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ARMY CHEMICAL REVIEW

PB 3-94-1 January 1994

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HEADQUARTERS, DEPARTMENT OF THE ARMY

About the Artist

Gas Attacks by Joy Beeson depicts the 1st Gas Regiment in World War I. The painting commemorates the 75th anniversary of the Chemical Corps. Readers can buy a signed and numbered (unframed) print by sending $46.00 (money order) to the Chemical Corps Museum Gift Shop, US Army Chemical School, Fort McClellan, Alabama, 36205.

Joy Beeson was born and raised in rural Nebraska and has been a Huntsville, Alabama, resident since 1964 and a member of the Huntsville Art League Gallery since its beginning. She has participated in juried shows throughout the state and feels honored to have had one of her paintings shown at the Alabama Council of the Arts in Montgomery and to win a purchase award from the Huntsville Museum of Art.

Her training began in 1957 at a commercial art school in Omaha, Nebraska, but was delayed when she married and had a family. She picked up her art career again in 1971, taking oil classes from a private teacher in Huntsville. She enrolled at the University of Alabama in Huntsville, taking classes in art and photography.

Her painting style is realistic and detailed. Oil is her favorite medium because it works well for this detailed approach. Subject matter is anything that pleases her. She has painted rusty gas pumps, still lifes, outdoor scenes, people, and bridal portraits.

Commandant MG Robert D. Orton

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Pencil Portrait of MG Robert D. Orton on page 2 by Kay Mundy, Visual Information specialist.

Chief of Chemical

In June 1993 our Corps celebrated its 75th anniversary of service to our Army and nation. It is fitting that the theme of this year's World Wide Chemical Conference and writing contest was "Protecting the Future Force." This past year also saw dramatic changes in how we will operate on the battlefield, US policy on the employment of chemical weapons, and a new Army operational doctrine.

The new FM 100-5, *Operations*, introduces the term "weapons of mass destruction" to the Army. While it's broadly defined, only nuclear, biological, and chemical weapons create the effects that can be considered under this term. It's clear that we must be prepared to operate under conditions created by weapons of mass destruction.

In the past we relied upon retaliation in kind to deter the enemy from employing chemical weapons. This retaliatory capability was backed up by a strong NBC defense posture. Today our NBC defense capability is our only means to deter a potential enemy from employing chemical weapons, should that enemy decide to violate the Chemical Warfare Convention. It is interesting to note that several nations suspected of possessing or seeking to possess chemical weapons have refused to sign the Convention.

Another important addition to the Army's operational tenets is a fifth tenet—versatility. We've always been a versatile Corps. Look at World War II--the United States won many engagements and battles in that war because of the indirect fire support provided by chemical mortar units. Chemical troops didn't wait for the enemy to fire gas. They sprang into action. Another good example of versatility within the corps? Our smoke/decon units—designed and tailored to be versatile.

I recently visited the 63d Chemical Company at Fort Campbell. These fine young chemical soldiers were participating in a concept evaluation program test sponsored by the Chemical School's Doctrine Development Center. The goal of the test is to refine the doctrine, material, and training associated with smoke/decon units. The Chemical School is currently working on two projects associated with this test—a field manual on smoke/decon unit tactics, techniques, and procedures, and battle drills for the smoke/decon platoons.

Another facet of our versatility is the support the Corps can provide in military operations other than war. Chemical soldiers deployed in support of Army actions in the wake of Hurricane Andrew and the relief efforts in Somalia. Chemical soldiers play vital roles during peacetime in supporting our nation.

We must shift our emphasis from NBC protection to contamination avoidance. The Fox, and soon the Biological Integration Detection System (BIDS), provide us the opportunity to protect the force from the effects of NBC protection. The best way to overcome the effects of MOPP4 is to avoid it entirely—not as easy as it sounds. NBC reconnaissance and contamination avoidance measures are difficult missions to execute.

The Schoolhouse is currently participating in a focused rotation on NBC reconnaissance integration at the National Training Center. The focused rotation is an intensive data collection program. Last April the Combined Arms Center sponsored a Training and Doctrine Day for the Combat Training Centers. Each center presented its top three doctrine and training problems by battlefield operating system, including NBC. Among the major deficiencies noted by National Training Center, the Combat Maneuver Training Center, and the Battle Command Training Program was NBC reconnaissance. Since then the Schoolhouse has been actively working to correct this problem.

FM 3-19, *NBC Reconnaissance*, has been completed and is being printed. A training video for combat arms leaders on NBC reconnaissance is nearing completion. We have fielded a draft tactics, techniques, and procedures field manual for Fox-equipped units. We're relooking our NBC reconnaissance training programs.

I wish to commend the hard work that each chemical soldier has given this year to protecting our Army and nation. It's the goal of our Corps never to allow our Army to find itself unprepared for NBC warfare.

1st Place

Weapons of Mass Destruction and Force Protection

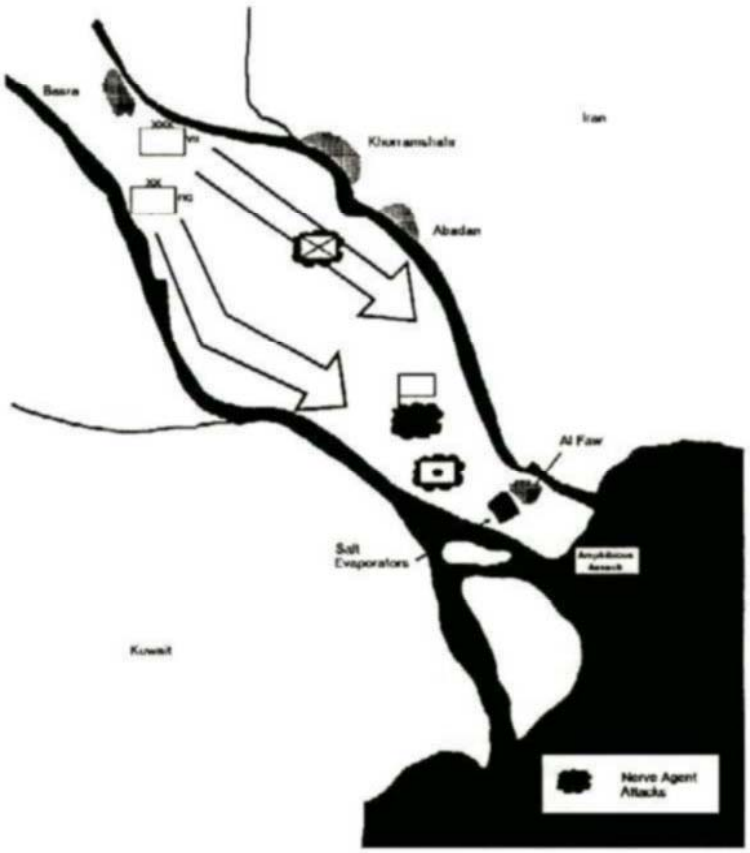
By Major Robert C. Neumann

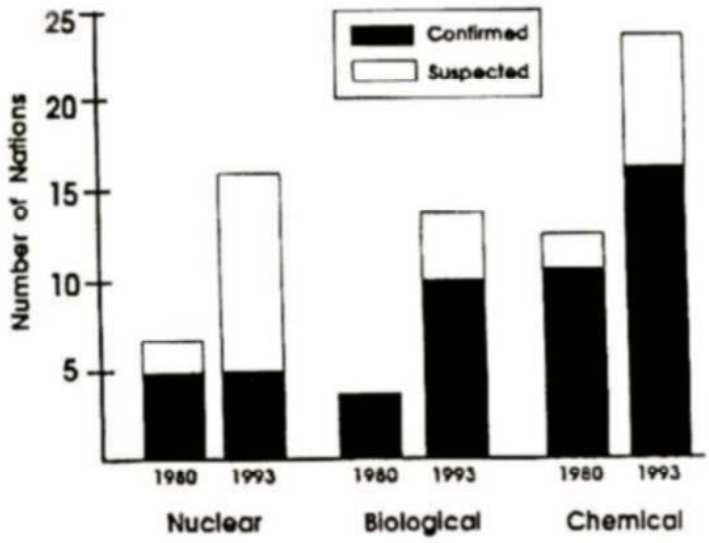
weapons of mass destruction:
Weapons that through use or the threat of use can cause large-scale shifts in objectives, phases, and courses of action.

FM 100-5, *Operations*, 1993

In April 1988, Iraq began Operation "Blessed Ramadan" to retake the Al Faw peninsula. The attack began on the morning of 17 April. Armored forces of the Republican Guards conducted the main attack. The Iraqi 7th Corps conducted a supporting attack along the west bank of the Shatt al-Arab waterway. The Iraqis also conducted two amphibious assaults along the western coast of the peninsula. The Iraqi plan called for a three-phase operation lasting four to five days. The employment of chemical weapons was an integral part of the Iraqi plan. Nonpersistent nerve agent was used on the defending Iranians. Reports indicate that front line forces, command and control sites, and artillery positions were targeted[1]. Both artillery and aircraft delivered the chemical agent on the intended targets. Only 35 hours were required to complete the operation. The Iranians never recovered from the initial assault and were unable to reestablish an effective defense. The Iranian retreat across the Shatt al-Arab waterway turned into a complete rout, with the Iranians abandoning most of their equipment. The Iraqis did not win this battle solely by employing chemical weapons, but their impact was significant[2]. The employment of chemical weapons in this battle caused casualties, disrupted operations, hindered battle command, and allowed the Iraqis to retain the initiative throughout the attack.

Lessons from the Iran-Iraq War show that the employment of chemical weapons did have tactical significance during several battles. One analyst felt that the employment in the Iran-Iraq War was an example of "low-level, sporadic use of





Proliferation of NBC weapons—1980 versus 1993.

chemical weapons." He concluded that "this was far less devastating to those involved than it might have been or could be in a future conflict[3]." Yet, this limited usage was a major contributor to Iraq's successes against an otherwise superior force. The Iraqi use of chemical weapons during its war with Iran clearly demonstrates the impact that weapons of mass destruction can have on the battlefield.

One of the significant factors affecting today's national security environment is the proliferation of weapons of mass destruction[4]. The new edition of FM 100-5 establishes that the Army must be capable of waging war under any condition, including those created by weapons of mass destruction. There is a need to reassess the implications and impact of these weapons on future military operations. FM 100-5 gives the term, *weapons of mass destruction*, a rather broad definition. Currently, only three weapon types, nuclear, biological, and chemical (NBC), meet the criteria because of their large-area coverage or long-lasting effects.

A recent Congressional inquiry determined that the chemical and biological warfare "threat has increased in terms of widespread proliferation, technological diversity and probability of use[5]." The proliferation of NBC weapons has increased over the past decade (see chart, above). Today more than 24 countries are confirmed or suspected of having an offensive chemical warfare program. Fourteen countries have or are suspected of having an offensive biological warfare program. Sixteen countries have confirmed or suspected nuclear weapons programs. One thing is certain, these weapons will continue to pose a threat to US forces facing future contingency requirements regardless of the region or level of conflict.

Nations seek to obtain these weapons as low cost alternatives to higher cost conventional weapons that provide an added measure of political leverage in dealing with their neighbors. Some nations seek these weapons as status symbols to gain acceptance as a world or regional power. Whatever the reason, nations seeking or already in possession of NBC weapons believe in their utility as force multipliers.

When ratified, the new Chemical Warfare Convention (CWC), is expected to limit the growth of chemical weapon stockpiles and reduce the likelihood of conflicts with massive employment of chemical weapons. However, the risk of employment on a reduced scale will grow as rogue nations seek to take advantage of the battlefield asymmetry one-sided use of chemicals can create. Several countries thought to possess chemical weapons, like North Korea and Iraq, have refused to sign the convention. Others that have signed it have a history of disregarding international accords.

Since the United States no longer allows itself to use chemical weapons in retaliation, chemical defense takes on greater importance. Further, the growing biological threat and the spread of nuclear weaponry increases the importance of both passive and active defense against these weapons as well. US forces must do more than survive an NBC attack—we must be trained and equipped to continue the mission under NBC conditions. Maintaining a robust NBC defense capability is the only way to ensure that the Army is ready to face an opponent who possesses an offensive NBC capability. NBC defense on a power projection battlefield is necessary to deter and, if necessary, counter an enemy's use of weapons of mass destruction.

Power Projection

Based on the continuing spread of weapons of mass destruction, no region or level of involvement is exempt from potential use of such weapons. Delivery systems range from intercontinental and ballistic missiles through standard battlefield weapons (artillery, bombs, for example) to terrorist or special operation force "hand delivery" (a rented truck or boat). This is particularly significant when the use of NBC weapons during the initial period of early entry operations could have devastating effects. It is reasonable to expect our potential enemies learned lessons from our recent operations in the Gulf War. Protecting the force against weapons of mass

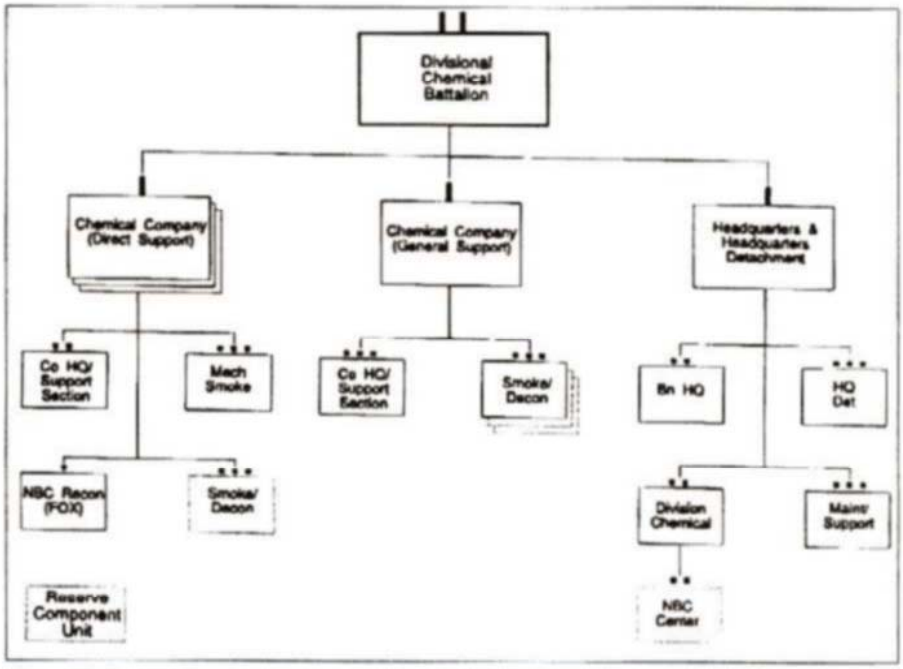


Figure 1. Armored and mechanized division chemical battalion organization.

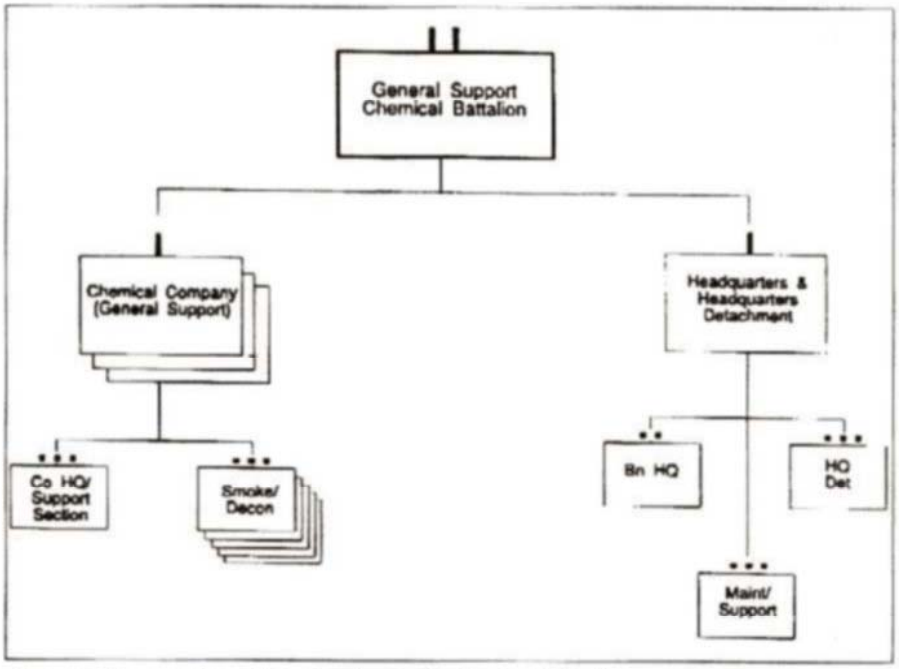


Figure 2. Organization of a general support chemical battalion.

destruction must begin long before any deployment. Training, logistical readiness, and intelligence are critical components. Units must train to protect themselves and to operate under NBC conditions. Just getting the troops in MOPP gear is not enough. The protective equipment, NBC recon systems, detectors and alarms, decon capability, and other critical items must be available and ready to use. Tactics, techniques, and decision matrices must be understood and practiced. Understanding the threat, his capabilities, and his intentions is a continuous task. We cannot afford any surprises.

During force projection operations, commanders must look at the impact of weapons of mass destruction by stage of the operation. In the case of nuclear weapons, actual projection of forces into the theater of operations may be difficult. During a recent wargame, the opposing force used a tactical ballistic missile saturation attack against the early entry force. The early entry force destroyed all but two of the missiles. These two, armed with nuclear warheads caused 1,000 immediate casualties among the early force. A lesson from this wargame is "that we will have to think about new ways of getting into a theater of operations[6]."

