduct NBC reconnaissance of aerial ports of debarkation (APODs), seaports of debarkation (SPODs), drop zones, and amphibious landing sites before deploying forces into the theater. Historically, forces are most vulnerable to attacks (especially NBC attacks) during the initial deployment and build-up phases of an operation. Normally, NBC defense units are not the first organizations to arrive in theater. Without NBC defense assets in theater, the ability to conduct NBC reconnaissance is very limited.

Second, high-altitude sensors can conduct reconnaissance of restricted terrain, urban terrain, and axes of advance beyond the range of tactical-level NBC detection assets. Imagine if the Iraqi army had protected its right flank with a blister agent during Operation Desert Storm.

The XVIII Airborne Corps could have slowed down or quite possibly aborted its attack once its lead elements had blindly entered a contaminated area. General Schwarzkopf's "end-around" maneuver would not have achieved surprise, and 6 months of planning and preparation would have resulted in disaster for the coalition forces.

Third, operational- and strategic theater-level commanders can investigate allegations of chemical weapons use against indigenous people or refugees. During the last 25 years, there have been several confirmed or alleged uses of chemical weapons against ethnic minorities. The most notable use occurred during the Iran-Iraq War. Saddam Hussein employed a chemical agent against the Kurds, an ethnic group in northern Iraq, after he accused them of assisting the Iranians during the war. As a result of the attacks, more than 15,000 Kurds, including women and children, died.

Finally, high-altitude sensors can conduct reconnaissance of industrial sites for toxic industrial materials. A recent incident in which soldiers were possibly exposed to a toxic substance occurred in Croatia. Canadian soldiers may have been exposed inadvertently to toxic substances, specifically bauxite and PCBs, while filling sandbags during a peacekeeping mission.¹⁰ Because the Canadians do not have a vehicle similar to the Fox, high-altitude NBC sensors possibly could have prevented this exposure.

Conclusion

Since 1990, the U.S. Army Chemical Corps has made significant strides to improve its chemical agent detection capabilities. It also has acknowledged that U.S. forces are the most vulnerable during initial- and early-entry operations. However, NBC defense units do not normally arrive in theater soon enough to provide force protection to initial-entry forces or contribute to the joint force commander's (JFC's) situational understanding.

For the Chemical Corps to remain a relevant member of the joint force, it must explore and, ultimately, acquire additional capabilities that will enable the JFC to reconnoiter APODs, SPODs, landing zones, and amphibious landing sites before an operation. This capability would complement, not replace, other NBC sensors—such as the Nuclear, Biological, and Chemical Reconnaissance Systems (NBRCRS) and the Scanning Airborne Emission for Gaseous Ultraspectral Analysis and Radiometric Detection (SAFEWARD)—and would eventually be an integral part of the interactive-networked detection system.

At this time, AVIRIS is probably the least expensive option to meet this requirement. Because NASA is already using it to map minerals on the earth's surface, AVIRIS would essentially be a government off-the-shelf acquisition. Not only would it meet an immediate need, but it would also serve as an interim solution and a bridge to the Objective Force.

Endnotes

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⁹Clark.

¹⁰"Inquiry Begins Digging Into Toxic Mystery," *Halifax Herald Limited*, (<http://www.herald.ns.ca/cgi-bin/home/displaystory/1999/08/28+109.raw+Canada>), 28 August 1999.

Major Dorroh is the chief of concepts, Chemical Division, MANSCEN, Directorate of Combat Developments, at Fort Leonard Wood, Missouri. Previous assignments include deputy team chief, Defense Threat Reduction Agency, Dulles, Virginia; commander, 44th Chemical Company, 2d Armored Division, Fort Hood, Texas; DIVARTY chemical officer, 9th Infantry Division (Mechanized), Fort Polk, Louisiana; battalion chemical officer, 4th Battalion, 7th Field Artillery Regiment, and assistant brigade chemical officer, 43d Field Artillery Brigade, Giessen, Federal Republic of Germany. Major Dorroh is a graduate of the Chemical Services Staff and Advanced Courses, Combined Arms and the Canadian 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.

Johnston Atoll Chemical Agent Disposal System Mines Its Business

By Gary McCloskey

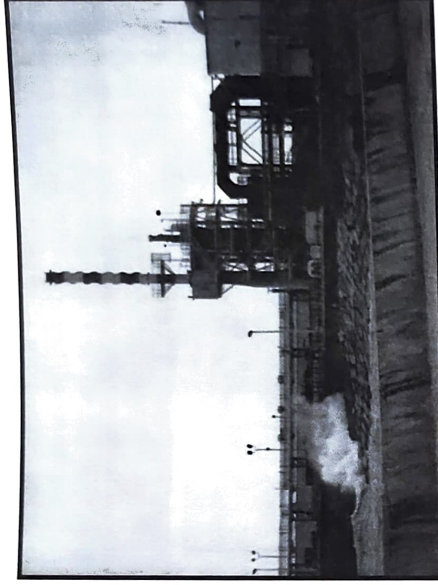
Type in the words "land mines" on your Internet search engine and initiate the search. In just a matter of seconds, your computer screen will flash hits for more than 37,000 Web sites, including several news articles and books. Even before the late Princess Diana made the destruction of land mines her personal crusade, land mines had been a hot issue around the world and were one of the harshest legacies of war.

Now type in "chemical agent land mines," or even more specifically "VX land mines." Hit search and you only find two entries under the VX land mine term, none under chemical agent land mines. Yet these land mines were made to contaminate with deadly nerve agent O-ethyl S-diisopropylaminomethyl methylphosphonothiolate (VX). Fortunately, while the United States produced and maintained a stockpile of chemical weapons, they never were used.

While there has been public outcry against conventional land mines, the U.S. Army has systematically moved forward to destroy the U.S. stockpile of chemical agent weapons, which includes nerve (VX and GB) and blister agents, bombs, mortar rounds, rockets, ton containers, spray tanks, and projectiles. This stockpile also originally included more than 100,000 M23 VX-filled land mines stockpiled at four continental U.S. sites, as well as on Johnston Island, which is located more than 800 miles southwest of Hawaii. More than 13,000 of these land mines were destroyed recently in the first U.S. M23 VX land mine disposal campaign at the Johnston Atoll Chemical Agent Disposal System (JACADS) stockpile sites storing the remaining U.S. chemical weapons are Umatilla, Oregon; Tooele, Utah; Anniston, Alabama; and Pine Bluff, Arkansas.

JACADS has been the site of many firsts in the Army's chemical weapons disposal program. It now has set yet another first with its final campaign: the destruction of the last remaining chemical agent munitions stored on Johnston Island—the M23 VX land mines.

Destroying conventional land mines in a safe and environmentally friendly manner is not easy. Adding to the complexity of JACADS's disposal process, the M23 VX land mines were filled with approximately 10.5 pounds of VX nerve agent in addition to the normal fuzes,



JACADS is the world's first full-scale facility built to destroy chemical weapons.

burst,ers, activators, and charges. Not only did the Army have to safely destroy the explosive components, but it also had to remove and destroy the VX and then clean the metal of explosives and agent contamination while maintaining worker safety and protecting the environment.

VX is an organophosphate-based (common household insecticides also are organophosphate-based), rapid-acting, persistent nerve agent. It also is the deadliest of the nerve agents. Its density is similar to oil, and it evaporates more than 2,000 times slower than water, which is why it is referred to as persistent. VX was designed to kill through skin contact and contaminate any contacted objects for long periods of time.

Mix in nearly a gallon of VX with an antivehicle or antipersonnel land mine and you end up with the M23. As assembled for storage, the M23 land mines are filled with VX nerve agent and have burster charges in the main fuze well and activator well. In storage, the M23s are packed in three mines to a 16-gallon drum, and normally 12 drums are in two layers to a pallet. Each drum contains three land mines with three fuzes and three activators in the top packing material. However, at Johnston Island, the Army repalletized the drums in a single, six-drum layer before delivering them to JACADS. This minimized the number of handling steps required in the unpack area during the disposal process and increased operator safety. Repalletizing is a lesson learned that will be shared with the other stockpile sites.

To start the disposal process, eight pallets of M23 mines (a total of 144 land mines) are delivered at a time by truck to the munitions demilitarization building. Here, a visual inspection is performed. Next, a forklift is used to transfer the pallets to the two building elevators. The elevators lift the pallets to the second floor where they are moved to a staging area in the unpack area.

Operators wearing Level B chemical protective equipment (burl rubber hood, apron, gloves, and boots) with supplied-air respirators and backup emergency air bottles prepare the drums to be unpacked. After removing the drum lid, the operators perform a visual inspection and use an automatic continuous-air monitoring system to check for traces of VX nerve agent. These monitors are real-time gas chromatographs capable of detecting VX nerve agent at extremely low levels. If the drum is clean, the mines can be processed normally as described in the paragraphs below. If an agent is detected, the drum is moved into the explosion containment vestibule and unpacked by operators wearing a higher level of protective equipment—a one-piece, sealed demilitarization protective ensemble with supplied air.

Operators in Level D chemical protective equipment (gas mask carried on the hip, burl rubber gloves, and boots) with rubber aprons remove the fuzes and activators from the top packing of the clear drums and place them into a cardboard dummy mine. This provides a means for the mine handling system to move these explosive components into the deactivation furnace system.

The operators can remove each mine from the drum manually. However, they have to lean over, reach into the drum, and pull out the 23-pound mines by hand. This is especially difficult with the bottom mine, which has a high friction force with the packing material—requiring much more exertion by the operator. Also, the operators must lift at least 20 mines per hour to maintain scheduled destruction rates. This particular operation poses a safety risk to the operators.

