ARMY CHEMICAL REVIEW

PB 3-97-1 January 1997

Army's first BIDS unit activates — page 8

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Articles

Departments

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Mustard

—Lessons of the Desert

by SFC Ricardo Soto-Acevedo

The main focus of this article is to relate field behaviors of mustard, as experienced by Chemical Destruction Group personnel. UN personnel did not cause any of the incidents described. They were caused by poor training and work habits of Iraqi personnel. The level of expertise was that of a common laborer and not of an individual who knew the potential effects of chemical agents.

On 3 April 1991, the terms for a cease-fire between Iraq and the coalition states were established under resolution 687 by the United Nations Security Council. Section C of the resolution deals with the elimination of Iraq's weapons of mass destruction, their facilities, and related items. Through this resolution, the United Nations Special Commission (UNSCOM) was established, with Swedish Ambassador Rolf Ekeus serving as Executive Chairman.

One of UNSCOM's mandates was to take possession of all chemical weapons, agents and precursors for destruction. This mission included facilities used in the production, filling, and testing of chemical agents. A chemical weapons advisory panel developed the destruction guidelines, while the Chemical Destruction Group was charged with carrying out the destruction process.

The bulk of the destruction process took place at the Al Muthana State Establishment, a large chemical weapons production complex. Destruction of the various chemical agents and precursors took different forms. Nerve agent was destroyed through a hydrolysis process, mustard was incinerated, and precursors were either burned in open pits or diluted to harmless levels.

Different nations supplied personnel protective equipment. The bulk of mission-oriented protective posture suits and protective masks were supplied by France and Great Britain. However, some personnel chose to bring their own personal protective equipment from their respective countries.

The main decon apparatus was of Austrian origin. It was a trailer-mounted unit consisting of a heater, water tank, pump unit, two roll-out hoses, and a blender. The main slurry generated was a mixture of Calcium Hypochlorite (HTH) and an electrolyte. The electrolyte was used to help the slurry cling to a contaminated surface longer.

Personnel decon stations were mobile and light, and consisted of basically one station. An individual coming out of a contaminated area walked up to the hot line and laid down any used equipment. He stepped up to the hot line and an individual on the clean side checked him for contamination using a chemical agent monitor (CAM), or an AP2C, the French equivalent of our CAM. Once checked, the person stepped into a pan filled with warm water and HTH; gloves and boots were scrubbed with a brush.

Upon completion, they stepped out of the pan and boots and gloves were

Vehicle, tire, and ground contaminated with mustard.

CML

rinsed off prior to stepping over the hot line and onto the clean side.

Bulk mustard was stored in large containers, comparable to our one-ton storage containers. Mustard was also contained in 250 kg and 500 kg bombs. Explosive Ordnance Personnel developed entry procedures for each "container" to access the agent by explosive ventilation. Once explosively vented, the container and bombs were transported to the incinerator area for draining by Iraqi personnel.

During the transport of containers and bombs, incidents of contamination occurred. In one instance, there was a two mile spill of mustard onto the roadway. In a separate case during transport of bombs, mustard spilled onto the roadway.

However, this time the driver abandoned the truck and did not inform anyone of its location. The vehicle was located the next day, but due to the time lag, mustard had contaminated the truck bed and undercarriage and saturated the tires as well as an area of ground around the vehicle.

In the first incident, personnel loaded the decon trailer and moved toward the spill areas. When they checked the contamination with a CAM, the readings showed 4 bars. Decontamination of the roadway was long and cumbersome. As the decon team progressed forward, the decon trailer had to be stopped, reloaded, and moved to the next position.

By the discoloration of the slurry, they could see that the mustard was being brought to the surface. While proceeding with the decon process, we noticed the local workers driving over the areas that had not yet been decontaminated. It was necessary to set up a checkpoint outside the contaminated area. We checked any vehicle exiting the area for contamination. What we noticed was that of all the vehicles that drove through the contaminated area, none showed any visible signs of contamination.

Once decontamination of the roadway was complete, operations were ceased. The following day, teams were dispatched to check and monitor the decontaminated area. The CAM still showed contamination (4 bars). It was decided that further decon would only be useless. Personnel would wear respiratory protection when driving through this area.

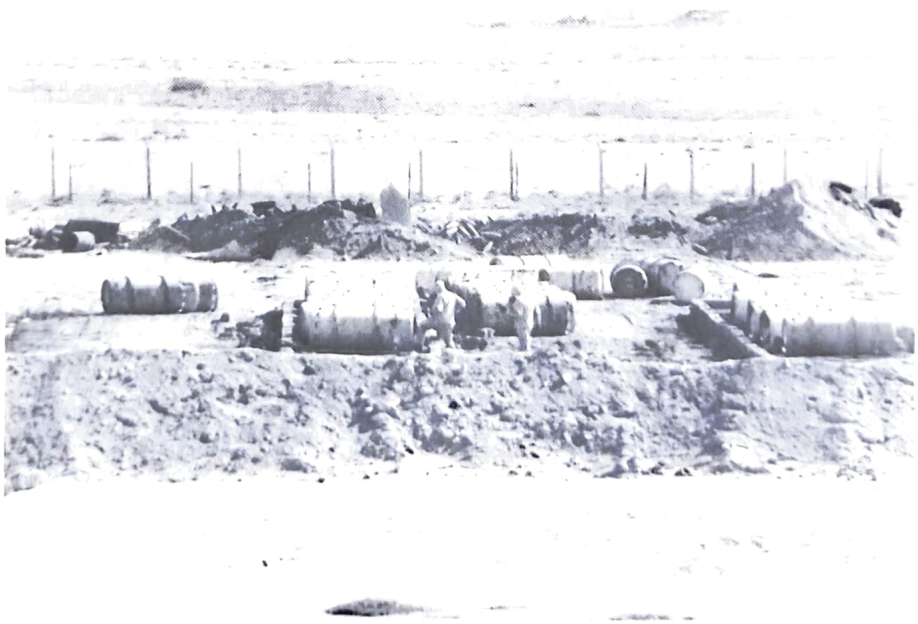
In the incident regarding the abandoned vehicle, the tires were the main concern. The vehicle did not have a chemical agent resistant coating and the bed was still holding 250 kg and 500 kg bombs. The bombs had been explosively opened, but since large vehicles were in short supply, the bombs had to remain. Positioning the decon trailer to begin operations was cumbersome and difficult. The area and vehicle were decontaminated. About 24 hours later, checking revealed that the tires were still contaminated, regardless of how much or often they were decontaminated.

Applications

Through these incidents there can be many applications related to chemical warfare on the battlefield. Speed is the main thrust in battle, but caution must be exercised at all times.

Crossing a Contaminated Area. Most procedures cover contamination avoidance when encountering areas of contamination. Other procedures are set up to decontaminate after crossing a contaminated area, mounted or dismounted. The basic composition of the road surface was asphalt, and the principal hazard was vapor. Decontaminating an asphalt road creates a liquid hazard because mustard, when decontaminated with a slurry, will mix and rise to the surface. However, not all the agent will come out. When expediency is the main thrust, one cannot afford to wait. To facilitate a crossing, it may be easier to send out a recon team to the proposed crossing area. If mustard is soaked into the asphalt, the only hazard will be vapor, and driving at a fair rate of speed will not contaminate the tires.

Airfields. Another point of consideration is airfields. Runways are basically constructed of asphalt. Should a runway require decontamination, consider when the aircraft will be landing, the threat, and the availability of resources for decon operations. For a hurry-up situation, a slurry-based decon should not be considered. Again, the creation of a contaminated water



United Nations EOD personnel prepare to set charges for the explosive venting of mustard one-ton containers.

hazard comes into play. Prior to aircraft landing, thoroughly recon the runway. Puddles of mustard should be covered with HTH. Use caution when doing this. When combined, HTH and mustard ignite.

Should time allow decon, an alternative means may be employed. Hot water with HTH makes a better decon solution because HTH cannot readily dissolve in cold water. The hot solution soaks into the asphalt and works directly on the agent. Use caution when mixing this solution. If too much HTH is used, you may end up with a thicker solution than needed and risk bringing the mustard to the surface.

If mustard has been used on the runway, chances are that the sand in the area is contaminated, too. Soldiers in this environment should use caution with aircraft landings, take-offs, and taxiings. Contaminated sand can blow about and find its way onto a soldier where it may work its way into the MOPP suit, through the elastic area over the boots and gloves or under the hood. If contaminated sand comes in contact with the skin, the individual may get mustard burns.

Heat, sweat, and contaminated sand form the perfect combination to activate the mustard. Aircraft crew chiefs should be aware of the extraction of possible contaminated soldiers. Ways to limit the spread of contamination in an aircraft:

- Have rubber matting covering the entire floor of the aircraft. Vehicles and personnel should always have contact with the matting.
- With 463L plastic pallet covers, seats may be covered. Personnel are limited to sitting only on the covered seats.
- Personnel movement should be kept to a minimum throughout the flight.

In the second incident there is little one can do with a contaminated tire. FM 3-5 discusses weathering as the simplest and easiest form of decon. However, there are many factors a leader on the battlefield may consider.

CAM reading six bars near ground contaminated with mustard.

One of the first questions is "How clean is clean?"

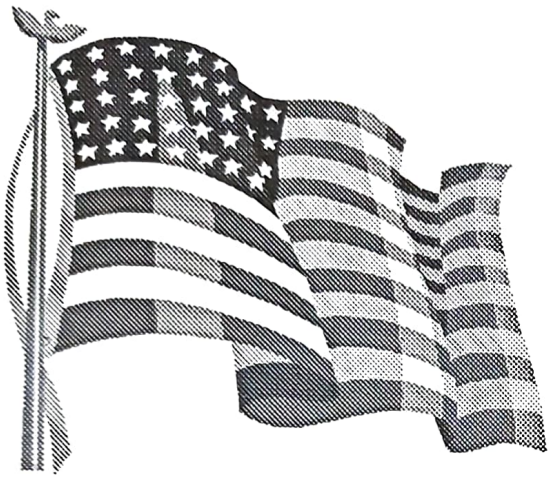
A decon squad or platoon may not have the necessary equipment to fully decontaminate vehicles, so leaders must plan ahead when requesting decon support. Give consideration to the availability of maintenance personnel and equipment. By having maintenance personnel within the contamination line, any tires or rubberized components can be changed out. If a maintenance unit is not available, an alternative plan could be to meet with a maintenance unit after decon is complete.

Leaders will always make decisions based on the threat and mission. If the unit must redeploy after a detailed equipment and detailed troop decon, then the leader must be informed about vehicles and equipment that have contaminated tires or rubberized components. The leader may elect to place those vehicles on the downwind side of the area away from the main body. Soldiers will know that there are still contaminated vehicles in that certain area and, as a minimum, respiratory protection is required.

The chemical destruction group finished its mission in June 1994 and the UN returned Al Muthana back to the Iraqi government. Its mandate was accomplished and all members returned to their respective countries.

The benefit of the lessons are of great value to the chemical soldier today. Leaders and soldiers alike can plan the effective use of their assets. A decon operation that may be soldier-intensive can be delayed till later. Resources on the battlefield can be limited. With this knowledge they can be better prioritzed.

At the time this article was written, SFC Ricardo Soto-Acevedo's was assigned as the USACAP Chemical Operations NCO at the Johnston Atoll. SFC Soto-Acevedo's past assignments include: Squad leader, 4th Chemical Company, Korea; NBC NCO, Co D, 39th Engineer Battalion, Fort Dix, NJ; Inspector, United Nations Special Commission, Chemical Destruction Group, Baghdad, Iraq (attached from Technical Escort Unit); Operations Sergeant, Stockpile Operations Group, Chemical Biological Defense Command, Edgewood, Maryland (attached from Technical Escort Unit). SFC Soto-Acevedo has a BA in Political Science (International Relations) from the University of Maryland. His military schooling includes graduation from Basic NCO Course, Advanced NCO Course, Technical Escort Course, Environmental Law, and School of Military Packaging.



F orce XXI—One Course, One Standard

The United States Army has implemented several programs and dedicated manpower to standardize Reserve Component (RC) training with the training of the Active Component (AC) in support of Force XXI. This is taking place under the provisions of the Total Army Training System (TATS), the Total Army School System (TASS), and Title XI AC/RC support. The goal of these programs is to eliminate identified, systemic RC training difficulties.

TATS is a United States Army TRADOC program that will result in the redesign of most proponent school courses, so that both the AC and RC soldiers receive equivalent instruction. Currently, many RC courses train different tasks to different standards than the AC in the same course. The intent behind TATS courses is that instruction may take place under different conditions and be delivered through different media. The goal is to ensure graduates from the AC and RC receive training on the same tasks and are held to the same standards. The United States Army Chemical School courses that are being redesigned under TATS include: 54B10 Reclassification, Basic Noncommissioned Officer Course, Advanced Noncommissioned Officer Course, 54B NCO Reclassification Course, Chemical Officer Advanced Course, and the NBC Defense Officer/NCO Course. The TRADOC goal is to redesign all of these classes by the end of FY97.

TASS has reorganized the Reserve Component training infrastructure, dividing the continental United States into seven TASS regions. Training in each of the regions is controlled by a USAR division (Institutional Training). The branch specific, institutional training conducted within these divisions is functionally aligned with the appropriate AC proponent school to ensure equivalency of instruction. Each division has subordinate brigades which, in turn, have subordinate battalions. One of the brigades under each division is a combat support brigade and each combat support brigade has a chemical training battalion; for a total of seven USAR chemical training battalions. Each battalion has numerous inactive duty training (IDT) sites throughout its region where chemical training is conducted.

Title XI is a program of Congressionally mandated AC/RC support for training the Total Army. The Chemical Corps is supporting this initiative by dedicating the support of one AC major and 18 AC senior noncommissioned officers to Title XI positions with duty at USACMLS and the USAR TASS chemical battalions. Chemical Corps Title XI AC/RC support under this program is twofold. The Title XI major and four senior NCOs are assigned to TRADOC with duty at the USACMLS. These individuals have the responsibility of supporting TATS training development and, more importantly, accrediting the chemical training conducted by the USAR TASS chemical training battalions, to include their subordinate IDT sites. The additional Chemical Corps Title XI NCOs are assigned to TRADOC with duty at the USAR TASS chemical training battalions, with each battalion having a master sergeant and a sergeant first class. These NCOs are the Chemical Corps subject matter experts for the unit. They provide full-time support and continuity to the unit, serve as liaison between the unit and USACMLS, assist in the training and certification of instructors, evaluate classroom instruction, and assist USACMLS with the evaluation of TATS products.

Reserve Component units and soldiers make up the majority of the Chemical Corps and will participate alongside the Active Component in future conflicts. The Chemical Corps and USACMLS are industriously implementing the above programs to ensure the finest possible training is provided to the chemical soldiers of the Total Army.

Contact Me

Please feel free to contact me if I can be of assistance. I welcome your thoughts and suggestions. My address is: LTC Jerry M. Elder, Chief, Reserve Component, Training Management Division, Directorate of Training, US Army Chemical School. I can also be reached at DSN 865-5005 or Commercial (205) 848-5005.