Intelligence concerning the enemy's capability to employ NBC weapons is critical. Types of weapons, delivery means, production and storage facilities, and employment doctrine are examples of the intelligence required long before deployment begins. The ability of the enemy to employ weapons of mass destruction will affect the force tailoring process. To provide force protection, the initial force package must include air defense units to provide a theater ballistic missile defense and chemical units to provide NBC recon, chemical/biological detection, large-area smoke, and decon.

NBC defense training at all levels is essential for providing a force capable of projection to regional conflicts. While units may not expect to deploy to a theater where there is an NBC threat, it can occur. We can assume that an NBC-capable enemy will not allow us to mass our combat power and conduct a lengthy preparation period that includes extensive NBC defense training. The newest tenet of Army operations—versatility—requires that units have the ability to operate in many environments. Once weapons of mass

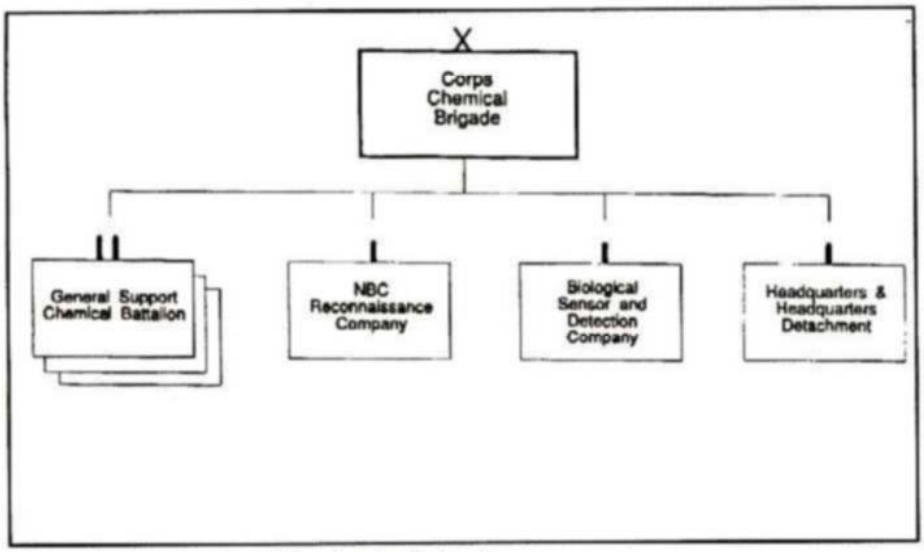


Figure 3. Organization of the chemical brigade.

destruction are employed, they create their own unique physical environment. NBC defense training and the introduction of NBC conditions during exercises is crucial for establishing a versatile force capable of power projection operations.

Force Protection

FM 100-5 states that when an enemy possesses weapons of mass destruction, the vulnerability to initial entry forces is acute[7]. To counter this vulnerability, force protection is critical and must remain part of the overall concept through war termination. Force protection considerations include dispersion of forces and installations, maintaining tactical and operational mobility, and planning for rapid reorganization of forces. Critical tasks of force protection[8] are—

- *Maintain alertness*. Commanders at all levels must be continuously alert to the use of these weapons. They must balance risk against mission requirements and adjust their MOPP level without losing momentum.
- *Develop leaders*. Leaders are the most critical component in force protection. Confident, competent leaders make the difference in such a complex environment. Once NBC conditions are imposed on the battlefield, the challenge to leadership increases dramatically[9]. Leaders must train to conduct operations under NBC conditions.
- *Instill discipline*. Units must continue their missions in spite of the employment of NBC weapons by an adversary. Personnel must be adequately trained, properly equipped, and psychologically prepared for the effects of nuclear and chemical weapons.
- *Avoid detection*. Units must use active and passive measures to negate threat target acquisition means. The combination of active and passive force protection measures will negate any possible advantageous use of these weapons by an adversary.
- *Retain mobility*. Tactical, operational, and strategic mobility will enhance chances for survival. Commanders at all levels must consider displacing or dispersing whenever the threat of nuclear or chemical use is imminent.
- *Disperse forces and installations to minimize potential damage*. Commanders will disperse forces based on an adversary's ability to employ weapons of mass destruction. The extent of dispersion depends on the mission, enemy forces, terrain, troops, and time available (METT-T). Dispersion includes plans for massing forces quickly once there is a reduction in risk of employment of weapons of mass destruction. The commander determines the size and type of maneuver forces and the timing for their concentration. Troop concentrations should be flexible to accommodate sudden changes, use deception of the highest quality, and be brief in duration. Operations should be swift and violent to take advantage of concentration.
- *Use terrain for cover and shielding*. Careful use of natural terrain shields personnel and equipment from the effects of nuclear and chemical weapons.
- *Ensure logistical preparedness*. Combat service support personnel and installations will disperse while continuing to sustain the force. Units must have sufficient supplies, protective clothing, decon equipment, and medical supplies to continue operations without immediate need for resupply.
- *Plan for reorganization*. Commanders must anticipate the need to reorganize units following the employment of weapons of mass destruction. Prompt damage assessment of personnel and equipment and the rapid implementation of reorganization measures will allow the unit to maintain momentum and continue the mission.
- *Reduce risk*. Commanders plan and conduct operations with the knowledge that weapons of mass destruction may be employed by an adversary at any time. Reducing the risk of their employment is essential by maintaining alertness, avoiding detection, and retaining mobility.
- *Conduct offensive operations*. Nullify the use of weapons of mass destruction by attacking them at their source, before they can be employed against friendly forces and populations.

Protection Of The Future Force

The organization and composition of Army units must change to meet the changing world situation. The current force structure of the Army is being questioned. The basic structure of corps and divisions are being analyzed and reviewed. The Chemical Corps must also examine its basic force structure to ensure it has a force structure capable of protecting the future Army force. Chemical units must be rapidly deployable, versatile, survivable, and logistically supportable. The current combination of chemical units lacks many of these desired features.

We must recognize that the basic combat unit chemical organizations support is the maneuver brigade. It is essential that the chemical force be designed and built to support the maneuver brigade. The German Army and its current force structure has taken the majority of the NBC defense units from corps troops and reorganized them as division troops to support their maneuver brigades.

The future chemical organization must capitalize on two mission areas —contamination avoidance and battlefield obscuration. If we can protect the force from becoming contaminated, then decon is unnecessary. The future chemical force must be recon and smoke heavy. However, we cannot ignore the need to provide decon support. To provide versatility, dual purpose type organizations (smoke/ decon) are essential. However, dual purpose units must be smaller and lighter to reduce the strategic transportation requirement. The mechanized smoke units must support heavy forces, while motorized smoke units support nonmechanized forces. This, however, does not mean that motorized smoke assets have no place supporting heavy forces.

Figure 1, page 5, shows the proposed organization of a chemical battalion designed to support a mechanized or armored division. The battalion has three direct support companies to support each of the ground maneuver brigades. The company commander also functions as the brigade chemical officer. The general support company is designed to provide chemical support to the division, particularly those units operating in the division rear area. The headquarters and headquarters detachment provides command and control and NBC staff support to the division. The battalion commander is also the division chemical officer. The battalion is a mix of both active and reserve component units, primarily at the platoon and section level.

> We must be ready to protect the force under any condition, anywhere on the globe, and with little warning.

The airborne and air assault division would also have a chemical battalion of the same organization as the heavy division. The major difference between the airborne/air assault chemical battalion and the heavy division chemical battalion would be the equipment. The smoke platoons would be equipped with motorized smoke systems instead of mechanized smoke systems. The NBC recon squads would be equipped with a light version of the M93 NBC recon system (FOX). Light infantry divisions would continue to have no organic chemical units. Chemical support for the light divisions would come from a corps general support chemical company.

Chemical organization at the corps and theater levels would also be reorganized. The chemical brigade would remain the largest chemical organization and would typically be assigned to a corps. The chemical organization structure under the brigade would change. General support battalions with fixed structures would replace the current chemical battalion that have no fixed organization. Most of the single function companies (smoke/decon, mechanized smoke, and motorized smoke) that operate at the corps level would be eliminated to provide the assets to form the divisional and general support chemical battalions. The structure of the general support battalion is shown at figure 2, page 5. Most of these battalions would be reserve component organizations. At least one general support battalion should be located in the active component as part of the contingency force pool, ready for immediate deployment.

Each corps would also be supported by two company-level organizations—an NBC recon company and a biological detection company. Both of these companies are directly subordinate to the chemical brigade (figure 3, page 6) or a battalion if that was the largest organization supporting the corps. Like the general support battalion, at least one of each of these companies must be in the active component ready for immediate deployment in the contingency force pool.

Echelons above corps would be supported by a general support battalion. The number of battalions supporting echelons above corps would depend on the size and

location of the theater. It is possible that the chemical brigade would be assigned to the theater, with a general support battalion providing support to a corps.

By reogranizing the chemical force structure, the supported commander will have more flexibility in developing his combat task organization. Habitual relationships will be formed at the combat brigade level, which will promote and enhance the proper utilization of chemical assets on the battlefield. The position of division chemical officer will be held by a commander, rather than a staff officer.

Conclusion

The proliferation of weapons of mass destruction has altered the nature of regional conflict. While international efforts continue to reduce the spread of weapons of mass destruction, in all reality, potential enemies will continue to seek and obtain these weapons. The introduction of forces into regional conflicts has become increasingly risky due to the proliferation of such weapons. Therefore, commanders must consider the impact of these weapons on all stages of their operations, from mobilization through post-conflict operations. US forces may encounter NBC weapons in operations other than war. Peacemaking, humanitarian, shows of force, and other operations all have potential for encountering NBC weapons.

The potential of the use of weapons of mass destruction requires planners consider creating force dispositions that do not provide lucrative targets. In addition, offensive operations must combine with defensive umbrellas to limit the threat as close to its source as possible. Finally, planners must integrate into the overall plan the use of NBC recon and decon assets.[9] The emphasis must be on training to reduce the effects of the use of weapons of mass destruction. It is necessary to meet the challenges that weapons of mass destruction have on our warfighting capabilities. We must stand ready to fight and win under any condition, to include those produced by weapons of mass destruction.

The challenge today is to prepare to protect the force in a future conflict that may involve weapons of mass destruction. Doctrine, training, organizations, material, and leader development must continually evolve to meet the needs of the future force. We must be ready to protect the force under any condition, anywhere on the globe, and with little warning.

Major Robert C. Neumann is Chief, Doctrine Development Division, U.S. Army Chemical School. He has a B.S. in Chemistry from Norwich University and is a graduate of the Army Management Staff College. His assignments include battalion and brigade chemical officer, company command, assistant division chemical officer, and observer/controller at the National Training Center.

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The author would like to acknowledge that portions of this paper were taken from "The Impact of Weapons of Mass Destruction on Battlefield Operations," by MG Robert D. Orton and MAJ Robert C. Neumann. This article is scheduled for publication in *Military Review.*

Defending our Future ...

—a national warfighting policy on the environment

By Dr. Charles Notar

Lessons learned from *Operation Desert Storm*, a review of the role of environment as enunciated in U.S. Army Environmental Strategy into the 21st Century, and the addition of *operations other than war* missions have prompted a questioning of the present Army planning procedures and their treatment of the environment in plans and operations.

Operations other than war are defined as counter-terrorism, security assistance, humanitarian assistance, counter-drug, peacekeeping, strikes and raids, noncombatant evacuation, support to insurgency or counter-insurgency, arms control/treaty verification, and support to domestic civil authority. The environment must be considered regardless of the downsizing of the Army. Environment, defined as land or water areas of the earth and the atmosphere, is not weather. It's the natural environment and industrial development. Environment is not the possible effects of weather conditions (sunshine, rain, snow, wind, fog, cloudiness, and storms) in the areas of the world, particularly deserts, mountainous regions, the Arctics, and jungle areas.

Presently, there is no known formalized policy information on this subject, and it's necessary to look at this arena--particularly as seen from the observations in *Operation Desert Shield* and *Operation Desert Storm*.

The Iraqi discharge of oil into the Persian Gulf to foul Saudi Arabian desalinization processing plants is a good example of environmental consideration during warfighting. Another example: blowing up the oil wells in Kuwait to decrease visibility and to overextend our medical facilities with patients from the civilian population.

The environmental cleanup cost was enormous. If we had studied the use of the environment as a consideration of war, could we have implemented an effective program that may have avoided or at least decreased the problem? Our husbandry of garbage assisted in the overall clean-up cost of Saudi Arabia. Rather than ignoring the garbage as a problem, we considered it and made a conscious decision to do something. We could have, after consideration, decided to ignore the problem, too.

Industrial hazards such as the incidents at Bhopal, India (sabotage) and Chernobyl (reactor accident) must be considered, too. However, similar hazards could occur through military operations. Such operations would change the environment and endanger U.S. forces and our allies.

The Army needs a realistic, proactive, cost effective approach to use the environment as a combat multiplier/lethal instrument. This plan should include procedures for insuring that the natural qualities of the environment are preserved (to whatever extent possible). The military relevance of the environment in warfighting will ensure that the Army maintains its edge through studying the consequences of the use of the environment as a combat multiplier/lethal instrument of warfighting against an enemy. It will provide guidance that will save dollars, time, and preserve world relations.

The Department of Defense needs a comprehensive analysis of environmental hazards, and all efforts in the planning area to analyze types of environmental hazards and the existing planning efforts within Department of Defense on environmental considerations as a function of war.

We have the responsibility to protect and preserve the environment. We are all custodians of Mother Earth. Where is this stewardship in our warfighting plans and operations? Where should it be? How do we move our CONUS national policy on the environment forward in deployment? Should we have an environmental annex to operation plans? What are the rules for accomplishing our long term goals—what are the risks of combat vis-a-vis implementation of our national policy on environment?

As the "U.S. Army Environmental Strategy Into The 21st Century" states, the Army is to be the steward

What are the national and international considerations in developing an environmental doctrine for peacetime, transition, and war?

of the environment, "conserving and preserving natural and cultural resources so they will be available for present and future generations to use." Warfighting planners must examine the aftermath of their actions and its effect on the environment; determine whether a different plan could be used, one that leaves the environment closer to its pre-war state rather than spending millions/ billions to rectify the problems caused in post-war cleanup.

National policy provisions/ environmental considerations are specific areas of interest for doctrine, organization, training, leadership, and materiel development. What are the national and international considerations in developing an environmental doctrine for peacetime (operations other than war), transition, and war? What responsibilities/ authority is there in present treaty provisions and status of forces agreements that must be incorporated into our national policy? We need a review of the environmental concerns (air pollution abatement, water resource management, noise abatement, natural and cultural resources, hazardous material handling, hazardous waste, pesticide management) to pre-determine how our national warfighting policy and planning can ensure compliance. This policy should also be based on the four pillars of the environmental strategy for the 21st century and the moral and ethical standards that are the foundation of the nation and military.

Our national environmental policy must be based on moral and ethical standards that have their roots in law. The laws of war, status of forces agreement, and settlement agreements should be reviewed to provide a basis for this policy.

We have a national policy on the Army's environmental strategy for the 21st century during peacetime. Should we have one for warfighting, and/or operations other than war, a movement of the CONUS national policy forward in deployment?

Do we need to develop a logical rationale war planners can use to take the effects of the environment away from the enemy? The benefits of integrated environmental compliance and battle-focused training are important and can actually improve combat readiness.

- First, implementation of environmental standards would reduce disease and non-battle injuries by eliminating or reducing hazardous materials exposure, improving individual and unit hygiene, and reducing on-the-job injuries.
- Second, our limited training resources would be maintained and their life-span extended.
- Third, unit combat signatures would be reduced.
- Fourth, combat effectiveness would be improved because equipment maintenance would improve.
- Fifth, unit maneuverability may be enhanced.

In addition, one of the major topics in the HQDA guidance to commanders, agency heads, and study sponsors for preparation of the FY93 Army Study Program was the Army's impact on the environment.[1]

A first step in developing a national warfighting policy on the environment is a review of all current material on the nation's position and a determination of the nation's position for operations other than war and wartime. From this review we develop a strict-to-loose national environmental warfighting policy. This policy should be national and international in application.

The establishment of a national environmental warfighting policy will lead to the writing of doctrine. This writing should start with a review of the IPB processes in FM 34-150 and the planning guidance in other pertinent Army doctrinal manuals, followed by an analysis of the various types of Threat, and the Department of Army existing battle planning processes, tactics, techniques, and procedures. After this analysis, the adequacy/inadequacy of these documents on planning can be used to develop required changes to the doctrinal planning manuals and to determine the Army's warfighting and *operations other than war* doctrine for the environment.

What kind of planning/thought should be emplaced in the Army's strategic/tactical planning and where? Doctrine should look at defined response standards and collateral damage. There must be a set of rules laid out for decisionmaking.

An integral part of the national warfighting policy on environment will be the definition of response standards for the warfighter. The definition and consequences of collateral damage must be a

consideration in determining the risks associated with implementing the national policy on environment during deployment forward. What are the inherent risks? What's the threshold where "inordinate risk" (as regards resources, mission, and soldiers) allows the commander to *disregard the environment during* military operations. Develop a risk analysis within the policy. This risk analysis will be used by commanders to determine when their warfighting mission takes precedence over environmental doctrine.

