

**A Curious Void --**  
**Army Doctrine and Toxic Industrial Materials in**  
**the Urban Battlespace**

**A Monograph**  
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This Monograph investigates US Army potential to operate in a toxic urban environment. The monograph begins by demonstrating the increasing likelihood of urban operations precipitated by global urbanization. Joined with the rapidly growing population is a growing list of operationally significant toxic materials in the urban environment. Toxic industrial chemicals, radioactive material and industrial hazards present unique hazards throughout the urban complex. The monograph frames the civilian emergency response capability in the DTLOMS model. Since Civilian emergency response agencies routinely plan, identify and mitigate toxic materials, analysis of their methods highlighted some of the critical functions. After Civilian capabilities are evaluated, the monograph identifies the current US Army capability using the DTLOMS model. A case study of the US Army's response to toxic materials in Bosnia-Herzegovina during Operation Joint Endeavor demonstrated the incoherent US response. The monograph concludes that US Army forces do not have the DTLOMS to plan, identify and mitigate these hazards. The conclusion recommends several changes needed to meet this new operational challenge.

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## **Abstract**

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The monograph frames the civilian emergency response capability in the DTLOMS model. Since Civilian emergency response agencies routinely plan, identify and mitigate toxic materials, analysis of their methods highlighted some of the critical functions.

After Civilian capabilities are evaluated, the monograph identifies the current US Army capability using the DTLOMS model. A case study of the US Army's response to toxic materials in Bosnia-Herzegovina during Operation Joint Endeavor demonstrated the incoherent US response.

The monograph concludes that US Army forces do not have the DTLOMS to plan, identify and mitigate these hazards. The conclusion recommends several changes needed to meet this new operational challenge.

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## Chapter One – The Curious Void

The keystone doctrine for the US Army is Field Manual 100-5, *Operations*.

FM 100-5 describes how the Army thinks about the conduct of operations. FM 100-5 undergirds all of the Army's doctrine, organization, training, materiel, leader development and soldier concerns.<sup>1</sup>

Given this charter, it is easy to understand the importance of the topics discussed in FM 100-5. If the keystone doctrine does not deem a subject worthy of mention, then the US Army, as an organization will not devote time, money or effort to that topic. It is then unsurprising to observe the lack of development of capabilities for urban operations. Yet, operations in an urban setting are becoming more likely for the future. As the US Army races to develop relevant urban doctrine, the new doctrine must address the cauldron of hazards that exists in any urban complex. A failure to address these hazards presents the force with a significant challenge.

Urban warfare is not a new challenge, but one that has perplexed military thinkers for many years. It seems that it is easy to discover the shortcomings of urban doctrine, but harder to address them.

We run into a curious void in the literature of warfare. Most practitioners of the Art who are also its ablest theorists, scholars and writers dwelt on its varied aspects to the limits of their imagination. One thing, however, they did not touch upon -- combat where life is centered ... Not one has anything to say about military operations within or against the city. The subject was too sticky, too little understood, or it was dismissed as unimportant. -- S.L.A. Marshall<sup>2</sup>

This curious void exists despite the long history of combat in cities. Thucydides wrote of city combat thousands of years ago. His account of the battle in the streets of Plataea described many of the contemporary urban combat challenges.<sup>3</sup> Another ancient philosopher, Sun Tzu, strongly counseled avoiding city combat altogether. "This tactic of attacking cities is adopted only when unavoidable."<sup>4</sup>

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<sup>1</sup> U.S. Army, *Field Manual 100-5, Operations* (Washington, D.C.: Headquarters, Department of the Army, 14 June 1993), p. V.

<sup>2</sup> S.L.A. Marshall, *Notes of Urban Warfare* (Aberdeen Proving Ground, MD: US Army Material Systems Analysis Agency, April 1973), p. 3.

<sup>3</sup> Thucydides, *The Peloponnesian War*, revised, with introduction by T.E. Wick (New York: McGraw-Hill, 1982), p. 130.

<sup>4</sup> Sun Tzu, *Art of War*, translated by Ralph D. Sawyer (Boulder, Co: Westview Press, 1994), p. 177.

Warfare has changed in many ways since the days of Thucydides and Sun Tzu, but surprisingly, military doctrine has remained the same—avoid combat in cities if possible. Current US Army urban operational doctrine, FM 90-10, *Military Operations on Urban Terrain*, was published 15 Aug 1979. Written to guide fighting on the urban battlefield of a Cold War Europe, the relevance of the manual for current operations is questionable. This doctrine has not changed in spite of the Army's keystone doctrine undergoing four revisions.<sup>5</sup> The 1993 version of FM 100-5, *Operations*, devotes a short paragraph to the challenge of urban operations and refers the reader to the then 14 year-old FM 90-10.<sup>6</sup> The advice of Sun Tzu was a heavy influence in the manual, as it too counseled that urban terrain was to be avoided whenever possible.

An additional manual, written in 1995, attempts to address some of the shortcomings of FM 90-10, but its focus is as a “how-to-fight” manual. This manual, FM 90-10-1, *An Infantryman's Guide to Combat in Built-up Areas*, provides the “infantryman with guidelines and techniques for fighting against an organized enemy in built-up areas who may or may not be separated from the civilian population.”<sup>7</sup> The organized enemy is one that is fighting a conventional fight, head-to-head against the US forces. The manual does not address the interaction of the civilian population within the city. It is designed for a World War II type battle where collateral damage is not an operational concern. Rubbling entire blocks remain a viable course of action.

This monograph answers the research question, “Does current US Army and joint doctrine proscribe a method of planning, assessing, identifying and mitigating the effects that urban environmental hazards can have on military operations?” The monograph first establishes the increased likelihood of future US Military operations occurring on urban terrain. Next, in chapter three, the monograph demonstrates the abundant presence of operationally significant materials in an urban complex. Once these hazards are identified, the monograph will compare civilian response capabilities against those in the US Army. The DTLOMS (Doctrine, Training,

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<sup>5</sup> The Army Capstone Doctrine is *Field Manual 100-5, Operations*. The versions published were the 1982 version that introduced the AirLand Battle, the 1986 version, the 1993 version that introduced the AirLand Operations, and the latest version *Field Manual 3-0*, which is in its Final Coordinating Draft.

<sup>6</sup> *Field Manual 100-5, Operations*, p. 14-4

<sup>7</sup> U.S. Army, *Field Manual 90-10-1, An Infantryman's Guide to Combat in Built-up Areas* (Washington, DC: Headquarters, Department of the Army, 03 Oct 1995), With Change 1: p. vii.

Leader Development, Organization, Material and Soldier Systems) model frames the two capabilities.<sup>8</sup> Chapter four presents civilian capabilities while the military capabilities appear in chapter five. The last chapter compares the two and answers the research question. Chapter six also presents recommended changes to allow the US Army to meet the requirements stated in the research question.

## **Chapter Two - The trend towards urban operations.**

Disregarding this doctrinal void, the world's population continues to migrate into larger and larger urban complexes. Sometime during 1999, a fundamental change took place in the world demographics. For the first time in the history of mankind, there were more people living in urban areas than outside them. The size and complexity of existing cities has grown accordingly. The new term for these large urban complexes is the mega-city, a term reserved for urban complexes with a population over one million.<sup>9</sup> In the Year 2000, twenty percent of the world's population lives in a mega-city. By 2020, that figure will rise to almost thirty percent.<sup>10</sup> Mega-cities are becoming more common in underdeveloped nations. Unfortunately, the poorer citizens, more dependent on the inadequate infrastructure of the urban complex, are populating these cities. The population requires a level of support beyond what the local governments can supply. Most new city-dwellers find themselves living in slums or shantytowns around the periphery of the city, frequently in living conditions worse than what they left behind.

These mega-cities are an incredible drain on the environment and frequently disregard international borders. Along the Ivory Coast of Africa, the continuous mega-city that is visible from satellite imagery straddles five struggling nations.<sup>11</sup> The infrastructure of the mega-city cannot keep up with the explosive growth of the population. Overpopulation creates sanitation hazards and pollution runs unabated. These urban complexes defoliate the countryside in a feeble sustenance effort. In essence, the mega-cities are consuming the countryside to feed an

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<sup>8</sup> US Army, *TRADOC Pamphlet 71-9, Force Development Requirements Determination* (Fort Monroe, Va: Headquarters, Department of the Army, 5 November 1999)

<sup>9</sup> James K. Mitchell, ed., *Crucibles of Hazard: Mega-Cities and Disasters in Transition* (Tokyo, Japan: United Nations University Press, 1999), p. 28.

<sup>10</sup> *Ibid.*

<sup>11</sup> Robert D. Kaplan, *The Coming Anarchy* (New York, NY: Random House, 2000), p. 15. (The



insatiable hunger that will eventually leave a barren landscape incapable of supporting life, even in the shantytowns. As the overcrowding increases, the urban complex divides more on ethnic and economic lines, rather than geopolitical ones.

As more and more people migrate into the larger cities, so does the insurgent and criminal element.<sup>12</sup> Insurgent forces, used to drawing their support from the rural society, have followed the rural population into the city. Cities lack the resources to exert any influence in these shantytowns and the insurgent and criminal elements quickly fill that void.<sup>13</sup> The destitute living conditions produce a large population of inactive males who are ripe for recruitment to the violent lifestyle. Insurgent forces in the mega-city present the promise of a better way of life than the day-to-day existence offered by the government. "As anybody who has had experience with the Chetniks in Serbia, "technicals" in Somalia, Tontons Macoutes in Haiti, or soldiers in Sierra Leone can tell you ... and where there has always been mass poverty, people find liberation in violence."<sup>14</sup> To paraphrase from Mao Zedung, their lifestyle comes from the barrel of a gun. This liberation has created a different type of warrior. These killers are motivated by the short-term riches and intoxicated by their newfound power.

The future antagonist of a US involvement cannot match forces in a conventional, head-to-head battle. Given the advanced capabilities of precision fires, future antagonists must look to cities as safe havens from precision-guided munitions and other advanced weaponry. "An enemy seeking asymmetric advantages will be hard pressed to find an alternative more likely to neutralize US superiority than urban operations."<sup>15</sup> The division and isolation of US forces caused by the urban terrain presents a tremendous opportunity to apply asymmetrical attacks against the US force. As witnessed in the past decade, in both Somalia (1993) and Chechnya (1994-5), the urban environment neutralizes the standoff advantage of many advanced weapons.