To reduce risk of injury, JACADS personnel developed a machine that extends from an overhead crane onto each individual mine and lifts it to the accumulation conveyor line. This mine-gripper device uses three metal gripping fingers to grip the bottom lip of each land mine and lift it from the drum. The pressure from the gripper "fingers" is not enough to damage the mines, and there is enough overlap of the fingers on the mine lip so that no amount of shaking or impact can accidentally release the mine. It takes two signals from the operator (pressing a button and activating the joystick)

to release the mine, which minimizes the risk of dropped mines. Using this lifting device for all the mines also eliminates the lifting strain for workers. From this point forward, the processing of the land mines is remotely controlled or automated.

Once the mines are placed on the accumulation conveyor, it automatically feeds the land mines through an air lock—in a continuous sequence of three M23 and mines and one cardboard dummy—into the explosion containment vestibule. Here, a machine called the arming plug extractor removes the arming plug and exposes the burster. The arming plug extractor also automatically spaces the land mines and cardboard dummy appropriately for feeding into the explosion containment room.

To safely contain any possible explosions, the explosion containment room is specially designed with steel-reinforced concrete walls that are more than 28 inches thick. All work on munitions in this room is controlled remotely, and the explosion containment room's steel doors must be closed and properly secured for the equipment to operate. Personnel are not allowed in the explosion containment room while the equipment is operating.

The mine machine in the explosion containment room passes the cardboard dummy mines carrying the fuzes and activators to the deactivation furnace system. The mine machine that senses the mine handle to orient the land mines properly orients the real land mines. This is done one land mine at a time. The lift table lowers, and the mine is rotated until it is vertical or standing on its side with the side burster well clear of the punch path. This is the drain position.

In the drain position, the mine is securely clamped in place and the drain punch—a hydraulically-

powered cylinder rod—punctures the side of the mine. The rod is hollow and drains the nerve agent from the land mine. It takes about 20 seconds to drain the agent, which is sent to a holding tank and eventually burned in the liquid incinerator at a temperature of about 2,700 degrees Fahrenheit (F). After the agent has been drained, the mine machine rotates the land mine 90 degrees and places it upside down on the trolley transfer station. The mine machine is ready to punch and drain another mine.



Photo courtesy of Joseph Bonfiglio, U.S. Army, Pacific

JACADS—with the destruction of the nerve agent VX land mines—has destroyed all the chemical munitions in the stockpile at Johnston Atoll.

while the already drained land mine is transferred via the pulley to the next station.

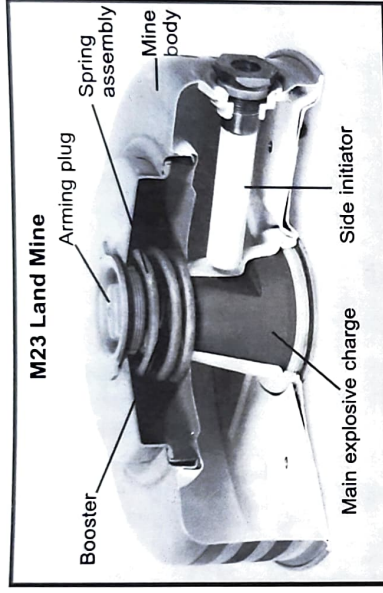
The buster punch station was originally developed to punch through the central buster and punch out a buster pellet in the buster's main explosive charge. However, this station is not used because M23 land mines made before 1964 have a steel, rather than plastic, bottom fuze-well assembly that considerably increases the chance of detonating the buster during the punching process. Instead, the JACADS team, together with the Army's Chemical Demilitarization Training Facility, developed a fuze-well removal station that automatically screws out the fuze-well assembly, exposing the land mine's main explosive charge. This increases the rate of heat transfer in the deactivation furnace system, allowing the explosive to burn safely. Using the fuze-well assembly removal station reduces the detonation risk from an 11 percent probability using the buster punch station to a statistically negligible risk. In other words, it makes the process much safer.

The now furnace-ready land mine is pushed onto the deactivation furnace system's slide gate. The gate opens and the land mine slides down a chute to a second gate. The top gate closes and the bottom gate opens, allowing the land mine to enter the deactivation furnace system's primary chamber. The land mine is thermally processed at 1,050 degrees F, which burns the explosives and destroys any residual VX nerve agent.

The metal and ash remaining from the land mine travels through an electrically heated discharge conveyor, is containerized and sampled to verify that it is agent free, and then is shipped to an off-site, permitted hazardous waste landfill. The gases generated in the primary chamber travel through an afterburner and are heat-treated at 2,000 degrees F before passing through a pollution treatment system where any residue or agent vapors are permanently destroyed.

Thus ends the life cycle of an M23 VX land mine. The intricate process automatically and safely destroys the land mine at a time. Skilled operators carefully control and monitor the entire disposal process from the control room. All aspects of the process are electronically logged to ensure that the data from this complex process are captured to verify the safe processing of these deadly weapons.

Preparations for the initial M23 land mine processing at JACADS resulted in the repalletization of the M23 land mines, the design and use of the mine gripper, the arming plug extractor, and the bottom fuze-well assembly station as described above. Each of these lessons learned benefit the mainland sites at Tooele, Umatilla, Anniston, and Pine Bluff, ensuring maximum safety of the workers, public, and environment as the U.S. stockpile of M23 VX land mines becomes part of chemical weapons disposal history.



JACADS recently completed destruction of more than 13,000 land mines filled with nerve agent VX.

"Eliminating chemical weapons from our nation's arsenal works at several levels: it eliminates the risk that a chemical weapons accident could occur within the United States; it frees up soldiers for use other than guarding and monitoring our stockpiles; and it sets the standard for the rest of the world to follow," said James L. Bacon at an environmental forum held 12 through 14 September 2000, in Columbia, Maryland. Bacon continued, "I look forward to the day we no longer have chemical weapons and our grandchildren only know about them through reading history books." Bacon has served as the program manager for chemical demilitarization since July 1997.

JACADS has set a high standard for the other U.S. stockpile sites and the world. Now that the last of 13,302 M23 VX land mines on Johnston Island has been destroyed, it is time to clean up, turn out the lights, and go home. November 29, 2000, marked a historic day for chemical demilitarization, as the first U.S. chemical weapons disposal facility finished its last campaign—the first processing of M23 land mines—and became the first U.S. facility to complete its mission. In doing so, it has made its mark in the history books and produced many lessons learned that will be shared with other U.S. stockpile sites and with the world community.

Mr. McCloskey is the site project manager for JACADS. Having served in this capacity for the past 10 years, Mr. McCloskey has overseen the destruction of more than 412,500 munitions processed in the U.S. prototype chemical weapons stockpile disposal facility. Mr. McCloskey's previous employment includes the U.S. Army Chemical Activity, Pacific (USACAP), where he served as an executive assistant and a chief engineer, managing the upgrade and renovation of various demilitarization buildings and serving as the contracting officer's representative for the facility's contract. Mr. McCloskey received a bachelor's in electrical engineering from the Rensselaer Polytechnic Institute in Troy, New York, and a master's in industrial engineering from Texas A&M.

The End of an Era...

Johnston Island Accomplishes Its Mission

By Burton Wright III, Historian, USACMLS

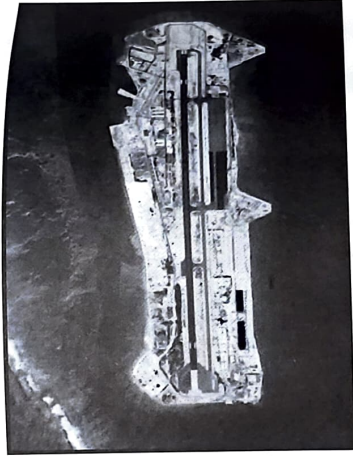
April 11, 2001, was a red-letter day in the history of the Chemical Corps. After three decades of operation, the U.S. Army Chemical Activity Pacific (USACAP) was deactivated during a Chemical Surety Decertification ceremony on Johnston Island. This little speck of land is located 825 miles southwest of Hawaii.

USACAP was a unique facility in that it brought together soldiers, Air Force personnel, federal civilian employees, and private-sector contractors to perform an important mission mandated by the Chemical Warfare Treaty. During its operation, USACAP was required to safely store, secure, transport, and account for chemical weapons. The destruction of the last stockpiles of chemical munitions, such as the nerve agent VX on November 29, 2000, ended the mission for the island.

The storage of chemical weapons on the facility began in 1971 when Operation Red Hat brought tons of chemical munitions from Okinawa to Johnston Island. However, the destruction of these munitions began in 1990 when the chemical agent disposal system facility was completed. In the last decade, the facility has successfully destroyed more than 400,000 rockets, projectiles, bombs, mortar rounds, ton containers, and mines. During this process not a single serious incident occurred.

The facility destroyed more than 2,000 tons of chemical agents such as sarin, VC, and blister agents like HD. This destruction adds up to 7 percent of the total chemical-munitions stockpiles of the United States. The Johnston Island disposal facility was the first of its kind, and all the other nine sites use the information developed from this facility to build better and safer disposal facilities. During the elimination of such dangerous chemicals, the island was responsible for the safety of the Pacific area and the environmental stewardship of the area, which is alive with all sorts of marine and bird activity. This operation required individuals to be away from their families for up to a year.

During its three decades of work, Johnston Island set standards for safety and storage of very lethal chemical agents that will be difficult to improve upon. During that process, all operations were continuously monitored for safety. Environmental concerns and the information



Johnston Island is a designated wildlife refuge.

developed from this process were immediately shared with other facilities going online or already online. In fact, the expertise developed from USACAP has been shared and will be shared with any nation seeking to destroy its chemical-munitions stockpile.