Also, as we plan the implementation of the national policy on environment, it must be progressive in nature; that is, a guerilla war implementation would be different than one of WWII magnitude).

The United States needs a national warfighting policy on the environment. We are in a period of review of our military strategy and how we will restructure the force and project that *force. Add into that review, as an* integral part of the strategy, and force multiplier, the environment.

[1]*Letter, Department of the Army, Officer of the Under Secretary, SFUS-MIS, 4 May 92, Subject: Fiscal Year 1993 Army Study Guidance.*

Editor's Note: The United States Army Chemical School has produced a TVT: "U.S. Army Environmental Strategy into the 21st Century". The order number is PIN 710289 TVT 3-86. Order through your local Training Support Center (TSC).

The TVT is a 13 minute, fast moving, awareness presentation. It covers the Army's environmental vision, the four pillars of the Army's strategy, and the Army's environmental philosophy. The target audience is all soldiers, NCOs, and officers.

Dr. Charles Notar is an instructional systems specialist. He is the chief of Training Design Branch and is responsible for curriculum design and testing, to include SDT. He has been at the Chemical School since 1981.

SDT UPDATE

The two-year SDT test period is over. In June 93, the Chief of Staff of the Army, GEN Sullivan, mandated the SDT be implemented for the Active Army in FY94 and FY95 for U.S. Army Reserve (USAR), U.S. Army National Guard (NG), and Active Guard and Reserve (AGR) NCOs. Regardless of your Army component, starting 1 Oct 93, you should actively strive to insure all of your eligible NCOs test. SDT is a fact of life for sergeants!

Next year's results will be provided to Active Component promotion and school selection boards. The passing score set by the Army is 70. The 70 is adopted from the passing score used in NCOES and the Army Correspondence Course Program (ACCP). The passing score of 70 means that you must get 70 of the 100 question on the SDT correct. The SDT is still made up of 20 question on leadership, 20 questions on training and 60 questions on your proponent MOS.

SDT is a measure of the individual NCO's self-development. It is not a unit training responsibility!

There is an SDT TVT entitled *Benchmark for Success: Self Development Test*. The run time is 10 minutes 15 seconds. The order number is PIN AO 517-93-0055. Order through your local Training Support Center (TSC). It is the replacement for the chain briefing.

The following self-development test study tips were provided by Jim Meadows, DSN 927-2441, COM (804) 878-2441.

- Develop year-round study plan that inclues the three areas of the SDT: leadership, training management, and MOS knowledge.
- Identify suitable times and locations for study as part of that plan.
- Limit individual study sessions to 30 minutes to maximize study efficiency.
- Do not study tired.
- Look for ways to use idle time for study purposes.
- Start your study of an MOS reference by scanning the table of contents for the pertinent chapters and sections to focus on.
- Concentrate and reflect on relevant pictures and subtitles; this should aid learning and retention.
- Read pertinent reference material onto cassette tapes and listen to them while driving; this will optimize study time and further aid retention.
- Form peer study groups.

As the doctrine writers for the Army, TRADOC must have data that can be used to change doctrine, if required.

Donald Richter
Chemical Soldiers: British Gas Warfare in World War I
University of Kansas Press, 1992
234 pages plus appendices, notes, bibliography, and index
ISBN 0-7006-0544-4

One of the most interesting organizations in World War I was the British special Brigade of the Royal Engineers. This was the unit that prosecuted the British gas effort responding to the German chlorine attack at Ypres in April 1915. Thus far the only book to chronicle the history of this unique unit has been Charles H. Foulkes' *Gas! The Story of the Special Brigade*, published by the former commander of the brigade in 1934. Far from being an unbiased account of the brigade, *Gas!* is rather self-serving and highly selective in the use of sources that extol the role of the Special Brigade in the war.

Donald Richter, professor of history at Ohio University, has done a great service to the history of chemical warfare by publishing *Chemical Soldiers: British Gas Warfare in World War I*. Highly readable, always objective, and often entertaining, *Chemical Soldiers* tells the story of the highly technical Special Brigade organized by Foulkes to end the stalemate of trench warfare in France and Belgium by the use of gas.

The story is that of Foulkes himself, an irrepressible, eternally optimistic officer who dreamt of a new branch of the service equal to the infantry and capable of ending the war with its new weapon. And it is the story of the officers and men who served with the brigade, men who at first all held the grade of corporal or higher because of the special expertise believed necessary for the Special Brigade.

If this were all Richter did, *Chemical Soldiers* would be worth reading as the story of a unit with a different mission. The author, however, does more than just give us another unit history. He tells the story of the introduction of a new type of warfare and all the problems of technology, organization, doctrine, and personnel this entailed. This story is as new as the latest technology we can produce, and there is much that can be learned from the experience with gas in World War I.

Richter also tells the story of highly qualified men, many teachers of chemistry in civilian life, and how they cope with the horrors of war and a mission that does not really require their skills as chemists. There is much to be learned in the mistakes made with and by these men. there is much to inspire in the esprit de corps these men developed, their humor, and their many examples of courage and heroism.

Chemical Soldiers does not evade the moral dimension of chemical warfare. Richter explores this in detail. We hear what the soldiers thought at the time—Foulkes, his corporals, and infantrymen in the trenches. And we listen to the thoughts of others at the time and since. Is chemical warfare Liddell Hart's "least inhumane" weapon or is it a devilish monster diplomats have tried to control since the Hague Treaty of 1899? The proliferation of chemical weapons in recent times makes this an issue that should again be addressed.

Finally, Richter explores the utility of chemical weapons. Were they or can they become, the decisive weapon envisioned by Foulkes? Or were they, and are they still, simply battlefield nuisances as many would say, including Ludwig Haber, son of the father of German gas warfare. Another issue that must be explored by those who make decisions regarding disarmament and chemical defense.

Chemical Soldiers is a valuable, most timely work. It presents a much-needed unit history. It explores some very compelling problems and issues. It is a well-documented work of the highest scholarship. It is good reading, and it should be read by all who are interested in contemporary military affairs.

Reviewed By Daniel E. Spector, Command Historian, U.S. Army Chemical School.

CANE

—Light Infantry Operations

By CPT Joe Burke
and
CPT Wes Watson

Since 1980, the US Army has conducted a series of field tests under the Combined Arms in a Nuclear/ Chemical Environment (CANE) testing program. The purpose of the field tests is to determine the efects of nuclear, biological, and chemical weapons on combined arms operations over an extended period of time.

These tests found noted common deficiencies that have resulted in doctrinal, equipment, organizational, training, and leadership fixes. While the first three tests concentrated on mechanized forces, in May 1992 a test was completed that focused on a combined arms force made up of light forces.

The CANE Close Combat–Light (CCL) test took place at Fort Hunter-Liggett, California, from February through May 1992. It evaluated the light infantry company with its combat support and combat service support elements against elements of a motorized rifle battalion company over a 96-hour period.

The test scenario included three night attacks and one day defense. The light infantry company and its supporting elements received an operations order from its battalion headquarters and the company planned and conducted all the necessary rehearsals and preparations,

Direct fire weapons were less effective in the NCE when compared to the baseline.

executed the mission, and conducted consolidation and reorganization phases.

Soldiers and their weapons were highly instrumented in order to obtain data on real time casualty assessments, unit and soldier locations, and command and control information. Experienced military subject matter experts from FORSCOM and TRAOC units gathered detailed subjective data through direct observation of subordinate elements of the evaluated unit. Human factors evaluators monitored and recorded soldiers' and leaders' levels of physical activity and mental acuity.

The participating units conducted missions in a conventional environment, where there was no NBC threat, used as a baseline environment. The missions were then evaluated in a nuclear/chemical environment using the same scenario and terrain. All data were carefully recorded and used in later analysis, which quantified any differences in performance while in MOPP. To avoid any learning curve by the units performing the same scenario twice, two units started the test in the baseline environment, and two units started in the nuclear/chemical environment.

The results of CANE-CCL support findings in these areas:

Maneuver

There was a significant difference in the ability of the light forces to maneuver between the two environments. Light forces moved at a one-third slower rate in the nuclear/chemical environment; that is, the unit required more time to reach the objective. Movement techniques were less effective and movement control was also degraded in the nulear/chemical environment.

During movement to the objective while in MOPP gear, light forces were less effective in avoiding skylining, using natural concealment, usng concealment in tactical movements, employing noise/light discipline, positioning key weapons and in taking appropriate actions at danger areas.

Movement control techniques that were also adversely affected included movement in the designated formation, movement on specified routes, and compliance with graphic control measures. In after-action reviews, unit leaders reported that, in the nuclear/chemical environment, movement was slower, difficult to control, and that personnel bunched up, fell often, were noisy, and became disoriented.

Weapons Effectiveness

In the nuclear/chemical environment, direct fire weapons during the attack were significantly less effective. The light force did not detect and engage the opposing forces (OPOR) until they were much closer. Twenty-five percent fewer soldiers fired their weapons and, of those soldiers firing, 45 percent fewer firers hit their targets. Of all the shots fired, 25-to-60 percent less rounds were fired. The reduced rate of fire

Casualty evacuation took twice as long in MOPP gear.

Soldiers wore vestpacks which recorded their locations back to a monitoring station. Their weapons were instrumented and provided real-time assessment of casualties that was recorded for later analysis.

and the increase in number of rounds required to hit a target resulted in 73 percent less OPFOR targets being engaged.

Survivability

The light forces were less survivable in the nuclear/chemical environment. The OPFOR detected and engaged the light forces at greater ranges. The light forces moved slower, bunched up, and maintained less security. In after-action reviews, unit leaders reported that in movement, they took trails and roads more often and took more tactical risks with closer formations and slower movements.

Soldiers also experienced problems when trying to use the AN/PVS7 night vision devices, which were not compatible with the mask and hood. Weapon accuracy was reduced because of the lack of training in MOPP3/MOPP4. Only 30 percent of the infantry players had ever fired their weapons in MOPP4, despite a twice yearly requirement to do so, and experienced compatibility problems between the mask and direct-fire weapons.

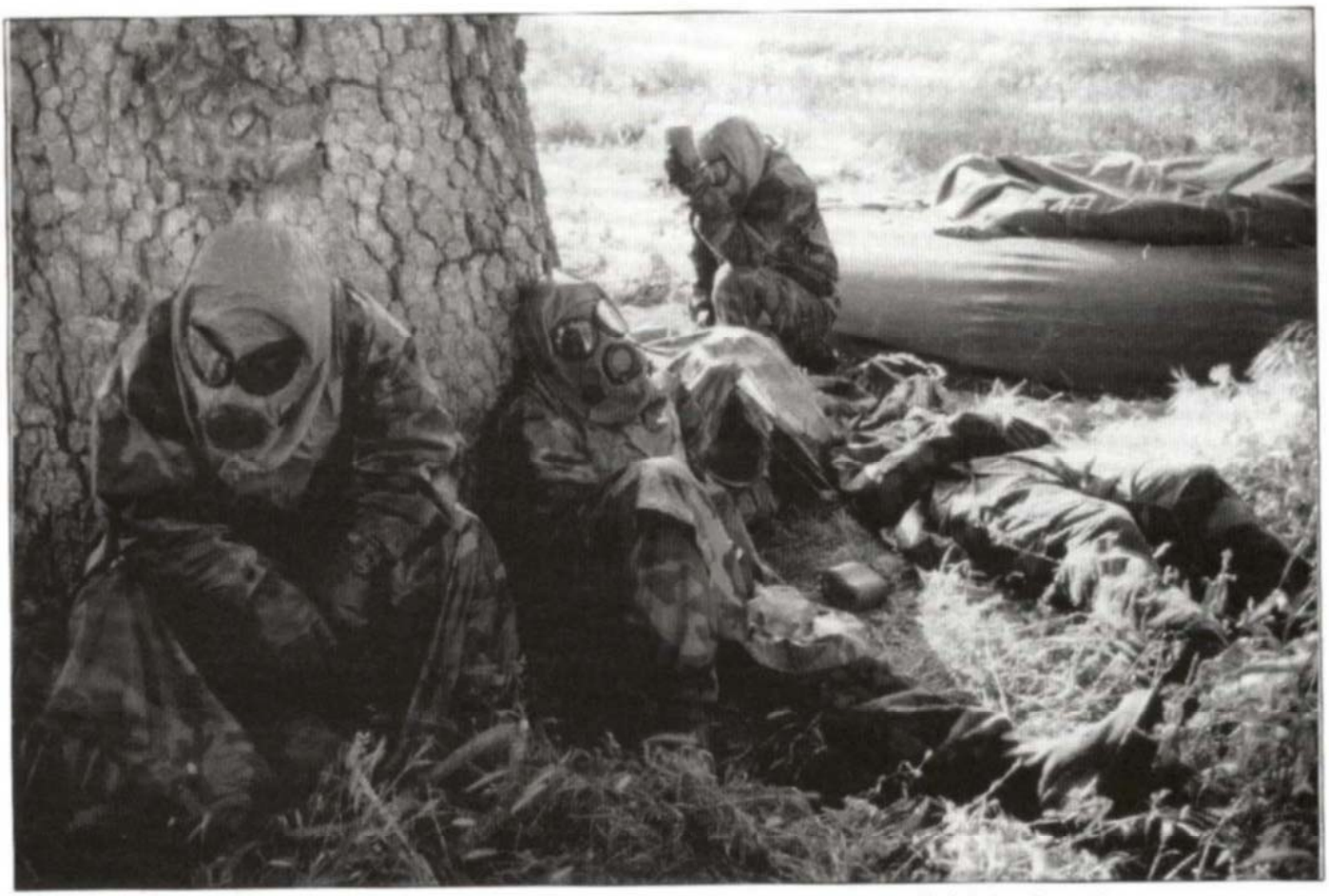
Battle Command

While moving, the light forces were degraded in their ability to maintain directional orientation for all elements. Leaders in the nuclear/chemical environment phase gave more care to mission analysis and restating the mission, developing courses of action, and making tentative plans while in the nuclear/chemical environment. Leaders had a tendency to keep more control over subordinates and delegated less authority.

As pressures and time increased in the nuclear/chemical environment, leaders became more exhausted, and critical tasks were neglected or poorly done. Synchronization of plans and operations became more difficult and coordination with supported and supporting units declined. Tactical discipline, camouflage, and OPSEC measures were normally not enforced, and unit cohesiveness suffered.

Troops began to worry more about their individual survival than the unit's mission performance. When communicating, there was a significant increase in requests for repetitions and clarifications of radio messages. Units were degraded in establishing radio nets and were more inclined to use range-enhancing antennas in the nuclear/chemical environment. Both radio and face-to-face communications were impaired by the M17-series masks and hoods, which hampered hearing and voice recognition, volume, and clarity.

In after-action reviews, unit leaders stated that they used the radio more and had difficulties in hearing or using the TA-1 handset in the nuclear/chemical environment. There was a tendency for leaders to try to keep things simple, and they modified their tactics accordingly.



Human factors such as sleep, soldier effectiveness, hydration, and visual accuracy were recorded during the test.

Execution

While executing the missions in the nuclear/chemical environment, the security elements tended to alert the company about one-sixth less often, and provided fewer contact reports to the company. More difficulty was encountered in the nuclear/chemical environment in suppressing the enemy to avoid fixing.

The ability of the light forces to maintain contact with the enemy and in platoon consolidation and reorganization were also degraded. Routine tasks that were reduced to SOPs could be accomplished with little or no degradation. However, battlefield tasks involving cognitive skills, movement to contact, maneuver and attack or defense over difficult terrain under varying weather conditions were rapidly degraded under nuclear/chemical conditions.

Mobility/Counter-Mobility

One combat engineer squad supported the light infantry company during the test. This squad of sappers experienced similar difficulties of operating in the nuclear/chemical environment as did the infantry. Specifically, the performance of engineer tasks were degraded in the nulear/ chemical environment because MOPP4 caused greater fatigue and slowed completion of tasks involving physical labor.

Movement from the line of departure to the objective was especially difficult since the engineers were heavily burdened with combat equipment with MOPP4 as an additional encumbrance. Construction of obstacles and the breaching of obstacles were made even more difficult because the chemical protective gloves caused the loss of manual dexterity. The breaching of wire obstacles took twice as long to complete.

Fire Support.

Indirect fire support was provided by a 105mm artillery battery, the infantry battalion's 81mm mortars, and the infantry company's organic 60mm mortars. Fire support killed about half as many OPFOR, less indirect-fire rounds were fired, and it required twice as many rounds to get a hit in the nuclear/chemical environment when compared to the baseline.

At the 105mm battery, the FIST acquired one-fourth more targets, but was less accurate in calling for fire, and took more time to transmit the

calls for fire in the nuclear/chemical environment. There were 50 percent more errors in settings on the guns, and the errors were twice as large. Firing the missions took 19 percent more time. The battery was slower in moving and laying the guns, there were errors when the guns were laid, and laying wire took longer.

Air Defense

During the test, passive air defense measures were degraded. Soldiers spent 43 percent more time performing camouflage activities while in the nuclear/chemical environment. Additionally, soldiers in MOPP were more vulnerable to air attack because of degradation of shielding heat sources, more movement within the unit area, and less use of air guards.

Combat Service Support

The light force had its slice of combat service support elements during the tests. Maintenance was degraded throughout the force, and performing and supervising preventive maintenance checks and services declined. Medical treatment and evacuation were degraded in the nuclear/chemical environment. During the direct fire battles in the nuclear/chemical environment, it took twice as long for the light forces to move casualties to the collection point, treat, and evacuate the casualties.