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nations are Ivory Coast, Ghana, Togo, Benin and Nigeria)

<sup>12</sup> As a few contemporary authors (Kaplan and Hunnington) have noted, the distinction between these two elements has blurred significantly.

<sup>13</sup> Jennifer Taw and Bruce Hoffman, *The Urbanization of Insurgency: The Potential Challenge to U.S. Army Operations* (Santa Monica, CA: RAND Corp., 1994), p. 14.

<sup>14</sup> Kaplan, *The Coming Anarchy*, p. 45.

<sup>15</sup> Russell Glenn, *Denying the Widow-Maker, Summary of Proceedings, RAND-Dismounted Battle Lab Conference on Military Operations on Urban Terrain*, (Santa Monica, CA: RAND Corp., 1998), p. 27.

The Army Transformation process recognizes the significant challenges of military urban operations and has focused a great deal of research on this topic. War games, Army Warfighting Experiments, Advance Concept Technology Demonstrations, and numerous symposiums have all identified some requirements for operations on urban terrain and highlighted Army current doctrinal, force structure, and training shortcomings. All of these efforts represent the U.S. Army's attempts to fill the "Curious Void" in the study of urban operations. Most of these efforts focus on advancements for the individual soldier. However, if this shortcoming in urban doctrine is just a void, then the gap in doctrine for recognizing and mitigating the many urban hazards represents a gaping abyss.

### **Chapter Three - Unique hazards of cities and their operational impact.**

An urban setting presents many unique challenges to a military operation. Hidden in the city are many dangers that present operational implications. No longer confined to industrial parks, toxic industrial materials are distributed throughout complex urban environments. Rapid modernization of industry, coupled with a resource-constrained hazardous material management program, creates a cauldron of hazards in the urban complex. The convergence of hazards and people serve to increase the magnitude of the danger.

The effects of these toxic industrial chemicals on an unprotected population can rival those of a chemical warfare agent. In 1983, the release of 40 tons of methyl isocyanate in Bhopal, India, 8,000 people died overnight, over 20,000 died in the ensuing months and almost 500,000 remain affected today.<sup>16</sup> The Bhopal release came from a Union Carbide pesticide plant. Methyl Isocyanate is a precursor of many common insecticides used worldwide. It affects the eyes, nervous and respiratory system of the victims. Most victims suffer some degree of vision impairment from their exposure.

As a comparison, consider the famous chemical attack at the battle of Ypres in 1914, German forces released 168 tons of chlorine gas against an Allied force void of any protective

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<sup>16</sup> Yogi Aggarwal, "The Union Carbide Unforgiven," Internet: <http://iwnetwork.com/subscribe/news/bgnd/991209-union.html>: Accessed 9 December 1999.

equipment. The attack caused 5,900 casualties.<sup>17</sup> The chemical weapons used in World War I were, with the exception of phosgene, casualty makers but not killers. Their effect was to reduce the efficiency of the opposing force and to increase the burden placed on the medical and logistical systems. The AEF casualty figures aptly demonstrated their efficiency, 31 percent of all wounded treated in AEF facilities were for gas wounds.<sup>18</sup>

In many cases, the lethality of these Toxic Industrial Chemicals (TICs) can be greater than those traditionally considered chemical warfare agents. The Immediate Danger to Life or Health (IDLH) for Methyl Isocyanate is three parts per million.<sup>19</sup> As a comparison, the IDLH for Chlorine gas is ten parts per million.<sup>20</sup>

In addition to the conventional weapons, the future antagonists now would have access to Toxic Industrial Materials (TIMs), as well as the historically regarded Weapons of Mass Destruction (WMD) agents. The asymmetrical advantage offered by TIMs is sobering. US forces currently do not have the means to detect them.<sup>21</sup> For the most part, they do not require a delivery system. They are just as lethal as the “traditional” chemical warfare agents are, and they have worldwide availability. These combinations of agents and materials present a wide range of employment options against both the US force and the civilian population. The complexities of the urban environment and the current US lack of understanding of the hazards provide the foe with an opportunity to use these hazardous materials. Use of these materials would significantly influence the US mission. Even an accidental release of a hazard source in the city would present a serious operational challenge that we are not prepared to face. Their presence in today’s sprawling urban environments represents an operationally significant challenge to the U.S. force.

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<sup>17</sup> MAJ (P) Charles P. Heller, *Chemical Warfare in World War I: The American Experience, 1917-1918*, Leavenworth Papers No. 10 (Fort Leavenworth, KS: Combat Studies Institute, September 1984), p. 10.

<sup>18</sup> *Ibid.* p. 91.

<sup>19</sup> National Institute for Occupational Safety and Health, “Documentation for Immediately Dangerous to Life or Health Concentrations (IDLHs)”, <http://www.cdc.gov/niosh/idlh/idlh-1.html>:

<sup>20</sup> US Army, *Army Regulation 385-61, The Army Chemical Agent Safety Program* (Washington, D.C.: Headquarters, Department of the Army, 28 February 1997), Table 2-2. As a further comparison, the IDLH for Sarin is 0.035 parts per million.

<sup>21</sup> While the M93 can be outfitted with an improved chip to allow its mass spectrometer to identify an expanded library of Toxic Industrial Chemicals, it would be a stretch to say we have the

Toxic Industrial Materials identifies the broad category of potentially dangerous materials. It can be broken down into three major categories, Toxic Industrial Chemicals (TICs), long-term health threats, and radiological materials. Each of these categories possesses the potential to influence significantly US Military Operation. These categories of hazards are prevalent throughout the city. Yet, the danger posed by each is very different.

### **Toxic Industrial Chemicals (TICs)**

Chemicals are part of everyday life. A report from the Chemical Abstract Service indicated that, out of the 6 million known chemical compounds, a first responder could reasonably expect to encounter any of 1.5 million chemicals in an emergency.<sup>22</sup> Of these 1.5 million, anywhere from 33,000 to 63,000 of these chemicals are considered hazardous. To complicate the issue further, these hazardous chemicals can be known by up to 183,000 different names.<sup>23</sup> Even among this long list, there are varying degrees of hazard. Further refinement by the Environmental Protection Agency (EPA) and the Department of Transportation (DOT) identified a list of 2,700 chemicals they deemed hazardous during commercial transport.<sup>24</sup> Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) required the EPA to prepare and maintain a list of extremely hazardous substances that are lethal air toxins. That current list contains 387 chemicals.<sup>25</sup> These toxic chemicals have sufficient lethality to produce fatalities in less than 30 minutes.<sup>26</sup>

As cities modernize, the presence of TICs throughout the urban complex grows exponentially. No longer confined to industrial parks, they represent a hazard everywhere. The hazard in under-developed mega-cities is even more profound. Without the resources or time available to provide basic sanitation needs, they are incapable of enforcing an effective

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capability to monitor effectively.

<sup>22</sup> Office of Emergency and Remedial Response, *HAZMAT Team Planning Guidance* (Washington, DC: Environmental Protection Agency, Sep 90), p. 17.

<sup>23</sup> *Ibid.*

<sup>24</sup> US Department of Transportation, *2000 Emergency Response Guide*, <http://hazmat.dot.gov/guidebook.htm>

<sup>25</sup> National Institute for Occupational Safety and Health, "Documentation for Immediately Dangerous to Life or Health Concentrations (IDLHs)", <http://www.cdc.gov/niosh/idlh/idlh-1.html>: Centers for Disease Control,

<sup>26</sup> *Ibid.*

hazardous material control program. Even the US has difficulty controlling hazardous materials properly all of the time. Small amounts of dangerous materials find their way into the community, sometimes with lethal results.<sup>27</sup> Other nations without a large industrial base also have the potential for these substances. The transnational movement of hazardous materials, especially undocumented movement, has become a global crisis.<sup>28</sup> Third world nations are willing to accept the materials for the cash influx, yet are the least prepared to handle the materials properly. A Nigerian businessman accepted 3,800 tons of hazardous material from an Italian firm in 1988. Only after nearby residents fell seriously ill were steps taken to remove the material.<sup>29</sup> If an area has become a transnational dumping ground, the presence of hazardous materials becomes more likely, but harder to detect without an industrial signature.

### **Long-Term Health Risks**

The second class of substances that can have an operational impact include substances that pose a long-term health risk. The documentation of the potential long-term effects of many chemicals exists. The US government requires the monitoring of 400 chemicals with known long-term exposure hazards. These chemicals contribute to increased cancer or the birth defects rates among workers, or have a long-term debilitating effect on workers' health. These classes of long-term hazards are generally categorized by their effect on humans. Carcinogens, genetic and chromosomal mutagens, developmental toxins, reproductive toxins, chronic toxins, and nervous system toxicants comprise the main categories of potential adverse health risk chemicals.<sup>30</sup>

The required monitoring for these chemicals mandates a very low-level measurement taken over an 8-hour period. The Permissible Exposure Level (PEL) for many of these substances is significantly lower than that the military detection level for chemical warfare agents.

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<sup>27</sup> Peter Stuebe, "Hydrofluoric Acid Causes Death of Sanitation Worker," *Fire Engineering*, Jun 1999

<sup>28</sup> Robert Mandel, "Deadly Transfers, National Hypocrisy and Global Chaos," *Armed Forces & Society*, Winter 1999:

<sup>29</sup> *Ibid.* The waste was laden with polychlorinated biphenyl (PCBs); one of the more dangerous wastes worldwide.

<sup>30</sup> Donald F. Harker and Elizabeth Ungar Nattar, *Where We Live: a Citizens Guide to Conducting an Environmental Inventory* (Washington, DC: Island Press, 1996), p. 310.

In many cases, it is possible to receive a life-altering dose before reaching the detection threshold.

An indeterminate but significant percentage of the veterans of Operation Desert Shield/Storm have suffered a debilitating series of ailments. These illnesses, given the name “Desert Storm Syndrome (DSS)” have been the focus of millions of dollars of research. Desert Storm Syndrome affects only a small percentage of the veterans, but many of the victims were in close proximity during the conflict. While there was no widespread affliction, the syndrome was clustered in some company-sized units while missing others.<sup>31</sup>

One of the first causative factors investigated for Desert Storm Syndrome was a low-level exposure to a chemical warfare agent. While there is no evidence of an Iraqi use of chemical munitions, the Coalition forces did use conventional explosives to destroy some captured Iraqi chemical munitions.<sup>32</sup> Later research has ruled out the possibility of chemical or biological weapons as the cause of DSS.<sup>33</sup> An initial concern of the research was the limitations of current US detection equipment. Numerous false alarms of chemical detectors reduced their credibility. Designed to alarm at the operationally significant concentration, the detectors could not detect a low-level dose. For nerve agents, the M8A1 Chemical agent alarm is set to alarm just before the concentration reaches the level needed to cause miosis.<sup>34</sup> The M8A1 Alarm will detect Sarin (GB) at 0.2 mg/m<sup>3</sup>. Levels lower than that will not trigger the alarm.<sup>35</sup> As a contrast, the Permissible Exposure Level (PEL) for Sarin is 0.000003 mg/m<sup>3</sup>.<sup>36</sup> This is a 10,000 times smaller quantity.