Army's first BIDS unit activates

By Pvt David S. Howell
Staff Writer, McClellan News

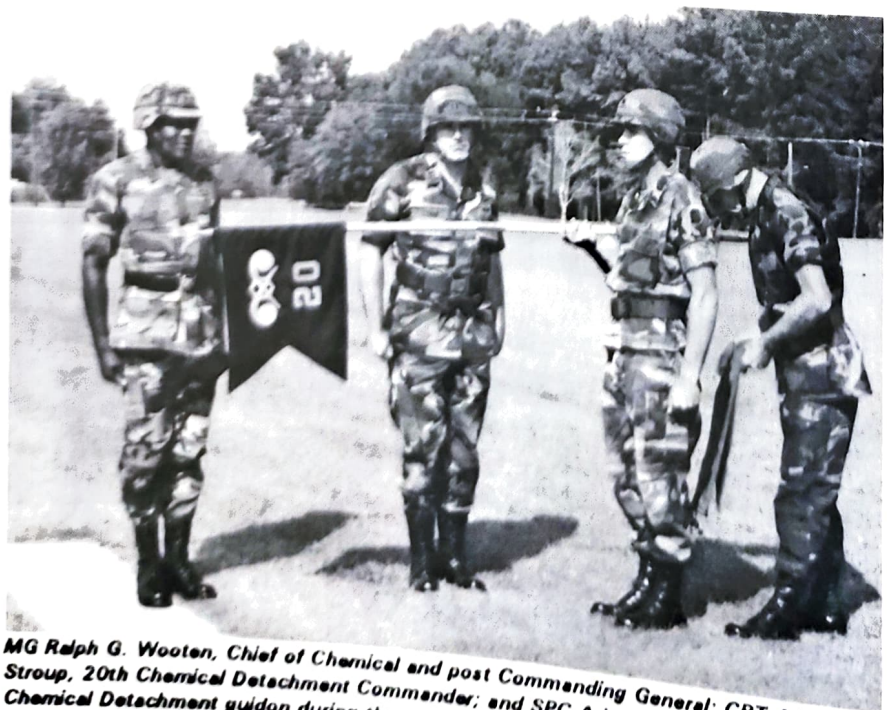
The activation of the only biological detection unit in the US military was held at Fort McClellan 5 October 1996 in a ceremony that marked a milestone for the Army's biological defense program.

The 310th Chemical Company, a Fort McClellan-based reserve unit and Fort McClellan's 20th Chemical Detachment make up the new unit. The company—the only one of its kind—can be deployed anywhere in the world to detect, identify, and combat biological warfare agents in the field.

The unit's primary equipment is the biological integrated detection system, BIDS, which is equipped with the technology to monitor, sample, detect, and identify biological warfare agents on the battlefield. The BIDS consists of a mounted shelter on the back of a modified HMMWV. The shelter houses a two-member biological detection unit which can presumptively identify a suspected agent.

"The equipment (BIDS) is important—but it is the soldier who makes the equipment special," said MG Ralph G. Wooten, Chief of Chemical and post Commanding Ceneral. "The unit standing before you is chemical trained and ready—capable of deploying immediately if called on to do so, to protect our forces from the terrible effects of biological warfare."

"The key to combating a biological threat is having the ability to detect all kinds of chemical agents," said BG James W. Darden, commander, 81st Regional Support command, USAR. "We want the enemy to know we have this technology, and they aren't going to be able to use their biological agents without us knowing it. Our soldiers will already be prepared."



MG Ralph G. Wooten, Chief of Chemical and post Commanding General; CPT Adam Stroup, 20th Chemical Detachment Commander; and SPC Aric Dean unfurl the 20th Chemical Detachment guidon during the activation ceremony held 5 October 1996.

While the samples are moved to a laboratory for positive confirmation, an alert warning is given to soldiers in the field so they can take the appropriate protective action.

"The BIDS system will give us the kind of early warning we need in order to treat our soldiers before they exposed to a biological agent," said Dr. Ted Prociv, Assistant Secretary of Defense for nuclear, biological, and chemical matters. "If you can detect the agent before it is unleased on to the field, then certainly you can treat soldiers with post antibiotics and save your force."

Unlike explosives, projectiles or chemical weapons which cause immediate signs of injury, Prociv said, with biological weapons, soldiers may not know they are affected for days, even months afterward.

"This is going to be, number one, a strategic system of defense, and number two, a major deterrence for our enemies," Prociv said.

Media interest has piqued on BIDS. In fact, it has risen to national level and higher. So far, affiliates from ABC, NBC, FOX, and CNN Headline News have reported on various aspects of the activation. Several radio stations have also carried interviews and news on BIDS. More than a dozen newspapers and publications have published articles, to include Associated Press.

CML

Radiation Protection

– the Chemical Corps professional

By CPT(P) Shirley L. DeGroot

Situation: A Soldier was exposed to a radioactive material. The commander needs to know how many REMs of ionizing radiation the soldier received.

Situation: Radioactive contamination has been detected and the dose rate measured within a storage room. The facility manager needs to know if any personnel may safely enter the contaminated room.

Situation: A supply warehouse receives radioactive source material in a shipment. The NCOIC needs to know how to handle the radioactive material, how to store it, and how to transport it to its final destination.

Situation: You encounter damaged or destroyed equipment that contains radioactive material. The commander needs to know what the risks are and how to handle the equipment.

You may have encountered situations similar to these while performing your duties as a chemical officer or NBC NCO. If one of these situations were to occur right now, do you know what your should do and how to do it? If you are not sure, you need to attend one of the Radiation Safety courses taught by the staff of the Edwin R. Bradley Radiological Laboratories (ERBRL), collocated with the US Army Chemical School, Fort McClellan, Alabama.

The role of the Chemical Corps encompasses much more than NBC Defense Operations and Smoke. The Corps has assumed responsibility for completion of new missions in environmental protection and hazardous materials management. As the commander's advisor regarding all things hazardous (including over 3,800 line items in the Army supply system which contain radioactive material), chemical personnel often must become the resident expert on items or topics that they are unfamiliar with. One of these topics is radiation protection.

Commanders must appoint a Radiation Protection Officer (RPO) in accordance with AR 385-11. As the chemical officer or NBC NCO, you are very likely to be selected for this additional duty. You, the RPO, must recommend various courses of action to your commander, to keep exposures to ionizing radiation As Low As Reasonably Achievable (ALARA). The objective is to complete assigned missions involving radioactive materials while ensuring the health and safety of your soldiers and DA civilians. The chances are, you have never had any radiation safety training during previous training completed at the Chemical School, other military schools, or within your unit.

The Edwin R. Bradley Radiological Laboratories, a Nuclear Regulatory Commission licensed facility, offers two courses that qualify individuals from all services to perform duties as Radiation Protection Officers. The ERBRL staff also teaches radiation safety blocks of instruction for COAC, COBC, BNCOC, and OSUT students.

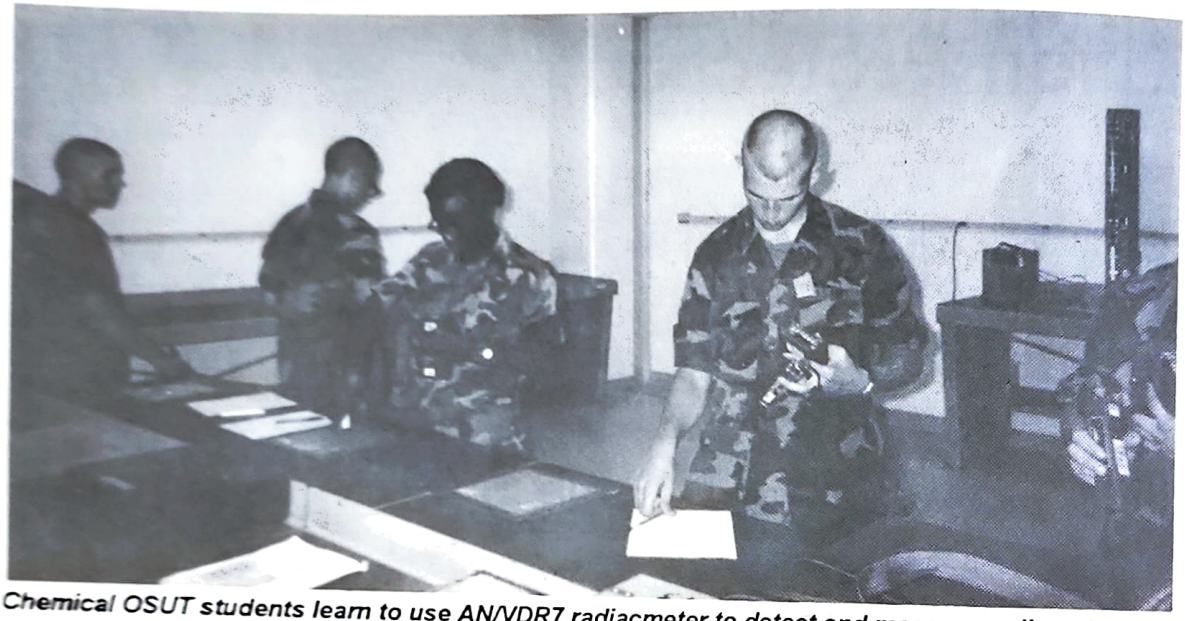
The Radiation Safety Course (RADSAFE) is a three-week, 120-hour curriculum. It teaches in-depth principles and practices of radiation protection and safety, and includes the following topics: properties of nuclear radiation and radioactive decay, radiation detection and measurement, medical biological hazards of ionizing radiation, radiation absorption and shielding techniques, and procedural guidance for reporting, storage, handling, transporting and disposing of radioactive materials. The course is designed for personnel responsible for radiation protection programs at the installation or facility level.

The Operational Radiation Safety Course (OPRAD) is a one-week, 40 hour curriculum designed for personnel responsible for calibration of standard tactical radiac devices. The course teaches the basic principles of radiation safety, regulatory guidance and instrument calibration, but without the detail required for radiation protection duties.

Upon completion of either of the Radiation Safety Courses, the new RPO will be able to recommend viable solutions to most radiation safety situations such as the following examples:

- How high is the dose rate being emitted, and can I reduce the dose I receive?
- How much radioactive material is concentrated in the air and is it safe to enter the area?
- How can a radioactive source material be stored and/or transported?
- Does the current radiation protection program protect us, and are we in compliance with all Nuclear Regulatory Commission and Department of the Army regulations and guidelines?
- How will I identify and specify safeguards to keep exposures "As Low As Reasonably Achievable?"

All courses emphasize safe handling of any equipment containing a radioactive source and application of the ALARA principle. ALARA calls for the intentional limiting of exposure to ionizing radiation by applying the basic tenets of radiation safety at all times.



Chemical OSUT students learn to use AN/VDR7 radiacmeter to detect and measure radioactivity.

Before you attend any of the classes, you should consider reviewing science and mathematics fundamentals. Radiation safety concepts involve scientific and mathematical principles. The course manager and instructors at each course have distilled these principles down to only those necessary to understand the concept and apply your knowledge to solve various problems. However, it is still nuclear physics and biology that you are studying. Before you go, you should accomplish the following two tasks:

- Do a math review. You should be able to work problems at a high school algebra level. Many of the exercises are in a story problem format, so brush up on reading and solving story problems. Your local post Education Center can help you get up to speed on the math skills required.
- Know how to use a scientific calculator. If you can, bring your own scientific calculator to the course. Calculators are available at the course, but you need to be acquainted with using one before class starts. Before you arrive, have someone show you how to use various functions on a scientific calculator such as scientific notation, square roots and values squared, and natural logs.

Once you have arrived, get ready to buckle down and study. There is homework assigned almost every evening, and even without any specific assignments, there is more than a fair amount of material to read and review before and after each day's class. You should be prepared to interact with other students inside and outside of class, either helping others or receiving help with difficult concepts. This interaction builds a network for you that will be very helpful later upon your return to duty. Interaction also ensures that eveyone in the course gets as much out of it as possible. The instructors will probably schedule "study halls" outside of normal course hours to enhance learning and interaction. An important learning tool you should utilize is that if you do not understand a concept or how to complete a calculation, **ask for help!**

Finally, after all your diligent study, you will graduate and return to duty. Being an RPO is, in most cases, an additional duty, so you will more than likely have other crises demanding your immediate attention. But at some time, you will want to get familiar with the existing radiation protection program in your command. Review any existing Standing Operating Procedures (SOPs) or write an SOP if none exists. Use the appraisal checklist provided by the school to evaluate your current program and build a plan of action to correct known deficiencies. Take some time to become acquainted with the RPO at your next higher headquarters or at your installation. These personnel will have a wealth of knowledge to share with you and help you build a solid radiation protection program. Finally, you should stay in touch with your classmates, and utilize their expertise.

Whatever your current job duties entail, if you are a chemical officer or an NBC NCO and you are offered an opportunity to attend a radiation safety course, **SEIZE IT**. Chances are good you will, at some point in your career, be appointed as an RPO. Having already completed the training, you will be able to perform your duties from the outset with a high level of expertise.

CPT(P) Shirley DeGroot is currently the Chemical Staff Officer for the 89th Regional Support Command, US Army Reserve. She is a graduate of the Chemical Officer Basic and Advanced Courses, the Radiation Safety Course, and the Combined Arms and Services Staff School. She holds a Bachelor of Science degree in Biology from Baker University and a Master of Business Administration from Mid-America Nazarene College. On active duty, she was a brigade chemical officer with the 17th Field Artillery Brigade and a group chemical officer with the 171st Support Group in Operation Desert Storm. As a reservist prior to assignment with the 89th RSC, she was a headquarters company commander and a group chemical officer with the 139th Medical Group. Her civilian occupation is process control manager for the SallieMae Servicing Corporation in Lawrence, Kansas.

The Great Fox Hunt
(Part II)

By Al Mauroni

This article continues the story of how the Army modified its first XM93 NBCRS vehicles, trained their crews, and deployed recon units to support *Operation Desert Shield/Storm*. The first half (published in the July 1996 *CML, Army Chemical Review*) narrated the concept generation through 1988, the initial request to the German government for the Fuchs and training at Sonthofen, and the deployment of the first four reconnaissance platoons to provide XVIII ABN Corps with an initial recon capability. This article continues with VII Corps' plans to get their recon platoons back and leads into the Fox teams' preparations for combat in *Operation Desert Storm*.

VII Corps Wants Their Foxes

Very much on the minds of LTG Fred Franks and his division commanders was the fact that three of their chemical recon platoons were already in Saudi Arabia, with a fourth on the way in mid-November. Two of those platoons belonged to units remaining in Europe (3d IN DIV and 8th IN DIV); however, the 1st AR DIV and 3d AR DIV commanders wanted their chemical units back from the 24th and 1st CAV DIV, respectively.

As the Foxes had been one of the earliest contributions from USAREUR to CENTCOM, LTG Franks had both visited the Sonthofen training and seen the recon platoons off. The XVIII ABN Corps' divisions had eagerly anticipated receiving the Foxes, had made extensive reconnaissance plans and assumptions based on these vehicles, and had to determine how to replace them. These divisions weren't exactly thrilled about the prospect of losing their valuable NBC reconnaissance capability.

Part of the solution would come from the Chemical School. The remaining three "Nunn" Fox vehicles that had been shipped to the General Dynamics Land Systems (GDLS) facility in Michigan for refit were ready in September, and had been shipped to Fort Hood, Texas, for deployment with the III Corps units.

Since the German government had made its initial 30 Foxes a gift, the Chemical School requested the 3 Nunn Foxes be sent to Fort McClellan, Alabama, to support training of chemical reconnaissance troops. The Chemical School did not have an NBCRS simulator such as the one in Sonthofen, and had submitted a critical needs statement to HQ DA to acquire two Fox simulators (to include two mass spectrometers, navigation systems, and a supporting chemical laboratory) at a cost of $6.1 million. However, these simulators would not arrive until November 1991. In the meantime, the School could make do with classroom training and the three Fox vehicles on hand.

On 3 November, the 1st IN DIV's chemical recon platoon from the 12th Chemical Company attended the first three-week NBCRS training course at Fort McClellan. The 3d ACR sent their platoon from Saudi Arabia to Fort McClellan in December, and one USMC platoon rotated through in January. The 1st IN DIV's recon platoon returned to Fort Riley, Kansas, to deploy with its division in early January. All three platoons waited for the orders to travel to Rhein-Main AFB in Germany to pick up their Foxes (after the second 30 vehicles were "Americanized" at Kassel).

The recon training program in Germany continued on track. MAJ Polley had left the German school to join the 1st IN DIV as their division chemical officer, and had the opportunity to stop by Fort McClellan to see his division's chemical soldiers' training. MAJ Jeff Adams replaced MAJ Polley as the liaison officer at Sonthofen to continue the training. The recon platoon from 87th Chemical Company (2d ACR) arrived at Sonthofen for its training in early November. As they arrived for training, the 5/25th Chemical Recon Platoon from 8th IN DIV was deploying to Saudi Arabia with its six Foxes. The 5/25th Recon Platoon would join the 2d Chemical Battalion on 16 November to begin a rear area support mission. The 87th Chemical Company platoon would deploy the last 6 vehicles of the initial 30 Foxes back to the 2d ACR in Saudi Arabia in late December.