Demographics/Human Factors

Pre- and post-test questionnaires were administered to test soldiers to get the demographics and training characteristics. The characteristics and opinions of the soldiers were analyzed to obtain profiles of the test participants, man-machine interface assessments, unit NBC training status, nuclear/chemical environment and BLE comparisons, and leadership assessments. Levels of hydration were measured using daily urine samples. Visual acuity of masked and unmasked soldiers was measured before the test. Cognitive/perceptional performance was measured by a daily performance assessment battery.

The light forces experienced significant challenges during the CANE evaluations in performing effectively on a battlefield with a chemical threat. However, there was a significant learning curve which proved that soldiers trained in operations in MOPP can perform their missions and overcome the challenges. Examples of the learning curves of soldiers operating in the nuclear/chemical environment: infantry survivability increased from the first day of the test to the fourth day. Degradation of howitzer crews decreased from 58 percent on day one to 29 percent on day four. In after-action reviews, most leaders reported that they were surprised that they could overcome the effects of MOPP by working through it and agreed that the test was a training benefit.

The results of the CANE CCL test are still being analyzed. Specific measurements will be identified as deficiencies and incorporated into the CANE implementation program. The CANE implementation program is a "fix" program where the problems of operating in the nuclear/chemical environment are identified to the responsible TRADOC or AMC command. The command, in turn, develops solutions. Since the CANE series of tests started, there have been over 100 corrective actions initiated in doctrinal, material, organizational, leadership, and training areas. Future CANE tests will examine air defense (May 1993), smoke (FY95), and aviation (FY96) issues.

In summary, the results of CANE CCL indicated that light infantry combat operations were significantly degraded in a chemical environment, but soldiers can learn to operate effectively in the nuclear/chemical environment—in the first days of war or now.

Soldiers learned to operate in MOPP4 after only 96 hours of intensive experience in a nuclear/chemical environment. Thus, training to perform missions under NBC conditions has a rapid payback in unit effectiveness.

CPT Joe Burke was a USACMLS test and evaluation officer at the time this article was written, and he worked on the CANE CCL test. CPT Burke's previous assignments have been in Germany, Turkey, and Saudi Arabia. He is a COAC, CAS3, Airborne Course, and Air Assault Course graduate.

CPT Wes Watson was a USACMLS test and evaluation officer at the time this article was written, and he worked on the CANE CCL test. CPT Watson's previous assignments have been with the 101st Airborne Division at Fort Campbell, Kentucky. He is a COAC, Red Thrust qualification course, Airborne Course, and Air Assault Course graduate.

Shaping Excellence—Trained and Ready

By MSG A. G. Manigross Jr.

As we enter into FY94, the Chemical Corps continues to serve the United States Army in all theaters. We continue to receive steady promotions and timely selection for schooling. The real focus of each and every one of us should remain on "manner of performance."

Army Family Action Plan

Army Family Action Plan (AFAP), which is presently working an issue on management of enlisted soldiers and their assignments, appears to be heading in the positive path of excellence. Some of the major highlights are: increasing soldier participation in his or her assignment selection process. This is being accomplished by several avenues of approach.

- Preferences of soldiers can be sent via DA 4187.
- SIDPERS annotation of the soldiers' preference, which can be monitored on the DA Form 2A.
- Enlisted Distribution Assignment System (EDAS) has been modified to ensure that the soldiers' CONUS and OCONUS areas of preference are given more consideration. More on this will follow in various publications.

Panama—Tour Changes

The accompanied tour length for assignment to Panama is now 24 months versus 36 months. Of course, the short tour option remains at 12 months. This change was effective 1 Sep 93. The assignment location for this tour change is Fort Sherman, Atlantic Community.

Stabilization for Somalia Soldiers

Effective immediately, all soldiers who served temporary duty in Somalia for at least four consecutive months will be granted PCS assignment restrictions as follows:

- No short tours for 12 months.
- No long-tour or CONUS-to-CONUS moves for four months.

Of course, if readiness requires the move, this stabilization could be broken. Soldiers could submit a volunteer application if they would like to move earlier than the stabilized period.

Overseas Extension Incentive Program

The Chemical Operations Specialist overseas extension incentive has been recently approved for SGT in all commands and skill level 1 soldiers at Johnston Island. This extension incentive will hopefully assist overseas commands in maintaining personnel readiness. Contact your personnel office for specific information on the incentives.

First Sergeant Assignments

A change to AR 614-200, Selection of Enlisted soldiers for Training and Assignments, Chapter 8, requires that all first-time first sergeants attend the First Sergeant Course (resident) Fort Bliss, Texas, prior to assuming 1SG duties. Only SFC(P) and MSG are awarded the skill qualification identifier *M*, First Sergeant. Waivers for this new requirement may be initiated in overseas commands if adequate 1SG are not available. Selected SFC(P) and MSGs destined for overseas short tour areas and who have not attended the First Sergeant Course will attend the resident First Sergeant Course en route to the assignment. This policy is effective 1 Oct 93.

Drill Sergeant/Recruiter Volunteers

This branch continues to accept all qualified volunteer applications for drill sergeant and recruiter duty. Although the authorizations for both drill sergeant and recruiter have decreased, we still want and support as many volunteers as we can. Soldiers who volunteer for these tough demanding and challenging duties will be successful and, in turn, enhance their promotion potential. Keep on sending the applications...

Airborne Duty

SGTs and below who feel that they would like to challenge themselves by volunteering for airborne duty should continue to submit their applications. All efforts will be made to support the request and follow up the training with an assignment to Fort Bragg, North Carolina.

Assignment Managers

Recently the Branch realigned duties. The new chemical assignment managers are: CONUS, Mr. Smith, DSN 221-6103; Overseas, Ms. Jones, DSN 221-9677. Duty hours are 0700–1700; however, the peak hours are 0900–1530.

Where to write

Correspondence to the branch should be addressed: Commander, PERSCOM, ATTN: TAPC-EPM-I., 2461 Eisenhower Avenue, Alexandria, Virginia 22332.

MOPPing Up Fort Drum

By CPT Paul Laundry

When you think of lanes training, what comes to mind? A platoon defending its perimeter from enemy infiltration? An ambush of a convoy movement? A fire fight on a patrol? Yes, these are some of the images that come to mind, but it can be much more.

Lane training doesn't always have to be geared toward infantry tactics or specifically towards the combat arms organizations. Combat support and combat service supports units can conduct this type of training with a little work, initiative and creativity and it can be resourced and conducted internally by the unit.

The 272d Chemical Company (Heavy Division) of the 26th Yankee Infantry Division, Massachusetts Army National Guard did just this during our AT at Fort Drum, New York recently.

The story and prep work actually began about a year ago, just after our annual training period. The leadership of the company and the chemical team from Readiness Group, Fort Devens, Massachusetts, sat together and came up with a game pla to introducethe lanetraining concept into the company. The goals were determined and using the backwards planning process, a road map to success was laid out.

Step one. Determine the lanes to be conducted and the collective training tasks to be conducted for each lane. The unit chose three MOS-specific lanes to conduct during annual training: Operational Decon, Prepare for Smoke Operations, and Conduct Chemical Route Reconnaissance.

Conduct Operational Decon

- •Prepare for decon operations
- •Occupy assembly area
- •Perform tactical road march
- •Maintain local security

2LT Clement (left) and the recon squad conducts an AAR of the chemical route recon lane using a sand table.

Contaminated soldiers conduct MOPP gear exchange while squad leader observes.

•Conduct operational decon operations (vehicle washdown and MOPP gear exchange)

Conduct Smoke Operations

•Prepare for smoke operations
•Occupy assembly area
•Plan smoke operations
•Perform tactical road march
•Maintain local security
•Conduct smoke operations
•End smoke mission

Conduct Chemical Route Recon

•Plan and prepare for NBC reconnaissance/survey operations
•Occupy assembly area
•Conduct tactical road march
•Maintain local security
•Conduct chemical route reconnaissance
•Mark NBC contaminated area
•Perform operational decon operations

Additionally the following non-MOS specific lane was picked:

Defend Unit Perimeter Lane

•Occupy assembly area
•Secure and defend unit perimeter
•Respond to chemical agent attack

Step two. Since we wanted to conduct training in a self-supported manner, it was determined to train at the squad/section level. We assigned roles. The platoon leaders and platoon sergeants were selected to be the observer-controllers for each of the lanes. The company operations officer, operations sergeant, and first sergeant were assigned the roles of resource managers, and the company commander acted as senior observer-controller and evaluator to validate the lanes.

Step three. Leader training. Without a well-trained and versed leadership, the training would have floundered. The commander, along with Readiness Group Devens chemical team, developed an observer-controller program to train the leadership in their roles and responsibilities. The program was modeled from other units in the 26th Division and breaks down into three phases: Self-Study, Classroom Instruction, and Hands-on Application.

During phase one (October through December), the observer-controllers reviewed the selected tasks from the appropriate MTPs and reviewed FM 25-101.

Phase two (January through March), was instructed by CPT Gary Francis from Readiness Group Devens chemical team and CPT Paul Landry, Commander 272d Chemical Company. Instruction included topics such as: Review of FM 25-101, scenario development, use of ARTEPs and MTPs, roles and responsibilities of an observer-controller, use of sand tables, conduct of AARs, OPFOR employment, avoidance of training distractors, and any other topic the observer-controller felt needed to be covered.

Phase three (April and May) is where, according to most of the observer-controllers, it all pulled together. The observer-controller had the opportunity to put into practice all they had learned by actually running through the task. Each observer-controller was given the opportunity to

Decon squad members conduct vehicle washdown during the operational decon lane.

work as an observer-controller while his or her peers ran through a task. The task chosen was *Conduct a Tactical Road March.*

While all of this was going on, the squad leaders were conducting training on individual skills and team/squad battle drills that supported the specific lanes that had been selected for training during annual training.

Step four. Development of guidance. Without guidance and information available to all, the plan just wouldn't work. A lane training handbook was developed for each of the observer-controllers. The book contained the following types of information and was placed in the three-ring binder:

- Annual training calendar of events
- Annual training and lane training memorandums of instructions
- Operations order
- Safety annex (very important)
- Event sequence (training schedule and sequence of events lists)
- Commanders evaluation of selected mission-essential tasks prior to annual training.
- List of tasks to be conducted and the appropriate training and evaluation outlines
- Task summary list to be turned in at the completion of the training day with the observer-controller evaluation of the training conducted during the day.

Give copies of training and evaluation outlines to each squad leader for each lane.

Step five. On the ground. The first three days of annual training are allocated to train-up, retraining, and revalidation of observer-controllers before conducting the actual lanes record. This time allows the squad the opportunity to practice skills before being evaluated and allows the unit to work out any "bugs" so they can hit the ground running. It's important here to review the after-action review process with everyone.

Days 4 through 10. Here is where the squad shows its proficiency. Now the lanes are run for record. Each lane is initially conducted with minimum to no difficulty level. It's important for the unit to be able to conduct the tasks to standard before raising the bar of expectations. The key to remember is not to set the unit up for failure, but for success. Then continue to increase the difficulty factor.

Initially the platoon leaders and platoon sergeants should be the observer-controllers for their own sections. This provides them an accurate picture of their organizational readiness. Since we are training internally resourced, the observer-controller should wear two hats and know when to take off one and put on the other. One role is as an impartial observer-controller. This is where he issues OPORDs and impartially views and evaluates the

lane. The other role is that of trainer. There will be times when leadership must revert back to the leadership role and provide retraining if tasks are not performed as well as expected. In this way the squads can continue to learn that it can become valuable training time.

To ensure an accurate evaluation of the tasks for each squad and also provide some professional development for each of the observer-controllers after the second or third iteration, we began rotating observer-controllers between squads. This gave the commander an impartial eye and some cross training for each of the observer-controllers into other functional areas in the company.

OPFOR as a training enhancer is essential. Again, since we were internally resourcing our lanes, after the third day each platoon was given the opportunity to play the role of OPFOR under the control of an observer-controller. This provided the lanes with that additional training enhancer it needed and took some of the repetition of the lane training away from a section per day. The platoons each had the opportunity to become OPFOR on a rotating basis as needed. An additional outcome of this was the inter-platoon competition created. Every platoon wants to be better than its rivals. In this case, the OPFORs are not evaluated but do provide excellent feedback on their lane and provide an invaluable training opportunity and morale booster for all those involved.

One last key thing to remember is: Have effective resource managers. This individual or individuals can have a pronounced effect on the success or failure of the lanes. His or her role is to coordinate everything from an adequate training area to use and employment of OPFOR during the lane.

Remember, you don't have to be in a combat arms organization to conduct effective and well-resourced lanes training. Also, commanders have within their own organizations the ability to conduct this type of training. We did. It takes time planning and getting an early jump on the process. Start now for next year's annual training.

Key Points for Lane Training Program:

- Pick lanes and tasks early.
- Develop and implement leader training program.
- Provide copies of all information needed to the appropriate user level.
- Train-up during IDT.
- Train-up and leader revalidation at the AT site.
- Train and retrain before conducting lanes for record.
- Set soldiers up for success but also increase difficulty level as appropriate.
- Don't bite off more than you can chew—quality not quantity of training.
- After action reviews verbal and written.
- Train safe, train smart, train to the Army standard.

1994 Chemical Corps Writing Competition

The Chemical School will hold its third annual Chemical Corps Writing Competition beginning in February 1994. The thesis for the contest has not yet been selected, but those interested in the competition can obtain information about entering by contacting Dr. Daniel E. Spector, Chemical Corps Historian, at DSN 865-5722 or commercial (205) 848-5722. The FAX extension is 4615.

Two Years with the Mask

—some problems, some answers

By the M40/M42 Mask Team
Project Manager, Nuclear, Biological, Chemical Defense Systems
Chemical Biological Defense Command

January 1994 will mark two years since the first M40 masks were fielded to surety personnel at Johnston Island. Since that time, M40 and M42 masks have also been fielded to Forts Bragg, Campbell, Stewart, Ord, and Benning. In general, the masks have received favorable acceptance and soldiers can see the advantages of the M40 over the M17-series mask.

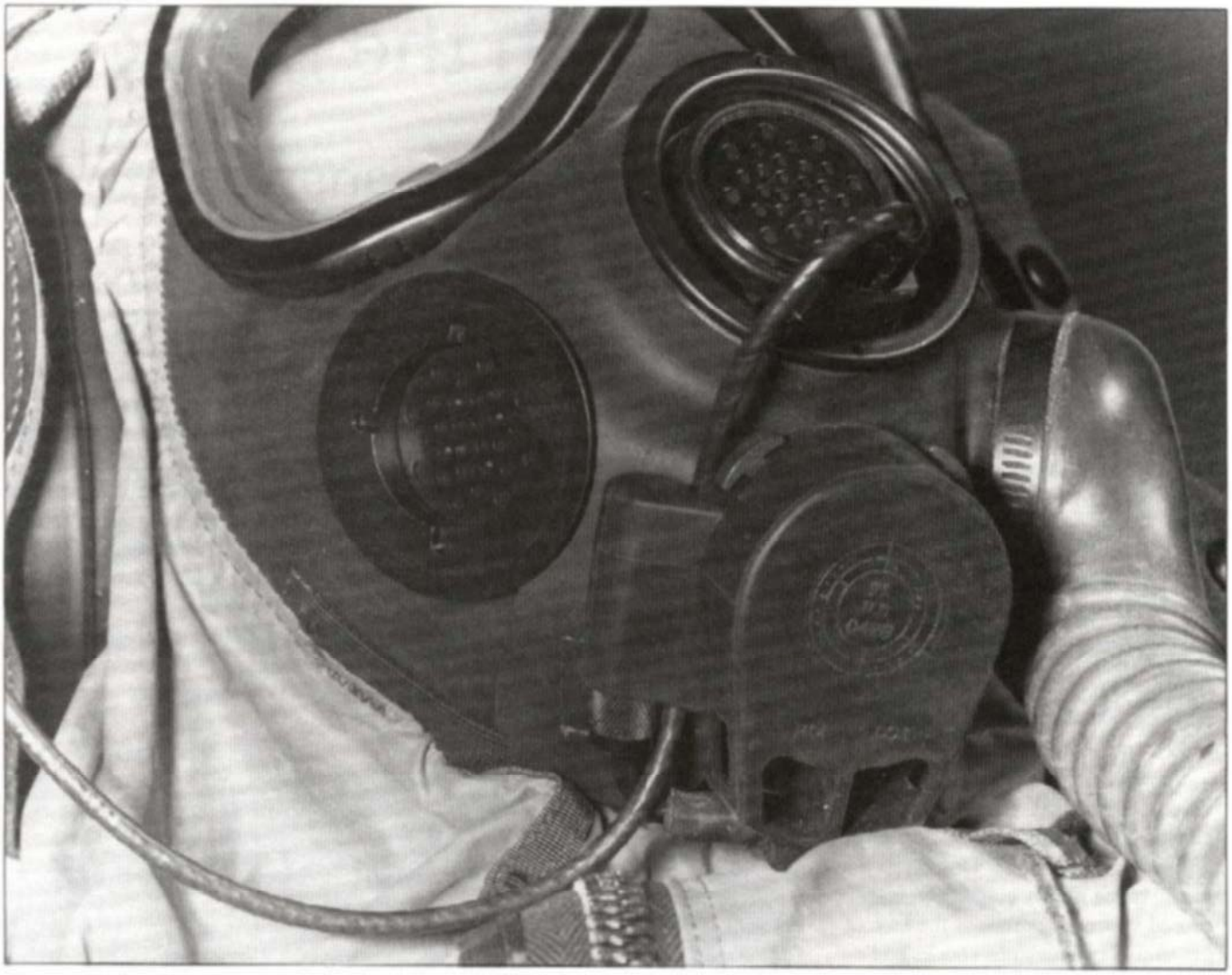
As with any new item, questions have occurred that require additional clarification. Many of these concerns will be addressed here. Our assessments of the masks in the field have caused concern because of the lack of preventive maintenance checks and services (PMCS) in the masks we inspected. It cannot be emphasized enough that PMCS standards in the manual must be followed to the fullest.