The pollution from the Kuwaiti oil well fires set by the retreating Iraqi forces in Operation Desert Storm was another possible causative agent for Desert Storm Syndrome. These fires

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<sup>31</sup> Office of the Special Assistant for Gulf War Illnesses, “Information About Khamisiyah”, [http://www.gulfink.osd.mil/khamisiyah\\_index.html](http://www.gulfink.osd.mil/khamisiyah_index.html):

<sup>32</sup> Ibid.

<sup>33</sup> Ibid.

<sup>34</sup> Miosis is the pinpointing of pupils. This is usually one of the first recognizable symptoms of nerve agent exposure. This condition result in greatly reduced visual acuity and limited night vision.

<sup>35</sup> US Army, *Department of the Army Pamphlet 50-6, Chemical Accident or Incident Response And Assistance (CAIRA) Operations* (Washington, D.C.: Headquarters, Department of the Army, 17 May 1991), p. 49. The M8A1 Alarm will detect Sarin (GB) at 0.2 mg/m<sup>3</sup>

<sup>36</sup> Ibid., p. 43

dumped a vast amount of a cocktail of pollutants into the atmosphere.<sup>37</sup> These chemicals were not detectable by any tactical monitoring equipment present in the force then, or today. The hazard presented by these fires was neither measured nor quantified.

Peacekeepers in Kosovo recently faced this type of hazard. The Serb run smelting plant, located at Trepca, was emitting significant quantities of lead into the atmosphere.<sup>38</sup> Lead is a cumulative poison; its effects become worse over time. The plant was intentionally releasing 200 times the allowable limit.<sup>39</sup> This intentional emission presented a long-term health risk to the surrounding population and the peacekeeping force.

If one wonders about the operational impact of exposure to these agents, the many potential foes that view the willpower of the American people as the strategic center of gravity would not. Recognizing the US aversion to casualties, use of these long-term hazards presents a way to end a US involvement. If the sight of dead US Servicemen in the streets of Mogadishu generates sufficient media and political power to end US involvement, consider the continuing media interest in the soldiers with Desert Storm Syndrome. A future foe indicating intent to use a long-term toxin against US forces might generate enough leverage to curtail US involvement.

Two additional urban conditions that can have an operational impact include the oxygen deficient and the flammable atmospheres. Common in urban environments both present lethal challenges. Some chemicals can displace the oxygen in the air we breathe. This produces an oxygen deficiency. A filtration type mask will not protect the individual in an oxygen-deficient atmosphere. Several soldiers in a MOUT-facility tunnel were seriously injured when a smoke grenade consumed the oxygen in the tunnel.<sup>40</sup> Other soldiers that impulsively tried to rescue them were also incapacitated when they discovered that their protective masks did not protect them.<sup>41</sup>

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<sup>37</sup> Executive Office of the President, *Report on the Costs of Domestic and International Emergencies and on the Threats Posed by the Kuwaiti Oil Fires* (Washington, D.C.: Office of Management and Budget, June 27, 1991), p. 20.

<sup>38</sup> Reuters, "Kosovo Serbs React Angrily to NATO Shutting Smelter," *New York Times* (New York), 15 August, 2000

<sup>39</sup> *Ibid.*

<sup>40</sup> U.S. Army Safety Center, "Smoke Injuries," *Countermeasures* (Fort Rucker, Al), March 1992

<sup>41</sup> *Ibid.*

This type of accident is common in industry as well. The danger goes beyond the first individual, in California; sixty percent of these types of fatalities are would-be rescuers.<sup>42</sup>

Flammable environments represent another dangerous situation in the urban complex. Many gases will become flammable or even explosive if the concentration reaches a certain threshold. A flammable atmosphere can detonate with a significant explosive force. Fuel-air explosives, powerful weapons that can produce shock waves on par with small nuclear explosions, function on this principle. Damage to gas lines or the presence of propane cylinders can also create a similar danger in a damaged urban environment.

### **Radiological Material**

While the world held its breath when India and Pakistan traded nuclear tests in 1998, real and ubiquitous nuclear hazards silently permeate the urban environment. Nuclear weapons, fission and fusion warheads, rightly remain the focus of arms control efforts throughout the world. "They are the culmination of the search for efficient mass destruction that paralleled the search for efficient mass production."<sup>43</sup> The American people have many long-standing misconceptions about things nuclear. They are righteously indignant at the thought of the US building another nuclear weapon, will protest long and loud to prevent a nuclear power plant from being built, yet are unknowingly surrounded by countless radioactive devices in their homes. Non-weapons grade nuclear materials (radionuclides) are an unseen part of society. These substances are readily available and easily turned into a radiological danger by mistake or mayhem.

In an urban environment, there are three prime locations for the concentrated collection of radionuclides. Medical facilities, commercial industry, and food industry locations all use significant amounts of radionuclides in their daily operations. While nuclear power plants merit inclusion, they are more obvious and seldom overlooked. A secondary source includes most universities. They will have nuclear material in their science departments. Recall that the first

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<sup>42</sup> US Air Force Ground Safety Division, "Confined Space Safety, <http://www-afsc.saia.af.mil/afsc/rdbms/ground/feedback/articles/space.doc>.

<sup>43</sup> Alvin and Heidi Toffler, *War and Anti-War: Survival at the Dawn of the 21st Century*, (New York: Little, Brown and Company, 1993), p. 192.



sustained chain reaction took place underneath the football stadium at the University of Chicago.<sup>44</sup>

Medical facilities have two types of radioactive hazards. Sealed sources irradiate the human body. Perhaps the most common device is the family of X-ray machines used today, but other similar machines also sterilize equipment not suitable for a heat sterilization process.<sup>45</sup> The radioactive source for these machines is contained in a sealed coffin that prevents radiation leakage. The mechanism of the machine allows for a specific release of radiation for a given procedure. As long as the source remains sealed, there is little radiation risk. Damage to the coffin could release a lethal amount of radiation in a short amount of time. An unsealed source of Cobalt-60 found its way out of its coffin and into a California landfill. Discovery occurred during a routine sweep for radioactive material. The source, about the size of a soda can, was totally unshielded and capable of delivering a lethal dose of radiation in under an hour.<sup>46</sup>

The second class of medical radionuclides is the unsealed source. These are the radioactive drugs designed for ingestion as part of a radiation therapy. While these facilities keep low concentrations, they have the dangerous ability to concentrate at the sewage treatment facilities.<sup>47</sup>

Commercial facilities use radioactive devices for many things. Common uses range from insect control, sterilization, thickness measurement, construction, non-destructive weld testing, and the commercial products that we use in our homes. Nearly all of the items used in industry are sealed source devices. The danger only becomes evident if the sealed source is liberated from its containment cell.

A dangerous situation with a commercial industry sealed source occurred during the initial days of Operation Joint Guard in Bosnia. A British unit occupied an abandoned boilermaker

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<sup>44</sup> Richard Rhodes, *The Making of the Atomic Bomb*, (New York, NY: Simon and Schuster, 1986), p. 399.

<sup>45</sup> Lieutenant Matthew E. Woods, *Threat of Radiological Terrorism*, (Master's Thesis dissertation, Naval Postgraduate School, Monterey, CA, 1996), p. 32.

<sup>46</sup> Russell W. Glenn, *The City's Many Face*, (Santa Monica, Ca.: RAND Corporation, 1999), p. 360.

<sup>47</sup> Gigi Marino, "The Nuclides in Town: Does Danger Lurk in Low-Level Radioactivity in Sewage?" *Science News* (Washington, D.C.), Oct 1, 1994. Of note is the comment that the excrement from patients receiving radioactive treatments is higher than the threshold required for a NRC permit.

plant as its billets. Soldiers were moving into one of the buildings when they noticed international radioactivity warning signs. They contacted US Army chemical reconnaissance units to perform a radioactive survey. The survey team found two exposed gamma radiation sources from the x-ray machine of the factory.<sup>48</sup> The room was sealed and the unit advised to occupy other parts of the facility.<sup>49</sup> If the signs had been ignored, the soldiers staying in that room would have received lethal doses of radiation overnight.<sup>50</sup>

Some of the more common radioactive sources in the home include smoke detectors and even the mantle from gas lanterns. In most cases, the amount present is not significant, but one recent example demonstrates the danger that these small amounts can present if intentionally mishandled. A Michigan teenager, in a misguided attempt to gain a merit badge, collected enough radioactive material to build a makeshift nuclear reactor in the shed behind his house.<sup>51</sup> Combining the Americium-241, the radioactive element used in smoke detectors, with the Thorium-232 he extracted from lantern mantles, this youth was able to build a breeder reactor that was producing uranium-235, a weapons grade material. By the time authorities had discovered the experiment, the accumulated radiation endangered up to 40,000 of his neighbors.<sup>52</sup> This was all done at low cost, using off the shelf products.

Depleted uranium (DU), present in many US weapons, also presents a residual radiological hazard. A portion of the DU round is vaporized on impact, producing a fine dust. Since DU is an Alpha-particle emitter, its greatest danger is in ingestion or inhalation.<sup>53</sup> NATO estimated that it fired 31,000 DU rounds in Kosovo.<sup>54</sup> An air survey in Macedonia reported alpha radiation to be eight times higher than expected.<sup>55</sup> Recent accusations by the Italian

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<sup>48</sup> Captain John W. Miller, Sergeant First Class Thomas Baron, Specialist Tharon Cook, "The Chemical Corps and the Environment in Bosnia-Herzegovina," *Army Chemical Review*, July 1996: p. 8.

<sup>49</sup> *Ibid.*

<sup>50</sup> *Ibid.*

<sup>51</sup> Ken Silverstein, "Tale of the Radioactive Boy Scout," *The Radioactive Boy Scout*, <http://www.dangerouslaboratories.org/radscout.html>: Originally appeared in Harper's Magazine, Nov 1998

<sup>52</sup> *Ibid.*

<sup>53</sup> *Ibid.*

<sup>54</sup> Scott Peterson, "Depleted Uranium Haunts Kosovo and Iraq," *Middle East Report*, Summer 2000: p.15.