Having accomplished the mission of reorganizing, training, and equipping the four initial NBC reconnaissance platoons, Task Force Fox stood down.

Fleet of East German tracks loaned to US Army to support the Dhahran Fixed Fox Facility.

After all, their soldiers had to deploy with 3d AR DIV to get into the war. The training at Sonthofen went on, however, as it did at Fort McClellan. Platoons from 13th Chemical Company and 95th Chemical Company (both from 3d COSCOM) were scheduled to enter Sonthofen on 8 February (ready by mid-March). Again, since no one could estimate when the war was going to end, there had to be a pool of replacements prepared to deploy.

The constant flow of Fox vehicles and support from the US to Germany and Saudi Arabia was difficult to track. By establishing liaison offices at the Thyssen-Henschel site at Kassel, at the Sonthofen NBC Defense School, and at Dhahran's King Fahd International Airfield (KFIA), the PM's office was able to continuously monitor and troubleshoot the production and deployment process. Ten systems would arrive in each month of October, November, and December (including the first five of the second batch), raising the projected total end-year figure to 37 NBCRS vehicles modified and manned.

Some were concerned about the fact that the Fox's profile resembled the Soviet-built BTR-60 (bought by the Iraqi Army). To avoid fratricide cases, the Fox crews raised Jolly Roger flags on their radio antennas and taped large inverted "V's" with florescent tape on the sides of their vehicles. The PM NBC Defense Office issued thousands of vehicle identification cards, meant to familiarize CENTCOM soldiers with the silhouette of the new vehicle.

Thirty-five General Dynamics Services Company contractors joined the Army Materiel Command maintenance facility at Dhahran, where the Army had established a depot for limited repair. The Fox facility in Dhahran grew to include a small fleet of vehicles to support the mobile organizational maintenance support for forward combat units, a second facility site supported at King Khalid Military Center (KKMC), and a total of seven organizational maintenance teams for around-the-clock operations by 11 February 1991. This included two with the USMC, one with the British forces, two corps-level direct support sites, and two fixed facilities.

During President Bush's Thanksgiving visit to the 2-18 Infantry Battalion, three Foxes from 5/69th Chemical Company stood guard in the event Iraqi chemical attacks hit the President's escorts. In the event of any danger, these Foxes would have whisked the President and several VIPs back to Air Force One. One Fox vehicle from the 92d Chemical Company hit a washout in the road in November during training operations, breaking its left front wheel and damaging the front axle. It could not be repaired in theater, and was shipped back to the depot in Kassel in December. The 92d Chemical Company received one of the two "Nunn" vehicles, the operational readiness floats, as a replacement. The 3d ACR received its five Foxes between Christmas and the end of December, bringing a total of 36 Foxes in theater: four divisional recon platoons with the 24th IN DIV, 101st ABN DIV, 1st CAV DIV, and 2d Chemical Battalion, two regimental recon platoons with 2d and 3d ACRs, and one Nunn vehicle as the theater float.

Operation Desert Storm Plans

Just after Christmas, a special Fox briefing was given to the division and corps commanders during an operation plan update. The two corps commanders agreed to transfer the two borrowed VII Corps platoons back to their originating units after the New Year, equalizing the distribution of Fox assets at three platoons each, but depriving the 24th IN DIV and 1st CAV DIV of their Foxes. Of the remaining 25 vehicles, GEN Schwarzkopf had promised 10 to the Marines, leaving 15 vehicles for the Army. ARCENT had evaluated the proposed two-corps attack plan with the intent of evaluating the CBW threat and which units would benefit the most by

adding Foxes to their chemical companies.

Their proposal was to equip the incoming 1st IN DIV with six Foxes and use another six for ARCENT rear area reconnaissance, leaving three vehicles as additional floats. The 1st IN DIV would be the last Army division to receive Foxes since they were the last major unit to arrive in theater and were designated to lead VII Corps main breach. The Foxes would monitor the breach operations to determine if the Iraqis used chemical weapons while the division's brigades were working through the border berm and minefields.

ARCENT's staff argued that if the theater rear area was attacked with persistent chemical agents, the results would impact on both corps' sustainment and operational tempo efforts. Troops under the 490th Chemical Battalion would man the last Fox platoon under ARCENT Support Command control. This would leave a total of four Foxes available as theater floats in the event of any combat losses to the divisions' recon platoons.

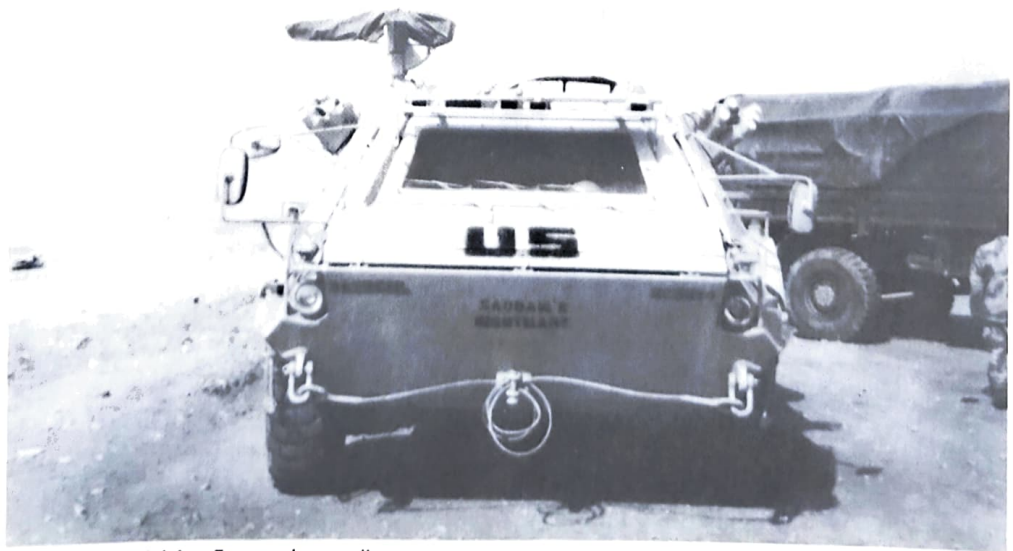
Other options were to field the latter six vehicles to either the 24th IN or 1st CAV DIVs. The 24th IN DIV had resisted sending its recon platoon to Sonthofen or Fort McClellan, stating the need to retain an in-theater reconnaissance capability. They felt that their attached Fox platoons had given them sufficient hands-on experience to warrant their own set of Fox vehicles. This would have freed the 5/25th Recon Platoon to protect the Corps' vulnerable rear area. If the XVIII ABN Corps did not receive the additional Fox platoon, it would have to decide whether the 5/25th Recon Platoon would support the 24th IN DIV, the rear area, or both.

As for the argument favoring 1st CAV DIV, it had become the theater reserve for the ground offensive. Because the 1st CAV DIV would have a prominent role in feinting up the Wadi, and possibly be called on to counterattack the Republican Guards, some thought it should get a Fox platoon (either from XVIII ABN Corps or ARCENT's second platoon option). These Foxes would help the two combat brigades negotiate through chemically-contaminated areas much faster than the M113's currently in the 68th Chemical Company's recon platoon.

LTG Gary Luck, XVIII ABN Corps commander, argued forcefully against this option, especially that his corps should release a Fox platoon to 1st CAV DIV. He stated that the Foxes should not serve in a reserve role, but rather be in general or direct support of front line units (similar to the concept of artillery support). Also, if 1st CAV DIV was supporting VII Corps over XVIII ABN Corps, that would make it five Fox platoons to his two platoons. In the 24th IN DIV's case, ARCENT staff pointed out that the 24th IN DIV had never received the Fox recon training, and would not have been able to properly operate and maintain the new systems. The decision was made to use the latter Foxes for ARCENT rear area missions.

As the *Operation Desert Storm* plans jelled, the division and corps commanders became increasingly involved in the status of the Fox vehicles. These vehicles were being tracked throughout their journey by the PM NBC Defense Office, both ODCSOPS and ODCSLOG at the Pentagon, the USAREUR chemical officer, and the CENTCOM, ARCENT, corps' and division NBCCs. Their personal involvement increased after the SCUD attacks, in relation to the number of high-ranking military and political officials inquiring as to their status. In some cases, they were actually tracking airplane tail numbers to monitor the progress of the vehicles.

Shortly after the New Year, all of the Fox platoons began playing "musical chairs" as they rotated to new commands. The Foxes in 1st CAV DIV went back to the 22d Chemical Company in 3d AR DIV (due to its expected arrival in theater). The 24th IN DIV gave up the 5/69th Recon Platoon to its originating division, the 1st AR DIV.



3d Armored Division Fox ready to roll.

The 5/25th Recon Platoon rotated from the 2d Chemical Battalion to the 24th IN DIV. The 101st ABN DIV transferred the 7/92d recon platoon to the 82d ABN DIV. The 101st had no replacement, given its planned air assault mission, but would pick up the 761st Chemical Company (Smoke/Decon).

There were an additional 12 Foxes due in by the end of January, raising the total to 48. The first 10 of those would go to the 1st and 2d Marine Divisions (whose soldiers would just be completing training at Sonthofen and Fort McClellan), and two vehicles would join the 1st IN DIV. Thirteen more might make the deadline of mid-February. Originally the schedule had called for the last five to be delivered in late March, but the PM office had been able to convince Thyssen-Henschel to accelerate the deliveries.

The plan was to deliver four more vehicles to 1st IN DIV, one to replace the 92d Chemical Company's float, and six vehicles for ARCENT, leaving the last two to be added to the theater "floats" for a total of four reserves. If all went according to plan, CENTCOM would receive a total of 62 Fox recon vehicles, one of which had been deadlined in November, leaving a final tally of 61 NBCRS in theater for the ground war.

Problems surfaced regarding the GDLS maintenance contract support. The British, Israelis, and now Turkish militaries had received their Foxes, and this began to put a strain on the maintenance system for spare parts. Because of the immediate contractor support and high visibility of the system (and the fact that most of the recon platoons had been careful not to overtax their vehicles), the operational readiness of the US Foxes remained above 95 percent.

The contractors had never been told about the possibility that they might have to go into Iraq to maintain the Foxes. As the coalition bombings began, and the offensive intent of the coalition became clear, many contractors left Dhahran. GDLS had to hire new contractors under terms that included the offensive plans.

After the initial SCUD attacks on 18 January, Foxes were roaming from one impact site to another verifying the presence (or lack thereof) of chemical agents. This became their first real acid test of detection and reporting procedures. So far, neither the SCUD attacks nor the bombings of Iraqi chemical-biological agent production and storage sites had seemed to have any repercussions, but the military leadership continued to worry.

After the initial SCUD attacks on 18 January, Foxes were roaming from one impact site to another, verifying the presence (or lack thereof) of chemical agents.

On 19 January, there seemed to be some confirmation of their fears. The Czech chemical units and French units reported low-level traces of nerve gas detected north of KKMC. ARCENT dispatched a Fox team to the location, but could not verify any chemical agents, nor did they find any sign of munitions (SCUDs, artillery shells, aerial bombs). They speculated that it could have been traces of agent released from the bombing of Iraqi chemical weapons manufacturing sites or the suspect chemical weapons bunkers at An Nasiriyah.

The next day, the Czech team discovered what they thought were low-level traces of mustard agent near KKMC; later in the day they also reported a small patch of nerve agent. Again, the Foxes responding to the site did not detect the agent, nor was there any sign of a delivery system. Since there was no correlating evidence of CB agent casualties or expended weapon systems in the area, CENTCOM NBCC decided the event was a false alarm. Once the media heard of this event, they immediately began speculating about CB agents originating from the bombed chemical munitions production facilities and biological weapons sites. Foxes continued to survey for any hazards from the bombing campaign, and no CENTCOM units had reported any immediate ill effects from low-level exposure of CB agents.

The division and corps commanders discussed the allied nations' needs for reconnaissance vehicles. The British force had 11 Foxes, 8 of which were outfitted for NBC recon, and 3 for electronic warfare. The French and Arab forces had decontamination assets, but no NBC recon vehicles. CENTCOM decided that the 82d ABN DIV's Fox platoon (now the 92d Chemical Company Recon Platoon) would be under the operational control of the French division (as would one brigade from the 82d) as of 16 February through the initial ground offensive. CENTCOM considered giving two Foxes to the Egyptian forces next to the Marine divisions, but no division commander felt comfortable giving up these assets. It was decided that if chemical agents were used against the Arab military forces, the nearest Fox platoon to the area would be tasked to assist them in marking the contaminated areas.

Once the VII Corps divisions began moving west to the forward assembly areas, their commanders decided to use the movement from the tactical assembly areas to the forward assembly areas as a rehearsal for the attack into Iraq. Each division occupied the planned distance and spacing, to include movement along axes that mirrored those that would be used in the actual attack. During this movement, the units were confronted with simulated contamination scenarios that caused them to use the Fox NBCRS platoons to negotiate

through the contamination. The divisions discovered during this rehearsal that a large maneuver formation traveling in column had to plan ahead on its actions upon encountering a contaminated area.

There had to be a quickly executed process where the NBCRS vehicles would discover the contamination, mark it, and guide the following units around the area without losing momentum. For the upcoming offensive, VII Corps decided to include military police in the forward units; once the NBCRS marked the contamination, the MPs could guide the rest of the column around it (until the agent evaporated). This would allow the NBCRS vehicles to resume their point recon mission quickly. Another potential problem was that the chemical markers dropped by the NBCRS were too small, too spread out, and would never be noticed in the dark hours of the morning. Instead, the NBCRS markers would use chemical luminescence lights.

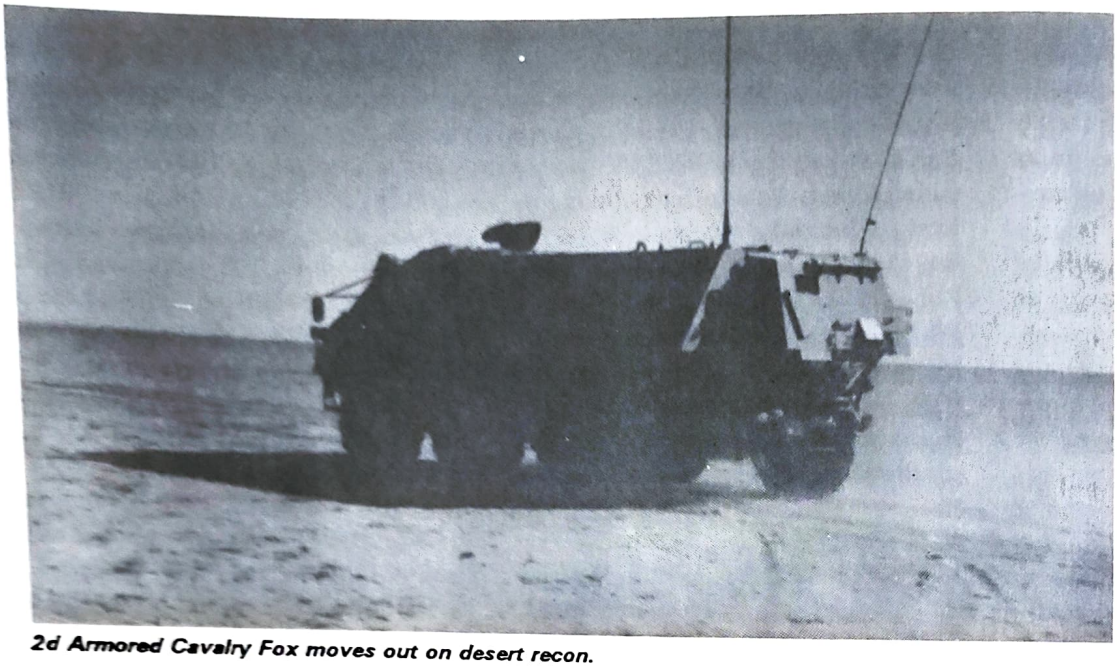
With the SCUD scares, pressure mounted to get the Foxes into theater. VII Corps directed 3d AR DIV to "lend" four Fox vehicles to 1st IN DIV on the morning of 21 January, in the event that the 1st IN DIV Foxes did not arrive on time (the 3d AR DIV had received its platoon back from 82d ABN DIV). Assuming the 1st IN DIV Foxes did not arrive, the deal arranged for two Foxes to be returned to 3d AR DIV immediately after the breach operations and the latter two Foxes returned once the British 1st AR DIV passed through 1st IN DIV lines. Five Foxes arrived for the 1st Marine Division on 27 January, and five more arrived for the 2d Marine Division by 3 February. The 1st IN DIV had become increasingly concerned over its lack of Foxes, especially after seeing the Marines accept their 10 Foxes.