One of the most important components of the M40/M42 mask system is the canister, but if it's not tightened properly on the facepiece, it's completely useless. Numerous fielded masks have been examined and found to have loose canisters.

The manual states that the canister must be *screwed tightly into facepiece*; however, changes are currently being made to clarify this requirement even further. It's important that the soldier firmly tighten the canister with the whole hand until the faceblank begins to flex. We don't feel anyone should be concerned about making the connector too tight as long as the mask itself is not damaged in the process.

Through years of using the M17-, M9-, and M25-series masks, soldiers have been accustomed to stowing the mask in the carrier with the facepiece pressed together and lenses facing the opening. Soldiers must adopt a new mindset for the M40/42 mask. Stow the M40/42 mask sideways, or in an open position with the lenses facing away from the soldier. See photo this page.

Proper stowage position of the mask in the carrier.



The proposed routing of the microphone cord in the M42 mask.

Many examples of broken drink tube couplings have been detected—attributed directly to the position of the mask during stowage. If the mask is flexed during stowage, it can be demonstrated how the molded-in metal side ring in the facepiece can make direct contact with the coupling and, by applying a side load, break off the coupling. A video tape on the care and use of the mask was released to the field as an aid during initial training, but could serve for retraining. Efforts are underway to revise the training video by correcting its few discrepancies as well as highlighting the proper stowage position of the mask in the carrier.

PMCS is very important in maintaining the cleanliness of the outlet valve seat and disk. It's very easy to get sand and dirt on the mask in a typical field environment; but, dirt in the outlet valve area can result in a mask leak. The valve assembly cannot seal properly if any foreign material lies along the sealing surface; so it's extremely important that this area be kept clean. Wipe with a clean, dry piece of cheesecloth or soft cloth, then check that the disk lies flat on the valve seat, and that no residue remains from your wipe cloth.

Soldiers using the M42 mask have reported cases of losing the microphone cord. The 24th Infantry Division at Fort Stewart, Georgia, has already instituted a technique to prevent loss; however PM NBCDS has developed a procedure where the cord is routed through and behind the outlet valve cover. If the microphone connector becomes detached, the outlet valve cover will prevent the cord from becoming lost (see photo, above). Actions are being taken to include this as a permanent change to the manual.

The sizing tariff was based on the overall size of the Army and established at 30 percent large, 60 percent medium, and 10 percent small. During the fielding of specific units, the number of required medium

The proper attachment of the rubber inlet valve seat to the metal ring.

masks exceeded the 60 percent tariff quantity. Units experienced unnecessary delays and expense while the surplus smalls and larges were returned to US Army Armament, Munitions, and Chemical Command to be exchanged for the required medium masks. The PM NBCDS will work with the US Army Chemical School to determine whether there should be different tariffs for different units, based on the soldier gender mix.

Another area of concern—a master shipping box does not necessarily contain eight masks. The number of masks is controlled by a production lot, and sometimes empty boxes are included to complete the load. This should not affect the total number of masks received. This quantity will be properly identified on the master shipping document.

Some of the masks initially delivered contained loose front voicemitter retaining rings. There was an isolated period of time where some production lots were improperly torqued and leakage test equipment was out of calibration. These masks had been identified, segregated into a nonissuable code, and returned to the manufacturer under the warranty recall program.

In addition to making factory corrections, the production torque requirement was increased and the manufactures apply a second torque to the ring. However, the manual outlines a good PMCS procedure: check both voicemitter retaining rings for tightness and, if necessary, tighten by hand. This does not mean to first loosen the ring to check for tightness because the front voicemitter locking gasket could become dislocated and unusable.

As stated in the manual, the soldier can wear the canister on either side of the mask depending on whether the individual is right- or left-handed. It's important that the inlet valve seat and disk be placed on the side of the mask that will contain the canister. It's also extremely important that the rubber inlet valve seat (wagon wheel) be properly attached to the metal ring. The metal ring must nest in the groove of the rubber inlet valve seat. See photo, left. If the seat is not properly installed, the mask could either leak, fog, or both.

It must be emphasized that the drinking system of the mask was designed to be used only with water. Sodas and drinks other than water can cause the quick disconnect assembly to become inoperative, possibly through the formation of mold or sugar hardening. Such drinks, therefore, are not authorized.

The bottom line of this article is to emphasize the importance of following PMCS standards, which are reinforced by the skill level 1 Soldier's Manual of Common Tasks as well as operational procedures described in the manual. This has a direct bearing on unit NBC readiness rating.

Technical manual changes will always be made when corrections are needed and improvements identified. The M40 and M42 masks far exceed the capabilities of the M17-, M9- and M25-series masks. Any mask is a piece of life-saving equipment and must be handled with care. The M40 and M42 masks represent the best available CB protective masks in the world and through proper care and PMCS, you can ensure that the mask is ready to protect you in the event of CB usage.

LTC Randy Kennedy new Deputy Assistant Commandant—Reserve Components

I arrived in July 1993 to replace COL Jensen who leaves to become the Inspector General for the 102d ARCOM in St. Louis, Missouri. I hope to continue to provide the quality of support to the RC that COL Jensen so ably provided for four years. My previous assignment was Chemical Officer for the 90th ARCOM in San Antonio, Texas. Prior to that assignment, I was with the Directorate of Training and Doctrine here at the Chemical School. I welcome your thoughts and ideas. Feel free to contact me if I can be of assistance. My address is Commandant, US Army Chemical School, ATTN: ATZN-CM-RC, Fort McClellan, Alabama 36205. I can be reached at DSN 865-5005 or (commercial) (205) 848-5005. My FAX is DSN 865-4615 or (commercial) (205) 848-4615.

Units of 404th Chemical Brigade Assist in Flood Relief Efforts

Several times during the months of July and August, units of the 404th Chemical Brigade of the Illinois Army National Guard were activated to take part in relief efforts organized because of flooding of the Mississippi River. More than 250 soldiers belonging to the 44th Chemical Battalion and 244th and 444th Chemical Companies assisted in flood relief operations conducted in the Mississippi Valley Region.

Soldiers performed a variety of missions during the relief operations. These included conducting pumping operations to relieve pressure from the rising water, filling sandbags, providing security, conducting levee patrols to check for major water seepage, providing transportation throughout the Mississippi Valley Region, and providing potable water to areas without a clean water supply.

The primary mission of the 44th Chemical Battalion was providing command and control of Task Force Gebhardt, which had the mission to organize relief operations in the Southern Illinois Mississippi Valley Region. Relief operations for units of the 404th Chemical Brigade officially ended 20 August. The units deployed, performed their missions, and returned to their home stations without a single injury or fatality. Some individuals stayed on in a voluntary capacity to continue assistance. The soldiers that took part in the relief operations will never forget the devastation they witnessed last summer; however, they know that without their efforts, conditions would have been much worse for many citizens of the Mississippi Valley Region.

Implementation of a new Chemical Officer Advance Course (COAC)

As discussed in the January 1993 edition of *CML, Army Chemical Review*, two important changes were implemented to the RC COAC 1 October 1993. First, a two-phased course replaces the old three-phased course. The new course consists of a 120-hour correspondence phase (NBC technical subjects) and a 96-hour active duty for training (ADT) phase (NBC technical subjects) to be completed at Fort McClellan. Officers who were enrolled in the old course, but did not complete all course requirements will have to complete the new course in its entirety. Secondly, officers wishing to enroll in the COAC, who did not attend the Chemical Officer Basic Course, will have to complete the two-week ADT Chemical OAC-RC (Branch Transfer) prior to attending Phase 2 of the COAC.

451st Chemical Battalion Inactivates

Effective 15 November 1993 the 451st Chemical Battalion located in Camden, New Jersey, will be inactivated. It's always sad to report the loss of one of our chemical units; however, this is especially sad for me because I served as the S3 of the 451st Chemical Battalion during my first AGR assignment (1981-1985). The unit was first constituted on 29 June 1944 as the 26th Smoke Generator Battalion. The unit served in the Pacific Theater during World War II for which it received the Philippine Presidential Citation. The unit was reorganized and designated the 451st Chemical Smoke General Battalion on 9 August 1948. The unit was ordered to active duty during both the Korean War and the Berlin Crisis. The unit participated in Team Spirit in the Republic of Korea in 1990. The current battalion command, LTC William Clemente, hosted a dinner 9 October 1993 to honor the unit and its accomplishments.

2nd Place

Protecting the Future Force
—versatile and ready

By CPT William E. King IV

The Chemical Corps has played a vital part in our nation's defense strategy for the past 75 years. As we approach the new millennium, we are preparing to support the future force. The United States Army is in the midst of momentous changes—the structure and mission of the force is changing with global evolution.

A New Mission

In the past three years, our nation's defense policy has changed as drastically as the countries that occupy our world. No longer is the United States a Superpower concerned with merely defense and cold war deterrence. We have become the leader in the New World Order and a major part of the peace-keeping force of the United Nations. Now, not only do we find ourselves facing increasing terrorism from anti-American regimes, we also bear most of the world's burden in providing humanitarian aide to third world nations.

In light of these new responsibilities, we have judiciously examined our existing policies and doctrines. We have discerned what must change and what must remain the same. Thus, the mission of the United States Army has changed "*to protect and defend the Constitution of the United States of America. The Army does this by deterring war and, when deterrence fails, by achieving quick, decisive victory-on and off the battlefield-anywhere in the world and under virtually any conditions as part of a joint team.*"

What this means, in layman's terms, is that today's Army must be multi-faceted. This is evidenced by the addition of *versatility* to the "Tenets of Army Operations." Versatility is defined as the:

- "Ability of a unit to meet diverse mission requirements
- Capacity to be multi-functional
- Ability to operate across the full range of military operations
- Ability to perform at the tactical, operational, and strategic levels
- Ability of tactical units to adapt to different missions and tasks, some of which may not be on the unit's mission-essential task lists."

Chemical Corps Specificity

Let's examine how the Army's new mission affects the Chemical Corps. There are essentially five new elements in this mission statement:

- On the battlefield.
- Off the battlefield.
- Anywhere in the world.
- Under virtually any conditions.
- As part of a joint team.

On the Battlefield

The Chemical Corps' missions of NBC recon, decon, and smoke generation seemingly have changed little over the past several years. Although NBC recon is theoretically unchanged, the FOX recon vehicle and its associated components have greatly enhanced the method of recon. It allows the chemical soldier to locate and identify the deadly agents, with real time results, from within its protective shelter. The chemical soldier can now detect the deadliest agents, determine the amount of contamination, mark the contaminated area, and report to higher headquarters—with minimum risk of personal exposure to the agent.

In the decon arena, the DAP and the SANATOR reduce the chemical soldier's time of exposure to deadly agents as he decontaminates vehicles. It has replaced the old-fashioned mop and bucket scrub and simply is faster.

The M157 smoke generator, mounted on either the M1059 track vehicle or the M1037 HMMWV, expands the smoke mission from merely static to highly mobile. Finally, with mobility as fluid as the modern battlefield, the smoke soldier and his system have a greater chance of survival.

Unfortunately, the application of off-the-shelf technology has changed our mode of operation to such an extent that most commanders don't know how to employ our talents. In order to provide the best support, we must aggressively educate maneuver commanders about our mission capability.

In addition to standard missions, chemical units can do non-standard missions. There are many successful examples. During *Desert Storm*, the 46th Chemical Company, 2nd Chemical Battalion soldiers conducted many non-standard missions. While on the border of Iraq, they ran a brigade EPW site, conducted brigade passage point control, and functioned as the First Infantry Division's east flank security element. Today at the NTC, chemical

platoons are rear area security and reaction forces, limited convoy security patrols, area and route recon elements, and limited flank security elements.

My support of the non-standard role should not suggest that we look for ways to participate in the operation to the point that we cannot do our basic mission of chemical support, but that we don't underutilize our capabilities. We have already demonstrated that we can play a major role in the accomplishment of the commander's mission. Let's not regress into passive combat support.

Off the Battlefield

The element of "off the battlefield" has opened a wide range of operations and missions for the Chemical Corps. The essence of versatility is found in this new area termed *operations other-than-war:*

- Strikes and raids.
- Peace enforcement.
- Support to insurgency.
- Antiterrorism.
- Peacekeeping.
- Noncombatant evacuation operations (NEO).
- Counterdrug.
- Disaster relief.
- Civil support.
- Peace building.
- Nation assistance.

These will most likely be given to any unit or to a number of units who will receive little or no special training or additional assets. Hurricane Andrew relief and *Operation Restore Hope* are prime examples of other-than-war missions in which Chemical Corps units participated. Other missions that may be specifically assigned to Chemical Corps soldiers are:

- Arms control implementation.
- Treaty verification.
- Environmental protection management.
- Hazardous waste clean-up.

These types of missions simply require a chemical background. With the likelihood of a major world war diminishing, our future as a Corps depends upon our utilization in other-than-war capacities. Fortunately, we are already the leading agency for the development and implementation of standards of operation in several of these categories. Our doctrine must spell out training standards that incorporate all of these contingencies.

Anywhere in the World

This element requires us to rethink our deeply-rooted training perspective, based on defending the world from the Soviet Union's impending attack in Europe. We've already sent troops to unlikely locations around the world. In the last six years, we've deployed to Panama for *Operation Just Cause*, to Southwest Asia for *Operations Desert Shield/Desert Storm*, and to Somalia for *Operation Restore Hope*. We must keep in mind the emerging concept that units are no longer war-time aligned with geographic orientation. Small regional threats and events (that is, nation building, disaster relief, peace enforcement) will dictate our future deployments and missions.

Under Virtually Any Conditions

Much like the last element, this one requires us to know how various environmental conditions affect our equipment, our ability to support the mission, and the technique to execute the mission. We must understand how our assets will, or will not, operate in the most extreme environments.

In addition, operations in underdeveloped nations may face unusual deficiencies in resources we would take for granted in a European theater. For example, Somalia does not have enough fresh water or compatible fuels to support operations. Areas like this require additional logistical support in order for us to accomplish our mission. Each of us must learn to quickly calculate our capabilities and limitations in terms of logistics support to even the most obscure theater of operations.

As Part of a Joint Team

This last part of the Army's new mission statement implies more and more global interaction. We will fight as part of a complex team or, as in *Desert Storm*, as part of a coalition. We won't be able to plan our own operations unless we know precisely how we will interact with our sister services and allies. The Chemical School is anticipating this by conducting joint training with the Marine Corps, the Navy, and several of our allied nations. (We will soon integrate the Air Force, as well.)

Summary

As we assume our new role in world politics, we find ourselves confronted with formidable demands—change is inevitable. Many years ago, under similar circumstances, Abraham Lincoln said:

"The dogmas of the quiet past are inadequate to the stormy present. The occasion is piled high with difficulty, and we must rise with the occasion. As our case is new, so we must think anew and act anew."

For the past 75 years we have protected the fighting force. The future of the Chemical Corps promises an even more exciting and versatile challenge, but we have to prepare now. Stand ready!

At the time this article was written, CPT William E. King IV was attending the Chemical Officer Advance Course at USACMLS. CPT King's past assignments have included battalion chemical officer, 1st Bn, 3d FA, 2AD; smoke platoon leader and company executive officer, 46th Chemical Company (M)(SG); battalion S1/adjutant, 2d Chemical Battalion; and Aide-de-Camp to the Deputy Commanding General, III Corps. CPT King has completed CAS[3] Phase I, Air Assault School, and Airborne School. He holds a BS degree in chemistry from the University of Richmond in Virginia.

Lightweight Chemical Recon

—German Air Force fields new system

By LTC Jeffrey A. Adams, Liaison Officer
German NBC Defense and Self-Protection School, Sonthofen, Germany

The German Air Force has developed and is fielding a lightweight chemical reconnaissance system for employment at main operating and deployment operating bases as well as other installations. In this article, I'll cover the background of the system, its major components, the crew, training, operational capabilities and mission execution, and procurement.

Background

In 1986, with the fielding of the SPURFANZER FUCHS, the German Army finally possessed an efficient means for conducting high-speed armored NBC reconnaissance. This capability did not come cheaply. Millions of German Marks in research, development, test, and evaluation (RDTE) funds and over ten years of time were invested. However, few will dispute the fact that it was worth the cost involved to fill the gap that had existed in the Army's ability to conduct NBC reconnaissance. The importance of the capabilities afforded by a system such as the

NCOIC operating the Mobile Mass Spectrometer.

Top, soldier performing point detection with the probe. Above, soldier recovering a drop-off detector.

Army's FUCHS did not go unnoticed by the German Air Force.