Those who will live in the twenty-first century will not have to worry about the material stored on Johnston Island. It's gone and never will it be restored!

Although both an Air Force and Army facility, Johnston has continuously worked in cooperation with federal agencies like the Environmental Protection Agency and the U.S. Fish and Wildlife Service. With the plant in the process of closing, protection of the environment is a top priority at USACAP.

The final closure of the plant and the Army's facilities will take another 33 months. But when the work is completed, the dangerous work there will be over, and no damage to the delicate Pacific environment will be occurred.

USACAP personnel raised professionalism and dedication to duty to a new level. That no problems occurred can be directly attributed to the training and dedication of all USACAP personnel. More work needs to be done to rid the world of these dangerous chemical weapons. The superb work of USACAP is a good start. This never will soon pass into history, but its work must never be forgotten.

Ten years after the event, and 5 years since the revelation of the Khamisiyah incidents, DOD still struggles to understand what happened in 1991, and more importantly, what we should do to ensure that this confusion does not happen again.

Reflections on Khamisiyah

By Albert J. Mauroni

Ten years ago, most of our military forces committed to the Persian Gulf War were on their way home. It was a good news story; with minimal casualties, they had liberated Kuwait, defeated the fourth largest military force in the world, and avoided the threatened use of chemical and biological (CB) weapons. Many veterans and a majority of the public don't quite believe we dodged that bullet entirely, despite the presence of more than 4,000 chemical specialists, thousands of chemical detection devices, and medical specialists reaching for CB agent symptoms. While it may be accepted that Iraqi forces did not employ CB weapons against the coalition force, there is the perception that the Department of Defense (DOD) didn't fully understand the effects of blowing up Iraqi chemical production sites or abandoned stores of Iraqi munitions. The DOD CB defense community sees the negative CB reports and lack of medical and physical (expended munitions) evidence as proof that there was no exposure, but that is not conclusive enough evidence to convince the U.S. political leadership. Rather, the events immediately following the cease-fire continue to plague our ability to move forward from the Gulf War. I refer to the Khamisiyah depot and Khamisiyah pit explosive ordnance demolition operations in March 1991.

On 4 March 1991, engineers from the 82d Airborne Division rigged and detonated 38 of the approximately 100 bunkers filled with what they assessed as conventional ammunition. One of these bunkers is now believed to have held chemical munitions, specifically 122-mm rockets filled with sarin or cyclosarin mixes. On 10 March, the same engineer units blew up a large number of 122-mm rockets in a pit about 1 kilometer south of the depot, destroying about half of the rockets. None of the munitions at the bunkers or in the pit were marked as unconventional munitions, nor were any leaking to the degree that chemical specialists might have identified the munitions as chemical-filled. One M8A1 chemical detector activated in the engineer's location, but an M256A1 chemical detector kit did not confirm the

presence of agents. It was not until October 1991, when a United Nations Special Commission (UNSCOM) team found unexploded 122-mm rockets still in the pit that it was identified that the rockets were filled with sarin and cyclosarin nerve agents. In May 1996, a UNSCOM inspection of the depot bunkers revealed that the remnants of munitions in one of the shattered bunkers were identical to those found in the pit, leading UNSCOM to report the potential release of chemical warfare agents. The Pentagon and the Central Intelligence Agency oversaw computer simulations of the possible release of chemical warfare agents and gave this data to the Presidential Advisory Committee, which started a media blitz questioning DOD's previous claims that no military personnel were exposed to chemical warfare agents in the Gulf.

Details of these events are laid out in great detail on <http://www.gulfink.osd.mil>, thanks to the fine investigative work of the Office of the Special Assistant for Gulf War Illnesses (OSAGWI). In fact, Dr. Bernard Rotsker noted, in a recent newsletter, that the Khamisiyah incident was the primary reason for establishing OSAGWI in 1996. Because OSAGWI believes that the Khamisiyah pit demolition represents the only Gulf War event that may have exposed service members to chemical warfare agents, it became the center of focus for both veterans' and DOD groups, especially those who work to prepare our military for future conflicts. If you have not read OSAGWI's investigative narratives of these events, as professionals in this field, you should become intimately familiar with their details.

Ten years after the event, and 5 years since the revelation of the Khamisiyah incidents, DOD still struggles to understand what happened in 1991 and, more importantly, what we should do to ensure that this confusion does not happen again. In the National Defense Authorization Act of 1999, Congress tasked DOD to examine the effects of low-level chemical agent exposure to understand what actions were necessary to protect military personnel against even single exposures of low

levels of chemical agents. An Office of the Secretary of Defense working group has been formed to execute this tasking. From this group, two working groups were created—a technical working group to develop the medical and nonmedical data required to understand how one protects against low-level chemical agent exposure and an operational working group to identify the conditions under which military personnel would be exposed to low-level chemical agents.

Chemical Warfare Agents Research

The United States has been working with chemical warfare agents for decades—in the case of mustard agents, research has gone on for more than 80 years. Two things have changed: first, Edgewood scientists have postulated that expressions of lethality are not constant over time, as previously thought. For instance, the lethal dose for 50 percent of the population for sarin was thought to be 100 mg-min/m³, which meant a person exposed to 100 mg of sarin for 1 minute or 50 mg of sarin for 2 minutes had a fifty-fifty chance of dying. Recent research indicates that exposure to lower doses of a chemical agent for longer durations may be more potent than previously believed, that the calculations are not as linear as had been portrayed. This means much of the chemical lethality data that we previously accepted as gospel has to be revalidated, and past corollaries of chemical defense must be challenged. Now, in addition to lethal dose, incapacitating dose, and effective dose, we add low-level dose measurements.

The second change is trying to understand what exactly low-level chemical agent exposure is. What are we trying to protect our forces against? One definition of low-level chemical agent exposure is “exposure to chemical warfare agents without causing any immediate harmful or adverse reactions.” OSAGWI has used the term “first noticeable effects” as the term for chemical agent exposure that would cause miosislike effects. For instance, low-level chemical agent exposure would occur when a person is exposed to agent levels below the standard of “first noticeable effects.” The question is, what is the operational impact of low-level agent exposure? If there is no immediate adverse effect on troops, maybe there is no operational impact. It then falls to the medical community to determine long-term health consequences of that exposure.

To add to the confusion, the duration of exposure to chemical warfare agents must be identified also. Exposure is temporary (also called acute), short-term, or long-term (also called chronic). Some categorize acute exposure as less than 8 hours, short-term as less than 2 weeks, and chronic exposure as more than 2 months. Specifically,

this means a person is continuously exposed to a substance for the duration. So, low-level acute exposure means a person has been exposed to agent levels that do not cause any immediate harmful effects for less than 8 hours duration. The medical community, in particular, is often more interested in chronic-exposure effects than the nonmedical community, which focuses more on the acute-exposure effects.

The Khamisiyah Pit

How exactly did we get to the DOD statement that 100,000 military personnel may have been exposed to nerve agents as a result of the demolitions? In May 1997, DOD completed a series of small-scale demolition tests using simulant-filled 115-mm rockets at Dugway Proving Ground, Utah. These tests allowed OSAGWI to understand better what might have happened when engineers blew up the Iraqi 122-mm rockets at the Khamisiyah pit in 1991. These tests, combined with a better understanding of conditions on the day of the explosion, lowered the estimated agent release from 715 kilograms to 315 kilograms. OSAGWI employed five different computer models when trying to identify where the agent might drift in a 4-day period. This included three weather models and two chemical warfare agent dispersion models (SCIPUFF and VLSTRACK). The resulting plume stretched 250 miles south, stopping north of King Khalid Military City (KKMC) (see Figure 1). On day one of the demolition, more than 45,000 military personnel may have been exposed with possibly more than 61,000 more on day two. This yields the now-famous number of 100,000 military personnel that may have been exposed.

Exposed to what? Interestingly enough, the downwind hazard area that might have caused first noticeable effects of chemical warfare agent exposure extended only 4 miles downwind from the pit and no one was in that area (see Figure 2). All the exposed personnel were in a hazard area at a level generally known as the general population limit, which would not have caused an M8A1 alarm to go off. This level is 0.000003 mg/m³, or 0.013 mg-min/m³ for sarin in a 72-hour period. General population limit is defined as a standard used for those workers who handle toxic chemical agents. It means that if a worker was exposed to this level of agent for 40 hours a week for the extent of his working career, he will not show health effects.

An independent peer-review panel stated that OSAGWI's methodology, while improved, would still be on the conservative side; (that is), they very likely are overestimates of the dosages actually received to be personnel.” DOD made the deliberate decision to be

conservatively safe-sided, "on the side of the precaution," to ensure that they didn't omit anyone who could have been exposed to low levels of agents. By the previous estimates, had those agents stayed downwind of the Khamisiyah depot and pit explosions for the rest of their life, let alone another few days, they would not have been exposed to levels against which unprotected civilians were working every day at the chemical weapons sites are protected. What message are we communicating here?

The Army's chemical demilitarization program is closely watching the results of OSAGWI's work because there is a definite parallel to occupational chemical agent exposure and their risk-management practices. If the level of acceptability for chemical agent exposure to soldiers on the battlefield goes down, there is the significant possibility that it will go down for the agent workers during peacetime operations. There are other interesting parallels between chemical demilitarization and OSAGWI's assessments, as well. Consider the following two messages:

The first group will be veterans who deployed to the Gulf War and who reported symptoms which include fatigue; lightheadedness; headaches; nervousness; difficulty sleeping; muscle pain; trouble thinking; concentrating, or remembering; or a fast heart rate." This is from the November/December 2000 *GulfNEWS* newsletter discussing a planned John Hopkins research effort on Gulf War illnesses.