When their first 2 NBCRS vehicles were ready in late January (with the USMC allotment of 10), VII Corps NBCC tasked the 1st IN DIV to send their property book officer, their platoon leader and some personnel from the chemical recon platoon to fly to Rhein-Main AFB to sign for them. While 1st IN DIV had looked forward to receiving the vehicles, the division staff was reluctant to send its entire chemical platoon to Germany to personally sign for the receipt. Being so close to the ground war initiation, they were reluctant to part with half of its NBC recon assets, and requested that normal logistics channels deliver them to KKMC. In the interests of time, the VII Corps NBCC sent one of their captains to Kassel to sign for the vehicles and escort them to Dhahran.

The 12th Chemical Company crew members traveled to Dhahran on 11 February to accept the two Fox vehicles. Yet there was one problem; the Foxes arrived without vehicle radios and CVC helmets (due to the shortage of radios caused by the wartime requirements). These vehicles had to stop by the GDLS/PM NBC Fixed Fox Facility to receive the final equipment. This allowed the 1st IN DIV to return two borrowed Foxes to the 3d AR DIV, with a promise to return the other two after the breaching operations on the first day of the ground war. On 16 February, their last four Foxes were on the way on specially-chartered C5A cargo flight, when a SCUD scare at KFIA during the flight caused the planes to fly back to Germany. Once the SCUD alarm was over, the planes finally delivered the four Foxes to Saudi Arabia. In the early hours of 19 February, VII Corps NBCC called to inform 1st IN DIV that their last four Foxes had arrived at KKMC. The 1st IN DIV had their Fox-equipped recon platoon in place and operational less than a week before the ground offensive started.

While the 1st IN DIV issue was resolved, that still left the last nine Fox vehicles of the 60-Fuchs loan to go. The 490th Chemical Battalion sent a team to Germany on 16 February to escort the nine vehicles to Dhahran. By 21 February, they were ready to return, but the Air Force couldn't deliver them all at once. Last minute theater airlift priorities had prevented all of the vehicles immediate return, although they were

Unidentified 3d Armored Division soldier uses his MM1 mass spectrometer in the Fuchs vehicle.



2d Armored Cavalry Fox moves out on desert recon.

third priority for in-bound logistics (first being Patriot missiles, second being 120mm tank ammunition). Four vehicles arrived at KKMC on 23 February. The rest would miss most of the war, with four more vehicles arriving on 26 February, and the last one finally arriving on 27 February.

On the eve of the ground offensive, there was a total of 56 operational Fox vehicles in the US forces. VII Corps had 24 of the vehicles on line, while XVIII ABN Corps retained 17 vehicles. The ARCENT Support Command would use 4 Fox reconnaissance vehicles and the Nunn vehicle, with these vehicles doubling as rear area reconnaissance and as floats. MARCENT had the other 10 vehicles, 5 would recon the front and 5 would patrol their rear support areas. While the greatest concern was focused on the threat of Iraqi chemical strikes against CENTCOM forces during the breach operation, there was equal concern about the possibility of chemical SCUD attacks and Iraqi air attacks against the rear area supporting the offensive operations. CENTCOM and ARCENT both counted on the inbound five Fox vehicles to augment their slight rear area recon capability.

Most know of the role played by the Fox NBCRS throughout the ground war. These vehicles, operating in pairs, spearheaded brigade and cavalry movements across Iraq to offer a continuous on-the-move capability. More importantly, the XM93s kept up with the M1A1 tanks and M3A1 Bradley IFVs, a feat which the M113 chassis could not have hoped to duplicate. In the 2d MARDIV sector, Foxes tentatively identified a suspected chemical mine, proven by later analysis to be a false alarm.

One Fox hit a conventional mine, but was quickly repaired and returned to duty. Because there were no chemical or biological agent attacks, the true value-added capability of the Fox vehicles remains unknown. We do know, for the first time in decades, division and corps commanders kept their expectations on these chemical troops to avoid contamination that would have caused thousands of casualties and disrupted their operational tempo. Less than a week later, their main mission accomplished, the XM93s stood watch over the demolition of Iraqi ammunition dumps.

Because Iraqi chemical munitions were unmarked, all artillery and aerial munitions were suspect, and all troops felt more comfortable with the Foxes nearby.

After the war's end, there was one last unpleasantry. The Foxes had to be collected and redistributed based on the original fielding plan. In addition, ARCENT had been told to leave one platoon of Foxes behind for POMCUS stocks at KKMC. Looking down the list of divisions, it fell on 1st IN DIV's 12th Chemical Company to turn over their hard-won Foxes. Given all the difficulties they had seen in obtaining the Foxes, the division bitterly fought the issue—from the chemical company commander, CPT Visser, all the way to the commanding general, MG Rhame himself. All to no avail. ARCENT had to select someone's six Foxes, and the 1st IN DIV was at the bottom of the priority list.

Lessons Learned

The Fox NBC reconnaissance system was a resounding success in every division. The Fox's main role was to rapidly locate contaminated areas and determine clean bypass routes around them, thus allowing the following forces to maintain their momentum in the attack and not requiring the forces to increase their MOPP levels. It proved sufficiently mobile to keep pace with the M1 tanks and M3 IFVs. Division commanders fought over these systems, their staffs tracking the status of the vehicles continuously from the time the Foxes left Kassel to when they arrived at the owning units. MG Barry McCaffrey, commander of the 24th IN DIV, stated after the war:

"If there was one absolute hole in our repertoire of capabilities, it was chemical reconnaissance . . .There was just no practical way to determine in advance where the contamination was on the ground . . . Getting the Fox into the field was a tremendous confidence builder and ended up being a major

factor in how we task organized for battle."

While the Fox deployment had truly been a benefit, there were still shortcomings. Reconnaissance doctrine and employment still requires some refinement, particularly how following combat units should respond to large areas of contamination discovered by these vehicles. Because it was a new piece of equipment that filled a previously ill-practiced function, commanders tended to view the Foxes as their good luck charms. They felt that as long as the Foxes were in their areas of operations, their units would be significantly safer from CB agent attacks. This wasn't necessarily so.

Having a Fox nearby as opposed to chemical recon APCs didn't make the threat of CB munitions use against defensive positions, headquarters, rear area units, ports, airfields, and cities any less plausible or any easier to detect and warn troops. Some units attempted to use the Fox vehicles as portable chemical detectors, realizing that they had the most sensitive detectors in the theater.

Unfortunately, the German mobile mass spectrometer was designed as a ground contaminant agent detector, not as an automatic vapor agent detector. Operator training was understandably rushed, and in some cases (such as the report of chemical mines in the 2d MARDIV sector), operators made mistakes. Soldiers needed more maintenance training than what they were given, especially with the constraints of civilian contract maintenance, lack of military maintenance capability, and the strigent environment of the desert.

The performance of the Foxes was stellar, nonetheless. Despite its resemblance to a Soviet-style vehicle and its position in front of combat units, there were no fratricide cases. They kept up with the maneuver units, which the M113s could not have done. The contractor maintenance support, while very skimpy on spare parts, kept systems at over 90 percent operational.

One unforeseen fault included the on-board navigation system, which was designed for European roads, not desert sand. To supplement this, each Fox obtained a GPS to verify navigation points. Another fault lay in the NBC marking signs, which were too small and next to useless in the dark. The full capacity Fox, the M93A1 (type-classified in June 1995) features an M21 RSCAAL mount, digitized radio communication, a Global Positioning System (GPS), and a meteorological system to better perform the chemical agent early warning mission. To become a true NBC reconnaissance system, the next generation NBCRS will replace the MM1 mass spectrometer with the CB mass spectrometer (when it is fielded).

Another major lesson is understanding the importance of identifying the true needs of the combat arms community, by becoming a true partner and combat supporter to the warfighters. MG McCaffrey noted that it had been economics and politics that had denied the Army an NBC reconnaissance capability prior to 1990, not the lack of military requirements. The late development of the Fox reflects a fundamental misunderstanding on the part of Army decisionmakers as to the critical need and real military value of a modern NBC reconnaissance capability, and an equal misunderstanding on behalf of the acquisition community on how best to develop and delivery this capability in a timely manner. We in the chemical defense community must show the added value of NBC defense equipment if the combat arms are expected to buy into these programs. Hopefully, we can use this experience to implement better practices with all NBC defense equipment developed for future military operations.

My deep appreciations to the individual contributors to this article, without whom I would not have been able to piece this story together: MG Bob Orton, COL Rick Read, LTC (Ret) Jeff Adams, LTC (Ret) Mike D'Andries, LTC (Ret) W.A. Funderberg, LTC Walt Polley, CPT(P) Ed Marshall, SPC Todd Ferris, and Dr. Burton Wright, Command Historian, US Army Chemial School.

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101st Chemical Company

The 101st Chemical Company was originally constituted on 21 June 1942 as a Chemical Impregnating (Processing) Company. This type company processed clothing and other wearable items used in decontamination procedures or to protect personnel in contaminated areas. It was activated on 11 July 1942 at Edgewood Arsenal and designated as the 101st Processing Company. The company departed Edgewood on 19 March 1943 for Camp Sibert, Alabama.

The company was alerted while at Camp Sibert for overseas duty on 5 October 1943 and moved to San Francisco, California, for shipment to the Pacific Theater on 21 February 1944. The company's first port of call was the Russell Islands on 1 July 1944. The 101st was then transferred to Guadalcanal in the Southwest Pacific Command on 1 February 1945, and assigned to the Army Air Forces (Pacific). On 5 July 1945, the company was moved from Guadalcanal to the island of Espirito Santo from which it staged for its final destination in World War II, the island of Luzon. The company had been moved there to begin preparations for the final invasion of Japan which were rendered moot by Japan's surrender. The company was then deactivated on the island of Luzon on 30 November 1945.

The 101st was again activated, this time as a detachment at Fort Riley, Kansas, on 18 April 1967 and assigned to the Fifth Army as the munitions safety control unit. It then contained one officer and seven soldiers. It was inactivated on 25 August 1967. The detachment was reactivated on 16 September 1979 at Fort Bragg, North Carolina, and attached to the 530th S&S Battalion. Consolidated on 18 August 1983 with the 101st Chemical Detachment (active), it was reorganized and redesignated at the 101st Chemical Company and the company was assigned to Fort Bragg. As such it participated in *Operation Urgent Fury* and deployed to the island of Grenada from 5 November to 15 December 1983. During this time, the company provided tactical defense for the Port Salinas Airfield and security for the 46th Support Group Logistical Support Activity.

In February 1985, the 101st Chemical Company deployed to Panama to participate in *Operation Kind Liberty 85*. It provided decontamination support to the 1st Corps Support Command Airfield, and decontaminated six CH-47s and five UH-1 helicopters that had been contaminated at the refueling facility. In addition to its decon mission, it also doubled as fire fighters and executed two firefighting missions at the petroleum dump. In January 1986, the unit supported the XVIIIth Airborne Corps Field Artillery and over a period of five days decontaminated 75 vehicles, in addition to supervising 200 people through a personnel decontamination site. During this time the unit was attached to the 507th Transportation Group. Currently, the 101st is assigned to the 83d Chemical Battalion of the *Dragon* Brigade at Fort Bragg.

71st Chemical Company

The 71st Chemical Company was originally constituted on 15 May 1942 as a Chemical Smoke Generator Company and assigned to the Chemical Warfare Center, Edgewood Arsenal, Maryland. On 10 November 1942 the unit was redesignated the 71st Smoke Generator Company and it was manned entirely by African Americans. During World War II, the 71st participated in the Ryukus Campaign on Okinawa (from 26 March to 2 July 1945).

In January 1946, the 71st Smoke Generator Company was inactivated under the US Army Western Pacific Administration, but was reactivated at Edgewood Arsenal, Maryland, on 10 April 1946 as part of the Chemical Warfare Center. On 7 September 1946, the company was assigned to the Seventh Army and sent to Fort Benning, Georgia.

During the Korean War, the unit departed for the Far East on 6 August 1950. On 28 May 1952, the United States Army removed the all African-American status of the company and it was integrated. While in Korea, the 71st Chemical Smoke General Company received campaign credit for the Third Korean Winter and Korean Summer—Fall 1953 Campaign. The unit received the Meritorious Unit Commendation for the period 4 April 1953 to 31 December 1953. On March 1954, the 71st was inactivated and in October 1986 the 71st was reactivated at Schofield Barracks, Hawaii. It was designated as the 71st Chemical Company (Smoke/Decon). It became the first dual-purpose chemical company in the US Army.

Combat Exposure

—low concentrations of NBCW agents

By CPT Steven R. Pressman

Interview of Fred Wadsworth, WWI ambulance driver, from The American Experience PBS Television Series episode, "The Great War 1918."

"I went into the ...down into where the gas was—and the gas was about three feet all over the ground. Real yellow, real yellow. And I had my mask on, I knew what it would do. So, I drove in there, but, I had to turn around down in there, too, so, I could load my patients to go take them back out. And there wasn't one of those fellas had a gas mask on down in there...Not One! And that mask was there (on my face). And that lieutenant says, "Oh, its mild," he says, "That won't hurt you. Get that @!&!#," he swore. Made me take mine off...I took the mask off. And, I went in three or four more times, and, I landed in the hospital."*

Traditionally nuclear, biological, and chemical warfare (NBCW) agents have been thought of in terms of their ability to quickly kill or incapacitate their victims within a short period of time, either 10 or 30 minutes. Obviously Fred Wadsworth's experience took place over a period of several hours. Other WWI soldiers had similar experiences that took place over a period of days. In industry, the harm inflicted upon an individual due to a hazardous chemical or physical agent in the workplace is calculated to take into account the some 50 years workers may spend employed in their chosen occupation.

Calculation of Dose

The dose, the amount of a toxic chemical or physical agent (nuclear radiation, heat, etc.), that an individual is exposed to is calculated by multiplying the concentration by the time of exposure, or:

Dose = Concentration x Time

Acute and Chronic Exposures

Since most literature identifies either a 10 or 30 minute exposure to a toxic agent as producing incapacitation or death in laboratory animals, this will suffice as a working definition of an *acute* exposure. Also implied is that the exposure is a high field concentration (about 1% to 5% by volume).

A *chronic* exposure takes place over much longer periods of time (hours, days, months, and years), and involves low concentrations (less than 1% by volume).

Chronic exposures to chemical agents can be very dangerous. As a general rule, it will take a lower concentration of a given toxic agent to kill or incapacitate over a long period of time than would be required over a short time period. Using the choking agent phosgene as an example, it takes 500 mg/M^3 (miligrams percubic meter of air, concentration) to kill with an exposure time of 10 minutes, but only 360 mg/M^3 to kill if the exposure time is increased to 30 minutes.

NBCW Agents Found on Battlefield

Nuclear, biological, and chemical agents may be encountered on the battlefield. Some of these agents are cumulative toxins, that is, a dose from an earlier exposure remains in the victim and is added to later doses. Other health damaging effects due to chronic low concentration of NBCW agents may include:

- Irritation—a reversible inflammation of the skin, eyes, and mucous membranes.
- Carcinogenic—a cause or suspected cause of cancer.
- Corrosive—visible alteration or destruction of living tissue on contact.
- Mutagen—a substance that alters the genetic code of the next generation causing birth defects.
- Terogen—a substance that can alter or damage a developing fetus.
- Pathogen—any nuclear, biological, or chemical agent that can cause disease.
- Sensitizer—chemical and biological substances that cause allergic reactions in most people that are exposed to small amounts of them over long periods of time.