<sup>55</sup> *Ibid.*

governments blamed the death of six Italian peacekeepers on DU exposure.<sup>56</sup> DU also prompted the Spanish Government to test all 32,000 of its peacekeepers for DU exposure.<sup>57</sup> With over twenty nations producing DU-based weapons, the hazards will be present on future battlefields.<sup>58</sup>

Toxic industrial materials exist in every urban complex. Nations that have the least capability to mitigate the hazards are most likely to be affected by them. This chapter has introduced the three basic categories of TIMs, Toxic industrial chemicals, long-term hazards and radiological hazards. Each can have an operational impact on a US military operation. Though all are dangerous, each also presents its own set of challenges. Toxic chemicals possess lethality on par with chemical warfare agents. Dangerous chemicals that can change one's life are prevalent. Radioactive material is not thought of often, but surrounds us everyday. Low or higher-than-normal levels of oxygen can turn a relatively safe area into either a death trap or a fuel-air explosive. All of these hazards present dangerous situations with operational impact and therefore warrant serious consideration.

## **Chapter Four - Civilian Capabilities**

The previous section portrayed the many hazards that exist in the urban complex. These hazards present a significant operational challenge to a deployed force. Confronting this challenge from a cold start would present a formidable challenge. Fortunately, civilian organizations deal with the urban hazards on a daily basis. In 1998, there were seven million pounds of hazardous material released in the US.<sup>59</sup> Local emergency officials meet the challenges of planning, identification and mitigation of these urban hazards. Members of the civilian public safety organizations make up the backbone of the responder community. Fire and police departments are the core organizations that meet these challenges on a daily basis. They are able to perform this important mission thanks, in large part, to a nationwide professional

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<sup>56</sup> Reuters, "Italy Asks NATO to Check Deaths Tied to Uranium," *New York Times* (New York), January 4, 2001.

<sup>57</sup> Dave Eberhart, "DoD, Allies at Odds Over Depleted Uranium Dangers," *Stars and Stripes Onmimedia*, January 3, 2001.

<sup>58</sup> Peterson, "Depleted Uranium Haunts Kosovo and Iraq,"

<sup>59</sup> Environmental Protection Agency, *Summary of 1998 Toxics Release Inventory (TRI) Data*,

education and awareness program. This allows operation within a common, understood framework.

The method used to compare civilian capabilities to the military's is the Army's DTLOMS model. This frames both civilian and military capabilities under a common model. Examining these civilian response capabilities within the DTLOMS framework will identify the essential elements of the program. Insights here will establish a standard to compare to the military response. This comparison to a mature and successful program should produce quantifiable recommendations. The Soldier criterion is not used to prevent any military-civilian issues from clouding the comparison.

### **Doctrine**

Civilian responders do not suffer from a lack of guidance from outside agencies. Most of the guidance from these agencies comes in the form of statute or law. The provisions of most of these statutes are very specific. Since the guidance is prescriptive in nature, local agencies must comply. The Environmental Protection Agency (EPA) is the lead federal agency for hazardous materials. Other agencies that are proponents for statutory guidance include the Occupational Safety and Health Agency (OSHA), part of the Department of Labor, and the National Institute for Occupational Safety and Health, part of the Centers for Disease Control and Department of Health and Human Services. The Federal Emergency Management Agency (FEMA) serves as the coordinating agency when a federal emergency disaster exists. Each of these agencies represents a special area of concentration. Together, they form the national strategy for dealing with hazardous materials in our nation.

The Environmental Protection Agency's mission is to protect the nation's environment. Its concern with hazardous materials is limiting their release into the environment where it could present a risk to the environment as a whole. Communities finally realized the dangers posed by the spread of toxic materials through the biosphere. This realization prompted the Superfund Amendments and Reauthorization Act of 1986 (SARA) to mandate that commercial enterprises located within a community report the presence of threshold quantities of these toxic materials to

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<http://www.epa.gov/tri/tri98/data/1998datasumm.pdf>: September 12, 2000

the local community. This provision, the Emergency Preparedness and Citizens-Right-to-Know act (EPCRA), has greatly enhanced the preparedness of the local responder community by giving them the list of hazards that exist in their community.<sup>60</sup> This gave the local responders with a limited list of hazards to focus the response effort. The EPCRA lists the likely hazards present in a community. Additionally, EPCRA required local communities to establish plans to meet these unique challenges of an incident response to those reportable chemicals.

The charter of Occupational Safety and Health Administration is to protect the worker from risk. Most of its guidelines limit or eliminate hazardous materials from affecting either the short-term or the long-term health of the individual worker. OSHA guidance limits, at very low levels, the amount of hazardous substances that exposure occurs before incurring any health impacts. The Permissible Exposure Level (PEL) identifies the quantity of a substance that an unprotected worker can be exposed to during a forty-hour workweek without effect.<sup>61</sup> The PEL ideally, protects the worker for a lifetime of exposure without any health impact.

A second tier of the OSHA involvement is the regulations passed to protect those that will respond to a hazardous material incident. The OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) regulation defined the training and response guidance from the individual worker to the incident commander.<sup>62</sup> HAZWOPER established the structure of the command system and the training required at all levels of the response.

The National Institute of Occupational Safety and Health establishes the standardized protective levels required for specific hazards. NIOSH takes the EPA and OSHA guidance and translates it into protective procedures required for a given hazard. NIOSH is the translator of national guidelines into the specific guidance for responding to a hazardous material environment. NIOSH established the minimum protective standards for masks and other protective gear. NIOSH also establishes the IDLH levels for most lethal chemicals.

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<sup>60</sup> Donald F. and Elizabeth Ungar Nattar Harker, p. 47.

<sup>61</sup> Occupational Health and Safety Administration, "Frequently Asked Questions - HAZWOPER," *OSHA FAQs - HAZWOPER*, <http://www.osha-slc.gov/html/faqhazwoper.html>: Accessed 12 Dec 2000. The PEL standard was designed to allow an unprotected worker to work eight hours per day, five days per week, for a forty-year career without any health impact.

<sup>62</sup> Ibid. CFR 1910.120(q).

## Training

The OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) regulation defines the training guidance from the individual worker to the incident commander.<sup>63</sup> These guidelines establish a baseline of knowledge that permits skill standardization nationwide. These guidelines give the worker the skills needed to work at their appropriate level during a hazardous material release. OSHA defines two basic levels of training for first responders, Awareness Level and Operational Level.<sup>64</sup> Both of these levels define the respective allowed procedures in a HAZMAT incident. These regulations protect the responder and are much different from the exposure guidance presented in the OSHA regulations designed to protect the average worker in the average workplace. The first responder level of training focuses on “defensive actions” or actions designed to limit the spread of contamination.

Awareness level training is required for individuals who are likely to observe a hazardous material release and can sound the proper alarm. Under the HAZWOPER, individuals trained at this level have enough training to recognize a HAZMAT incident and attempt to safely clear the area and call for better-trained and better-equipped personnel to respond. While OSHA does not establish a minimum training requirement for this level, most communities use a four-hour training package.<sup>65</sup> The outcome of this training is an increased awareness in the individual of the danger of a hazardous material release. The individual should be able to recognize the inherent danger of a hazardous material and its potential health risk to the individual. The awareness level of training should enable them to identify a possible hazardous material release and safely warn others of the danger and request assistance from the appropriate emergency response personnel. Individuals trained at this level are not the ones who would act to contain or stop a hazardous material release. Giving individual workers this training raises the level of hazardous materials awareness. These individuals serve as watchdogs for a possible release. The early identification is essential to the rapid warning, response, containment and mitigation of a hazardous material release.

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<sup>63</sup> Ibid. CFR 1910.120(q).

<sup>64</sup> Ibid.

<sup>65</sup> David F. Peterson, "Hazardous-Materials Response: Know Your Limitations," *Fire Engineering*,

First responders at the Operational level training receive the awareness level and receive additional training on measures designed to limit the further spread of the hazard. Operational level actions contain the release from a safe distance to keep it from spreading and prevent exposures. The training does not give them the skill needed to stop a release, but focuses their efforts on containing the release in the smallest possible area. Since these actions might take them close to the release area, they receive training on the use of protective clothing and equipment. Protective equipment used does not allow them to enter the danger area, but rather to protect the workers if an accidental contact with the hazardous material occurs.

Neither the Awareness nor the Operations Level training allows the responder to enter the hazard area to stop the release. Responders with the specialized training to take these actions are certified at the Technician level. OSHA requires 24 different competencies for the Technician level certification.<sup>66</sup> While OSHA requires a minimum of 24 hours of training, California requires 240 hours of classroom and hands-on training to gain state certification.<sup>67</sup> Only personnel with this level of certification can act to stop or control a release. Since the technician will operate inside the hazard area, a great deal of his training focuses on the appropriate level of protection.

The highest level of training mandated by OSHA is the specialist level. A Hazardous Material Specialist parallels the duties of the technician. Additionally, the specialist has received specialized training in the procedures for a specific hazardous situation.

### **Leadership**

Leader development also follows the HAZWOPER regulation. In addition to the establishment of the training required by the individual responder, HAZWOPER mandates the structure for the command and control required for a response. The Incident Command System (ICS), mandated by HAZWOPER, establishes the standardized roles and missions for those leading a response effort.<sup>68</sup>

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Mar 2000: p. 157.

<sup>66</sup> Ibid.

<sup>67</sup> Ibid.

<sup>68</sup> OSHA, 29 CFR 1910.120(q)

The ICS is a recognized and adopted standard nation-wide. The incident commander has total control over the response effort. The commander is mandated by law to ensure that many specific conditions are met before beginning a response. Some of the critical tasks that must be met include, appointing a safety officer, establishing the correct personal protective level, ensuring that SCBA be used initially, mandating a buddy system for all responders, establishing a back-up team, and ensuring that on-site medical support and decontamination teams be set-up and ready to operate.<sup>69</sup> The National Fire Protection Association offers standardized training and certification for incident commanders. FEMA offers training programs for citywide emergency staffs. NFPA and FEMA also serve as the nationwide repository for lessons learned. Responders can leverage these information streams to learn from incidents across the nation, fostering a shared knowledge far greater than personal experience.

### **Organization**

Only the largest cities have a standing organization to handle hazardous material emergencies. Most communities rely on fire and police department personnel trained at the first responder levels. For larger incidents, communities rely on pre-existing support agreements with surrounding communities. This allows them to respond initially and then scale the response effort based on the magnitude of the incident. The ICS framework and common training allows for a seamless integration of outside agencies into the response effort. This variable response allows communities to be responsive without maintaining a costly, standing organization.