"Direct physiological responses (to stress) are then associated with increased levels of adrenaline and other catecholamines that increase the heart rate and blood pressure and accelerate respiration. Inspiration, and other physiological symptoms... Physical symptoms of these responses include muscular tension, memory lapse, headache, insomnia, tiredness, sweating, dizziness, and general weakness. These are typically referred to as somatic stress effects because of a lack of a specific etiology for their manifestation." This information is the result of the Final Programmatic Environmental Impact Statement of the Army's Chemical Stockpile Disposal Program, dated January 1988.

Recognizing that many veterans object to the supposition that they could be suffering from stress due to participation in a high-paced, pitched battle between mechanized forces, I make no connection between the two paragraphs. Other medical journals have examined Gulf War veterans and developed better studies on stress. Consider all the evidence

The Pit—Day 1

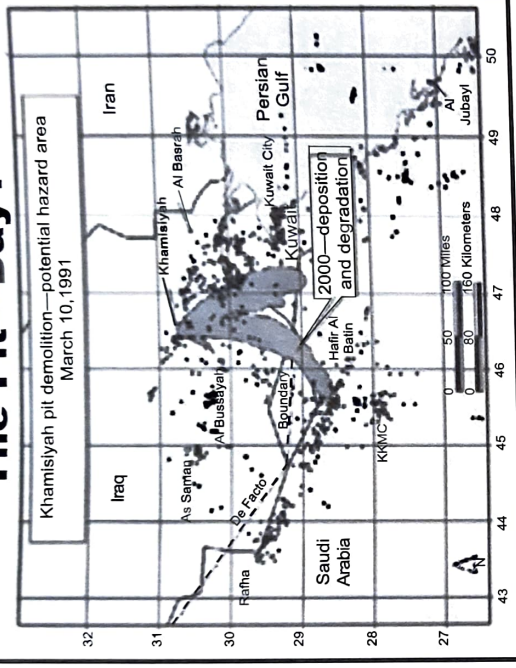


Figure 1

before answering this question—What are we attempting to solve with this low-level agent exposure study?

Questions About the Future

The reason for understanding this event is because it has the strong potential to shape how the warfighter develops requirements for future doctrine, training, leadership, organization, and materiel. There are a number

First Noticeable Effects

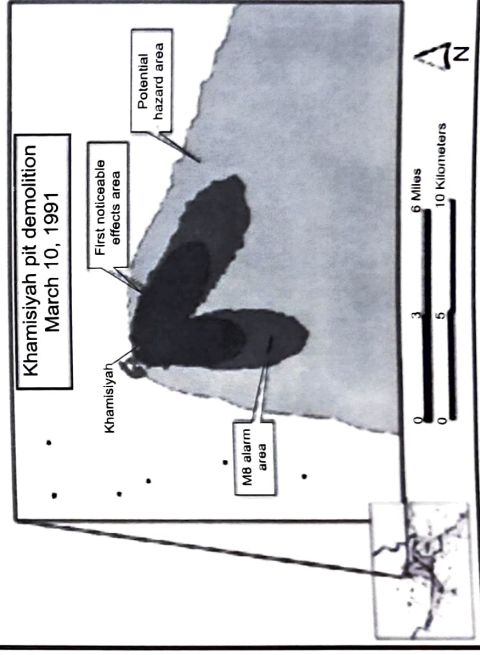


Figure 2

of debates ongoing in the DOD CB defense community, all of which focus on what exactly the future threat is perceived to be. Given the end of the Cold War and new studies on "agent fate," or how long chemical agents remain a threat in the environment—specifically what happens to an agent when it hits a particular surface given a particular set of environmental conditions over time—some believe the threat of chemical warfare attacks is highly exaggerated. Others believe that the political ramifications of the Gulf War and perceived "zero-risk" mentality will demand that the warfighters increase their concerns about CB agent exposure. There is no current DOD policy that addresses how warfighters should address operational risk management in a military scenario that includes the deliberate employment of CB weapons against our forces.

Part of this absence of policy is because of the lack of hard research data on low-level agent effects. As noted previously, there is a concerted research effort ongoing in the medical and nonmedical CB defense communities. The nonmedical community focuses more on validating the inhalation and percutaneous exposure data to understand what may be required for chemical agent detectors and protective suits and masks to function adequately. The medical community focuses more on validating how the human body responds to agent exposure to understand what diagnostic and treatment regimes are necessary. There is shared data but not so clear agreement on the philosophy of how to use this data.

Some argue that the Gulf War experience has created a new paradigm—which the CB defense community can no longer afford to set its detection limits at lethal and incapacitating levels. While it is generally understood that military personnel in a combatant environment will not be using peacetime general population limits, the alarm level that *some* would be more comfortable with would be between the incapacitating and the general population limit. This might entail redesigning all our detectors to activate at levels significantly lower than what they do now, increasing protective capabilities of suits and masks, and decontaminating all equipment and personnel to the point of eliminating 100 percent of all traces of agent—not 99.5 percent but 100 percent because people will argue for that last 0.5 percent.

This train of thought has alarmed some as being unrealistic. The concept of risk management is sound, but in terms of what information is valuable to the commander, overreaction is deadly. Imagine the following scenarios:

A lieutenant colonel is about to order his troops to assault a hill, and the chemical officer runs up to him. "Sir! That hill was contaminated with nerve gas 3 weeks ago and may have levels of agent there to which our detectors won't alarm!" The colonel looks at this chemical

officer with concern and asks, "How many troops might die from the chemical agents if we attack now?" "Oh, none, sir, but in a few years from now, they might not sleep well."

After the chemical officer is summarily kicked out of the colonel's command post and sent to the rear as the battalion's new mail clerk, the unit assaults and clears out the enemy position without incident. After the war, 10 percent of them report health issues.

In the second scenario, the colonel listens to the chemical officer, orders his troops to don full MOPP gear, and sees a third of them killed because they were constrained while the enemy was not wearing any protective gear.

This story may seem a bit exaggerated, but it strikes to the heart of this discussion. Is DOD investing millions of dollars in research because of a political reaction to a single postconflict event where there was no immediate adverse reaction to low-level chemical agent exposure? Or, are there real concerns that our detectors, suits, masks, and decontamination systems are not addressing the necessary threat levels? If the decision is that DOD must protect its forces from low-level agent exposure, do we then invest in very sensitive, false-alarming chemical detectors, impermeable protective suits and masks, and decontaminants that destroy all agents (good-bye to striving to be environmentally friendly)? Are we convinced that the threat of low-level chemical agent exposure is significant enough to mandate overturning the existing materiel program? Or have we overreacted to the low-level issue rather than calling for the need to educate our military and political leaders that we can afford some operational risks on the battlefield? Is there a middle ground here?

I don't pretend to have the answer to this low-level issue. This issue calls for inspired discussions and continued strong leadership to ensure that the joint CB defense community is heading down the right track. We may not have the necessary research data for many years to come, but people are making decisions on doctrine, policy, and materiel solutions now. We need to ensure that we understand what near-term and far-term courses of action are required and what assumptions have been made in developing them. At the base of this discussion lies the shadowy history of Khamsiyah.

Mr. Mauroi is a senior policy analyst for Analytic Services Inc., Alexandria, Virginia, and a former chemical officer with more than 15 years experience. He is the author of several journal articles and two books: *Chemical and Biological Defense: U.S. Military Policies and Decisions in the Gulf War and America's Struggle with Chemical and Biological Warfare*. He is currently writing a book on the history of the chemical demilitarization program.

83d Chemical Battalion *on a* Cutting Edge Deployment



A soldier stands guard at Camp Ranger Russell.

By: MajorMark Pomeroy and Second Lieutenant Eric Samaritoni

During April 2001, the 83d Chemical Battalion—commanded by Lieutenant Colonel Raymond Van Pelt—had attachments from the 519th Military Police (MP) Battalion, the 115th Field Hospital, and the U.S. Marine Corps deployed to Bahrain, Saudi Arabia, (via a C5) for Operation “Neon Falcon.” This joint exercise, sponsored by the Chairman of the Joint Chiefs of Staff, involved the 83d Chemical Battalion; the U.S. Navy; the United Kingdom’s joint nuclear, biological, and chemical (NBC) defense regiment; and Bahrain military forces. For the exercise, the 83d deployed a battalion command-and-control element and a representative chemical company team comprised of 53 personnel, one Fox NBC reconnaissance vehicle, two biological integrated detection systems (BIDS), and a Coyote smoke vehicle. The company team, as well as the deployment of a chemical company team, was on the cutting edge of Army, joint, and coalition doctrine.

The 83d began its deployment on 6 April by building up the battalion’s maintenance section and a maintenance support team from the 142d Corps Support Battalion. Upon completion of the inspection, the 83d convoyed the deploying vehicles to the Alexandria, Louisiana, airport of embarkation. On 7 April, the battalion returned to Alexandria for the Air Force joint inspection and the load out of vehicles and equipment on the C5. After the last vehicle was tied down in the C5, the Air Force loadmaster was quoted as saying “that the aircraft load out was “one of the best I’ve seen.”

On 8 April at 0300, the chemical company team commanded by Captain Carlos Gonzalez and First Sergeant Ronald Hilaire (dubbed “Team Gonzalez”) conducted its final manifest call and boarded buses for the hour-long trip along Highway 28 to Alexandria. Upon arrival, Team Gonzalez loaded the C5 and took off for the 2 1/2-week exercise. After stops in Gander, Canada, and Rota, Spain, the 83d arrived in Bahrain. On 10 April, the C5 touched down at Muharraq International Airport in Bahrain where all the soldiers disembarked. After a quick refuel, the C5 then flew to Shaikh Isa Airbase on the other end of Bahrain where the 83d soldiers linked up with the aircraft and assisted with a combat offload of its equipment.