The point is all of the above effects,

...standard Army chemical detectors confirm only the presence and/or identity of chemical agents.

and pronounced symptoms, occur at dose levels far below the LD_{50} (median lethal dose 50%) and ID_{50} (median incapacitating dose 50%).

In the case of a terogenic agent, theoretically, the presence of one molecule in the early stages of cell division of the zygote may cause birth defects.

And in the case of a potent sensitizer chemical contaminating the fortifications of a strongpoint, the adverse effects on morale will have to be dealt with as one soldier after another is medically evacuated experiencing shortness of breath, severe chest pain, and ugly skin rashes. This means that both tactical and personnel planners must take into account the effects of minute residual amounts of NBCW agents when writing their operations orders and policies. This is very clear to most of us who have dealt with line of duty actions, in the aftermath of *Operation Desert Storm*, resulting from anthrax vaccination, nerve agent prophalaxis PB pills, and severe rashes resulting from leshmaniasis.

Contamination and Persistence

Gases, vapors, and aerosols each present a different challenge to troops operating on the NBC battlefield.

The choking agent phosgene is 3.4 times heavier than air and is considered a nonpersistant agent in open areas. However, phosgene will linger, in low lying areas, depressions, and fortifications, for hours or even days.

Liquid agents generally will vaporize at room temperature (68°F). The danger of liquid agents will vary with temperature. For example, methylene chloride is a low molecular weight chemical with variable toxicological properties. Fumes from methylene chloride, a common industrial solvent, are mild at 32°F, but will punch through carbon protective mask filters and produce unconsciousness or death at 90°F. Distilled mustard, a potent blister agent, may be harmless outside in Arctic weather, but can produce severe casual- ties when contaminated soldiers seek shelter in warm buildings.

Particulate type agents, such as yellow rain, CS powder, or radioactive fallout, may persist for days in the leaves of vegetation.

Low-Level Exposure Standards

In industry low-level exposure is gauged in relation to a set standards. For chemicals and physical agents regulated by the federal government, the Occupational Health and Safety Administration (OSHA) sets permissible exposure limits (PELs). Voluntary industry standards are set by the working committees of the American Conference of Governmental Industrial Hygienist (ACGIH) which are called threshold limit values (TLVs). DA PAM 385-61 governs the exposure of workers in chemical munitions production facilities. As a general rule, the analytical limit of detection of the facility exposure alarm system, such as the trigger point of the M8A1 alarm or the M256A2 detector, is the exposure limit. It is, however, important to remember that standard Army chemical detectors confirm only the presence and/or identity of chemical agents. At present the Army does not have chemical instruments that will measure the total dose of soldiers in the field in the same way as the IM-93 and DT-236 ionizing radiation dosimeters. In dealing with low levels of chemical agents and long exposure times, the ability to measure the dose received by troops of a given NBCW agent is crucial to the development of valid troop safety guidance.

TC 3-4, *Chemical Battle Staff Handbook*, October 1995, gives the Army-adopted PELs for GB Sarin and VX as 0.0001 mg/M^3 and 0.00001 mg/M^3 respectively. However, the limit of detection of the CAM is only 0.02 mg/M^3, and the M256A1 nerve agent detector, between 0.02 to 0.05 mg/M^3.

Skin Absorption

Soldiering is a dirty business. Troops are expected to be in the field, in the dirt, for months at a time without showering. Chemicals can enter the body through the skin by exposure to contaminated air, water, and soil. The average soldier's exposed skin is about 2940 cm^2, assuming the soldier is wearing a short sleeved uniform with an open neck and no hat. From 0.2 to 2.8 mg/cm^2 of dirt can adhere to the exposed skin of a soldier. Also, since skin contains about 10% carbon and soil only 1 - 4%, skin has a great affinity for absorbing toxic chemical agents from the soil. This is why the M291 Skin Decon Kit works so well, since it is made of a carbonized synthetic resin, essentially 100% carbon specially treated to promote the uptake of toxic chemical agents from the skin.

In agricultural workers approximately 60 - 80% of the total dose of pesticide absorbed is through the skin, with about 90% of that through the hands alone.

One advantage of the US Army Fox NBC Recon vehicle is that it is designed with a ventral bulkhead (floor) which seals the crew compartment from the bilge. As a rule, armored vehicles leak like sieves and offer their crews little protection from mud, dust, and bilge fumes.

Physiological Effects

When people are exposed to low levels of chemicals or physical agents, subtle changes to the body occur. For instance, mild exposure to nerve agents may cause irritability and slight short-term memory loss. At slightly higher levels the symptoms may include miosis (the involuntary contraction of the pupils (pinpointing) of the eyes resulting in temporary blindness due to difficulty in seeing in dim light), pain, and headaches. According to the Armed Forces Information Service, the symptoms reported to the VA by some 7,000 Gulf War Veterans, which are now called Gulf War Syndrome, include:

- Initial burning sensation to skin.
- Pain in joints.
- Lethargy.
- Headaches.
- Forgetfulness.
- Dizziness.
- Skin lesions.
- Muscle aches.
- Weight loss.
- Bleeding gums.
- Cold sweats.
- Loss of hair.
- Lymphoma and other cancers.

One theory was that residual chemical agents drifted south when coalition aircraft destroyed Iraqi NBCW munitions dumps. Chemical detectors operated by the British, Czechs, US Navy, and 82d Airborne Division read positive for levels of agent that were too small to be tied to all the symptoms reported. There is also some evidence to support that one Navy CB unit was exposed to the very volatile and corrosive unspent fuel from an Iraqi Scud missile attack. More widespread was the health effects from breathing in the fumes from the oil fields in Kuwait that Iraqi forces set on fire as they retreated and the use of waste oil, of questionable pedigree, by many coalition units to keep the dust down in their base camps. Also, the covert use of biological warfare agents by the Iraqis should not be discounted.

Though it has been reported, in the open media, that the levels of chemical agents detected in the air by Czech and US NBC reconnaissance units were below the levels considered harmful the *duration* of exposure must be taken into account.

Training was also a factor in accidental chemical exposures during the Gulf War. One young NCO lost the hair on his arms and legs in strips matching the places where M9 chemical agent detector paper was worn on his chemical protective suit for seven months in the desert!

Conclusion

The most poignant lesson of the Gulf War was that, very likely, the highest concentrations of chemical agent that US soldiers were exposed to probably occurred in the tightly controlled environment of the Chemical Defense Training Facility (CDTF) at Fort McClellan, Alabama. During CDTF training soldiers learn effective techniques for detecting and decontaminating chemical agents in order to limit the length of time and concentration of exposure to these acutely toxic substances. To date, more than 20,000 troops have completed CDTF training with no ill effects. This is because CDTF training teaches soldiers the importance of discipline and following instructions while in the contaminated area, as well as how to use their equipment.

This is critical since on the AirLand Battlefield units deploy by vehicle crews, squads, and sections. And it is the leaders of these small units that must keep their soldiers masked in the presence of an unseen threat. This was also the case when Gulf War tankers stopped to take war trophy photographs on top of an Iraqi tank they had destroyed moments before with a depleted uranium sabot round.

Using civilian environmental science measurement techniques in war is valid due to the close relationship between industry and NBCW agent production. During WWI the United States forces experience 70,000 gas casualties, not including the 925 individuals injured by toxic gas during its manufacture at Edgewood Arsenal in 1918 alone.

Under battlefield conditions minute amounts of chemical agents, below the levels detectable by standard Army test kits and instrumentation, may be ingested by inhalation, by mouth, or absorbed through the skin. Under these conditions, harmful doses can be experienced by troops on the battlefield by exposing them to low concentrations of toxic agents over a long period of time.

CPT Steven R. Pressman currently is assigned to the staff of USA Element Atlantic Command. He served as the commander of the 68th Chemical Detachment LA (Recon), USAR, which was inactivated in July 1993. This article was written pursuant to his research for writing FM 3-17, NBC Operational Recon Team LA. His previous assignments include S-2 Intelligence, 464th Chemical Brigade; Special Project Officer, 319th Quartermaster Battalion, USAR; Senior Chemical Instructor, 2077th USAR Forces School; and Regimental Chemical Officer, 107th Armored Cavalry Regiment OHARNG. He holds a BA degree from the College of Urban Affairs of Cleveland State University. He is a graduate of the Chemical Officer Basic and Advanced Courses, Combined Arms Special Staff School, and the Command and General Staff Officer Course. He lives in Cleveland, Ohio, where he works as an industrial hygienist.

Biological Warfare

—its control regime

By Colonel (S) Randall J. Larsen
with
Robert P. Kadlec, M.D.

In the July 1996 issue of CML, we presented the second part of Colonel Larsen's article. "Biological Warfare—its control regime" is the last part of his article.

—Editor

Since the focus of this paper is to examine the threat of biological warfare, particularly to America's mobility forces, rather than widely discussed nonproliferation efforts, it will not include a detailed examination of the biological warfare control regime. However, to fully appreciate the threat of biological warfare, it is necessary to have a rudimentary understanding of the loopholes, limitations, and liabilities of the present control regime.

In World War I more than 800,000 soldiers were killed or injured by chemical agents, including phosgene, chlorine, and mustard gases. During international negotiations on the prohibition of chemical weapons that followed WW I, the Polish delegation suggested that "bacteriological methods of warfare" also be included. Their suggestion was adopted in 1925. Formally known as, "The Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare," it is more commonly referred to as "The 1925 Geneva Protocol." It was signed in Geneva in June 1925; however, due to various reasons, it was not ratified by the US Senate until 1975.

While the 1925 Geneva Protocol provided a first step in controlling biological warfare, it has many limitations.

- It does not prohibit research, development, production, and stockpiling of biological weapons.
- It is not clear whether it prohibits use of BW against animals and plants.
- Some parties have reserved the right to use BW against non-signatories.
- Some parties have reserved the right to use BW in retaliation.
- It does not prohibit use of viruses and rickettsias (not yet identified in 1925).
- It only prohibits the use of BW in warfare. (Does this mean it may be used in conflicts less than declared, that is Iraqi attacks on Kurds?)
- No means of verification are identified.
- No mechanisms are established to deal with violations.

The 1925 Geneva Protocol remains as the only international agreement that prohibits the use of chemical weapons; however, a second agreement on biological warfare was necessary. "The Biological Weapons Convention" (BWC), formally titled, "Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and Their Destruction, " was signed by the US in 1972 and ratified in 1975. As of 1 November 1994, 135 states, including most who would be viewed as potential proliferators and/or threats to US security interests, have signed this treaty. Israel, however, has not signed and Iraq did not ratify the BWC until mandated by UNSC Resolution 687, the Persian Gulf War Cease-Fire Resolution.

The 1972 BWC was the world's first disarmament agreement, banning both the use and production of an entire class of weapons. It was a major improvement over the 1925 Geneva Protocol, ameliorating some of its major deficiencies.

- It prohibits any use, in war or lessor conflicts, of BW, even in retaliation or against non-signatories.
- It prohibits development, production and stockpiling in quantities above and beyond that needed for prophylactic, protective, or other peaceful purposes.

...velvet glove of diplomacy has been backed up by the steel fist of military power.

• Adding the word "biological" included all microbial and other biological agents such as viruses and rickettsias.

• Complaints can be made to the Security Council which in turn could launch an investigation.

Despite these improvements, limitations remain.

• Development, production, and stockpiling in limited quantities are allowed for "protective and peaceful purposes." These amounts are not identified, and modern breeding procedures allow the transition from "research quantities" of agents to "significant weapons stockpile quantities" in a matter of weeks.

• It does not prohibit use of BW agents on plants and animals.

Three review conferences have been conducted in accordance with Article XII of the BWC (1981, 1986, and 1991). At the Second Review Conference the parties agreed to implement confidence building measures, such as data exchanges to increase transparency (open access) and cooperation in biological research. The Third Review Conference established an ad hoc group of experts (VEREX) to identify, examine, and evaluate the technical feasibility of 21 potential verification measures.

In September, 1992 the United States, United Kingdom, and Russia issued a joint statement to build confidence and increase transparency on biological weapons programs. All three nations have pledged to allow unrestricted, unscheduled inspections of its facilities.

The primary problem with the biological warfare control regime is obvious—it is not effectively verifiable. This is not only the opinion of this author and virtually all others who write on the subject, but more importantly, it is the US government's position. Because of the nature of biological agents and production methods, virtually any nation and some non-state actors have the capability, with off-the-shelf technology, to go from laboratory quantities of agents to weapons quantities in a matter of weeks. Without a reliable means of verification, a control regime is based only on trust.

Despite the fact that there are many weaknesses in this control regime, many would still argue it has worked—at least no one has been caught using biological weapons since the BWC was signed. This is true. However, one could also argue that during the past two decades the "velvet glove of diplomacy has been backed up by the steel fist of military power." In other words, a credible deterrent sometimes succeeds even when diplomatic efforts fail.

During the Cold War, the primary threat was from the Soviet Union and Warsaw Pact forces. At that time, the weaknesses of the biological warfare control regime were not as critical as they are today because most people believed deterrence was the key to prevention. In fact, when one official was asked what the US response would be to a BW attack on NATO forces, he replied: "We would tape our formal demarche to the warhead of a nuclear tipped missile and deliver it most expeditiously!" In reality, this "cocktail joke" was not too far off from the actual US policy.

The problem with the post Cold War world is that the threat of nuclear retaliation is less likely and therefore less of a deterrent. If a Somali warlord had used a low-tech biological weapon against US forces, would the US have responded with a nuclear weapon? Even during the Persian Gulf War, would the US have responded to a BW attack with the nuclear option? Of course, the possibility of non-lethal attacks with agents such as influenza or Venezuelan Equine Encephalitis (VEE) make the threat of nuclear retaliation even less likely.

The unfortunate bottom line on the potential use of biological weapons in the post Cold War era is that the combination of an unverifiable control regime and the reduction in credible deterrence has created an environment where the probability of biological weapons use is increasing rather than decreasing.

...we have to adjust how we fight wars. We are developing guidance for dealing with this new threat (weapons of mass destruction) ...We have directed the services to tell us how prepared they are for it. The Chairman of the Joint Chiefs of Staff and our regional commanders—the CINCs—are developing a military planning process for dealing with adversaries who have weapons of mass destruction. And our concerns are by no means limited to the nuclear threat. We have a new joint office to oversee all DoD biological defense programs. This is the first time the department has organized its collective expertise to deal with the tough biological defense problems we face.

Secretary of Defense Les Aspin

The BW Threat to Strategic Mobility Forces

The majority of articles and books on biological warfare focus on biological agents as a frightening terrorist weapon (World Trade Center type scenario); a low-tech weapon of mass destruction (the poor man's atom bomb); or the ultimate nightmare, an out-of-control bioengineered virus that could kill millions world-wide. All of these scenarios are possible and each is most certainly a threat to the United States. One scenario, however, that receives little or no mention is the use of biological warfare as a tactical weapon with strategic consequences. This use of biological warfare, particularly against mobility forces, could neutralize America's vastly superior conventional forces. Despite the focus on the doomsday scenarios for biological warfare, a less draconian, and perhaps more likely threat, may prove to be the tactical use of biological agents against strategic mobility forces.

There were many "lessons learned" during the Gulf War, and from the perspective of a future US adversary, none was more important than the need to avoid a head-to-head, force-on-force, Clauswitzian confrontation with the United States. No nation today, or in the foreseeable future, can take on America's combined air, sea, and land forces in a conventional battle and expect to win. This does not, however, mean that US forces cannot be defeated, but to do so, an adversary must fight asymmetrically.

Asymmetrical warfare is as old as warfare itself. When Joshua's army marched around the city of Jericho, the priests played their trumpets, the people shouted, and walls fell down. That was asymmetric warfare. When the Vietnamese communists realized they could not defeat the US in a conventional manner, as they had defeated the French, they changed to an asymmetric strategy. They focused on defeating the will of the American people rather the might of America's armed forces. Asymmetric warfare means playing outside the normal rules. It's like a high school football team showing up to play the Dallas Cowboys, and on the first play, the high school kids all pull out cans of mace. (Who would have bet on the high school kids? Only those who knew they were going to use mace!) Asymmetric warfare levels the battlefield. Or, in some cases, it tips it dramatically in the other direction.