Those cities that are large enough to field a standing response team are able to keep those teams occupied. The Houston Fire Department HAZMAT team responds to over 1200 calls annually.<sup>70</sup> These teams have little problem maintaining their proficiency. Most other teams conduct around 8 hours a month in refresher training.<sup>71</sup>

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<sup>69</sup> Ibid.

<sup>70</sup> David F. Peterson, "Hazardous-Materials Response: Know Your Limitations," Fire Engineering, Mar 2000

<sup>71</sup> Peterson, "Hazardous-Materials Response,"



## **Material**

EPCRA and HAZWOPER have driven many communities into developing some form of HAZMAT response. The size and scope of the response should be driven by a mission analysis of the needs of the community and contrasted against available funding. In general, material for any hazmat response capability falls into three major equipment categories: monitoring, personal protection, and containment.

A response team entering a hazardous environment must be able to monitor and assess the atmosphere. The recommended minimum team requirements includes a combustible gas indicator, and oxygen level indicator, some colorimetric tubes for a specific chemical or family of chemicals, pH paper to assess the potential corrosiveness of a substance, and an electronic detector to detect the presence of a suite of likely hazardous materials.<sup>72</sup> A combustible gas indicator detects the presence of flammable gases in the atmosphere. This will help prevent responders from entering an explosive environment or act to prevent an atmospheric explosion. The oxygen level indicator is important to the response team to warn them of two potentially lethal situations. If there is a higher-than-normal level of oxygen, the potential exists for rapid reactions that could endanger the team. A lower-than-normal oxygen level indicates that something is consuming or displacing the oxygen. Depending on the level of respiratory protection the team possesses, this could indicate a lethal situation as well.<sup>73</sup> Colorimetric tubes use a chemical reaction to produce a color change in the presence of a specific chemical. These devices are relatively inexpensive and easy to use. They can be both qualitative and quantitative. The disadvantages are that they are very specific and relatively slow. The types of tubes needed must be identified in the planning phase. Information obtained by EPCRA requirements makes this step easier. Responders buy the tubes related to the hazards in their area. The team should also carry pH paper. Identification of a corrosive environment can serve to protect the team. The presence of corrosive agents could damage team equipment or dangerously react with other substances. The electronic detector should use either flame ionization or photo ionization to

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<sup>72</sup> Office of Emergency and Remedial Response, "HAZMAT Team Planning Guidance," (Washington, DC: Environmental Protection Agency, Sep 90), p. 10.

<sup>73</sup> For example, a filtration-type protective mask would protect the worker from harmful vapors but

detect concentrations as low as 0.5 parts per million (PPM). These detectors provide near-real time detection and quantification for the response team.

OSHA defines four levels for personal protective equipment. Each of these is designed to afford the proper level of protection for a given situation. Many responders have made the mistake of assuming their fire-fighters equipment provides adequate protection.<sup>74</sup> While the self-contained Breathing Apparatus (SCBA) does offer good respiratory protection, the rest of the outfit does not protect the rest of the body.

Level A affords the highest possible protection against known and unknown hazards. It consists of SCBA and an impermeable suit that totally encapsulates the wearer. There are many different types of encapsulation suit materials. The type of material, type and duration of protection also factor into the cost of the suit. A Teflon suit will cost close to \$6,000 each, while a PVC suit would only cost around \$1,100.<sup>75</sup>

A majority of hazardous material responses will require Level B protection.<sup>76</sup> This level consists of the SCBA and impermeable dermal protection. The level B suits are not encapsulating or sealed like the Level A ensemble. Most level B suits will use some type of sealing tape on the places where SCBA, gloves and boots meet the suit. Level B suits are significantly less costly than a Level A suit, usually costing less than \$200 each.<sup>77</sup>

The Level C ensemble consists of a filtration type respiratory protection and a chemical protective coverall gloves and boots. The chemical coverall is not impermeable, but does offer some splash protection. This type of respiratory protection is not permissible except in known concentration atmospheres. Additionally, this type of protection does not protect the wearer in an oxygen-deficient environment. These restrictions preclude the use of this level for nearly all Hazmat responses.

The role of the first-responder and hazmat technician requires specialized equipment to contain and stop the release. This includes material and equipment needed to decontaminate the

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would not protect them in an oxygen-deficient environment

<sup>74</sup> Peterson, "Hazardous-Materials Response,"

<sup>75</sup> Office of Emergency and Remedial Response, p. 12.

<sup>76</sup> Office of Emergency and Remedial Response, p. 11.

<sup>77</sup> Ibid., p. 12

responders if they are accidentally contaminated. Possible hazards in the area should dictate the type and quantity of the equipment needed by a response team. A beginning set of containment equipment should cost around \$3,500.<sup>78</sup> EPCRA planning will help a response team to identify and special tools or procedures for dealing with the hazards in their community.

This chapter examined the methodology used by civilian responders to plan, identify and mitigate toxic materials in the urban environment. This is a mature and successful capability and the DTLOMS framework reveals the essential components of the program. Civilian responders meet the challenges of urban hazards every day. The HAZWOPER and EPCRA regulations discussed earlier provide statutory guidance for both the community and the individual responder. HAZWOPER serves as the keystone operational doctrine for the response community. The regulation not only specifies the needed skills; it also establishes the command and control methods for a response. The strong doctrinal foundation directly leads to the comprehensive and coordinated national response capability. Standardized training and equipment ensures a seamless integration of response teams into a larger incident. EPCRA greatly simplified the planning effort for the civilian responder. This regulation focuses the planning effort of the responder to identify any lethal hazards in their area. These two regulations provide the civilian responders with the doctrinal base for their efforts.

## **Chapter Five - Current Military Capabilities**

Just as the civilian response effort was modeled using the DTLOMS approach, a similar effort is needed to assess properly the capability of the US Army to meet challenge of TIMs. A framing of the current systems will allow for a later comparison of the military to civilian capabilities.

### **Doctrine**

The military's requirement to address the issues of TIMs became more focused after the issuance of Presidential Review Directive 5 (PRD5) in 1998. It established the mission to "identify and minimize or eliminate the short and long-term health effects of military service, especially during

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<sup>78</sup> Ibid., p. 13, Table 2

deployments (including war) on the physical and mental health of veterans.”<sup>79</sup> The DoD response was to issue a memorandum requiring all services to comply with PRD 5.<sup>80</sup>

The first Joint doctrine published that addresses some of the implications of TIMs is Joint Publication 3-11, *Joint Doctrine for Operations in Nuclear, Biological and Chemical Environments*. Published in July 2000, this new doctrine introduced a new definition of NBC Environments, “...includes the deliberate or accidental employment or threat of NBC weapons and attacks with other chemical, biological or radiological materials or toxic industrial materials (TIMs).”<sup>81</sup> In a later section on TIMs, it identifies twenty-four “high-hazard Toxic Industrial Chemicals.”<sup>82</sup> These TICs were listed because all are used in bulk quantity worldwide, are highly toxic and rapidly vaporized.<sup>83</sup> It also includes a downwind hazard distance for a few of these chemicals.

While the technical information is important, the most valuable portion of the TIM section is the planning section. JP 3-11 clearly identifies the need for the Joint Force Commander to consider the potential impact of these hazards as part of the Intelligence Preparation of the Battlefield (IPB) process. It specifically tasks the Armed Forces Medical Intelligence Center (AFMIC) to provide threat assessments that “include the identification of industrial sites in the theater that can produce toxic industrial hazards.”<sup>84</sup>

Joint Pub 3-11 establishes TIMs as operationally significant hazards in the battlespace. Joint Pub 3-11 defines them this way:

Industrial chemicals: Chemicals developed or manufactured for use in industrial operations or research by industry, government, or academia. These chemicals are not primarily manufactured for the specific purpose of producing human casualties or rendering equipment, facilities, or areas dangerous for human use. Hydrogen cyanide, cyanogen chloride,

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<sup>79</sup> National Science and Technology Council, “Presidential Review Directive 5,” Office of Science and Technology Policy, *Planning for Health Preparedness for and Readjustment of the Military, Veterans and Their Families After Future Deployments* (Washington, D.C.: Executive Office of the President, August 1998), Internet:

<http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/directive5.html>.

<sup>80</sup> DOD information memorandum, Subject: Military and Veterans Health Coordinating Board (MVHCB) and Presidential Review Directive 5 (PRD 5), Dec 99.

<sup>81</sup> Joint Chiefs of Staff, *Joint Pub 3-11, Joint Doctrine for Operations in Nuclear, Biological and Chemical (NBC) Environments*, (Washington, D.C.: Department of Defense, 11 July 2000), p. I-1.

<sup>82</sup> *Ibid.*, p. D-4

<sup>83</sup> *Ibid.* p. D-4

<sup>84</sup> *Ibid.*, p. IV-2

phosgene, and chloropicrin are industrial chemicals that also can be military chemical agents.<sup>85</sup>

While this is a doctrinal first step in the identification of the problem, there is still some confusion over the implications of this new mission. Although Joint Doctrine is prescriptive in nature, JP3-11 fails to designate clearly a single proponent to address this new hazard. The Joint Force Surgeon is responsible for the Health Service Support (HSS) for the Joint Force. Accordingly, he is charged with the collection of AFMIC intelligence and planning for the Preventive Medicine (PVNTMED) efforts. For the most part, the remainder of NBC defense falls within the service responsibility. The executive agent for the DoD NBC defense effort is the US Army Chemical Corps.<sup>86</sup> Accordingly, chemical doctrine comprises the majority of JP3-11. This approach leverages the expertise available in the different proponents, but violates the principle of unity of effort. The division of tasks falls on neither the expertise, nor the distribution of the appropriate knowledge and equipment during an operation. While it does ensure participation by all parties, it does not reflect the operational realities facing a commander today.

Even with Presidential Review Directive 5 and a prescriptive joint publication, very little US Army doctrine exists. In addition to the keystone doctrine of the Army, doctrine for urban operations, planning, and branch specific doctrine could potentially address urban hazards.

#### US Army Keystone Doctrine

The keystone doctrine for the Army is Field Manual 100-5. FM 100-5 devotes one paragraph, an insignificant passage of seventy-six words to address the complexities of urban terrain.<sup>87</sup> The final sentence refers the reader to the outdated FM 90-10.<sup>88</sup>

The next version of the Operations field manual is FM 3.0.<sup>89</sup> It presents a much-improved discussion of the complexities of the urban environment. It recognizes urban

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<sup>85</sup> Ibid., p. GL-7 This term and its definition are approved for inclusion in the next edition of JP 1-02.