Senior air force leadership recognized the need for reconnaissance in the event of NBC attack; however, thinking differed from their Army counterparts. As radiation detectors were already in place at most Air Force installations and biological detection remained an imprecise endeavor, detecting and plotting areas of chemical agent contamination were viewed as the challenges. Certainly the Army's FUCHS was a fine system and could do the job; but, it actually offered too many capabilities (at too expensive a price tag). The armored chassis was but one example of this.

The requirement for a chemical reconnaissance system for the Air Force was formalized by General Hans Eimler, then Air Force Chief of Staff, in a 1985 directive. Basically, General Eimler directed that efforts to develop the reconnaissance system focus on mass spectroscopy and not the carrier vehicle. The Air Force wanted a highly efficient as well as cost effective piece of equipment to improve its chemical reconnaissance capability. Their developmental efforts resulted in the system currently being fielded.

Major Components

The system consists of four major components: mobile mass spectrometer, passive collection device, furnished equipment, and an installation kit. The carrier vehicle is a standard German Air Force Volkswagen Transporter. As this vehicle has no overpressure system, the crew must operate at MOPP4.

The mobile mass spectrometer (MMS) is the standard version developed by the German Army for the detection and identification of chemical agents and agent mixtures and employed as part of the NBC suite of the FUCHS. Suspected chemical agents can be fed into the MMS by means of a probe, a

Above, soldier emplacing contamination marker. Right, soldier using detector wheel.

manually operated detection wheel, or the passive collection device.

The passive collection device has two components: the drop-off sampler disks and a chemical agent sampling chamber. The sampling disks are small, lightweight, and meant to be positioned at various locations on the military installation or in the area to be reconnoitered. After a suspected chemical attack, the disks are retrieved by the reconnaissance team and placed into the sampling chamber. This chamber feeds any chemical agents directly into the MMS. At the end of the mission, the sampling disks can be reconditioned and reused.

The furnished equipment consists of the communication system (intercom and FM radio), power supply unit, contamination marking set, and decontamination equipment.

Crew

The system has a crew of three: the NCOIC, the reconnaissance specialist, and the vehicle driver. The job of the NCOIC is to command the crew and operate the MMS. He is also responsible for training. The NCOIC is physically located in the cabin of the vehicle. It's interesting to note that the Air Force, unlike the Army, assigns the senior member of the crew to operate the MMS.

The reconnaissance specialist, normally a senior airman, operates the detection equipment, including the detection probe, the detection wheel, and the passive collection equipment. He also is responsible for emplacing contamination markers. The reconnaissance specialist is positioned in the cargo area of the vehicle. The driver operates the vehicle and acts as backup for the reconnaissance specialist.

As the German Air Force has no dedicated NBC Defense Corps, the chemical reconnaissance mission is conducted as an additional duty. Normally, two complete crews are trained per vehicle.

Training and Certification

The training required to produce a mission-capable crew is accomplished in four steps. First, the NCOIC receives formal instruction at the NBC Defense and Self-Protection School in Sonthofen. Areas covered include operation of the MMS, principles of NBC reconnaissance, operator-level maintenance, and principles of conducting training. The course of instruction lasts four weeks and an estimated 60 percent of the time is spent on the MMS. A certificate is awarded upon successful completion of training.

After his return to the unit, the NCOIC trains the NBC reconnais-

sance specialist and vehicle driver. This training is 40 hours and, for the most part, hands on. Reconnaissance missions integrated into the periodic NBC drills and exercises conducted in the unit sharpen team interactive skills. The final step in the process is advanced tactical training and formal evaluation at the NBC Defense and Self-Protection School. This is a week-long EXEVAL in which the ability of the personnel to function as a team in a variety of situations is evaluated.

Upon successful completion of the training and evaluation, the crew is certified as mission-capable. Upon certification, a team is deemed eligible for deployment in support of their parent unit or other deploying units.

Senior Air force personnel attending courses at the NBC Defense and Self-Protection School are given a series of short familiarization briefings in order to understand the equipment, its crew, and its importance.

Operational Capabilities and Mission Execution

With regard to chemical contamination, the Air Force Lightweight Chemical Reconnaissance System affords commanders basically the same capabilities as does FUCHS. Rapid detection and identification of chemical agents and agent mixtures are made possible. Chemical compounds not previously employed can be catalogued and stored. Also, the extent of the contamination can be determined and marked, and decisions concerning decontamination made.

Normally, a reconnaissance mission is limited to no more than six hours. If a crew member has a dismount during sampling operations, he must perform immediate decontamination before reentering the vehicle. If the vehicle becomes contaminated, both vehicle and crew must undergo decontamination.

Procurement

The systems are being delivered. The numbers purchased: 16 for the Air Force, 3 for the Navy, and 2 spares. The cost is less than 600,000DM per machine ($364,000), and they are being manufactured by the firm of Bruker-Franzen in cooperation with A. Weidelt GMBH of Bremen, Germany. The first systems are being sent to units with an actual flying mission (with an eye to the Rapid Reaction Force). Senior Air Force leadership has delayed purchasing more pending feedback from the field.

Summary

The German Air Force has developed and is fielding a lightweight chemical reconnaissance system for employment at main operating and deployment operating bases, as well as other installations. The system is lightweight, low in cost, easily deployed, and requires one less crew member than the German Army FUCHS. The Air Force believes this system will correct a problem that had previously existed at their installations—how to provide the commander with accurate and timely information on chemical contamination.

LTC Jeffrey A. Adams is the US Army Chemical School Liaison Officer to the German Army NBC Defense and Self-Protection School, Jaeger Kaserne, Sonthofen, Germany. Previous assignments include brigade chemical officer, division chemical staff officer, and commander, 86th Chemical Detachment (JA), 1st Infantry Division, Fort Riley, Kansas; staff officer at the US Army Chemical School and commander, D Company, 2d Battalion (BT), Training Brigade, Fort McClellan, Alabama; and brigade chemical officer and assistant division chemical officer, 25th Infantry Division, Schofield Barracks, Hawaii. LTC Adams is a graduate of the Ordnance officers basic course (chemical track), the chemical officers advance course, the combined arms and services staff school, the command and general staff college, and the basic and advanced German courses at the Defense Language Institute, Monterey, California. He holds bachelor and master degrees from the University of Arizona.

3rd Place

Biochemical Decon

—protecting the future force

By CPT Adam N. Stroup

We will go a long way if we lighten the load that the individual soldier carries into combat... The shift in our strategy from forward deployment to force projection creates great logistic challenges, now and in the immediate future. Technology will play a key role in meeting these challenges."

General Gordon R. Sullivan

With the United States' recent decision not to use chemical weapons, we must increase our efforts in chemical and biological defense research, new equipment fielding and training, all in an era of reduced defense spending. The threat of chemical warfare use remains significant despite the fact a majority of countries have signed the Chemical Weapons Convention Treaty.

Of great concern is the export of technology for producing chemical warfare agents from the states of the former Soviet Union to countries determined to possess weapons of mass destruction. Restructuring of the military toward a lighter, rapidly deployable force demands a reduction in our logistical burden.

Battle labs now coordinate materiel development so we can maintain our technological edge. I would like to focus on the current research efforts toward producing a safer, lightweight, biochemical decontaminant to meet the challenges of protecting the future force.

Decontaminant Research and Development

Any new decontaminant must significantly improve the currently fielded decontaminant, DS2, particularly in the areas of toxicity, flammability, and corrosiveness.

FM 3-5 lists these safety precautions when working with DS2:

"Use extreme caution at all times when handling DS2. Do not allow DS2 to spray on personnel or protective clothing. DS2 is a combustible solution. Severe chemical burns can result if personnel fail to observe all safety precautions. DS2 can severely injure eyes and skin and, if inhaled, can cause illness. DS2 can damage the NBC protective overgarment. Long-term contact with DS2 (about 24 hours) can damage the NBC protective gloves, hood, and overboots."

Decontaminating agent, multipurpose (DAM), is a product in research and development that has lower toxicity compared to DS2, but is quite similar to DS2 in other aspects. DAM does not significantly improve upon our capabilities to warrant replacing DS2.

A more technologically advanced area of decon research being conducted in DOD laboratories is biochemical decon. The goal of this research is to use state-of-the-art biotechnology to find, characterize, improve, and produce a superior product. Enzymes, which are naturally-occurring proteins, are the key component of a biochemical decontaminant. They are lightweight, noncaustic, nonhazardous, and act as catalysts. A small amount of enzyme will go a long way!

Historical Perspective

In 1946, Mazur discovered the first enzyme that detoxified nerve agents. Unlike acetylcholinesterase (the target of nerve agents) which reacts with one nerve agent molecule, Mazur's enzyme catalyzes the destruction of many times its own weight of nerve agent. Others have described similar enzymes, called organophosphorus acid (OPA) anhydrolases (formerly sarinases or somanases), from numerous sources, including enzymes from bacteria, protozoa, squid, and mammals. To date, no one has identified the biological role of this class of enzymes.

Doctrinal Advantages

Advantages of an enzyme-based decontaminant include its lightweight solid composition that any soldier dilutes on site with any available water (fresh or salt). The enzyme preparation, packaged in various sizes to be compatible for use with all types of currently fielded decon apparatuses, would replace the standard decontaminants, DS2, and STB. It would require no new equipment fielding or extensive soldier training.

Particularly advantageous is the absence of adverse effects on the soldier, his equipment, and the environment. The biochemical decontaminant could be used on contaminated casualties or mortuary remains. Currently, decon procedures do not allow DS2 to be used on road wheels or tires, parts very likely to contact chemical agent. No such restrictions would be necessary for an enzyme-based decontaminant.

Aircraft decontamination would be greatly improved since the noncaustic enzyme preparation would not harm optics or the airframes, and for the first time effectively detoxify the chemical agent. The enzyme-based decontaminants would also have little or no disposal costs and may be used

in training without special precautions, possibly with a simulant that gives a color change upon "dexotification."

Nerve Agent Detoxification.

Enzymes have been found that detoxify G-type nerve agents; recently an enzyme was shown to detoxify VX by breaking its phosphorus-sulfur bond. It's important to understand that the enzymes work as catalysts—one enzyme molecule detoxifies thousands of molecules of nerve agent per minute under mild conditions. With recent advances in molecular biology, it has become possible to clone the DNA encoding the enzyme and thus produce bulk quantities of promising OPA anhydrolases for an advanced decontaminant.

With the cloned DNA, it's also possible to improve upon nature and produce an enzyme that, for example, combines the heat stability of thermophilic (heat-loving) enzymes with an active site from a halophilic (salt-loving) enzyme that detoxifies GA, GB, GD, and GF. In addition to decon applications, enzymes could be used for demilitarization of stockpiled nerve agents under mild conditions without the need for an incinerator.

Mustard Decontamination

Enzymatic decontamination of sulfur mustard is problematic since mustard is extremely insoluble in water, and enzymes normally need water to work. Mustard will rapidly hydrolyze to the nontoxic thiodiglycol (TDG) under basic conditions. Often the limitation of this reaction is mixing or scrubbing to obtain good contact between mustard and water. The organic components of DS2 (which are the toxic components of DS2) greatly enhance the solubilization and subsequent alkaline hydrolysis of mustard to TDG.

Two recent developments may provide researchers tools for enzymatic mustard decon. The first is the production of an antibody that binds sulfur mustard. As described above, researchers can manipulate the DNA encoding the antibody gene to engineer the capacity to detoxify mustard. A catalytic antibody, termed an *abzyme*, could facilitate mustard destruction, even when mixed with nerve agent enzyme decontaminant.

The second development is the isolation of microbes that use TDG for food. While this research focused on microbial demilitarization of stockpiled mustard, the enzymes from this microorganism could be isolated for mustard decontamination in the field.

In a related area, oil companies use biosurfactants (biologically produced molecules that act as efficient detergents), to solubilize heavy crude oil to clean up oil spills. Biosurfactants may help solubilize mustard or thickened agent (allowing aqueous mustard detoxification) and, like enzymes, are nontoxic and nonhazardous. Thus, recent advances indicate good alternatives to use of DS2 for decontamination of mustard.

Smart Materials

The stability of enzymes can be greatly enhanced by placing them within a porous matrix. Novel uses for these materials include the production of extremely long-lasting chemical protective suits or equipment covers. In effect the material becomes self-decontaminating by impregnating the fabric with the biochemical decontaminant.

The recently fielded M291 skin decon kit uses an absorbent material to remove agent. Incorporation of enzyme within this matrix would allow the detoxification of the used wipe and eliminate any subsequent exposures to troops or the environment. In addition, enzymes such as the OPA anhydrolases may prove useful as an injectable prophylaxis (antidote) for soldiers exposed to nerve agent.

Conclusions

I've shown many advantages for the fielding of an enzyme-based biochemical decontaminant. While researchers need to address many remaining problems, the importance of this advanced, lightweight, nonoxic decontaminant warrants increased efforts to field a product in the near future.

The early entry, lethality, and survivability battle lab at Fort Monroe, Virginia, has the modernization objective of protecting the force. All of the battle labs need to recognize the importance of a biochemical decontaminant for protecting a future, high-tech force. They must ensure that the science and technology community can field an advanced decontaminant even with reductions in personnel and funding occurring in the DOD work force and laboratories.

The resolve to perfect an enzyme-based decontaminant will result in a greatly enhanced ability of all our forces to defend against chemical attack. We can reduce the logistical burden of carrying bulky decontaminants and reduce risk to soldiers and the environment before and after use of chemical weapons.

CPT Stroup's references available upon request.—Editor

At the time this article was written, CPT Adam Stroup was attending the Chemical Officer Advanced Course at the US Army Chemical School. CPT Stroup holds a BS from Bloomsburg University in Pennsylvania, majoring in biology and chemistry. He completed his MS degree in biochemistry from the University of Delaware. In 1989 he received his PhD in biochemistry from the University of Texas Southwestern Medical Center in Dallas. Following graduation from the Chemical Officer Basic Course, CPT Stroup served as squadron chemical officer, 5/17 Cavalry Squadron, 2d Infantry Division, Republic of Korea. In 1991, he was assigned to the Chemical Research, Development, and Engineering Center, Aberdeen Proving Ground, Maryland, where his jobs have included chemical training officer, Provost Marshal Division, and research biochemist, Biotechnology Division.

Countermeasures Integration

By MAJ Robert C. Neumann
US Army Chemical School
and
MAJ Mark T. Anderson
US Army Reserve

Obscurants, camouflage, concealment, deception and electronic warfare are traditionally viewed as separate countermeasures to threat reconnaissance, surveillance, target acquisition (RSTA) and munitions guidance. Each countermeasure has separate agencies developing requirements and conducting research and materiel development.

Here we will define camouflage, concealment, and deception (CCD), explain why CCD is important, discuss the environment of combat and the need for an umbrella concept, describe the components of the system and anticipated benefits. Finally, we will generate ideas to help chart the way ahead.

What Are Countermeasures?

Countermeasures to Threat RSTA efforts include obscurants, directed energy weapons and jammers, signature alteration methods, and decoys or other means of deception. Joint Chiefs of Staff Publication 1 does not define CCD as a system. Therefore, we will define CCD as "The concept of employing camouflage, concealment, deception, obscurants, and electronic warfare in combination to diminish the enemy's ability to detect, identify, and destroy forces and assist in the manipulation of enemy decision making."

In plains words, CCD measures help to protect the force by enhancing individual system and unit survivability. In addition, CCD measures enhance maneuver by limiting the enemy's ability to acquire and engage the force.

In general, CCD measures disrupt enemy RSTA efforts by:

- Altering Signatures (masking hot spots, camouflage, radar scattering netting, for example).
- Deceiving the enemy to force intent or manipulating the enemy's perception of reality (with decoys or tactical through strategic deception).
- Obscuring.
- Jamming or using directed energy weapons for "direct attack" of sensors.

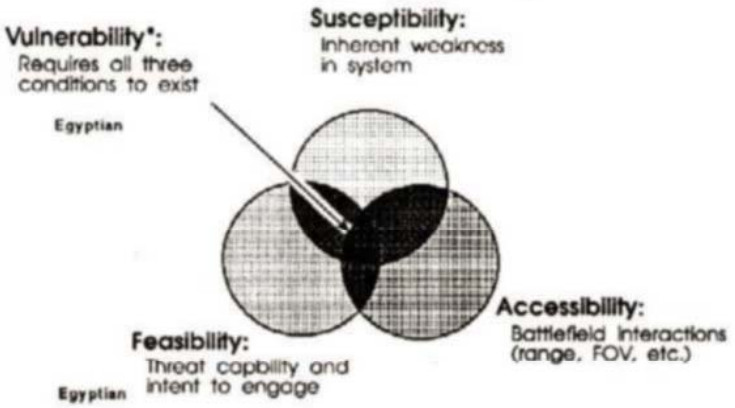
As shown in the figure below, for CCD measures to work, threat sensors must be susceptible to the countermeasure, accessible to the countermeasure (in range of smoke delivery systems, for example) and the threat must be attempting to acquire and engage. These conditions create vulnerability to the CCD measure[1].

Countermeasures Integration

We will not attempt to explain how the components function independently or in combination. Instead, we make the following assumptions:

- CCD measures, used independently, will help to disrupt enemy RSTA efforts.
- There is a synergistic effect of two or more CCD measures, which provides greater protection than the sum of the individual parts.

We make the assumption that there is more value added by countermeasure integration without making the case for the values added. This appears to be self-serving on the surface, but is not in fact, and should become apparent as you read on.



* EW vulnerability includes a fourth circle - Interceptability

Why is CCD Important?