A Fox is driven into the C5.

As one group of soldiers downloaded the vehicles and equipment, a second group, charged with force protection for the deployment, secured Camp Ranger Russell—a small base camp on the outer perimeter of Shaikh Isa Airbase. The camp was named in honor of the battalion's Command Sergeant Major Dan "Ranger" Russell.

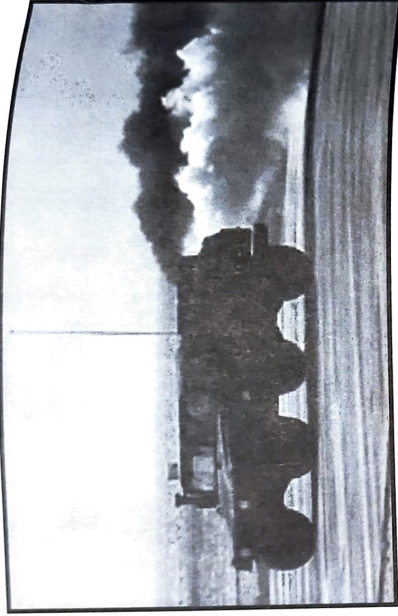
Over the next several days, the soldiers of the 83d adjusted to the hot, arid weather of the host nation; prepared vehicles and equipment for operations and training; and continued making improvements to the camp's force protection plan. Sergeant First Class Southern and Staff Sergeant Jefferson from the 519th MP Battalion provided expertise to the 83d's three force protection teams.

Each team maintained a three-soldier gate guard, a roving patrol, and an observation post on the top of the headquarters building. Throughout the exercise, the force protection teams worked long and tedious hours to deter and react to a potential terrorist threat. While improvements were made to the camp's security and vehicles were prepared for the exercise, key leaders from the battalion were busy coordinating training events and conducting leaders' reconnaissance of sites to deploy the NBC reconnaissance, biological surveillance, smoke, and decontamination assets.

The first major joint and coalition part of the exercise occurred on 18 April. The Bahraini NBC defense company, the Bahraini air force, the Naval support activity's emergency reaction team (ERT), and the 83d joined forces to participate in an exercise to demonstrate their combined NBC defense capabilities. The exercise was commanded and controlled by a combined joint task force (CJTF) headquarters situated on the opposite end of Bahrain. The exercise began with a Bahrain F5 flying low over a mock airfield to simulate a chemical attack. The Bahraini explosive ordnance disposal unit provided realism to the attack by exploding a device with heat waves felt by the spectators.



The Fox confirms the presence of a chemical agent.

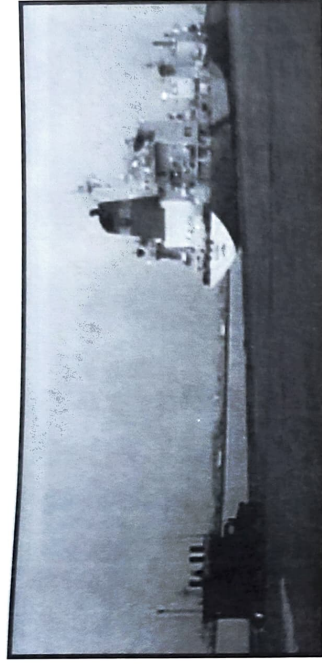


A "Coyote" vehicle blows smoke to cover the Fox.

Immediately following the attack, the CJTF headquarters requested that Team Gonzalez from the 83d provide an NBC route and area reconnaissance to locate, identify, and mark potential chemical agents on the airfield. Within minutes, soldiers from the 101st Chemical Company, one of 83d's war-traced companies, blew a graphite smoke haze to protect the Fox NBC reconnaissance vehicle from enemy observation as it approached the attack site. As the smoke haze thickened, soldiers from 2/51st Chemical Company (Recon) expertly maneuvered their Fox to the attack area and began a zig-zag reconnaissance pattern in search of the chemical contamination. As the MM1 mass spectrometer alerted to a possible chemical agent, the Fox lowered its probe to verify the agent. Within minutes, the Fox dropped a contamination marker and resumed its reconnaissance.

Immediately following the demonstration, soldiers from 2/101st Chemical Company conducted an operational decontamination of the Fox. The exercise finished with an NBC mass-casualty exercise by the Navy's ERT and the Bahrain defense force's NBC defense company. After the exercise, the 83d set up static displays for the Bahraini military, the UK's joint NBC regiment, and U.S. Navy personnel. The most noteworthy dignitary was General Al Zianni, J3, Bahraini defense force Commander Willis (U.S. Navy), the primary Navy Component, Central Command (NAVCENT) action officer for Neon Falcon, was quoted as saying the demonstration was "a 10.0—Perfect!" After the training was complete, all participants joined the 83d for lunch at Camp Ranger Russell.

On the evening of 18 April, Captain Gonzalez deployed the team to the landing area of Shaikh Isa Airbase for the first phase of a 3-day field training exercise. The BIDS provided biological surveillance, while the FOX provided chemical reconnaissance and surveillance of the



A BIDS conducts biological surveillance.

grounding area. The 2/101st established a decontamination point and provided smoke support for several missions. On 20 April, Captain Gonzalez issued a fragmentary order and deployed the team to a seaport of debarkation—Mina al-Bahrain Port, 40 miles north. The six-vehicle team performed the road march at 0300 local time, moving with Bahraini police escort through the streets of Manama. Once on-site, the Fox and 501st platoon leaders selected the best sites for BIDS and Fox to conduct biological surveillance and NBC reconnaissance at the port. The 501st was established on the pier between two great ships, while the Fox crew set up their M21 “Rascal” launch near the southern part of the pier. For the remainder of the exercise, the crews worked through the night to sweep the port and identify potential biological and chemical agents and attacks.

At 0930 on 21 April, a small vessel in the port area simulated a biological attack. The BIDS crew reacted quickly and positively identified the biological agent. As the scenario progressed, the CJTF headquarters struggled with the numerous issues involved with a biological attack in a port in a populated area. At the conclusion of the exercise, the crew from the 7th Chemical Company BIDS conducted a biological-sample transfer to the 1st Army’s technical escort unit who then evacuated the sample to the theater Army medical laboratory. This was of special significance, as it was the first time that joint coalition NBC defense units played out a possible biological attack from start to finish. The event concluded with a static display of all vehicles for U.S. and Bahraini very personnel in the port.

Throughout the exercise, members of the 83d and XVIII Airborne Corps NBC staff worked in the CJTF NBC cell. The cell was comprised of NBC experts from the U.S. Army, Navy, and Marine Corps and augmented with officers from the United Kingdom and Bahraini defense forces. The staff conducted NBC planning and operations that included the use of the Joint Warning and Reporting Network (JWARN). During the exercise, the cell conducted the first-ever “ship-shore” use of JWARN.

The last few days of the deployment focused on preparing vehicles and equipment for movement to Fort Polk, Louisiana. Just minutes before the C5 took off from Bahrain, the 83d got a special surprise—Vice Admiral Moore, Commander of the 5th Fleet (NAVCENT), awarded it the

Fifth Fleet Commander’s plaque. The admiral expressed his appreciation to the soldiers of the 83d and extended them an invitation to train together in the future. Afterwards, the 83d loaded the C5 for redeployment. Like the deployment, the redeployment also went flawlessly. When the last soldier stepped off the bus at Fort Polk and all weapons and sensitive items were accounted for, the mission was deemed an overwhelming success.

The benefits that the 83d gained from this exercise are many. Operation Neon Falcon enabled the battalion to validate its readiness standing operating procedures and deployment operations. It validated the battalion’s role as an “early deployer” to provide NBC defense at critical nodes (aerial and seaports of debarkation) within a theater of operations. It forced the battalion’s leaders and soldiers to plan and execute force protection and to apply the rules of engagement under real-world conditions. Perhaps most important of all, the exercise enabled the battalion’s leaders to demonstrate the 83d’s capabilities and roles as a force multiplier in a joint and coalition environment where weapons of mass destruction can be delivered by conventional or unconventional means.

Major Pomeroy is the S3 for the 83d Chemical Battalion at Fort Polk, Louisiana. In previous assignments, he served as the deputy corps chemical officer for the XVIII Airborne Corps; as a program analyst in the Office of the Chief of Staff, Army; as the HHC commander for the Quick Reaction Force in Somalia; and as an NBC reconnaissance platoon leader for the 1st Infantry Division during the Gulf War.

Second Lieutenant Samaritoni is the first platoon leader, 7th Chemical Company (BIDS). He attended the Virginia Military Institute to pursue a career in the military. He continued a family tradition of service by choosing the Army.

Patient Decontamination— A New Perspective

By Captain Robert Crouch



The year is 200X, and U.S. forces along with the European Coalition have begun combat operations in the country of Destonia. Fearing a complete rout at the hands of the coalition, the Destonian leadership feels it has no other choice but to engage in unconventional warfare by using its chemical stockpile. During their first attack, Destonian forces use a combined high-explosive and blister-agent artillery barrage to send coalition forces reeling. Almost immediately, casualties are identified. The only problem is these casualties are in various stages of protective posture and are covered in blister agent. The order to conduct patient decontamination operations is given. Panic is felt throughout the brigade area. Although the soldiers have trained for a chemical attack, no one is sure how to deal with the casualties.