<sup>86</sup> Commandant, US Army Chemical School, *Chemical Vision 2010*, Ft Wood, MO, 3 February 1999.

<sup>87</sup> Army, *FM 90-10*, p. 14-4.

<sup>88</sup> Ibid.

<sup>89</sup> *U.S. Army, Field Manual 3.0, Operations*. The version reviewed for this monograph is the 15 June 2000 Doctrine Review and Analysis Group (DRAG) edition.

complexes as “...dynamic entities that include hostile forces, local population, and infrastructure.”<sup>90</sup> The information provided in this draft presents a better visualization of the complexity of urban operations. While it did not include the urban hazards directly, the manual does establish the premise that the urban complex is a system of systems. The interaction of these systems with the urban hazards could have effects on several systems at once. This system’s interaction discussion opens the door for the inclusion of TIMs.

#### US Army MOUT Doctrine

While FM 3.0 introduces the complexity of urban operations, it does not address how to identify and mitigate these complexities. The next step in the doctrine quest is to look at the Army’s doctrine for urban operations, FM 90-10, *Military Operations on Urban Terrain*. This offspring of the 1976 version of FM 100-5, *Operations*, was published in 1979.<sup>91</sup> This manual was written as a how-to-fight manual for the defense of Germany from the Warsaw Pact forces. While it goes into detail about the construction properties of various European structures, it discusses an urban hazard only once. In describing the fire hazard of the industrial/transportation area of a city, “Stockpiling of fuel and combustible chemicals is common in industrial /transportation areas – *avoid them*. Isolated fires will be common in this area.”<sup>92</sup> Even in 1979, the writers of FM 90-10 proffered the advice to avoid urban terrain if at all possible. This guidance was tempered by the admission that urbanization was making this advice harder to follow.<sup>93</sup>

The shortcomings of FM 90-10 were partially addressed with the 1995 publication of FM 90-10-1, *An Infantryman's Guide to Combat in Built-up Areas*. The focus of this manual is at the tactical level. “This manual provides the infantry battalion commander and his subordinates a current doctrinal source for tactics, techniques and procedures for fighting in built-up areas.”<sup>94</sup> Given the infantry-centric focus of the manual, it nevertheless provides several insightful cautions against urban hazards. It advised the commander to query the local government officials on the

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<sup>90</sup> Ibid., p. 6-20.

<sup>91</sup> This version of FM 100-5 introduced the “Active defense” concept of operations.

<sup>92</sup> U.S. Army, *Field Manual 90-10*, p. A-9. Italics in original text.

<sup>93</sup> Ibid., p. 1-1

location of hazardous materials.<sup>95</sup> The focus of the manual may have excluded it, but there is no mention of the methods used to identify, assess or mitigate urban hazards.

#### Planning Doctrine

Field Manual (FM) 101-5, *Staff Organization and Operations*, describes the basic doctrine of the roles, relationships, organization and responsibilities of staffs in the United States (US) Army.<sup>96</sup> It lists in significant detail the responsibilities of the members of a staff. A search of the chapter on staff responsibilities shows one section with the primary responsibility to advise the commander of the possible effects of TIMs on the operation. A specific task for the Chemical Officer is to “advise the commander, in conjunction with the surgeon, on possible hazards and effects of low-level hazards, such as low-level radiation and toxic industrial material.”<sup>97</sup> The chemical officer also provides the same type of assessment to the commander on the employment of traditional NBC weapons.

This is a dead-end reference, since a similar coordination task is not listed for the surgeon.<sup>98</sup> The closest task calls for the surgeon to advise the commander on “the effects of the medical threat (including environmental, endemic and epidemic diseases, NBC weapons, and directed-energy devices) toward personnel, rations and water.”<sup>99</sup> In the context of this statement, “environmental” refers to the challenges of operating at temperature or altitude extremes, not the environmental hazard or TIMs discussed earlier.<sup>100</sup> Given the JP 3-11 guidance, the surgeon most likely serves as the conduit for intelligence received from AFMIC.

Joint Pub 3-11 identifies the need for assessing the urban hazards during the Intelligence Preparation of the Battlefield (IPB) process. IPB is designed to foster an “understanding the

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<sup>94</sup> U.S. Army, *Field Manual 90-10-1, An Infantryman's Guide to Combat in Built-up Areas*, p. 1-1.

<sup>95</sup> *Ibid.*, p. 2-7.

<sup>96</sup> US Army, *Field Manual 101-5, Staff Operations*, (Washington, D.C.: Headquarters, Department of the Army, 31 May 1997), p. vii.

<sup>97</sup> *Ibid.*, p. 4-24.

<sup>98</sup> *Ibid.*, p. 4-21.

<sup>99</sup> *Ibid.*

<sup>100</sup> US Army, *Field Manual 4-02.17, Preventive Medicine Services*, (Washington, D.C.: Headquarters, Department of the Army, 2000), p. 1-1. Environmental factors listed are heat, cold, humidity and significant elevations above sea level.

battlefield and the options it presents to friendly and enemy forces.”<sup>101</sup> The field manual for this process is FM 34-130, *Intelligence Preparation of the Battlefield*, published in July 1994. The manual describes four distinct actions and how the IPB process fits into the different scenarios. The first two scenarios involved a conventional attack and defense. In both scenarios, all the urban terrain is bypassed.<sup>102</sup> The third scenario portrays a battalion counter-insurgency operation. Although the scenario depicts seven distinct urban areas, they are not included in the analysis except as hindrances to mobility and as likely locations for an enemy ambush.<sup>103</sup> The fourth scenario involves a brigade noncombatant evacuation (NEO) of US citizens from within a major urban complex.<sup>104</sup> There is no mention of any battlefield characteristic except for the classification of terrain as “Dense, Random Construction,” or “Trees/Park.”<sup>105</sup> The only other mention of urban hazards falls under the heading of “Other Characteristics of the Battlefield.”<sup>106</sup> A bulletized list of logistic infrastructure aspects includes bulk fuel storage and transport systems, transportation means and systems, industries and technologies, power production facilities and chemical and nuclear facilities.<sup>107</sup> There is no further discussion of these aspects in the manual, particularly not their operational impact.

While the review of Army doctrine does not address toxic materials, there are three branches of the US Army that, to differing extents, deal with hazardous materials as part of their branch charter. There are three essential players in the mission to protect the force from Toxic Industrial Materials. The Health Services, as the preventive medicine team, the Engineers, as the Army environmental stewards, and the Chemical Corps, as the NBC experts. Each now will be examined separately across the DTLOMS framework.

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<sup>101</sup> U.S. Army, *Field Manual 34-130, Intelligence Preparation of the Battlefield*, (Washington, D.C.: Headquarters, Department of the Army, 07 Aug 94), p. 1-1.

<sup>102</sup> Army, *Field Manual 34-130*, p. 3-1.

<sup>103</sup> *Ibid.*, p. 3-61

<sup>104</sup> *Ibid.*, p. 3-77.

<sup>105</sup> *Ibid.*, p. 3-85

<sup>106</sup> *Ibid.*, p. 2-26.

<sup>107</sup> *Ibid.*, p. 2-27.



## **US Army Engineer Corps**

The Army Corps of Engineers is the Army proponent for environmental matters.<sup>108</sup> As such, its charter is to manage the Army's compliance with applicable environmental regulations. "Environmental Management in the Army is the means of conserving, protecting and restoring our natural and cultural resources while accomplishing the military mission."<sup>109</sup> In compliance with this task, engineer units often build storage facilities to allow units to store safely the hazardous material they generate during their daily operations. Combat engineer doctrine does not address TIMs or their potential impact.

Most of the environmental training comes from the US Army Environmental Center. The focus of the material is geared towards environmental stewardship and compliance. Proper handling of the hazardous waste stream generated by normal Army operations is the critical task. Formal training ranges from regulatory guidance to the proper storage procedures.

The US Army Engineer Corps has two distinct branches. The combat engineers are devoted to providing support to theater forces. Their principles of support are Mobility, Counter-mobility and Survivability. The second branch is the Army Corps of Engineers. Their charter, among other things, is to serve as the Army proponent for environmental compliance and stewardship. The focus on compliance means that their efforts are at the unit level. Engineer leaders can serve in both branches of the Corps. This allows for the development of leaders that can meet the operational necessities and the environmental compliance requirements.

Engineers do not have standing organizations in tactical units to oversee environmental compliance. MACOM engineer sections have assigned environmental personnel. These personnel can form ad-hoc detachments to serve the environmental compliance mission of the deployed force.<sup>110</sup>

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<sup>108</sup> US Army Environmental Center, *Commander's Guide to Environmental Management* (Aberdeen Proving Ground, MD: US Army Environmental Center, May 1993)

<sup>109</sup> *Ibid.*, p. 1.

<sup>110</sup> MAJ Charles Litzelman, "Environmental Actions in the Former Republic of Yugoslavia," *Engineer* (Fort Leonard Wood, MO), March 1997: p. 13.

Most of the engineer equipment used for environmental compliance is commercial, off-the-shelf technology. The preponderance of equipment is for containment and packaging of hazardous materials.

### **US Army Medical Corps**

The charter of the Army Medical Corps is to “preserve the fighting strength.” Their mission is a throwback to the Ben Franklin adage that “an ounce of prevention is worth a pound of cure.” Accordingly, the Corps places emphasis on preventing effects, rather than treating. A review of the recently published FM 4-02.17, *Preventive Medicine Services*, reveals an emerging interest in the requirement to prevent the injuries that TIMs can pose on the battlefield.<sup>111</sup> The doctrinal emphasis comes with the recognition of occupational health hazards as a significant threat to mission accomplishment.<sup>112</sup>

The unit designated to address this challenge is the preventive medicine detachment. There are two basic configurations for these detachments, Sanitation and Entomology. Their mission is to prepare and update the medical threat database, publicize the medical threat, and stimulate the employment of preventive medicine measures.<sup>113</sup> The PVNTMED detachment will monitor the unit waste disposal facilities and advise the commander about the units’ occupational health program. These efforts are geared towards making the base camp as safe as possible. It also briefly describes the use of the M93 NBC reconnaissance vehicle for environmental sampling.<sup>114</sup>

Military Occupational Specialty (MOS) 92S soldiers are the preventive medicine specialists. Their initial training consists of a 15-week One-Station unit training (OSUT). Training encompasses the gamut of preventive medicine tasks. This training most closely represents civilian industrial hygienist training.<sup>115</sup>

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<sup>111</sup> US Army, *Field Manual 4-02.17, Preventive Medicine Services*

<sup>112</sup> *Ibid.*, p. 1-1.