You only have to look at the devastation the Coalition Forces inflicted on Iraq in the 1990-1991 Persian Gulf War to understand the importance of CCD. From the 85 percent accuracy of the cruise missile to the F-117A fighter, smart weapons and new technologies helped destroy the Iraqi war machine. The Central Command deception plan was also brilliant, and surely saved thousands of lives by tying down Iraqi forces with a threatened amphibious assault landing and moving two corps 500 miles after Iraqi surveillance was neutralized.

According to FM 100-5, *Operations*, the dynamics of combat power decide the outcome of campaigns, major operations, battles and engagements. Combat power is the ability to fight. It measures the effect created by combining maneuver, firepower, protection and leadership in combat actions against an enemy in war[2]. Camouflage, concealment, and deception are fundamental to protecting the force and, therefore, are fundamental to preserving combat power[3].

CCD measures, used independently, will help to disrupt enemy RSTA efforts. Individual components of CCD have over half a century of research and use in combat to back this assertion. There is also a synergistic effect of two or more CCD measures, which provides greater protection than the sum of the individual parts.

For example, smoke and obscurants provide a tangible increase in force protection and survivability. The following vignette illustrates smoke use that saved hundreds of lives in one critical operation.

1973 Arab-Israeli War

Prior to the attack on the Bar Lev forts in October 1973, the Egyptian government had engaged in a highly effective deception plan. The Israelis believed that the Egyptians would attack in May 1973, but the Egyptians delayed the attack to permit the Syrian and Jordanian armies to prepare and to confuse the Israelis. Ramadan, the Moslem high holy days, began in mid-September, and the Israelis did not expect an attack during this period. In early October, Egyptian President Sadat dispatched official peace envoys and completed the deception with a movement of forces to the Suez that coincided with annual maneuvers to the area[4].

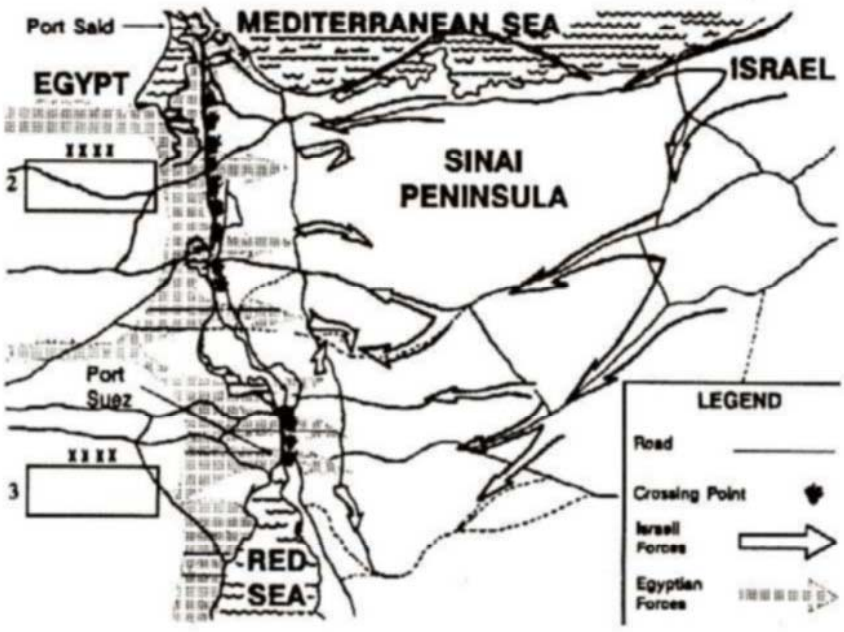
On 6 October 1973, at 1400, Egyptian forces attacked prepared Israeli positions defending the west bank of the Suez Canal. The Egyptians initiated the attack by deploying 200 attack aircraft into the Sinai to destroy Israeli communications centers, airstrips, and artillery positions.

Within moments, Egyptian artillery opened up with a massive barrage of high-explosive munitions and blinding smoke. The Egyptians intended to degrade the ability of the Israelis to engage targets and adjust artillery fire with that blinding smoke, which induced a feeling of total isolation among defending Israeli units. The fear caused by the addition of yellow smoke to the artillery preparation amplified the psychological effects of isolation (the Israelis believed they were being gassed).

Minutes later Egyptian armored and artillery assets began to deploy forward to firing positions on their side of the canal. These units engaged the Bar-Lev strongpoints with direct fire while infantry units conducted a forced crossing in dinghies under the cover of canister-generated smoke[5].

Airmobile operations placed commando units ten miles into the rear to disrupt reinforcing echelons. Egyptian engineer units emplaced bridges over the canal. Smoke from artillery, canister, and smoke generator assets supported the engineer effort.

Synchronized artillery high explosive and smoke fires for 15 minutes before the operation commenced, which continued until the crossing sites were secured. The infantry forces crossing the canal used



canister smoke to conceal their movements as well. This was a synchronized deception smoke operation lasting less than 6 hours.

CCD measures used in this operation included strategic and operational deception, decoy bridges, smoke synchronized with the forced crossing and subsequent storming of the Bar Lev forts, and concealed positioning of forces, particularly tanks, artillery pieces, and bridging equipment. It is one of the best examples of countermeasures integration at all levels of war: strategic, operational, and tactical.

These actions demonstrated the tremendous impact of CCD measures, particularly smoke and obscurants, when synchronized with a combined arms assault. Within the first 24 hours of the attack, the Egyptians moved five divisions, 100,000 men, 1,020 tanks, and 13,500 vehicles across the canal and established a bridgehead nearly fifty miles into the Sinai. The Egyptian losses were 208 killed and 50 tanks lost. Israeli forces lost 150 tanks, almost one-tenth of their total in the Sinai. The blinding smoke placed on the Bar-Lev strongpoints effectively reduced the Israeli ability to acquire targets and spot for artillery/aircraft[6].

We can conclude from this and other examples and testing that there are *operational* advantages to developing an umbrella concept for CCD, and the synergies from countermeasures integration result from how we fight rather than sterile test results.

The Anticipated Benefit of Synergy

In electro-optical warfare, the enemy is the electro-magnetic spectrum. Individual counter-measures, by their very nature, are limited to functioning against sensors that operate in a particular portion of the electro-magnetic spectrum. Unless we can alter the laws of physics, no single CCD measure works against all types of sensors. That said, the fact that two or more counter- measures may provide effective coverage of the entire spectrum is the essence of our case. The figure on page 36 illustrates the effective spectral regions of some common countermeasures.

While the individual countermeasures cannot provide full spectrum coverage, combining countermeasures may. For example, if your aim is to disrupt acquisition and tracking, you can use fog oil smoke combined with a heated plate decoy and you may achieve full spectrum protection. Obviously, the measure of success will be if you win the engagement, and your loss-exchange ratio goes down.

This is, in fact, how we fight. Divisional intelligence and electronic warfare, chemical, and engineer assets use jammers, smoke, decoys, earth moving, and other equipment and techniques to manipulate how the enemy sees the battlefield. Psychological operations (PSYOP) units deceive the enemy to our intent. Yet there is no doctrine to comprehensively manage this activity.

You cannot assume, however, that it is possible for these separate systems to just work out on their own. Historical evidence has shown that not all countermeasures are compatible. For example, fog oil smoke is an outstanding obscurant, and fire pots work well to alter signatures and confuse the enemy. However, fire pots in smoke tend to change the background for reflectivity, and betray the object (e.g., troops in the open maneuvering down streets in built-up areas) hiding in the smoke.

The Environment of Combat

The Army's AirLand Battle doctrine has given way to a power projection, regional conflict doctrine. The Army today must be capable of deploying anywhere with sufficient combat power to defeat a regional enemy. As the proliferation of high technology weapons and sensor systems around the globe increase, it is likely that the Army will face these systems in military operations. These systems will make any operation more difficult, and, therefore, require detailed planning. The need for accurate intelligence information on the types of weapons and electro-optical devices and sensors is critical.

The need for protecting the force during early entry dictates the need for countermeasures. During forcible entry operations the commander must balance the risk of protecting the force against decreasing his combat power. The composition of his countermeasure operations must be dictated by the threat. Lightweight, easily deployable countermeasures can increase the survivability of the force.

Why We Need an Umbrella Concept

The countermeasures and survivability community includes members from the TRADOC, AMC, and Intelligence communities. These agencies feed information on the requirements, technical support and integration, assessments and evaluations into the program executive officers or project managers for the individual smart weapons, survivability, and other systems.

In the concept-based requirements system, concepts are supposed to drive the requirements, which drive the development process. It is this linkage that is broken, because the individual combat developers, by the very nature of the system, do not develop countermeasures based on their interrelationships with survivability as a whole.

In the past four years there have been several attempts to form a CCD umbrella concept or establish an agency responsible for integrating requirements. The efforts have failed due to turf wars over proponency and resourcing. The most recent plan was to establish an integrating office at the Combined Arms Command, which would strip personnel authorizations out of the proponent schools to

which would strip personnel authorizations out of the proponent schools to establish the office; the plan failed because the integrator would still be under resourced, and would have to task actions back to the schools from which they had just taken the bodies.

Nevertheless, we still believe a single integrator, resourced to develop concepts and requirements, is preferable to the fragmented process as it stands. The integrator should be free from parochial influences and be able to look across the depth and breadth of the battlefield. We make no recommendations, but note that some CCD testing is being done by a joint office under the Office of the Secretary of Defense. As resources become more austere, there are probably inherent savings in Joint Service coordination on requirements, testing, and management.

So What Does the Countermeasures "Community" Actually Know?

Countermeasures themselves have undergone years of robust testing. The first major experiments with camouflage for soldiers and equipment was during World War I in Britain. Smoke and obscurants have undergone exhaustive testing and modeling since World War I, and have been used effectively in World War II, Korea, Vietnam, and the 1973 Arab-Israeli War. The values of the individual countermeasures are generally well known; how they work together is not.

Little work has been done to quantify the effectiveness of CCD equipment and techniques against multi-spectral engagement. On 10 October 1991, the Office of the Secretary of Defense chartered the Joint CCD Joint Test Force, located at Vicksburg, Mississippi. A proponent concern is that there is not a chemical officer assigned to the Joint Test Force, although smoke and obscurants are playing a big role in the research. Nevertheless, the staff there is very talented, and we expect the Joint CCD Test Force to develop valuable information on the synergistic effects of current generation countermeasures over the next 1-5 years. This information will provide an excellent basis for developing requirements for protecting the force at the turn of the century.

Another missing piece of the puzzle is a thoroughly packaged electro-optical threat. There is now proliferation of high technology sensors not seen before the mid 1980s. Brazil, India, and South Africa all make and export good thermal imagery equipment. The old-time arms manufacturing nations of the US, Western Europe, China, and the Commonwealth of Independent States have stepped up weapons and technology sales to developing nations. In short, it is becoming more difficult to predict who has what, and in what quantities.

The Way Ahead

We have laid out the requirement for a unified CCD/or electro-optical warfare concept. This program needs centralized management and needs to integrate requirements into a comprehensive plan, perhaps at the Joint level.

The obstacles to this are formidable. The absence of a (packaged) electro-optical threat makes it difficult to tailor countermeasure response—in short, a true multi-spectral capability is necessary. The absence of a single proponent or integrator seriously fragments concepts, doctrine, and requirements development, yet the demands for "bill-payers" to create an integration office are tough to overcome, particularly since decreasing resources tend to make proponents increasingly parochial.

If this article does nothing more than raise awareness and create some interaction, we will have met our aim. There is no question that countermeasures integration is the way we fight today, even if we fail to recognize it in our doctrine and materiel developments.

Endnotes

1. Staff, "Countermeasures Effects on Smart Weapon Sensors," Dynetics Corporation (under contract to the Smart Weapons Management Office), Huntsville, Alabama, 30 June 1991.

2. Field Manual 100-5, Operations, June 1993, Pg 2-10.

3. Field Manual 100-5, Operations, June 1993, pp. 2-10 through 2-11.

4. O'Ballance, Edgar, "No Victor, No Vanquished: The Yom Kippur War," Presidio Press, San Rafael, California, 1978, pp. 42-47.

5. O'Ballance, Edgar, "No Victor, No Vanquished: The Yom Kippur War," Presidio Press, San Rafael, California, 1978, pp. 69-84.

6. Field Manual 3-50, Smoke Operations, December 1990, pg. 28.

MAJ Robert C. Neumann is Chief, Doctrine Development Division, Directorate of Training and Doctrine, USACMLS. MAJ Neumann's previous assignments include observer/controller at the National Training Center, battalion and brigade chemical officer, chemical company commander, and assistant division chemical officer. MAJ Neumann is a graduate of the Army Management Staff College. He is a graduate of Norwich University and holds a BS in chemistry.

Mark Anderson is a major in the Individual Ready Reserve, and works as an NBC Defense Specialist for ARC Professional Services Group, Anniston, Alabama. He enlisted as a medical corpsman in 1979 and received his commission in 1981. MAJ Anderson has served as platoon leader, both as the XO and commander of an NBC element, brigade chemical officer, senior platoon trainer, smoke instructor, and doctrine writer. He was also the chief of the Contaminated Human Remains mobile training team during the 1990-91 Gulf War.

Chemical Corps Hall of Fame and Distinguished Members of the Chemical Corps

By Daniel E. Spector, Chemical Corps Historian

Major General Robert D. Orton, Chief of Chemical, U.S. Army, has approved the 1993 selections for the Chemical Corps Hall of Fame and Distinguished Members of the Chemical Corps programs. Major General (Retired) David W. Einsel, Mrs. Elsie Fisher, Colonel Garland M. White, and Lieutenant Colonel Edwin M. Chance will be inducted into the Hall of Fame at the Chemical School Honors Day Ceremonies on 15 October 1993. At the same time Brigadier General (Retired) David A. Nydam and Mr. Thomas R. Dashiell will become Distinguished Members of the Chemical Corps.

General Einsel devoted over 40 years of service to the nation. During this time he held numerous key positions where he had a great impact on all aspects of the nation's NBC offensive and defensive capabilities. He concluded his active duty service as Deputy Assistant to the Secretary of Defense from 1980 to 1985. He then served from 1985 to 1989 as National Intelligence Officer at Large with the Central Intelligence Agency, studying the proliferation of chemical and nuclear weapons. Since 1989 he has served as a consultant to the Director of Central Intelligence and a number of firms on worldwide nuclear, chemical, and biological matters. General Einsel and his wife, Elva, reside in Tiffin, Ohio.

Mrs. Fisher began her service with the Army at the lowest civilian grade shortly before the beginning of World War II. Early in her career she moved to the office of the Chief of the Chemical Warfare Service where she served as a key administrative staff member through many successive reorganizations and renamings until her retirement in 1987 as a GS-9. By the mid 1960s she had become the senior administrative member on the staff of the senior Chemical Officer at Headquarters, Department of the Army. Mrs. Fisher was a superb trainer of the Chemical Officers who served in the Pentagon, many of whom later reached general officer rank, often attributing their success to her influence. She became the "institutional memory" of the organization, preserving key records through reorganizations and attempts to abolish the Corps. These, plus her memories of what had happened were invaluable to the revitalization of the Corps in the late 1970s and 1980s.

Colonel White, now deceased, began his military service as an enlisted man in the National Guard in 1913, receiving his commission as a second lieutenant in 1924. He became the Chemical Officer of the 45th Infantry Division in 1940 and formally transferred to the Chemical Warfare Service in 1942. In February 1945 he assumed command of the new Guard and Security Division established to manage disposal of chemical agents. At the end of the war Colonel White convinced the Army that his organization would be ideal for dealing with captured German chemical agents. As there was no existing emergency medical kit for exposure to nerve agents, Colonel White and an Army medical officer developed the first nerve agent first aid kit to use atropine. In 1947 the Guard and Security Detachment was redesignated the Technical Escort Detachment with Colonel White remaining the commander. Under his direction the unit experimented with various methods of handling all types of chemical munitions and developed several special tools for this purpose. The hundreds of officers and enlisted men he trained provided the Army with the vital special skills necessary for transport and disposal of chemical agents.

Lieutenant Colonel Edwin M. Chance received his Bachelor of Science degree in chemistry from the University of Pennsylvania in 1907 and was a natural candidate for the Chemical Warfare Service when it was established during World War I. He began his military career as a lieutenant colonel, reporting on

9 August 1917 for duty at Edgewood Arsenal, Maryland. His first task was to construct the first toxic gas filling plant in the United States. After reviewing French plans for a similar plant, he determined that both were inefficient and unsafe. Using technology from the American bottling industry, Colonel Chance then developed plans that became the standard for filling toxic gas shells at Edgewood Arsenal. He later played a key role in establishing the toxic gas production plant at Edgewood, firmly believing that it would be more efficient to have such a plant near the filling facility rather than at private industrial sites. In addition to his considerable contributions in production and operations, Colonel Chance also ordered establishment of the first chemical research laboratory at Edgewood arsenal. This laboratory was designed to support control, inspection, production, and technical research at the Arsenal rather than the basic research and development being done at American University. After the war, Colonel Chance had a long and distinguished career in private industry. He died on 26 November 1954.