The use of weapons of mass destruction (WMD) is one of the greatest threats to the modern soldier. Commanders at all levels must be prepared for WMD use and the possibility of contaminated equipment, soldiers, terrain, casualties, and remains. The first three are deeply rooted in Chemical Corps doctrine and are practiced and trained to some degree of expertise. The last two are a joint venture operation between the Chemical Corps and other branches and, at times, are forgotten or not trained. This article addresses some possible fixes to the structure and process (but not the technique) of patient decontamination.

The current doctrinal method of patient decontamination is outlined both in FM 3-5, *NBC Decontamination*, Chapter 9, and FM 8-10-7, *Health Service Support in an NBC Environment*, Appendix C. However, this method has a few problems, such as logistical and personnel support and environmental considerations that are usually overlooked. Both references discuss a decentralized patient decontamination site set up at every medical treatment facility (MTF). At such a site, every battalion and station in a division area (about 12 to 15) is prepared to take contaminated patients during a WMD attack.

This decentralized concept is not the answer. It overburdens the logistics channels, diverting transportation assets needed for other missions to resupply each separate MTF with extra equipment and water for

decontamination operations. If an MTF receives contaminated casualties, it effectively shuts down that facility to other patients to decontaminate the casualties. The personnel augmentee requirement for patient decontamination is too high (8 augmentees per battalion and station and 20 per combat support hospital) to conduct at every level. Any augmentees that are sent, assuming the unit can or will send them, will be untrained and unprepared and arrive later than the time they actually are needed for patient decontamination. Also, upon the completion of patient decontamination, a large amount of contaminated items (personal medical and decontamination equipment and expended supplies) are generated. They must be decontaminated, marked, buried, and/or destroyed, depending on what the item is. This creates the possibility of 10 or more contaminated areas from patient decontamination operations only, causing a great concern for U.S. forces and host nations.



The best place to set up a patient decontamination site is in conjunction with the detailed equipment and troop decontamination site (not the actual activity). Having one consolidated patient decontamination site has many benefits:

- Less transportation assets are tied up in preparing these separate patient decontamination sites with equipment and water.
- The problem of having untrained, ill-prepared augmentees arriving late could be eliminated if planned properly.
- The site could be used for troop and equipment decontamination, reducing the contaminated areas to only one.
- There is no lag time between preparing the site and decontaminating/treating casualties, if the patient decontamination site is already established at a centralized location.

This consolidated patient decontamination approach has a few problems. Where do you put this site to balance between the timely treatment of casualties, limiting the spread of contamination and protecting the site from attack? Who's in charge of this consolidated site? How do you ensure the timely care of the patients? What is the fix for patient decontamination? How can we make it a more viable and survivable concept?

The placement of the site should follow normal decontamination doctrine and principles but also take into consideration mission, enemy, troops, terrain-time available and civilians (METT-TC). It should be placed as far forward as possible to limit contamination but should be out of direct fire and, when possible, out of indirect-fire range. The site should be near avenues of approach, have some form of overhead cover, and have accessible or available water. However, there is no one spot that will completely satisfy all requirements. The chemical unit leader should pick a suitable location for the decontamination site, preferably by a ground or aerial recon, but at a minimum by map recon. This decontamination site selection should fulfill as many criteria as possible (i.e., camouflage, avenues of approach, access to water).

The problem of timely treatment of contaminated casualties actually rests in the first echelon of medical care. Most casualties that are not immediately treated for exposure to WMD agents, either by self or buddy-aid, will not survive long enough to be transported to any MTF for treatment. Most chemical casualties have about 15 to 20 minutes before the agent takes effect. The average time to conduct patient decontamination on a litter casualty is 10 minutes, which does not include the travel time from



Soldiers decontaminating the hood, the first step of casualty decon.

exposure to the patient decontamination site. So why waste time with the patient decontamination? Patient decontamination conducted at MTFs is designed to remove patients from a contaminated environment allowing lifesaving care to be conducted in a clean, contamination-free zone. This process is necessary to protect the medical personnel and the patient from secondary exposure.

Ultimately, the chemical unit leaders must have overall responsibility for the decontamination site. They have the expertise to pick an adequate site and are already responsible for the troop and equipment decontamination sites. Placing the chemical unit leader in charge allows the medical personnel to concentrate on treating casualties.

The current preferred method for patient decontamination used during most field training exercises and combined training centers is more of a "patch-hole" concept. After a nuclear, biological, or chemical (NBC) event, the forward medical company dispatches a patient decontamination team (PDT) to the equipment and troop decontamination sites. Sometimes, the PDT is not even aware or notified of the mission until the event has already occurred. Usually, the team arrives a few minutes before or after the contaminated equipment and soldiers arrive at the decontamination site, which causes confusion as the PDT is usually poorly prepared and trained in setup and actual patient decontamination operations. The logistics usually is not coordinated for or in place, so the PDT is away getting adequate water and equipment instead of treating patients. The augmentees either don't arrive or arrive so late that they are more of a hindrance to the operation than a help. These problems cause more patients to die than normally would have. So how can the concept of patient decontamination be fixed?

The first approach to the patient decontamination problem is to attach a medical PDT directly to the chemical unit when there is an increase in the WMD threat level based on the military decision-making process. This team would ensure the proper setup of the patient decontamination site, to include the coordination for logistics and augmentation support. During an actual patient decontamination operation, the medical PDT would be augmented with a doctor or physician's assistant to conduct triage and emergency medical treatment for the contaminated patients. This approach allows for a well-prepared patient decontamination site (to include logistic considerations such as water), an established command and control structure for the site, and the possibility of trained augmentees from the chemical unit or any other unit at the site.

The disadvantages of this approach are the holding of medical assets in reserve (awaiting an attack that may never occur) and the possible misuse of these medical personnel at the decon site. Having the medical PDT set up a "mini" aid station to treat the soldiers in the immediate area can help eliminate these disadvantages.

An alternate version of the first approach is to attach a chemical element to the forward medical company and build a separate area for patient decontamination near the brigade support area. This approach still allows for an established command and control structure, a prepared decontamination site, and trained personnel. However, it has the same disadvantages of personnel misuse (except now on the chemical side) and some of the same concerns for logistics and augmentee support. The possibility of the MTF becoming contaminated because of its proximity to the decontamination site is another problem.

A third possible approach is perhaps the most radical one. Selected chemical personnel could be additionally school trained (and psychologically prepared) for patient decontamination, possibly adding an additional skill identifier. These specialized chemical personnel could then prepare the decontamination site for the medical personnel (eliminating the need to hold medical personnel at the decontamination site) collocated with the troop and equipment decontamination areas. During an NBC event, these specially trained chemical personnel would work

as either patient decontamination personnel or, if augmentation support was available, subject matter experts in patient decontamination for the augmentees. This approach frees the medical personnel to concentrate on the triage, treatment, and evacuation of patients and allows the chemical personnel to focus on command and control of the site and the actual decontamination procedures. The major disadvantage to this approach is the additional workload on the chemical unit, but increasing the number of augmentees or changing the force structure in the decontamination unit could fix that.

The first two concepts could be implemented using current force strengths and unit authorizations. They would require some prior coordination and planning at the brigade, division, or higher levels and development in the military decision-making process. They could be written into operation orders, standing operating procedures, and doctrine. These concepts might be enough to fix some of the patient decontamination problems. The third concept requires a Chemical Corps force-structure change and doctrine change. However, this method would possibly fix all the problems associated with patient decontamination.

Regardless of which method is used, the patient decontamination site must be consolidated to ensure proper support and to limit the number of contaminated areas that U.S. forces leave on the battlefield. The site must be properly resourced and set up before an NBC event actually occurs. During or after an event is too late. The overall command and control for the decontamination site must fall with the senior chemical person on the ground, thus allowing the medical personnel to concentrate on treating casualties.

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Extreme Cold Weather Decontamination— The Challenge

By Captain Eric Larimer

Decontamination in extreme cold weather poses a unique challenge that few are prepared to meet. Chemical leaders must start by dispelling the following misconceptions:

- Our enemies will not employ nuclear, biological, and chemical (NBC) agents in the cold.
- Chemical and biological weapons are ineffective in the cold.
- Cold weather decontamination is not worthy of training.

Leaders also must convince maneuver commanders that such ideas are false. They must overcome many obstacles. Cold weather hampers operations, injures soldiers, and breaks equipment. Finally, leaders must overcome the significant lack of reliable equipment, training, and materials required to complete their cold weather decontamination mission successfully.

Enemy Threat

The U.S. military currently operates in Korea, Germany, and the Balkans. Sixty-five percent of Eurasia and 45 percent of North America are characterized by extreme cold and deep snow during winter months. These areas include the republics of the former Soviet Union, China, and several other nations. Many have known stockpiles of chemical weapons and are experiencing political turmoil. We must maintain the capability to operate effectively in these regions.

The former Soviet Union developed a variety of agents specifically designed to be effective in cold weather. Some reports also indicate that the Russians used a biological agent in their recent offensive into Grozny, which attacked electrical systems effectively in cold weather. Table 1 identifies the volatility of seven common chemical agents based on work done by the Cold Regions Research and Engineering Laboratory (CRREL).

Agents AC, CK, and CG (in the Table) retain enough volatility to be lethal down to -65 degrees Fahrenheit (F). Although the other agents are not lethal at cold temperatures, they still pose a threat; as temperatures get colder, persistency increases. The transfer hazard of tracking these and other agents becomes very significant. Agents mix with frozen water and adhere to vehicles, equipment, and clothing. They are tracked and/or carried into heated areas such as warming tents, tactical operations centers, maintenance facilities, and buildings. This creates an off-gassing of contaminated vapor. This is the greatest threat that liquid and solid contaminants pose in a cold weather environment.