<sup>113</sup> *Ibid.*

<sup>114</sup> *Ibid.*, p. 6-4.

<sup>115</sup> US Army Medical Command, *Military Occupational Specialty (MOS) 91S Preventive Medicine Specialist*, [http://www.cs.amedd.army.mil/appd/Enl\\_pg/mpgs/91s.mpg](http://www.cs.amedd.army.mil/appd/Enl_pg/mpgs/91s.mpg):

The Preventive Medicine Detachment is the primary unit for preventive medicine support. The PVNTMED detachment is a small, rapidly deployable organization. Since a tenet of PVNTMED is prevention, the early deployment of the detachments is strongly suggested. Despite its critical role, the preventive medicine community in the Army is small. There are only 615 preventive medicine soldiers and 144 officers in the force structure.<sup>116</sup>

The Sanitation detachment is comprised of 10 soldiers. The basis of allocation for these units is one per 28,000 personnel and one per 50,000 prisoners of war.<sup>117</sup> A rule of thumb is two per division supported. The Entomology Detachment is comprised of 10 soldiers. The basis of allocation for these detachments is one per 66,000 personnel and one per 100,000 prisoners of war.<sup>118</sup> The rule of thumb for these detachments is one per deployed division. Additionally, preventive medicine specialists are in the divisional medical companies. The forward medical companies have two preventive medicine specialists, while the direct support company has a three-soldier team.<sup>119</sup> The preventive medicine detachment uses commercial technology to collect samples and test water, air, and pest management. The tests conducted by the detachment are rudimentary at best, and samples must be evacuated to a Medical Laboratory for definitive analysis.<sup>120</sup> This limits the responsiveness of the samples collected. The small size and limited allocation of the PVNTMED detachments limit their ability to cover the operational environment. There are adequately resourced to meet the needs of these static facilities, but little else. The detachments are unable to support the force fully.

### **US Army Chemical Corps**

The Chemical Corps operates under three principles of NBC defense, Contamination Avoidance, Protection and Decontamination.<sup>121</sup> Application of these principles has created chemical doctrine. They are equally suited to traditional NBC agents and TIMs.

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<sup>116</sup> US Army Medical Command, "Enlisted Proponent Division," *MOS 92S Strength*, [http://www.cs.amedd.army.mil/appd/Enl\\_pg/Enlframs.htm](http://www.cs.amedd.army.mil/appd/Enl_pg/Enlframs.htm): Personnel Proponent Division, Army Medical Center and School,

<sup>117</sup> US Army, *Field Manual 4-02.17, Preventive Medicine Services*, p. 4-10.

<sup>118</sup> Ibid.

<sup>119</sup> Ibid., p. B-2

<sup>120</sup> Ibid., p. B-4.

<sup>121</sup> US Army, *Field Manual 3-100, Chemical Operations Principles and Fundamentals*

Contamination avoidance requires the ability to recognize the presence or absence of NBC hazards. FM 3-3, *Chemical and Biological Contamination Avoidance*, devotes a one-page chapter to "Civilian Chemical Hazards."<sup>122</sup> There are several shortcomings in this passage. There is an over-reliance on using the Host Nation emergency response teams. As established in an earlier chapter, most governments in the urban complex do not have the capability to respond. When dealing with an unknown, MOPP-4 is assumed to provide adequate protection. This is the same as OSHA level-C protection. It also calls for an evacuation zone of 620 meters, and a 10-kilometer downwind hazard zone.<sup>123</sup> These zones are universal, applicable for any TIM. As a contrast, JP 3-11 dictates a smaller downwind hazard zone for many of the more hazardous chemicals.<sup>124</sup>

Initial entry training focuses on the three NBC defense principles against the traditional chemical warfare agents. Every chemical soldier has completed training in a toxic environment at the Chemical Defense Training Facility (CDTF). This training gives the soldiers a high degree of confidence in their equipment and capabilities. Soldiers that are assigned to specified units might have additional training in chemical accident and incident assistance (CAIRA) missions. This usually deals with the same type of agents, but introduces the civilian regulations and their possible impact. Soldiers that attend the three-week Technical Escort School receive HAZWOPER certification as part of their training.

Chemical soldiers are embedded throughout the Army. Accordingly, they develop as a function of their chemical training, but also as a reflection of the units they serve. Chemical units provide leadership opportunities for the chemical soldier.

Chemical soldiers embedded in the battlestaff of all Army units provide expert advice to the unit commander on NBC defense. Combat arms units have chemical soldiers assigned at the

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(Washington, D.C.: Headquarters, Department of the Army), p. 4-1

<sup>122</sup> U.S. Army, *Field Manual 3-3, Chemical and Biological Contamination Avoidance*, (Washington, D.C.: Headquarters, Department of the Army, 16 November 1993), p. 6-0.

<sup>123</sup> *Ibid.*, "The 620-meter distance is a standard safety zone for protection from explosive debris. The 10 km circle downwind hazard distance for a non-persistent Nerve agent attack when the wind speed is less than 10 km per hour. (Field Manual 3-3, p. 3-13)

<sup>124</sup> *Joint Pub 3-11*, p. D-3.

company level, while combat support and combat service support units have chemical soldiers at the battalion level.

The divisional chemical company provides organic reconnaissance, decontamination and obscuration to the division. These units provide support to divisional units as required. The chemical battalion provides additional support to the division and corps units.

Chemical reconnaissance units possess one of the best tools for environmental detection. The M93 NBC Reconnaissance System (NBCRS), or Fox, contains a mobile mass spectrometer capable of discerning thousands of chemicals and provide quantitative analysis as well. This detector can rapidly detect traditional chemical warfare agents as well as TIMs. The vehicle is highly mobile and has a collective protection system for crew survivability.

#### **A Case Study - Operation Joint Endeavor**

A review of the engineer, preventive medicine and chemical efforts in support of Operation Joint Endeavor (OJE) in Bosnia-Herzegovina demonstrates an application of the DTLOMS models to support an operation. This case study presents one bridge between the doctrinal theory and the operational reality. OJE was the initial deployment of US forces as part of the implementation force for the Dayton Peace Accords. The First Infantry Division deployed to parts of war-torn Bosnia-Herzegovina as the lead US Army unit.

The Engineer effort for OJE began with the bridging of the Sava River and the construction of base camps for the force. Yet, as the Army proponent for environmental matters, the engineer corps quickly moved into that portion of their mission to ensure environmental compliance of the OJE forces. The purpose of these efforts was two-pronged; to keep the force from creating a hazard that would adversely affect mission accomplishment and to comply with established hazardous material handling procedures.<sup>125</sup> All of these efforts were very effective in the protection of the force and the environment. In fact, the US often found itself cleaning up hazardous materials left in the base camps from the previous occupants.<sup>126</sup>

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<sup>125</sup> MAJ Charles Litzelman,; p. 12.

<sup>126</sup> Ibid., p. 14.

The Preventive Medicine effort for OJE was unique and very successful. Faced with an operationally challenging mission with a large area of responsibility, and multiple base camps, the scope of the PM effort required a comprehensive plan. Most of the effort focused on the many disease risks faced by the OJE soldiers. The mission of the deployed PM team was to, "Preserve the health of deployed US Forces and establish countermeasures to the risk of disease and injury."<sup>127</sup> The main effort was to prevent any of the deployed soldiers from contracting any of the score of serious and fatal diseases that were prevalent in the Balkans. Protection of the force in the base camps was a critical task, and the PM teams eventually came up with quantifiable standards to measure the protection of the various facilities.<sup>128</sup> Their environmental sampling procedures primarily focused on the base camps. Concerned about the air quality in the Tuzla valley, they began a comprehensive air monitoring. They also found time to collect 2,300 environmental samples of soil and water during the first year.<sup>129</sup> Although a theater support medical laboratory later deployed to Bosnia, the most samples went to facilities in CONUS.<sup>130</sup> Despite the large number of samples taken, the focus of the PM team remained inside the wire of the base camp. This focus limited the sampling done outside the base camp.

The Chemical Corps units deployed to OJE focused their efforts outside the wire. The First Infantry Division Chemical section recognized early in the planning process that there were operationally significant hazards in the area. Their efforts led to numerous intelligence requests and culminated in the execution of several CPX exercises for the Division and Chemical battle staffs to work out the difficulties presented by toxic substances in the battlespace.<sup>131</sup> While it took some time to convince the command of the importance of this aspect of mission analysis, the operationally significant impact a TIC release could have on the OJE mission became clear.

Once the forces entered the Balkans, chemical soldiers began their environmental reconnaissance mission. Taking advantage of the "environmental" chip in the M93 Fox, they

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<sup>127</sup> Kenneth J. LTC Tannen, LTC John J. Ciesla, and MAJ Mustapha Debboun, "Military Preventive Medicine Support: The Balkan Experience," *Center For Army Lessons Learned (CALL) Newsletter* (Fort Leavenworth, KS)

<sup>128</sup> *ibid.*

<sup>129</sup> *ibid.*

<sup>130</sup> *ibid.*

<sup>131</sup> Lieutenant Colonel Robert J. Launstein, Sergeant Major Randal J. Schlosser, "Operation Joint

were able to move quickly throughout the area of operations and confirm or deny the presence of toxic materials.<sup>132</sup> These soldiers were the ones that confirmed the presence of radioactivity in the British compound discussed in chapter three.

There were several important lessons from these operations. Thanks to the efforts of the PM and engineer teams, the base camps occupied by US personnel was some of the healthiest ground in the Balkans. The force deployed showed a DNBI (Disease, Non-Battle Injury) rate much lower than other deployments.<sup>133</sup> They rightly focused all of their efforts on protecting the force, but were unable to cover the remainder of the operational environment.

It demonstrated that field commanders routinely look to the chemical battlestaff to be the advisor for these matters. From division level and down, the Chemo was the one sought by the commander. Chemical soldiers are expected to offer the same mission-oriented advice to the commanders for toxic chemicals as well as traditional NBC matters.<sup>134</sup> Lastly, the planning process was validated and the hazards were present. Chemical recon teams found both chemical and radiological hazards during their surveys.