General Nydam began his military career with an ROTC commission in the Chemical Corps in 1958. He served in a wide variety of key positions which included command of the Radford Army Ammunition Plant, Radford, Virginia; Chief of the Nuclear and Chemical Division, Office of the Deputy Chief of Staff for Operations, U.S. Army Europe; command of Dugway Proving Ground, Utah; Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Maryland; and command of the Chemical Research, Development and Engineering Center, Aberdeen Proving Ground, Maryland. General Nydam's numerous major contributions included refining and implementing a $325,000,000 modernization plan at Dugway. His distinguished service with the chemical demilitarization program included responsibility for disposal of a wide variety of chemical agents and munitions. During this period he received the U.S. Public Health Service Award of Honor for his work with the Centers for Disease Control at Atlanta, Georgia. Since retiring in 1991, General Nydam has served as a consultant. He now resides at Salt lake City, Utah.

Mr. Dashiell, who now resides in Frederick, Maryland, has bachelor of science degrees in both chemical engineering and biological sciences. His long association with the Chemical Corps included twenty years as a project engineer, staff chemical engineer, and laboratory supervisor at Fort Detrick, Maryland, where he worked on critical projects in process engineering and environmental work related to the Chemical Corps biological program. From 1972 to 1986 he was a Staff Specialist for Chemical Technology with the Office of the Secretary of Defense, representing the Secretary on chemical warfare and defense programs that increased from $30,000,000 to $300,000,000 during this time. He concluded his service with the military as Director of Environmental and Life Sciences, Office of the Secretary of Defense. He provided critical policy guidance and program direction in a wide variety of chemical and biological programs, managing a directorate budget of $1,400,000,000.

The Chemical Corps Hall of Fame consists of former members of the Chemical Corps community who have made significant contributions to the Chemical Corps. This year's inductees will bring the number of people so honored to twenty-two. Previous Hall of Fame selectees have included such Chemical Corps heroes as Major General William L. Sibert, first Chief of the Chemical Warfare Service; Colonel Lewis McBride, father of the 4.2 inch chemical mortar; and Mr. Ed Bradley, a distinguished radiological sciences instructor at the Chemical School.

The Distinguished Members of the Chemical Corps program honors former Chemical Corps personnel who have made significant contributions to the Corps and are willing to serve as spokesmen for the Chief of Chemical. The 1993 class of Distinguished Members will bring the total number of spokesmen to fourteen. Previous selections for this program have included Colonel (Retired) Walton Phillips, former Assistant Commandant of the Chemical School who directed the reestablishment of the school and its move to Fort McClellan; and Command Sergeant Major (Retired) George Murray, an NCO who served with the Corps from World War II to the Vietnam era and who still volunteers his services full time in the Chemical Corps Museum.

Selections for these programs were made by a board appointed by the Chief of Chemical and chaired by Brigadier George E. Friel, Commanding General, U.S. Army Chemical and Biological Defense Agency. Other members of the board included two active duty chemical colonels, a reserve chemical colonel, the Chemical Corps Command Sergeant Major, and an active duty chemical lieutenant colonel. The board met at Edgewood Arsenal, Maryland, on 19 July 1993 to review forty nominations for the Hall of Fame and seventeen for the Distinguished Members of the Chemical Corps program. The Chief of Chemical approved the board's recommendations on 28 July.

Directorate of Evaluation and Standardization

Director	DSN 865-5968
Ch, Eval & Standardization	DSN 865-3787
Ch, Anal & Technical Support	DSN 865-3480

Do you have a question concerning the Chemical Corps? What does doctrine say about the role of weapons of mass destruction in AirLand operations? What training material is available for a Reserve Component NBC recon unit? Are there any organizational changes pending for dual-purpose units? How are we coming on fielding the M40 mask? Which pre-command courses include toxic agent training? For these and other issues you could call your buddy at the Chemical School, but what if you don't know anyone?

One function of the Directorate of Evaluation and Standardization (DOES) is to provide a HOTLINE service to answer or direct your inquiries. A call to DSN 865-5592 or (205) 848-5592 will get an NCO or an answering machine. In any case our goal is to get a response back to you in three working days.

The DOES is the smallest (two officers, five NCOs, ten civilians) directorate in the US Army Chemical School (USACMLS), but has one of widest ranging missions. The DOES manages a number of interrelated functions.

Evaluation consists of feedback, analysis, and reporting systems used to determine whether course graduates are capable of performing their duty tasks and whether unit performance is maximized through TRADOC interaction in the areas of doctrine, organization, training, force modernization ,and leader development. The training system is designed to adapt to changes in the Army environment. Evaluation is an integral part of training both the soldier and the unit. The changes in our operational environment have resulted in the downsizing of forces, moving from forward deployment to forward presence, and a more deployable, lethal, and versatile force.

This changing environment puts significant demands on the evaluation efforts of the USACMLS to determine the quality of training and doctrine needed, as well as the organizations, materiel systems, and leaders required to meet these challenges. We must meet the needs of a power projection Army, in a Post-cold war environment.

External and internal evaluation are key elements in providing quality assurance to analysis, design, development and implementation, particularly in assuring that resident and nonresident training satisfied the student requirements and meets the needs of the field. External evaluations of our proponent functional areas provide objective, specific feedback on the quality and capability of USACMLS graduates, doctrinal sufficiency, adequacy of training support materials, adequacy of individual and unit items of equipment, and the ability of officers and NCOs to perform competently in the units as both "doers" and leaders.

As a primary tool of external evaluation, the Branch Liaison Team (BLT) examines battlefield management, retaliation, NBC defense, smoke, and flame integration, provides units with information from school subject matter experts (SME), and obtains feedback from operational units. As funding precludes BLT visits in FY 94, we'll use electronic means to enhance visits by the school leadership, (for example, the Commandant and Command Sergeant Major) to identify and resolve issues. The internal evaluation focus includes: the adequacy of training and doctrine, the incorporation of field input, the use of instructors as subject matter experts to write and teach doctrine, the integration of FM 25-100 and FM 25-101 philosophy and that current doctrine is both taught from the platform and included in all training materials.

Evaluations identify whether the USACMLS is on the right track in achieving TRADOC and Army goals, and where changes need to be made. Objective, specific feedback is obtained, analyzed, and used to substantiate decisions or make changes in institutional training, doctrine, or training support. Evaluations also identify performance deficiencies. The difference between the results training should have produced and what actually occurred is isolated and analyzed.

Deficiencies that require a training fix are cycled into our systems approach to training process. Deficiencies that are created by doctrinal or system problems are referred to combat development or doctrine writers for fixing. Internal evaluations examine, in a systemic and orderly fashion, the quality of training and the resulting training products. It ensures that training products, as well as training, reflect what

is required of a soldier and a unit to do the mission.

Standardization is the process of checking all USACMLS products to ensure current policies and procedures are presented in a nonconflicting manner and IAW AirLand battle doctrine or the emerging AirLand operations concepts. Standardization assessments focus on the process and procedures used to develop products, as well as the implementation of the Standardized NBC Training Strategy.

Other functions include the Accreditation of affiliated Reserve Component Training Institutions; the conduct of Training Effective Analysis in support of developing systems; and the management of the Combined Arms in a Nuclear/ Chemical Environment (CANE) Implementation Program (CIP).

Directorate of Combat Developments

Director	DSN 865-6476
Ch, Concepts & Studies Div	DSN 865-6572
Ch, Material Logistics Sys Div	DSN 865-4987
Ch, Test & Evaluation Div	DSN 865-6554

During *Operation Desert Shield*, the Chemical School was flooded with requests from data from field units as well as DOD analytical agencies—requests for data published in reams of technical reports; published in formats that make your head spin and your eyes water; published by researchers for other scientists and analysts.

Since the majority of you are not current in your hard sciences—I majored in economics—scientific reports are not likely the right medium for you.

Instead you need *information*—processed, cleaned up, and formatted for human consumption. You need information that is pertinent to your unit, your mission, your situation, information you can use to keep your soldiers alive.

The Chemical Biological Operational Support System (C/BOSS) gives you just that: Information you need, in the format you need.

The two main features of C/BOSS are:

- An automated 1.3 gigabyte database of operational NBC data.
- A friendly analyst to run this data base and be a human interface for you.

This way, you don't have to know which test report you need—Combined Arms in a Nuclear/Chemical Environment (CANE) I, IIA, or IIB. You don't have to know that the data base resides on a SUN SPARC station 2 running ORACLE RDBMS under Unix at the Chemical School.

All you need to know is one simple phone number—DSN 865-6455—and a name—Uwe Stutz. (You don't even have to know how to pronounce that name.) This phone number gives you easy access—no red tape or paperwork—to all the NBC operational test data ever accumulated by the Chemical School. Currently, the core of C/BOSS is mission performance data from the CANE, P2NBC2, and DO49 test programs. But, as C/BOSS grows, it will include other sources and types of data.

In the meantime, if the required data does not reside on the computer, we won't stop there. We continue to search other sources (published reports, for example) as necessary to answer your questions and update C/BOSS in the process.

You decide the final content of C/BOSS. Your requests and demands for C/BOSS data will shape the growth of the system.

The C/BOSS mission is answers—for operations and studies. So, call us whether you need raw data for analysis, evaluated data for a specific application (computer model), or information for an operations plan.

C/BOSS is your tool. Take advantage of it!

C/BOSS mailing address:

Commandant
USACMLS
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Directorate of Training

Director	DSN 865-4522
Ch, Training Support Division	DSN 865-5854
Ch, Training Division	DSN 865-5962
Ch, Automated Training Division	DSN 865-5832
Ch, Chemical Defense Tng Facility	DSN 865-3786

The Directorate of Training (DOT) has reorganized and is now composed of four divisions: Training Division (TD), Automated Training Division (ATD), Chemical Defense Training Facility (CDTF), and the Training Support Division (TSD).

The Automated Training Division is the newest division in DOT. Its two branches are responsible for computer literacy training and battle simulation. The Computer Training Branch provides introductory instruction for DOS, word processing, spreadsheet, database, graphics, and the Automated NBC Information System (ANBACIS). The purpose of this training is not to produce experts. We expect officers and NCOs graduating from the Chemical School to become knowledgeable enough about computer applications, in general, to learn and use whatever software they happen to find in their units.

The Battle Simulation Branch uses the Brigade/Battalion Battle Simulation system (BBS) in the Dragon Warfighter Center to train officers and NCOs in staff coordination and NBC battle management. In addition, they receive training on the Maneuver Control System (MCS). The Training Division has been working in conjunction with ATD to integrate use of BBS into the Chemical Officer Advanced Course. Currently, we have developed two exercises: a 7-day defensive operations CPX and a 4-day chemical operations CPX. During the next 6 months we expect to integrate use of the BBS into Chemical Officer Basic Course and Advanced NCO Course. Beginning in November, the Basic NCO Course will use the Dragon Warfighter Center for its MAPEXs using the MCS.

The Chemical Defense Training Facility continues to implement new ideas to improve operations and training at the site. In May 1993 the CDTF brought the autoclave process on line for the reutilization of BDOs. The autoclave, a chamber built in-line with the CDTF incinerator, treats BDOs under temperature and pressure conditions designed to hygienically clean the BDO with no significant degradation in protective capability. In the past, the BDOs were used once and then destroyed. Autoclave technology allows the BDOs to be used up to 4 times for toxic training before incineration, producing significant savings for the Chemical School.

The CDTF is taking the lead in designing toxic training courses to meet user-specific requirements. The Chemical Weapons Convention (CWC) is a multi-national treaty designed to prohibit the use and production of chemical weapons. In preparation for the implementation of the treaty, training programs are being designed to educate personnel in the duties involved in enforcing the provisions of the treaty. A pilot program conducted a phase of the training at Fort McClellan in July 1992. Part of the course involved toxic training at the CDTF. Students donned protective clothing, entered the training bays, and conducted inspections, using techniques similar to those expected to be part of their mission requirements as CWC inspectors. We expect future courses to include the CDTF training as a part of the course of instruction.

The CDTF continues to offer Toxic Agent Training (TAT) to soldiers (chemical and non-chemical) and DOD civilians throughout the Army's force structure. TAT is a one-day training exercise at the CDTF. Soldiers and civilians practice critical skills in a GB/VX contaminated environment. It's a regularly scheduled course at the CDTF offered through the Army Training Requirements and Resources System (ATRRS). In FY94 TAT has been modified to allow units to design mission-specific training in the toxic environment by prior coordination with the CDTF. Interested individuals can enroll in the course by contacting their schools representative. For a copy of the memorandum of instruction on TAT, contact the CDTF at DSN 865-3096.

DOT continues to work diligently to provide better-trained soldiers, NCOs, officers, and civilians to meet the Army's needs.

Directorate of Training and Doctrine

Director	DSN 865-3855
Doctrine Development Center	DSN 865-4080
Training Analysis Division	DSN 865-5071
Training Development Division	DSN 865-5304

Training Materials

Training developers have been busy updating training materials to support revisions of initial entry and professional development courses. Special focus is being directed toward our professional development courses as we revise/expand the current POIs to include changes in doctrinal publications and a host of other mandatory training requirements.

We've recently completed the pilot course for Multi-national Chemical Warfare Convention Inspectors. The POI is being revised for a second pilot where it should be finalized and approved by the Preparatory Commission of the CWC.

Advanced NBCRS crew training is scheduled to begin FY95. Quotas must be obtained through your training manager. It's a one-week course designed to train 72 students per year. Please note that the entire crew must attend...so start planning now!

Training and Doctrine Publications

Several training and doctrine publications have been completed and will be in distribution shortly: FM 3-19, *NBC Reconnaissance*; FM 3-5, *NBC Decontamination*; FM 3-101, *Chemical Staffs and Units*; ARTEP 3-7-10-DRILL; *Drills for the Smoke Platoon (Mechanized and Motorized)*; and ARTEP 3-447-10 DRILL, *Drills for the Decontamination Platoon*. Field staffing of FM 3-101-2, *NBC Reconnaissance Squad/Platoon (FOX)* has been completed, and work on this manual should be completed in December 1993. We are revising FM 3-100 to be consistent with the new FM 100-5. The revised FM 3-100 should be fielded next fall. Work will soon be finished on FM 3-3-1, *Nuclear Contamination*, and fielding is expected in the spring of 1994.

CAM Update

The CAM fielding has proceeded very well. The CAM is intended to satisfy an urgent requirement for a soldier-portable chemical agent monitor which can quickly detect and determine relative levels of mustard and nerve agent vapors. It's simple to use and presents the information in an easily understood bar display.

When using the CAM you must consider all aspects of the total chemical situation. The following items have been fielded to assist the operator in best utilizing the CAM: Operator's Manual for CAM, TM 3-6665-331-10, dated 12 Jun 92; Training Circular 3-4-1, *CAM Employment*, dated 17 Dec 91; Training Video Tape 3-41 (PIN 705803), *CAM Preventive Maintenance Checks and Services (PMCS), Use and Maintenance*, dated Mar 90; TVT 3-82 (PIN 710125), *CAM Employment*, dated Mar 93, and Graphic Training Aid 3-6-4, *CAM User's Guide* dated Mar 93.

When operated within the guidelines of these documents and tapes, the CAM enhances the user's ability to ensure a chemical environment. Also fielded is the Battery Assembly, Training (BATs). The BATs is a D-cell adapter which allows the user to power the CAM with a cheap power source when compared to the standard CAM battery. The BATs is only utilized during training and for conducting PMCS.

An extended warm-up may be necessary if CAMs have been in storage 30 days or longer. You must allow the CAM to run until it will pass the confidence test or a total of 8 hours of run time is reached. CAM PMCS includes a weekly procedure.

Don't forget to conduct your weekly PMCS! Weekly PMCS is critical to ensuring your CAMs are operational quickly. This PMCS has been overlooked in many units and warrants emphasizing again. These steps are as follows: Perform self-test and a confidence test; run CAM until it passes the confidence test, but at least 30 minutes minimum and run CAM at least 5 minutes after bars from confidence test clear.

The 83d Chemical Battalion was constituted in the Army of the United States on 12 March 1942 and activated at Camp Gordon, Georgia, on 10 June 1942. After training in the Continental United States, the 83d departed from New York for North Africa on 26 April 1943. It arrived in Oran, Algeria, on 11 May and subsequently earned campaign participation credit for Sicily, Naples-Foggia, Anzio, Rome-Arno, Southern France, Rhineland, Ardennes-Alsace, and Central Europe. Three of these campaign credits were designated "with arrowhead" to indicate an air or amphibious assault. During the fighting in Sicily the 83d earned the title "Artillery of the Rangers."

The 83d was reorganized and redesignated twice during World War II. The first was on 27 June 1944 when the battalion became the 83d Chemical battalion, Motorized. The second was on 7 December; this time the battalion became the 83d Chemical Mortar Battalion. At the end of the war, the 83d was inactivated on 26 November 1945 at Camp Myles Standish, Massachusetts.

On 5 June 1951 the battalion was redignated the 83d Chemical Smoke Generator Battalion and then activated on 16 July 1951 at Hanau, Germany. About six months later, on 15 January 1952, the Battalion was inactivated at Mildenhall, England, and redesignated the 83d Chemical Mortar Battalion.

In 1955 the 83d returned to active service at Fort McClellan, Alabama. On 1 February the 83d became the 83d Chemical Battalion, and on 18 March it was activated. The unit remained in active service until 20 December 1966 when it was inactivated at Fort Bragg, North, Carolina.

The 83d has recently returned to the active Army. On 1 October 1993 it was activated at Fort Bragg, North Carolina. Its wartime mission: The 83d Chemical Battalion is prepared to deploy anywhere in the world with no notice and to conduct effective chemical support operations immediately upon arrival to protect the force.

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