Today, and in the future, an element of America's armed forces clearly susceptible to asymmetric warfare is the defense transportation system. As an "island nation" separated by two oceans from many of its vital interests and allies, America has long been dependent on a strategic transportation system. With the end of the Cold War, and the return of most US forces to the continental United States, this dependence has increased. Without a robust strategic transportation system, as was demonstrated during the *Desert Shield* deployment, America's armed forces would be a paper tiger, unable to defend America's security interests or those of its allies.

America's strategic mobility forces are assigned to the US Transportation Command (USTRANSCOM). This unified command is composed of three component commands from the Air Force, Navy, and Army: The Air Mobility Command, the Military Sealift Command, and the Military Traffic Management Command.

One of the elements these three distinct commands have in common is their dependence on the commercial sector. It has long been a practice of the defense transportation community to acquire and operate only systems that are militarily unique. Certain types of airplanes, such as the C-17, provide the capability to carry large pieces of cargo (Apache helicopters, Patriot missile systems, M-1 tanks), air drop personnel and equipment, and operate out of small austere airfields. On the other hand, nearly half of the airlift requirements in a major deployment can be satisfied with commercial aircraft, such as a 747. In the *Desert Shield* deployment, America's air carriers, through the Civil Reserve Air Fleet (CRAF), carried 64 percent of the personnel and 26 percent of the cargo to Southwest Asia. Had the US been denied the luxury of a six-month period for deployment, the percentage of personnel and cargo carried by the CRAF would have increased.

In many scenarios, the only military forces to arrive during the first week will be those transported by air. This was true in both *Operations Just Cause* (Panama) and *Desert Shield*. However, the vast majority of military forces in any large conflict, up to 95 percent of all tonnage, will be transported by sealift.

In sealift operations the dependence on civilians is even higher than in air mobility operations. Despite the fact that 86 US government-owned ships (8 Fast Sealift Ships and 78 ships from the Ready Reserve Force) were used during the *Desert Shield* deployment, an additional 464 commercial ship voyages were needed to complete the deployment and sustainment operations. The crew members on all of these ships, both government and privately owned, were civilian mariners. Furthermore, the vast majority of personnel who off-load these ships are also civilians.

This significant dependence on non-military personnel provides a major

benefit to the US taxpayer by keeping the cost of a peacetime defense transportation system low, while still providing the surge capability needed during a major crisis such as *Desert Shield*. However, this dependence on civilians in the defense transportation system may soon become the weak link of America's military forces.

As discussed in the technical section of this paper, the use of biological warfare against well-trained, well-equipped and disciplined military forces as a weapon of mass destruction would prove to be a daunting logistical task. On the other hand, it remains a superb weapon of terror against civilian targets, including commercial airlift and sealift crews and the civilians who operate air and seaports.

It would have been difficult, if not impossible, for Saddam Hussein to use biological agents as a weapon of mass destruction against coalition forces in Southwest Asia. However, had he chosen to attack air and sea port facilities with guided or cruise missiles, or with special forces units, it would have crippled one of the most successful military deployments in history.

There is little question military operations in air and sea ports would have been temporarily hampered by a BW attack, but disciplined, well-trained, well-equipped military personnel would have been able to continue operations. Casualties (hundreds, perhaps thousands) would have occurred, but some experts had predicted 10,000 casualties per day during a ground assault. The point is, military operations don't cease once casualties begin. Military forces are prepared to operate in highly lethal environments and understand that in most major conflicts, *Desert Storm* being rare exception, large numbers of casualties are expected. However, the same is not true for civilians in the commercial sector.

This difference between what types of BW attacks or environments would shut down military operations and what would shut down civilian operations is the key to understanding the BW threat to America's defense transportation system, and ultimately America's ability to project power.

The US Army is the executive agent for doctrine, research and development of defensive measures against biological warfare. The US Army Medical Research Institute of Infectious Diseases at Fort Detrick, Maryland, does not classify biological agents as persistent. The term, "persistent," is frequently used to describe types of chemical agents which can contaminate an area for months or longer making it an effective weapon for terrain denial.

> *Biological agents are not "persistent" ...use of biological agents is an unlikely terrain denial strategy...the likelihood of secondary aerosol production is not great following a BW attack.*
>
> —*Biological Weapons Proliferation,* Defense Nuclear Agency

However, what the Army would describe as an ineffective terrain denial weapon against disciplined, well-trained, well-equipped soldiers, may prove to be a highly effective terrain denial weapon against civilians in the defense transportation system. In the same paragraph the Army claims that biological agents are not persistent and not an effective terrain denial weapon, they also state:

> *The particles which fall out of the primary aerosol are relatively large and are difficult to re-aerosolize because of the adhesive forces between agent particles and the contacted surface (Chin, 1990). Agent powders can be designed so that these adhesive forces are overcome and secondary aerosols can be generated ...BW agents are unlikely to pose a significant battlefield casualty problem after the primary cloud has passed.*
>
> —*Biological Weapons Proliferation,* Defense Nuclear Agency

Obviously, there are some significant caveats to the claim that BW agents are not persistent. Using technology developed during the golden age of biological warfare (1960s) "secondary aerosols can be generated," seems to admit there may be a problem with persistence. Perhaps re-aerosolized BW agents will not pose a "significant casualty problem," but even a "limited problem" could cause serious disruptions to operations dependent on civilian personnel.

Convincing transportation executives and union officials that transit through "recently contaminated areas" will not pose "*significant* casualty problems" would be a major challenge. There would also likely be concerns about contaminated aircraft and sealift vessels returning to CONUS for routine commercial operations. Who, for example, would want to put their family on a 747 that had recently transited an airfield contaminated with a Biosafety Level 4 virus or anthrax spores? How long would it take for the press to report that areas of Gruinard Island, off the coast of Scotland, are still "hot" (contaminated) today from anthrax bombs tested in 1943?

Anthrax spores, a dormant, naturally encapsulated form of this bacteria is not as susceptible to normal environmental factors that degrade most other BW agents. In fact, the Army states that anthrax spores, "might persist in target area." However, the Army does not consider anthrax spores or other infectious agents to be of utility for terrain denial because of "(the) time required for the effects of infectious agents."

This delay in effects (2-4 days for most agents) combined with the general lack of persistence (failure to cause significant casualties) is the primary reason the Army continues to downplay the utility of biological agents for terrain denial. Clearly, these are limitations for battlefield use. There is little or no argument that biological agents would not be a highly effective means of protecting one's flank or slowing

down an attacking enemy force on a highly mobile battlefield.

On the other hand, a "quiet" undetected attack on an air or sea port, two to three days prior to the commencement of hostilities, could prove to be a highly effective tactical use of biological warfare. In fact, in certain scenarios, a tactical BW attack on several key air and sea ports could produce strategic consequences. Even though casualties might be limited to a few hundred or thousand, it could turn the tide of the entire battle. According to the Executive Summary (unclassified) of the congressionally mandated Mobility Requirements Study, the reinforcement of US forces in Korea is essential to an allied victory. If North Korea could deny this strategic reinforcement, or severely restrict it, they would likely win.

Conclusion

- One of the most significant lessons learned from the Gulf War was that few nations, perhaps no nation, can defeat America's armed forces in a head-to- head conventional war.
- One method of leveling the battlefield, and neutralizing America's superior technology, training, and personnel is asymmetric warfare, such as the use of weapons of mass destruction.
- Of the three types of weapons available—nuclear, chemical, and biological—clearly biological is the one most available to third world nations. It requires minimal capital and technological investment. Penny-for-penny and pound-for-pound, it is the most lethal weapon of mass destruction.
- The deterrent against the use of biological weapons during the Cold War, primarily a nuclear retaliation, is in most cases no longer valid. The biological weapon control regime is filled with loopholes and not effectively verifiable. And despite claims that a gentlemen's agreement/rational actor model will prevent the use of biological weapons, it did little to deter the Iraqis from using chemical weapons against the Iranian army and Kurdish civilians. The fact the West did little to retaliate for these acts seems to have further weakened this argument.
- The bottom line on the threat of biological warfare is clear: the incentives for use have increased while the deterrents against use have decreased. The probability of use against US forces is on the rise.
- While there is some debate concerning the effectiveness of biological weapons against well-trained, well-equipped, disciplined forces, there is no question these weapons would be devastating against civilian populations and other soft targets such as sea and air ports.

a successful attack against strategic mobility forces is not an option that receives a lot of attention.

- As America has returned the majority of its forces to the continental United States, these forces have become even more dependent on strategic mobility—they can't fight and win if they can't get there.
- America's defense transportation system is highly dependent on the commercial sector. In a major conflict more than half of the air mobility fleet and virtually all of the sealift fleet will be dependent on civilian crew members. Most in-theater port operations will also be dependent on civilian personnel.
- Therefore, an attack with biological weapons on key in-theater air and sea ports would most likely disrupt a major deployment to such a degree that it might ultimately result in the defeat of US forces. In other words, America's defense transportation system's high level of dependence on the commercial/civilian sector, a fact that has served the taxpayer well during the Cold War (by keeping costs low), may ultimately prove to be the "soft underbelly" of America's defense forces in this new world of disorder.

Recommendations

Substantial increases in biological warfare training for strategic mobility forces is not the answer to this problem. Some minor modifications and updates to current classroom training would be useful; however, additional training is not the answer to the BW threat against the defense transportation system. In fact, there is very little that can be done to "harden" the defense transportation system against a BW attack. (While a defense transportation system comprised of all uniformed military personnel could operate in a BW environment—albeit with casualties—the cost of maintaining such a system in peacetime is prohibitive.

Therefore, the best answer, and perhaps the only answer to this difficult problem must come from outside the mobility community. It must come from those responsible for fighting such a battle, the regional CINCs. In 1993, the regional CINCs and the Chairman were in fact directed to develop plans for such a contingency.

> *The Chairman of the Joint Chiefs of Staff and our regional commanders—the CINCs— are developing a military planning process for dealing with adversaries who have weapons of mass destruction.*
>
> *Secretary of Defense Les Aspin*

This planning process (referred to as deliberate planning) must develop options for scenarios that include a BW attack on strategic mobility forces. This includes plans for fighting a campaign if the strategic deployment of CONUS-based forces and sustainment supplies were severely disrupted or

completely shut down. There are actually two types of scenarios. The first would be a BW attack on air and sea ports prior to the deployment of forces. The second would be an attack during the deployment phase, leaving a partial ground force that would be cut off from its logistical tail. In either scenario, the effectiveness of ground forces would be neutralized or severely limited.

Unfortunately, a successful attack against strategic mobility forces is not an option that receives a lot of attention. In fact, it is not uncommon in war games conducted both in Washington, DC and at the military war colleges for the Red Force (enemy) to severely disrupt the strategic deployment of the Blue Forces; however, this is almost always disallowed by referees so "that we can get the forces in-theater and begin the battle." This is a mistake. It is a failure to recognize emerging threats and the changes that are likely to result from the ongoing revolution in military affairs.

Attacking strategic mobility forces is a cost-effective means to level the battlefield and neutralize America's superior conventional forces. In the post Cold War era, deploying forces to the theater, particularly heavy ground forces, may not be possible based on the time-phased deployment schedules required by the regional CINCs. America's armed forces no longer have the luxury of ignoring this scenario.

Long-range, strategic strike capability from naval and air power and perhaps some in-theater, land-based air assets, that could be supported by military airlifters, might be the only forces available to a regional CINC. This does not mean that biological warfare would make ground forces obsolete, but it does mean their arrival in a theater of operations could be significantly delayed...delayed so much that if alternate plans were not readily available, the war could very well be over before the ground forces arrived in-theater.

Fighting a major regional conflict without ground forces, or fighting the first phase of a campaign without a significant number of ground forces in-theater is a post Cold War paradigm that deserves attention and serious planning efforts. America's future adversaries should not be the only forces developing asymmetric strategies and tactics for the 21st Century.

At the time this article was prepared for printing, Colonel (P) Randall J. Larsen was the Deputy Commander of the 43d Air Refueling Group, Malmstrom AFB, Montana. Prior to assuming his current position, Colonel Larsen served as a National Defense Fellow at the Matthew B. Ridgway Center for International Security Studies, University of Pittsburgh. Colonel Larsen earned a BA degree in Criminology from Southwest Texas State University in 1974. In 1983 he earned his MA degree in National Security Affairs/Asian Studies from the Naval Post Graduate School. His military education includes Squadron Officer School, Air Command and Staff College, Air War College, and Defense Intelligence College.

Lt Col Robert P. Kadlec, USAF, is a physician assigned to the Office of the Secretary of Defense for International Security Policy as a Senior Assistant for Counterproliferation. He is a distinguished graduate of the US Air Force Academy. He holds a Doctorate of Medicine and a Masters Degree of Tropical Medicine and Hygiene from the Uniformed Services University of the Health Sciences. He also holds a Masters Degree in National Security Studies from Georgetown University.

Photo ID Correction

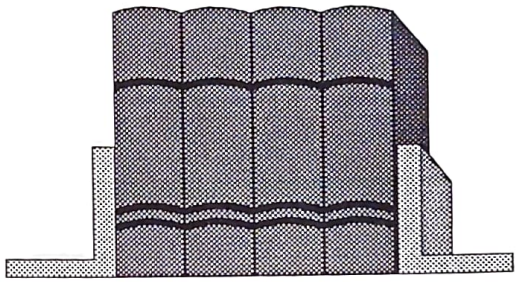
MAJ Robert Walk, battalion commander of the 3d Battalion, 291st Regiment at Shawnee, Oklahoma, wrote us reference the photo we used on the inside back cover of the July 1996 issue of *CML*.

He wrote that the masks appeared to be of World War II vintage, NOT World War I. He was right.

Dr. Burton Wright III, our command historian here at the US Army Chemical School, verified MAJ Walk's comments. The horse mask may, indeed, be from World War I, Dr. Wright says, but the masks the soldiers are wearing are not.

Our thanks to MAJ Walk for bringing this to our attention.

Book Review



Gordon F. Rhea. *The Battle of the Wilderness, May 5-6, 1864* (Baton Rouge, La: Louisiana State University Press, 1993).

The Battle of the Wilderness (May 5-6, 1864) is often found in military history books, but the story is often told in them that this battle was nothing more than two large forces attacking and retreating through dense thickets and in impossible terrain. So far as it goes, that's fine, but this battle has many, many lessons learned for commanders today.

The Battle of the Wilderness is a well-written and superbly researched book on the two-day battle of 5 and 6 May 1864. There were ties in the battle where both sides could have won it all, but were not able to make that last effort. sometimes, this effort was through ignorance of the importance of a particular piece of terrain (for example, the Chewning Farm the Federals initially occupied, but gave up even though the division commander there realized how good the terrain was, and was most reluctant to give it up).

The description of the fighting in the book is excellent although it lacks the lyrical qualities of Bruce Catton describing the same battles in *A Stillness at Appomattox*. The chaos of battle is amply described in the text, and how and why decisions were made in the heat of combat easily understood in context.

The characters of the principals are well-developed. The best part of the book is at the end when the author sums up the campaign. Both Lee and Grant are taken to task for missed opportunities, and each assumes a distinctly human form rather than the "military immortals" both have become. The person who seems to come out behind nearly everyone else is Meade. Much was expected of him, and little realized. The author contends that Grant began to realize during the fighting that Meade just wasn't up to the level needed to maneuver a large army and he (Grant) began to take a larger role in the direction of the army. But Grant himself was responsible for some of the problems because he insisted on directing Burnside's Ninth Corps when it rightly should have been under Meade directly. Coordination between the two was Grant's and not Meade's responsibility.