Table 2 (page 56) lists the freezing points and hazards of selected chemical agents as illustrated in Table 6-2 of FM 3-5, *NBC Decontamination*.

Friendly Threat

Unfortunately, most leaders in the Army compound the issue of cold weather decontamination by ignoring this significant threat and failing to conduct cold weather decontamination training. As the platoon leader of the only chemical platoon in Alaska, I encountered this attitude often. Leaders cited the increased risk of injury caused by working with water in the extreme cold and the increased risk of breaking equipment. They also were convinced that agents

Table 1. Volatility of seven agents

	32°F	0°F	-20°F	-40°F	-65°F	State (Gas, Liquid, Solid)	Lethal Dosage (mg-min/m ³)
AC	4.4x10 ⁵	1.6x10 ⁵	8.0x10 ⁴	3.6x10 ⁴	1.3x10 ⁴	L<78°F S<8°F	2.0-4.5x10 ³
CK	1.6x10 ⁵	6.6x10 ⁵	3.0x10 ⁵	1.4x10 ⁵	4.5x10 ⁴	L<55°F S<20°F	1.1x10 ⁴
CG	3.3x10 ⁵	1.6x10 ⁵	8.9x10 ⁵	5.3x10 ⁵	3.1x10 ⁵	L<46°F	3.2x10 ³
HD	75	23.3	7.4	2.1	0.3	S<58°F	1.5x10 ³
L	1100	238	85	27	5.6	S<32°F	1.2-1.5x10 ³
GB	4100	780	380	96	25	S<-68°F	7.0-10.0x10 ³
VX	1.3	0.2	0.04	8.3x10 ⁻³	1.0x10 ⁻³	S<-24°F	1.0x10 ³

would be ineffective in the cold; therefore, no enemy would employ them. When pressed to explain why the leaders believed this, they could produce no credible evidence. While it is true that hazards in training increase with the cold, proper risk management techniques can be employed to negate the risks. We cannot ignore this important task.

Current Research and Doctrine

Fortunately, some groups recognize the importance of cold weather decontamination. The CRREL in Hanover, New Hampshire, is one. Listed below are some recommended research topics it hopes to start as early as winter 2001. It intends to make informed recommendations for improvement in doctrine, training, and materiel.

Effectiveness of vapor detectors in cold temperatures. The detectors include the M8 alarm, the M22 automatic chemical agent alarm, the chemical agent monitor, and the improved chemical agent monitor. Cold temperatures pose problems for these detectors for two reasons. First, the life of the battery is reduced significantly. A battery that lasts 24 hours at 45 degrees F may last less than an hour at -45 degrees F. Second, the volatility of liquid and solid agents in cold weather is often too low for the instruments to detect. False readings may occur that lead soldiers to believe that they are clear of contamination when it is actually all around them.

Impact of snow and ice particles on standoff detection systems. Blowing snow or very fine ice crystals may impede standoff detection capabilities. These instruments may not be able to distinguish the difference between an ice cloud, a weaponized aerosol, or an ice cloud mixed with a weaponized aerosol.

Effectiveness of M256 detection kits in cold weather. The solutions inside the ticket may freeze. Chemical reactions also occur more slowly at cold temperatures or may simply not occur at all. M256 kits will give false readings of no contamination when the chemical reactions from different portions of the ticket are not given sufficient time. Soldiers need either a cold weather ticket or instructions on how to modify the use of M256 kits in cold weather.

Effectiveness of the battle dress overgarment in cold weather. We do not know the effects of cold, snow, and ice particles on the activated carbon in the battle dress overgarments (BDOs). Also, we do not know what effects these conditions have on dry decontamination agents such

Table 2. Freezing points of chemical agents

Agent	Symbol	Contact Hazard	Vapor Hazard	Freezing Point
Nerve				
Tabun	GA	Extreme	Low-Moderate	-58°F
Sarin	GB	Extreme	Extreme	-69°F
Soman	GD	Extreme	Probable	-44°F
	VX	Extreme	Negligible	60°F
	VR-55	Extreme	Probable	Unknown
	TGD	Extreme	Probable	Variable with Thickness
Blister				
Distilled mustard	HD	Extreme	Negligible	58°F
Mustard-lewisite	HL	Extreme	Low	-13 to -25°F
Nitrogen mustard	HN-1	Extreme	Low	-29°F
Nitrogen mustard	HN-2	Extreme	Low	-76°F
Lewisite	L	Extreme	Negligible	0°F
Nitrogen mustard	HN-3	Extreme	Low	25°F
Phosgene oxime	CX	Extreme	Low	-1°F
Blood				
Hydrogen cyanide	AC	Low	Extreme	8°F
Cyanogen chloride	CK	Low	Extreme	20°F
Arsine	SA	Low	Extreme	-176°F
Choking				
Phosgene	CG	Slight	Extreme	-198°F
Diphosgene	DP	Slight	Extreme	-71°F

as those in the M291 and M295 kits and the new sorbent decontamination system (SDS).

The impact of cold weather on computers. Computer prediction models such as the Joint Warning and Reporting Network and Hazard Prediction Assessment Capability may be inaccurate in cold temperatures. Computer modeling of how chemical vapors and aerosol clouds move under a thick inversion layer will be tested.

Working in Extreme Cold Weather

The first step in a successful cold weather decontamination operation is the ability to work efficiently in extreme cold weather conditions. This takes practice. The following is a short list of challenges commanders face during cold weather missions:

Time. A good rule of thumb is, what takes you 1 hour to accomplish under normal conditions will take at least 1 1/2 hours in extreme cold weather. Soldiers need to rotate into warming shelters. They move slower and lose flexibility and agility when wearing several layers of clothes.

Cold weather injuries. These types of injuries can inflict anyone, especially those not accustomed to cold weather. Heated facilities are required to ensure that soldiers are able to warm themselves. Leaders must be especially vigilant in checking soldiers for injuries. Include visual

inspections of the face, fingers, and toes. Ensure that soldiers change their socks often.

Vehicle/equipment use. If a vehicle is turned off in extreme cold weather, it may not start again until the entire unit is warmed. Oil thickens, fuel gels, and moving parts simply freeze. Batteries die in just a few short hours when left in the cold. Winterization kits that include a battery blanket, an engine block, and oil-pan heaters are required for garrison activities. Electrical sources are usually not available in the field. This forces units to keep their vehicles running continually for the duration of deployments. Fuel consumption and training cost increase greatly. Every device that uses an internal combustion engine experiences the same problem. Keep these machines warm if you expect them to turn on in the cold.

Drinking water. People expend large quantities of water in cold weather and become easily dehydrated. Most soldiers either don't feel thirsty, or they think they will feel colder if they drink cold water. Five-gallon water cans and water buffaloes will freeze quickly if left in the cold. Plenty of hot liquids such as soup or hot chocolate in warming areas is great.

Decontamination in Extreme Cold Weather

FM 3-4, *NBC Protection*, and FM 3-5 provide a good starting point for decontamination operations in the extreme cold. This doctrine was developed as a result of tests done in Alaska in the early 1980s. The chemical battalion of the 172d Separate Infantry Brigade (SIB) at Fort Wainwright, Alaska, and the 59th Chemical Company at Fort Drum, New York, use them regularly. Another source is the article, *Extreme Cold Weather Decontamination—A Chilling Scenario*, by Captain Ian McCulloh, commander of the 11th Chemical Company, Fort Lewis, Washington (see *Army Chemical Review*, January 2000). He draws from his experience with the 59th Chemical Company to provide important cold weather tips. The issues listed below are a collection of the most important techniques discussed in published doctrine and those you won't find in the books.

Prepare to operate in arctic climate. FM 3-5 states, "With present technology, equipment decontamination problems in the field are difficult to overcome in an arctic climate. Commanders may seriously consider fighting dirty in arctic regions. Fresh units can be rotated into the field so that dirty units can be moved back to built-up areas to decontaminate in heated areas. A reliable source of heat is the key to success in any cold weather decontamination operation because DS2 does not function in temperatures colder than -25 degrees F. At temperatures less than 0 degree F, it becomes very thick and the contact time required to neutralize agents is greatly increased. Water poses a greater problem because it freezes on contact with cold metal. The spray

also creates large clouds of ice fog. Dry decontamination agents such as those in the SDS or the M291 and M295 kits or STB or STH will be ineffective in physically removing frozen contaminants, especially if they are mixed with snow and ice. Solvents such as JP-8, kerosene, and diesel fuel may be used to physically remove contamination, but the runoff will remain contaminated and create a fire hazard. At temperatures below 10 degrees F, decontamination missions should be performed in a heated environment if at all possible. Additional research should be conducted to provide a nonaqueous decontaminant that won't freeze and is chemically effective in the cold.

Select a site. Captain Paul Sigler, commander of HHC 172d SIB, recommends that chemical decontamination units adopt trailers like those of the Army chemical depots. These vehicles are heated, converted 18-wheeler trailers with built-in liquid and vapor barriers and would be used as a detailed troop decontamination or mission-oriented protective posture (MOPP) gear exchange site. Other options are frame tents or general purpose mediums, both of which are bulky and hard to set up. These would become contaminated during the operation and need to be disposed of after each use. A hard site such as a hangar or a warehouse also could be used and decontaminated upon completion of the mission.

Provide warming tents for contaminated soldiers. Soldiers can suffer cold weather injuries even in MOPP4. Place M8 or M22 chemical agent alarms in all warming tents. They are much more effective inside because they are usually inoperative in the cold due to low vapor pressures and dead batteries.

Drain water tank and pump units of all water before storage. This prevents freezing. Water will usually not freeze while its tank is in motion; however, when left stationary for several hours, tanks will need to be heated.