US Army forces are not prepared to plan, identify or mitigate toxic materials. Neither the Army keystone doctrine nor Army MOUT doctrine mentions the hazards. Both staff operations and planning doctrine only contain a single reference to the existence of these hazards. Engineer and preventive medicine doctrine focus on the preservation of the environment inside the base camp. Only the chemical doctrine begins to address the issue. With so little doctrinal focus, training, leader development, organization and material efforts lag far behind requirements. Unit performance during Operation Joint Endeavor demonstrated the command tendency to default to chemical leaders and units. Without an Army-wide doctrinal backing, this becomes a disaster waiting to happen. The failure to recognize the hazards presented by toxic materials represents a significant vulnerability for the deployed force.

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Endeavor - Chemical Training and Preparation," *Army Chemical Review*, July, 1996: p. 10.

<sup>132</sup> David SFC Zapata, "Environmental Reconnaissance - an Old Mission with a New Twist," *Army Chemical Review*, July 1996: P. 13.

<sup>133</sup> The original source cited by LTC Tannen, et al, appears to be the July 3, 1996 edition of the *New York Times*. No further documentation was found.

<sup>134</sup> Launstein, p. 12

## Chapter Six - Recommendations

The very name of urban warfare is unpleasant and unpalatable, and probably unacceptable to the American people, if not to their government. It could become as much so as was the name of chemical warfare in recent decades, and as repugnant to the masses as the thought of nuclear war.<sup>135</sup>

The urban complex defines the next operational environment. As the urban complex grows across the world, the likelihood of US forces operating in the mega-city becomes much greater. As such, the need to limit the impact of urban hazards on mission accomplishment grows.

While there is a significant difference between the priorities of a hazmat team member in Houston, Texas and a soldier on patrol in Tuzla, Bosnia, the common danger both face warrants a closer look. MOUT might be the widow-maker, but an exposure to some of these substances can also quickly kill or worse, take the danger home to a family.<sup>136</sup>

This monograph finds that the research question, “Does current US Army and joint doctrine proscribe a method of planning, assessing, identifying and mitigating the effects that urban environmental hazards can have on military operations?” must be answered negatively. Compared to the civilian response capabilities, the US Army is not adequately prepared to plan, assess, identify and mitigate the effects that urban environmental hazards can have on military operations. The US Army is not ready to face TIMs on the battlefield today. While joint doctrine establishes the need to plan for TIMs, US Army doctrine has not caught up. The ability of the soldiers deployed for OJE to meet these challenges is a testament to their leadership, proficiency and dedication. OJE was an opportunity to learn about this new hazard and adjust appropriately. The remainder of this chapter contains recommendations to meet the shortcomings. The recommendations in this chapter will use the same DTLOM framework used to introduce the civilian and military capabilities.

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<sup>135</sup> S.L.A. Marshall, p. 50.

<sup>136</sup> Russell Glenn, Summary of Proceedings, RAND-Dismounted Battle Lab Conference on Military Operations On Urban Terrain, *Denying the Widow-Maker* (Santa Monica, CA: RAND Corp., 1998)



## Doctrine

Joint Pub 3-11 establishes TIMs as an operational challenge. This generates a doctrinal starting point with tremendous potential. Several areas require modifications to make it more useful. While TIMs enjoy a newfound prominence in doctrine, failure to clarify several points could reduce the speed at which the joint force can prepare for this new challenge.

JP 3-11 needs to define clearly who in the joint force command is responsible for assessing the impact of TIMs on operations. The command surgeon is now responsible for the health-related matters. Since JP 3-11 now pulls TIMs under the NBC umbrella, the best choice for primary responsibility is the joint force command chemical officer. A clearer delineation of responsibility among the elements of the joint force command would make it much easier to translate into component and branch doctrine. Chemical officers, present in every joint force command, must have the formally designated responsibility to assess the operational impact TIMs. They have the technical and battlestaff training to advise the joint force commander on the potential impact of TIMs within the joint area of operations.

JP 3-11 must reasonably expand its catalogue of toxic materials to represent properly the cauldron of hazards present in the urban environment. This list needs to expand to include the 373 chemicals on the EPA's Extremely Hazardous Substance (EHS) list.<sup>137</sup> Expansion of this listing ensures that the planning process highlights these significantly hazardous materials. Since the EHS identifies threshold quantities, generations of finite requests for information are much easier during the planning process. The EHS list, reportable to support EPCRA, provides a much wider spectrum of cauldron assessment while not overwhelming the chemical staff. While this is significantly larger number of chemicals than in the current JP3-11, it provides a focused approach. The list should not expand to the 2700 chemicals found in the *Emergency Response Guidebook* (ERG). The ERG would serve as an additional resource for other substances. If communities, in order to comply with EPCRA, develop assessment, identification and mitigation plans for these substances, then Chemical staffs can do the same.

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<sup>137</sup> Office of Emergency and Remedial Response,

FM 3-0, *Operations*, establishes the need for a systems analysis approach to urban operations. TIMs can influence many different systems both directly and indirectly. A continued emphasis on a systems approach should hasten more TIM involvement in subordinate doctrinal development.

FM 90-10, MOUT, is negligently overdue for revision. If the systems approach to MOUT carries over from FM 3-0, then the new MOUT doctrine should address the significance of TIMs. While it should not lose its focus of a “how-to” manual, it needs to recognize presence of TIMs in the urban environment and the possible affects on an operation.

The IPB process needs to have a systematic approach to identifying TIMs in the battlespace. The emphasis should be towards gathering the types of information recommended for inclusion into JP3-11. Although the TIMs exist throughout the entire urban complex, the IPB process must develop a means of templating high hazard areas during the planning process.

Similar to the shortcoming of JP 3-11, FM 101-5 does not clearly identify a single point of responsibility for TIM planning. Experience has shown that the chemical officer routinely gets the task. A change to the regulation would codify that responsibility. This would also place greater emphasis of TIMs in the planning process.

Preventive medicine efforts need to remain focused inside the wire, protecting the living space of the deployed force. The doctrine should reflect a passage of the 'outside the wire' TIM mission to the chemical reconnaissance units. It should delineate the hand-off procedures of samples for the Theater Army Medical Laboratory for detailed analysis.

Since the engineer effort has always been towards environmental compliance, there should be little change in the engineer doctrine. Tactics, techniques and procedures need to be established for remediation of a site that is operationally required.

Chemical doctrine needs to embrace this new mission. The chemical units need to be able to assess, identify and mitigate TIMs on the battlefield. Chemical doctrine should reflect these new skills.

## **Training**

Training needs to address two basic groups: the Army and the chemical soldier. Each of these groups has specific requirements to meet the challenge of TIMs. Without this integrated approach, we face the risk of falling short across the spectrum of operations.

### **The Army**

It is not the goal of this paper to induce an incapacitating fear of toxic materials into every soldier. Knowledge builds confidence. The OSHA first responder- awareness level training is a four-hour block of instruction that is designed to train the individual to recognize a TIM incident and alert appropriate personnel. This is the right training for every soldier. Providing enough training to be aware of the danger can save lives.

### **Army Chemical Soldiers.**

Chemical soldiers will become the *de jure* experts on TIMs; the Army needs to provide the training to make them the *de facto* experts as well. Initial entry training should produce chemical soldiers that are HAZWOPER technicians. This will give them the basic skills to compliment and advise the awareness training of the rest of the Army. Additionally, insertions of applicable parts of the preventive medicine specialist program will establish a common understanding with these soldiers. Leader development should include training in the Incident Command Systems and some specific hazmat-specialist level skills. Chemical reconnaissance training should include both mounted (M93) and dismounted sampling techniques.

## **Materiel**

The Army must obtain new detection equipment to detect TIMs, low oxygen and flammable environments. The oxygen and flammability sensors need to be small enough for issue down to squad or team level. The company would maintain other TIM detectors, where the Chemical soldier in the company could control them to best support the mission requirements.

There is a significant disagreement between Army protective clothing and OSHA standards. MOPP meets the requirements for the bulk of the force, but chemical response forces need a lightweight encapsulated suit with SCBA. The emphasis to develop full encapsulation will increase proportionally to the awareness of low-level health threats.

## **Leader development**

A working knowledge of the Incident Command System becomes a critical skill in a TIM incident. ICS will support operations taking place in a foreign location without a local response by establishing a standardized set of actions. If the host country does possess a response capability, it most likely will use the ICS. US forces familiar with the ICS will provide support that is more effective if needed. Lastly, in support to a domestic emergency, the ICS knowledge will allow the military forces to fit into the effort with much improved efficiency.

One of the oftspoken tenets of leadership is never order your soldiers to do something you would not do. Given that, how can leaders of tomorrow expect to lead their forces in a potential TIM environment? Even a perceived hesitation would have a rippling effect throughout the unit. This hesitation can come from many factors, but fear of the unknown is a major contributor. Experience breeds confidence. A proven confidence builder is the toxic agent training at the Chemical Defense training Facility (CDTF) at Fort Wood, Missouri.<sup>138</sup> This training should be required of all leaders in the Army. Leaders complete the training with the credibility and confidence to lead their soldiers in a toxic environment.

## **Organizations**

Given the Army's finite strength limitations, creating new organizations is a daunting task. The chemical soldier, embedded into the Army, provides the starting point for training the force. Creating additional force structure to meet a TIM mission has been done domestically with the Weapons of Mass Destruction – Civil Support Teams (WMD-CST). The active duty chemical force structure, in both chemical units and battlestaff positions, provides the required knowledge dispersion to meet the challenges of a TIM environment. The challenge will be to meet the training requirements mentioned above.

## **A New Mission – a New Future**

As the new century dawns, the US Army is transforming. The roadmap for transition remains unseen. One of the capabilities we must develop for the future is the ability to protect the force for the affects of Toxic Industrial Materials. The Chemical Corps needs to establish itself as

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<sup>138</sup> The author served as the Laboratory officer at the CDTF for 11 months and participated in

the doctrinal leader for our armed forces in this important field. The Chemical Corps must have this mission for four simple reasons. First, the battlestaff and chemical units are already in place. Secondly, experience demonstrates chemical soldiers serve as an asset the commanders are sure to go to when faced with a difficult situation. Thirdly, growing the chemical soldier's knowledge base to include TIMs is an incremental, not exponential step. Lastly, it would embrace the vision statement for the Chemical Corps from Chemical Vision 2010, "The ability to protect the force throughout the depth of the battlespace and across the full spectrum of operation environments."<sup>139</sup>

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over 25 training events.

<sup>139</sup> Commandant, US Army Chemical School, *Chemical Vision 2010*, Ft Wood, MO, 3 February 1999

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