The subordinate generals like Warren, Sedgewick, Hancock, Ewell, Hill, and Longstreet all performed lower than expectation. Of course, the author concedes that hindsight is better than foresight, but he makes solid cases for the transgressions and lack of capable direction of several of those subordinate commanders named. One of the little vignettes is of Major General Warren on the night of 5 May engaging in a little less than honest behavior by "fixing" the casualty returns of his corps for his (Warren's) betterment. The maps are fairly well detailed—not as good as Cozzen's *This Terrible Sound*, but good enough to grasp the essentials of the battle. The pictures that accompany the text show in detail some of the more important areas of the fight. The pictures were taken just after the war..

This book review was provided by Dr. Burton Wright II, US Army Chemical School Command Historian.

Chemical Warfighter Operations Division

The Chemical Warfighter Operations Division (CWOD) is the Chemical School's newest organization. The CWOD was established 15 May 1996 in response to increasing concerns over a wide range of NBC tactical and training issues. These were highlighted in the March 1996 GAO Report, Counter-proliferation studies, BCTP Warfighter, NTC and Joint Exercise NBC lessons learned, and tactical unit requests for assistance.

The primary responsibilities of the CWOD include:

- Issue resolution involving Army and Joint Service exercises.
- Coordination responsibility for training model generation and maintenance.
- Primary coordinating responsibility for Army-generated doctrinal, logistics, equipment, exercise, and personnel issues.
- Supervisory responsibility for Proponency and Threat offices.
- The conduct of the commandant's senior leadership visit program and the management of the issues generated from it.
- The addressing of the Chief of Chemical's issues as they relate to field forces.
- Oversight of the Contingency Support Detachment (CSD).

CWOD is composed of four main parts:

1. The *Proponency Office* keeps the Chief of Chemical informed on officer and personnel development and management issues. These issues include the Personnel Functional assessments and the monitoring of Corps recruiting, retention, promotions, assignments, and strength management.

2. The *Threat Office* is responsible for the managing and analyzing of intelligence as it involves the Corps. This includes dissemination of the classified NBC monthly message and NBC Threat Briefings to the tactical level and the briefing of courses and visitors. The office is also involved in briefing NBC counter-terrorism and doing any threat assessments requested by the Chemical School.

3. The *Warfighter Support Operations Office* provides the primary interface with the Field Army on NBC Warfighter operational, logistic, exercise, and contingency deployment issues. The office coordinates the NBC scenario development for BCTP exercises. It also integrates and advises on NBC scenarios in all levels of exercises and participates in major joint and Army exercises as an NBC controller. The office has coordination responsibility for simulation training model generation and maintenance.

4. The *Contingency Support Detachment* is responsible for assisting and coordinating with other government departments on NBC issues. Courses are taught at the Chemical School as part of this program.

The current organizational heads are:

Chief	LTC Gary Wallace (wallaceg@mcclellan-cmls.army.mil)	DSN 865-6239
Deputy	LTC James Scott-Clarke (scott@mcclellan-cmls.army.mil)	DSN 865-6152
Chief, Proponency	MAJ Scott Robinson (robinst@mcclellan-cmls.army.mil)	DSN 865-4006
Chief, Warfighter Support	MAJ Ray Naworol (naworolr@mcclellan-cmls-army.mil)	DSN 865-5835
Chief, Threat Manager	CPT(P) Frank Sokol (sokolf@mcclellan-cmls.army.mil)	DSN 865-6452
Joint/Army Simulation Exercises	CPT(P) Walter Chase	DSN 865-5909
Cdr, Contingency Support	CPT David Deyak	DSN 865-3340

Biological Operations During Desert Storm

By CPT Jon Drushal

Mission: The 9th Chemical Detachment provides point biological and stand-off chemical detection capability to strategic sites throughout the theater of operations to provide early warning and confirmation of suspected chemical and biological attacks by Iraqi forces.

During Operations Desert Shield/ Storm, there was concern that Saddam Hussein might use biological weapons. At the time, no system existed capable of detecting and confirming the use of these agents. As a result, the 9th Chemical Detachment was formed to counter that threat.

This is the story of a unit whose obscure mission during Operation Desert Storm played a big role in the United States' ability to counter Iraq's chemical and biological threat. The 9th Chemical Company was in the process of downsizing with the loss of the 9th Infantry Division. On 12 January 1991 during the downsizing process, the company was alerted for deployment.

The orders specified a detachment of soldiers be formed from the company consisting of two officers and 43 NCOs. The division immediately began a search to come up with 19 additional NCOs that could not be filled from within the company. Orders called for the detachment to be organized into 12 teams with a headquarters element. Each team would consist of a team chief and two biological detection NCOs. The headquarters consisted of those elements necessary to sustain the teams along with a command and control element. Teams were further organized as biological (bio) teams and chemical/biological (C/B) teams. The C/B teams had the additional requirement to conduct chemical agent monitoring and were all led by staff sergeants. The bio teams were lead either by a staff sergeant or sergeant.

On 15 January 1991, 30 soldiers were sent to Aberdeen Proving Ground, Maryland, to undergo training on three systems: the XM-2 Biological Sampler, the PM-10 Commercial Sampler (also a biological detector), and the XM-21 Chemical Agent Automatic Alarm. An additional 30 soldiers arrived on 19 January 1991 to undergo training, but only on the biological samplers (these would be the biological teams).

The XM-2 and PM-10 are biological samplers capable of collecting airborne particles in a collection media typical of those used in a biological warfare attack. They do not identify, detect, or alarm in the presence of agents. The procedure calls for a liquid sample used in conjunction with a smart ticket. There were two smart tickets, one anthrax and one for Botulism (test tickets A and B). The results of the test with the smart tickets signal the presence of one of the agents.

The XM-21 Chemical Agent Automatic Alarm is an automatic scanning, passive infrared sensor that detects nerve and blister agent vapor clouds at an LOS distance up to 3.1 miles (5.0 kilometers). It was tripod-mounted and powered by a 1.5k generator.

All teams transported their XM-2s and/or M-21s on an M998 HMMWV with 3/4-ton trailer. In addition to the soldier's personal weapon, each team was issued a .50-caliber machine gun with tripod. The crew-served weapon was usually integrated into the base defense plan of the supported unit.

Final orders for the detachment were received attaching it to the Foreign Material Intelligence Battalion (FMIB) of the 513th Military Intelligence Brigade. The relationship was established due to similar missions. The FMIB already had established evacuation procedures to a CONUS

laboratory and had a Technical Escort Detachment attached to it as well. On 26 January 1991, the first serial of the detachment deployed out of McChord Air Force Base on four C-141 aircraft with all equipment coming from Fort Lewis, Washington. All systems and associated equipment coming from Aberdeen would rendezvous with the detachment at the airhead in Daharan. The second serial of only 16 soldiers deployed on 2 February 1991 in the same manner.

Upon arrival at Daharan International Airbase, the detachment was initially housed in Khobar Towers. The FMIB headquarters was within walking distance. Two liaisons from Edgewood Arsenal met the detachment at Daharan. These two captains assisted the detachment commander by providing technical expertise and logistical assistance. All equipment from Aberdeen arrived on 29 January 1991 at the airbase. Pallets were broken down and the equipment transported to FMIB headquarters.

Orders were promptly received on 31 January 1991 to deploy the C/B teams to Jubail, Ras Safania, Riyahd, KKMC, and Daharan. These five teams were to begin sampling immediately two times daily. Meanwhile, the second serial arrived on 3 February, received their equipment from Aberdeen on 4 February, and were ready for deployment on 5 February. Once all teams were on the ground, orders were received to move the five C/B teams to the forwardmost sites at Log Bases Charlie, Echo, and Alpha, Al Qaisumah, and IMEF Forward. The remaining teams with just the biological samplers were deployed to Riyahd (Eskan Village and CENTCOM HQ), Daharan/Dammam (FMIB HQ and Daharan Airbase), Jubail, KKMC, and Log Base Bastogne. Sites were established by CENTCOM J3 NBC based on the current threat to large U.S. troop concentrations. Sites were located at log bases, port facilities, and major headquarters.

One test site was positive for botulinum toxin and all remaining locations were positive for anthrax.

Once all teams were in place, procedures were established to begin periodic monitoring. Monitoring would begin under the following conditions: Special operations forces in the area with special equipment, offensive actions by either side, unexplained dead animals, artillery impacting away from troop concentrations, or on order. The frequency of samples depended on the type of condition and ranges anywhere from one sample every three hours to continuous. Any "Hot Samples" were handled using DD Form 1911, Material Courier Receipt, to ensure the chain of custody was not broken. Samples required a sample number consisting of country code, date and time, sequence number, location, and sampler's initials. Each C/B team utilized its M-21 during specific vulnerability windows.

The first "Hot Sample" was received on 17 February 1991. The sample was taken at FMIB headquarters, Daharan, and had a high positive reading. It was taken using the XM-2 and was evacuated to the Naval Theater Laboratory in Jubail for further analysis. They ran a smart ticket test and took 10-15 ml of fluid to grow a culture. The additional smart ticket test showed that there was a possibility of anthrax contamination. It was not until the culture had matured that it was determined not to be anthrax, but a similar organism.

Simultaneously, the sample was being evacuated via Technical Escort to CONUS (Fort Detrick). This chain of custody, with the exception of actually evacuating the samples to CONUS, remained consistent throughout the entire operation. On 22 February additional "hot" samples were received from across the theater. One test site was positive for botulinum toxin and all remaining locations were positive for anthrax. Half of the samples were taken using the PM-10 Commercial Sampler and the remaining samples using the XM-2.

All samples were proven to be false positives. This large number of false positives triggered a number of procedural changes. Technical Escort no longer automatically evacuated the samples to CONUS. The unit maintained the samples at the FMIB headquarters until such time that the lab could confirm the samples as positive through culture results. Additionally, procedural changes to the PM-10 Commercial Sampler and actual testing procedures were made.

The filter paper used in the PM-10 was discarded due to the fact that it contaminated the wet sample. Fibers from the filter paper reacted with the smart ticket, rendering a false positive. The only reliability concern was the fact that the sample medium had to be diluted 10 to 1 with sterile water. This problem was quickly corrected with help from the Naval Forward Laboratory by introducing graduated 50ml vials to aid in the dilution. An additional preventive step was provided to the soldiers on checking and reading the smart tickets. All soldiers checked their smart tickets to ensure that there was a small pinhole in the middle of the test ticket. This pinhole allowed the fluid to properly distribute throughout the test ticket paper. If this hole was not present, they were to discard the ticket and

use another one. The soldiers also received additional instruction on the reading of the test spots. If the reaction spot was not a bright red and filled in completely, it was to be discarded.

Resupply missions were conducted every 4-5 days or as the mission dictated. The logistics base at FMIB headquarters sustained all teams within theater with supplies required to execute the mission. The resupply of teams was conducted utilizing a HMMWV and a commercial truck provided by the LNOs. The theater was broken down into two distinct sectors—an eastern and a western sector. Each vehicle would resupply six teams with enough expendables to support them for 5 days of 24-hour operations. In addition to system materials, maintenance, and administrative support were provided during these resupply efforts. On 21 February, it became necessary to move part of the headquarters element out of Daharan to KKMC. This move allowed stockpiling of supplies at a forward location, decreased the distance traveled, and allowed a command and control element to be readily available to the teams.

With the cessation of hostilities, orders were received on 1 March to redeploy 11 teams back to FMIB headquarters. A team with a command and control element would deploy forward to Kuwait City to conduct biological and chemical operations. On 3 March, an additional team was ordered to move to Kuwait City. These teams collected eight biological samples in Southern Iraq. This included one soil sample in which a team was air-inserted into the sampling position at Tallil Airfield. The teams also assisted FMIB in the search for chemical munitions within Kuwait. Although no munitions were found, the teams remained within Kuwait City to assist FMIB in the gathering of technical intelligence information on Iraqi chemical equipment. The two teams redeployed back to FMIB headquarters on 17 March.

On 23 March, the detachment was released by CENTCOM J3 from its mission, but had to leave four contingency teams on standby in case of emergency. Most soldiers took a MAC flight back to Fort Lewis.

The execution of this mission during Operations Desert Shield/Storm was critical to the United States. Several hundred samples were processed through labs with only minimal false positives. This was a direct reflection of the efforts of the operators and the CRDEC liaisons refining the sampling process. Between January and March 1990, the 9th Chemical Detachment employed 12 teams with CENTCOM, MARCENT, CENTAF, SOCCOM, and ARCENT. The 9th Chemical Detachment was the first unit of its kind in U.S. military history and the predecessor to the new Biological Integrated Detection System (BIDS) Company.

At the time this article was written, CPT Drushal was observer-controller at the National Training Center, Fort Irwin, California. His previous assignments include battalion chemical officer, 1-506th IN, 2ID in Korea and 2-1 IN, 9th ID at Fort Lewis, Washington; dual purpose platoon leader, 9th Chemical Company, 9th ID; deputy brigade chemical officer, 199th SIB, Fort Lewis, Washington; Armored Brigade Chemical Officer, 1AD, Germany; company commander, 25th Chemical Company, 1AD; and light infantry TF trainer, NTC. He holds a BS degree from the University of Tampa in Business Administration. He is a graduate of the chemical officer basic and advanced courses and CAS^3.

Wanted: History of 71st Chemical Company

SSG John Velarde, 71st Chemical Company, 25th Infantry Division (L), Schofield Barracks, Hawaii 96786, is looking for any information on the history of the 71st Chemical Company, particularly past campaigns or soldiers in combat. Anyone with information to share with SSG Velarde, please contact him at the above address. Phone him at (808) 655-9416. His e-mail address is: Velfamily@worldnet.att.net. His FAX number is (808) 655-9109.

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Directorate of Combat Developments

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TAA 05—Total Army Analysis 05

The Total Army Analysis is an Army process that generates Army warfighter requirements, resources below the line force structure, and provides force structure for the next Program Objective Memorandum. TAAs are done every two years. Our last TAA was TAA 03 conducted in FY94 and carries us through the year 2003. TAA 05 guidance states Force XXI will not be considered and allocation rules must be supported by studies and/or doctrine. Combined Arms Command, Force Design Director (CAC FDD) validates and approves all allocation rules. This was done by VTC 6 Sep 96. During this VTC, CAC approved all Chemical SRC03 rules of allocation to include increasing the number of smoke/decon companies at Theater Army level from two to four. The force being played in TAA 05 is two Major Regional Conflicts (MRC) with two Corps in each MRC: One Corps with three and one-third divisions and one Corps with two divisions. DADCOSPS conducted a requirements conference 21-25 October 1996 with all allocation rules briefed for approval or disapproval. All chemical allocations were approved. These rules will be used by Concepts and Analysis Agents in their FASTAL computer run against each MRC resulting in the required forces to fight two MRCs. Resourcing of these requirements by HQDA will be determined in the April/May 1997 time frame.

Chemical School Role as the Theater Missile Defense Passive Defense Proponent

On 11 August 1995 the US Army Training and Doctrine Command designed the US Army Chemical School the proponent for TMD passive defense. The USACMLS is charged to act as the TRADOC integrator, coordinator, and resource optimizer for both current and future TMD Passive Defensive efforts and initiatives. Passive Defense includes tactical warning, reducing targeting effectiveness, reducing vulnerability, and recovery and reconstitution.

Tactical warning allows forces to take appropriate reactive passive defense actions such as taking cover or putting on protective gear. Warnings may be general (that missile launches are imminent or have occurred) or specific (that specific units or areas of the battlefield or theater are in danger of attack).

Reducing enemy targeting effectiveness is accomplished through Operations Security (OPSEC), Deception, and mobility. OPSEC includes communications security, signature reduction, and local unit security. Deception manipulates, distorts, or falsifies friendly actions in order to deceive the enemy. Mobility reduces vulnerability and contributes to survivability of certain systems by limiting exposure to reconnaissance and targeting.

Reducing vulnerability includes hardening, redundancy and robustness, dispersal, training civilian authorities, and

NBC defense. Hardening reduces the effect of attack on systems and facilities. Protection for mobile ground forces and equipment may be best accomplished by careful site selection, field fortifications, and other field-expedient methods. Redundancy and robustness preserves combat power by duplicating critical capabilities that are particularly vulnerable to TM attack. Dispersal reduces target vulnerability by decreasing concentration and making a target less lucrative. Training civilian authorities will facilitate civilian protection efforts and may reduce the political impact of missiles hitting civilian areas and facilities. NBC defense provides passive defense against NBC weapons through contamination avoidance, force protection, and decontamination.