Minimize digging. Contaminants often become trapped in layers frozen beneath the surface. Digging exposes these layers, creating either a new transfer hazard or a new vapor hazard if warmed. Take a core snow sample when entering a new assembly area. Melt the snow to liquid and test with M8 paper, M9 paper, and a chemical agent monitor.

Take necessary precautions. If a unit is forced to decontaminate in the cold, use an additional decontamination apparatus at each water blivet simply to heat your water source. Redirect all spray wands back into the blivet when not in use. This prevents water in the wands and hoses from freezing.

Carry protective masks beneath outer garments. Body heat will keep the mask warm and flexible and reduce the hazard of contact frostbite. This will increase the time required to properly don the mask. To do so, complete the following six actions:

- Stop breathing and close your eyes.
- Lower your parka hood and remove ballaclava and any hats.
- Remove your gloves or mittens, as needed, to don the mask properly.
- Don the mask; do not clear by exhaling a large amount of air. This prevents frosting the eye pieces and freezing the valves.
- Put on any hats required and raise your parka hood.
- Refasten your outer garment.

To remove your mask—

- Brush snow and ice off the outside of your mask.
- Remove your parka hood, hats, gloves, or mittens, as necessary, to remove the mask.
- Remove your mask and immediately dry your face and the inside of your mask to prevent freezing.
- Store your mask in carrier and refasten your outer garment.
- Put on any hats required and raise your parka hood.

Modify MOPP. MOPP gear requires modification in a cold weather environment. Soldiers must follow the layering principle to prevent cold weather injuries. The layer closest to the skin must always be one that wicks moisture away from the body. Army issue Polypro works best. Wear BDOs as your second layer. Put your protective mask in its carrier and place it under your left armpit.

Then don your heavyweight Gortex pants and jacket. The last layer of clothing is your overwhite camouflage pants and jacket. Finally, put on your load carrying equipment or load bearing vest and Kevlar. Soldiers find this uniform quite bulky, and it reduces flexibility. Part of this problem will be solved when the new Joint Service Integrated Suit Technology overgarments are fielded. These suits are less bulky than BDOs and are about the same thickness of winter-weight battle dress uniforms. The problem with wearing a mask as large as the M40 under the arm can also be diminished by providing units operating in a cold weather environment a smaller mask such as the M45.

Extreme cold weather vapor-barrier boots provide adequate protection against chemical and biological agents. Chemical protective overboots are not required. Wear wool glove liners under your butyl rubber gloves instead of

cotton to wick away perspiration from hand surfaces. Also wear trigger finger or arctic mittens over the chemical protective gloves to provide adequate warmth.

The figure below provides a recommended layout for a detailed equipment decontamination (DED) in extreme cold weather.

Conclusion

Decontamination operations in an extreme cold weather environment are both a significant challenge and a necessity. Leaders within the chemical community must overcome the difficulties discussed above to meet the challenge properly. Improvements in doctrine, materiel, and training and an increased command emphasis are the keys to our future success.

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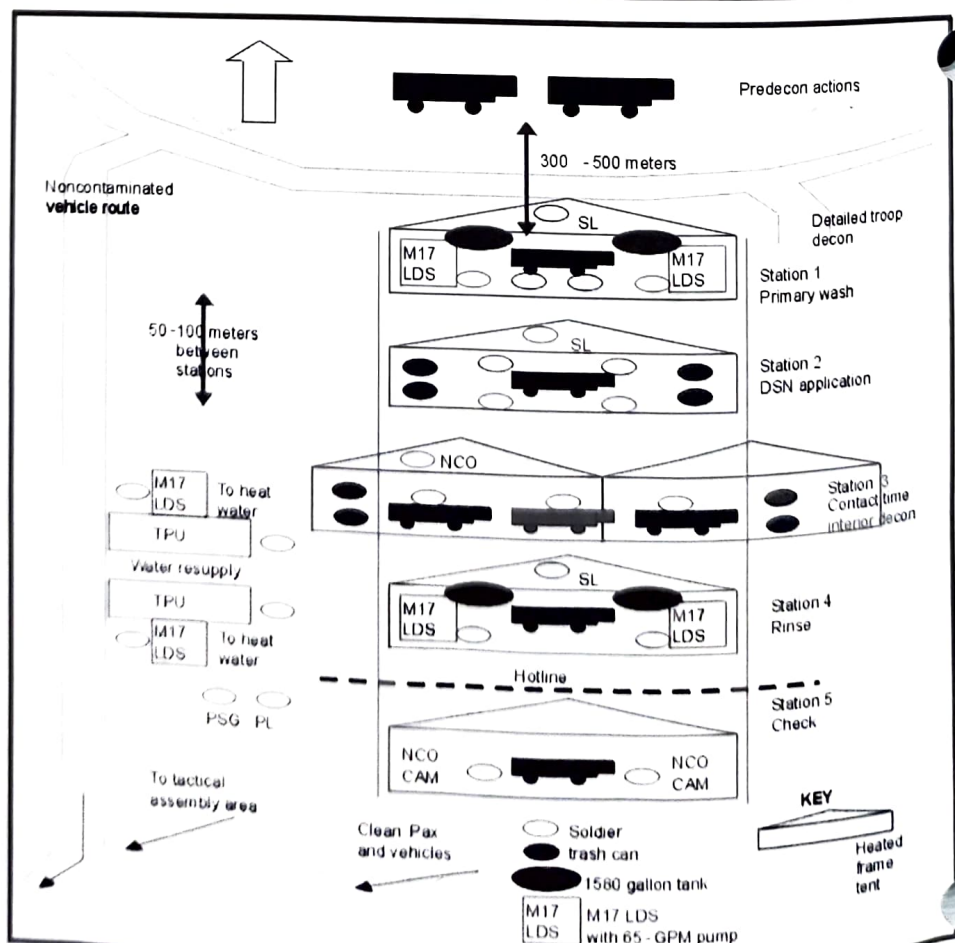


Figure. Recommended layout for DED in cold weather

Dragon Warriors' Prayer

Lord, we bow humbly before you
and acknowledge you as ruler of the earth
and all its elements.

Heavenly Father, we serve as Dragon Warriors,
skilled in the protection of our Nation
against nuclear, biological, and chemical dangers.
We acknowledge our need for your guidance
as we deal with these forces
and those who would employ them.

Our prayer is simple.
Lord, may we be a tool in the hands of a mighty God
by which lives are protected and freedom defended.
Grant us hearts of selfless service and courage
that provide safety to others at the risk of our own.
Arm us with the weapons of integrity and honor
that will continually guide our choices and actions.
Protect us. Mold us. Sustain us.

Strengthen us physically and mentally to endure
every challenge and when we have completed
all our tasks may we find rest in your mighty hands.

Amen.

*Chemical Corps Regimental Prayer
Chaplain Jeff Bruns*



Chemical School Commandant Promoted

*By Specialist Maurice Smith
GUIDON Staff*

Thousands of soldiers and civilians witnessed history in the making on 11 July as the commandant of the Army Chemical School, COL (P) Patricia L. Nilo, became the first female general officer in the history of the Chemical Corps.

BG Nilo delayed her promotion to give chemical soldiers the opportunity to see her special day, as she describes it.

"Originally, my promotion was projected in April. We decided to do it in the context of the Regimental Review," said BG Nilo.

"Being promoted in front of the corps was extremely significant for me. I thought about whether or not it was appropriate, but I think it is very appropriate because it is a promotion not just about me, but it's about the Chemical Corps," said BG Nilo. "Doing that with the chemical family was extremely significant, not only for me but also for the corps."

Soldiers and civilians in the chemical field came from all over the world to be a part of this year's Worldwide Chemical Conference and to see BG Nilo's promotion at Gammon Field.

"Today, you do me a special honor, helping me celebrate this milestone in my career. Thank you for your dedication and your professionalism," said BG Nilo.

"What a great day to be a soldier, and what a great day to recognize a soldier. Now, I extend to you heartfelt congratulations for this very well-deserved official step into the general officer ranks," said MG Anders Aadland, Maneuver Support Center and Fort Leonard Wood commander.

"Today marks a great occasion for the Chemical Corps, the Maneuver Support Center, and the Army we serve. This superb officer is being recognized for both the work she has done and the

work she will do in the future. I feel especially honored to have been asked to take part in promoting this fine officer," said retired MG Robert D. Orton, a former commandant of the Chemical School.

There are many challenges to face as leader of the Chemical Corps, according to MG Orton. But he said he felt confident that BG Nilo can handle those challenges and continue to bring honor to the corps.

"More opportunities for service lie ahead. New threats are on the horizon, threats that require uniquely chemical solutions. We live in a new kind of warrior world, but I have no doubt that you are up to the challenge," he told her. "You have the personal talent, and you have talented people in the school and in the Corps to get the job done," he added.

Besides being the first female general officer in the history of the Chemical Corps, BG Nilo has a long list of other first-time accomplishments in her career. She was the first female brigade chemical officer in the Maneuver Brigade, 1st Armored Division, U.S. Army Europe. She also was the first female commander of a gender-integrated company at Aberdeen Proving Ground, Maryland, and the first female battalion chemical officer in the 84th Chemical Battalion.



From left to right: BG Nilo's nephew, sister, BG Nilo, MG (R) Orton, and Mrs. Orton

"I think it is probably just timing. It's not so much a matter of making history, it is a matter of doing the right things," said BG Nilo. "First and foremost, I am a chemical officer. That is the important thing, and secondarily, I am a female chemical officer. I don't feel a strong sense of making history. I think it is a strong sense of being part of the chemical history and making sure that we have in place those things that will continue the vitality of the corps to continue in the future."



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