Recovery and reconstitution includes activities such as reestablishing or reinforcing C^2; replacing communications, personnel, supplies, and equipment; conducting essential training, reestablishing unit cohesion, and repairing battle damage. In some instances of mass devastation, whole unit replacement may be necessary.

USACMLS representatives have participated in several exercises and warfighting experiments involving TMD. They included Prairie Warrior 95 and 96 at the Command and General Staff College, Fort Leavenworth, Kansas; and Roving Sands 95 and 96 at Fort Bliss, Texas. The Roving Sands exercises demonstrated the potential unity of commercial pagers as a personal communications device for warning soldiers of inbound missiles. Planning is underway to participate in Roving Sands 97 at Fort Bliss, Prairie Warrior 97 at Fort Leavenworth, Kansas; and Division XXI at Fort Hood, Texas, to examine a variety of aspects of passive defense.

We have also helped prepare the TMD Concept (TRADOC PAM 525-XX), the TMD Field Manual (FM 100-12), and a materiel requirement (the Force Warning Mission Need Statement).

TMD—Passive defense must be a cohesively managed effort because of the number of key participants. We seek to optimize the use of resources by coordinating with appropriate schools to eliminate overlap and foster commonality. We are taking a team approach with the Passive Defense proponency in order to include all the schools who are stakeholders. Those schools include the Engineer School, the Signal School, the Intelligence School, the Army Medical Center and School, the Air Defense School, the Combined Arms Center, the Logistics Center, and the Field Artillery School.

TMD—Passive defense offers a significant new role for the Chemical Corps in the 21st Century.

FAA—Chemical Functional Area Assessment 97

The functional area assessment (FAA) process allows the Army leadership to examine the impacts of modernizing the Army. The Chemical FAA focus is primarily on the Army's ability to maintain readiness and force capability as well as to execute its chemical force structure and modernization plans as the Army restructures.

CM FAA 97 issues will focus on the objectives of the FAA which are to ensure that the Army's force integration efforts are accomplished with minimum adverse impact on: readiness, modernization, personnel and training, materiel distribution and redistribution, application of doctrine, total force (active/reserve component) integration, base operations, qualify of life, execution of functions in United States Code Title 10, and identification of systemic issues that may preclude or inhibit the smooth transition to a modernized force.

Chemical School Directorate of Combat Developments supported by EAI, the FAA contractor, hosted the CM FAA 97 Issue Identification Conference on 16 October 1996. During the conference over 120 issues submitted worldwide were reviewed, refined, discussed, and a tentative disposition was determined. The meeting provided a comprehensive first cut of potential FAA issues applying across doctrine, training, leader development, organization, materiel and soldiers (DTLOMS).

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Directorate of Chemical Branch Readiness

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Doctrine Division is responsible for the development and publication of Chemical Corps field manuals and training circulars. Within the past year, several new publications have been fielded and should be available through the publication distribution system. A brief synopsis of the most recent published manuals and manuals under development follow.

FM 3-11, *Flame, Riot Control Agents and Herbicide Operations*, 19 August 1996, supersedes the 19 September 1990 publication. The manual has been updated with regards to riot control agents (addition of oleoresin capsicum and herbicide delivery systems. The manual was also dual-designated as a Marine Corps reference publication (MCRP 3-3.7.2).

FM 3-50, *Smoke Operations, Change 1*, was printed in 1996. The change provided guidance on the employment of the new multi- spectral (visual and infrared) smoke systems, M56/M58.

FM 3-5 (Draft), *NBC Decontamination*, has been revised and is currently in final edit and design. It will be printed in first quarter, FY97. Decontamination concepts have been updated to meet current techniques and procedures as proven in field operations. MOPP gear exchange has been revised to meet the most current procedures and the Patient Evacuation and Decontamination chapter has been revised in coordination with U.S. Army Medical Center and School based on lessons learned by tests conducted by the Health Services Command. Sections on decontamination of depleted uranium, low-level radiation, and contaminated remains have been added to a chapter on Special Decontamination Operations.

FM 3-101-4 (Draft), *Biological Detection Platoon Operations—Tactics, Techniques, and Procedures*, is also in final edit and design. It is scheduled for printing in early FY97. This manual describes the tactics, techniques, and procedures for the chemical company (Corps) (biological detection) platoon and team equipped with the Biological Integrated Detection System (BIDS) in support of Army and joint service operations. The manual discusses the mission, organization, and function of the biological detection company, how to employ it, and also presents a thorough discussion of biological detection tactics, techniques, and procedures, particularly monitoring, sampling, detection, identifying, reporting, and sample evaluation techniques.

FM 3-14 (Draft), *NBC Vulnerability Analysis*, should be available to the field second quarter, FY97. The manual addresses NBC intelligence preparation of the battlefield, NBC vulnerability analysis, including toxic industrial chemicals, and vulnerability reduction measures. Once the manual is fielded, those areas currently addressed in existing manuals will be removed during revision to reduce redundancy.

FM 3-3, *Chemical and Biological Contamination Avoidance, Change 2*, is being developed. The change will primarily deal with a new simplified hazard prediction methodology for biological contamination. The method provides a more realistic approach for biological hazard prediction while, at the same time, providing protection and warning areas for troops. The change will also bring other portions of the FM in line with ATP-45.

FM 3-6, *Technical Aspects of Biological Operations* and FM 3-9, *Technical Aspects of Chemical Operations*, are under revision and should be in the process of field staffing in early FY97.

FM 3-101-6, *Biological Defense Operations, Corps Staff and Biological Defense Company—Tactics, Techniques, and Procedures* is in the final draft stages and should be published

in late FY97. This manual will provide tactics, techniques, and procedures for biological defense for joint task force, echelon above corps, and corps-level battle staffs with biological detection force assets. This manual is oriented at the operational level. It discusses biological defense concepts, detection capabilities, planning considerations, and employment of biological detection units. It also presents a thorough discussion of the management and analysis of battlefield sensor information to determine if a biological attack has occurred and provides an approach to decide which response actions would be appropriate.

Work is beginning on the revision of FM 3-4-1, Fixed Site Protection. The manual will be refocused to include all aspects of NBC defense for fixed site, ports, airfields, log bases, etc. It is intended to be as multi-service as possible and to address recognized deficiencies in doctrine. The manual will be a two-year effort, so will not reach the field until sometime late in FY98.

The Doctrine Division welcomes input and suggestions from the field on all chemical matters of requirement. Input can also be made through the Chemical Doctrine Internet Mailing List. The process for subscribing to this mailing list can be found on page 34.

Analysis Division conducts top-down analysis of the Chemical Corps units' missions, collective tasks, and individual tasks. This leads to a definition of conditions and standards for successfully completing those tasks, and ensures that all combat critical tasks are identified and developed. We maintain the Chemical Corps collective and individual critical task lists, produce the Combined Arms Training Strategy (CATS), Individual Training Plans (ITPs), ARTEP Mission Training Plans (AMTPs), Drill Books, and the Soldier Training Publications (STPs).

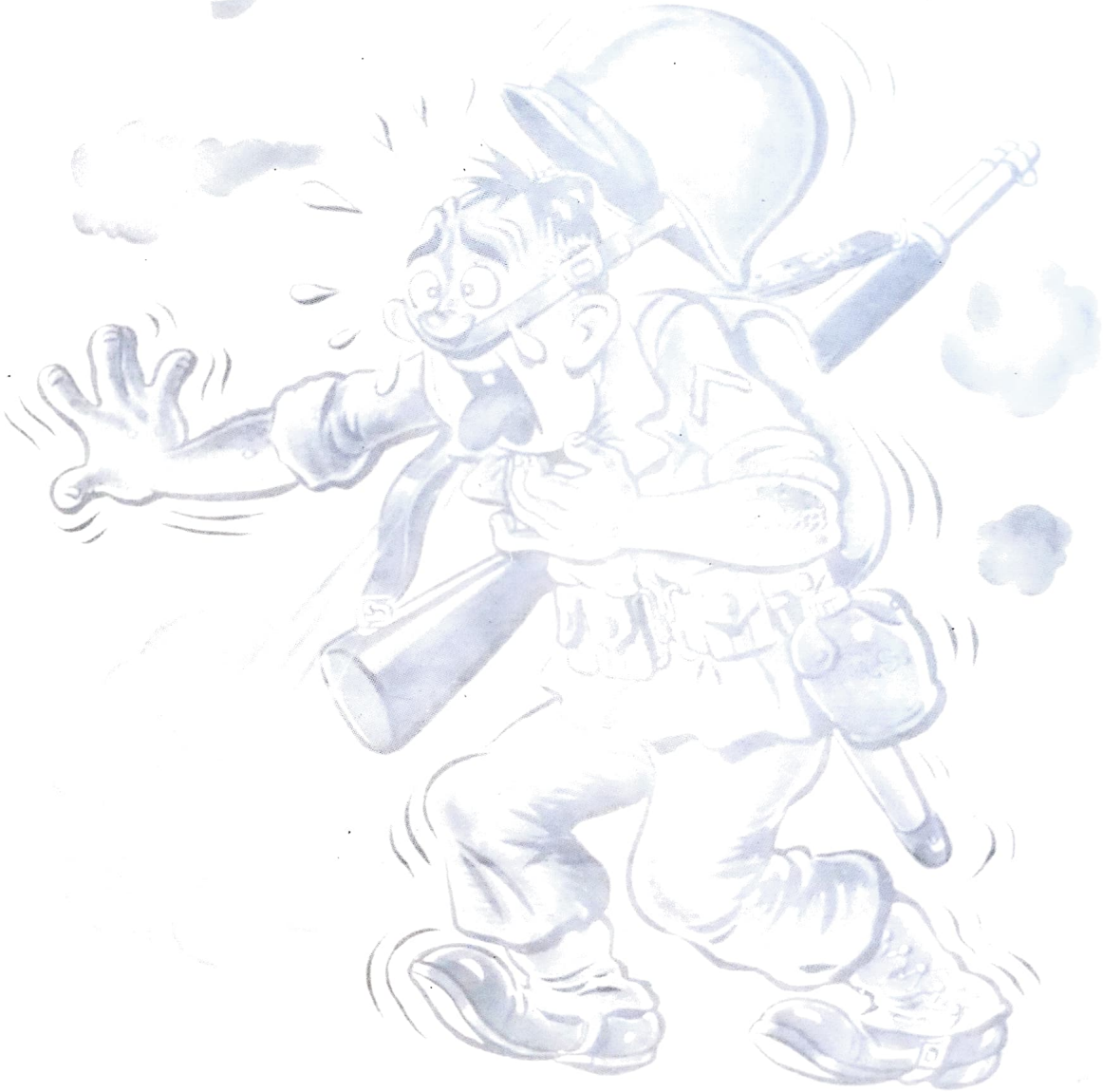
We are currently redesigning our NCOES professional development courses to bring them into compliance with the Total Army Training System (TATS). This will be at least a two-year contracted project. We will update, revise, and develop new training support packages (TSPs) for tasks that can be used as stand-alone, distributed training/distrance learning courseware. These exportable training packages will be created in both print and multimedia formats.

Some of the major actions we are continuing to work include the Army Training XXI NBC common task development, horizontal/vertical task identification and analysis of chemical officer and enlisted tasks, development of TC 3-30, Combined Arms Training Strategies, ARTEP 3-207-10-MTP, NBC Reconnaissance Platoon (M113/HMMWV), and ARTEP 3-477-10-MTP, BIDS Platoon.

Media Division has completed the following products since the last issue of *CML*: FM 3-11, *Flame Field Expedients; FM 3-50, Change 1, Smoke Operations; GTA 3-6-8, NBC Warning and Reporting System* (supersedes GTA 3-6-5 dated Feb 85); TVT 3-101, *Operate the AN/PDR-77 Radiac Set*, PIN 710787; TVT 3-102, *Operate the M21 RSCAAL*, PIN 710789; and TVT 3-103, *CAM, PMCS and Use*, PIN 710894.

New Systems Training Division ensures that all new equipment is adequately supported by the training system. We interface with the Directorate of Combat Developments and the Directorate of Training to prepare and review planning documents to ensure a smooth transition of new and improved NBC equipment into the Army Training System. We develop System Training Plans (STRAP) and Training Test Support Packages (TTSPs), verify technical manuals, and we are the point of contact for army Modernization Training, which includes WARNET XXI issues to improve training support to the Army Acquisition Process. We are currently working on the Multi-purpose Integrated Chemical Agent Detector (MICAD), Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD), Joint Warning and Reporting Network (JWARN), Joint Chemical Agent Detector (JCAD), Joint Service Light Nuclear, Biological, and Chemical Reconnaissance system (JSLNBCRS), as well as developing the USACMLS Operations Plan (OPLAN) for the Army Distance Learning Program (ADLP).

Fisher Library is the multi-media library for the Chemical School. The collection consists of classified and unclassified books, magazines, technical reports, video tapes, computer software, and current and obsolete DA publications. The library serves as the NATO control point and subregistry, and the MOS library for the post.



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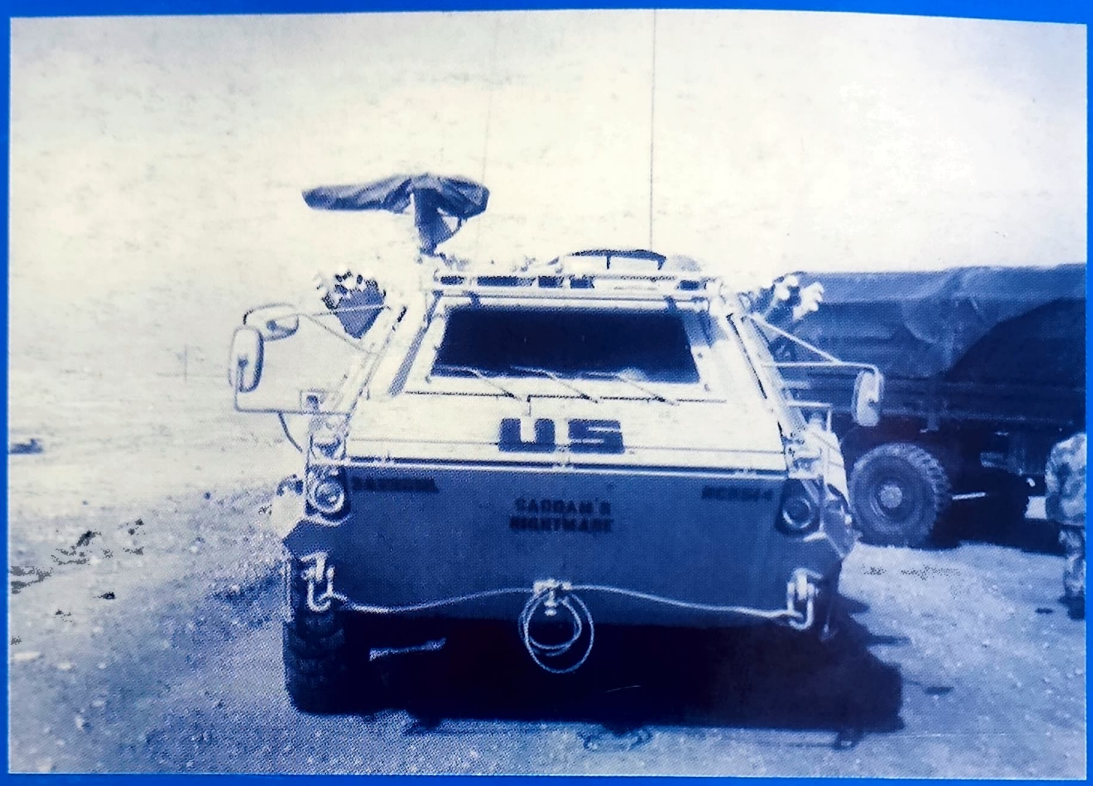

3d Armored Division Fox ready to roll. See story, page 11.

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