Fighting Dirty: Supporting the Joint Force in a CBRN Environment

A Monograph

by

MAJ Michael C. Tompkins

US Army

School of Advanced Military Studies

US Army Command and General Staff College

Fort Leavenworth, KS

2018

REPORT DOCUMENTATION PAGE

Form Approved
0MB No. 0704-0188

1. REPORT DATE (DD-MM-YYYY)	2. REPORT TYPE	3. DATES COVERED (From - To)
24-05-2018	Master's Thesis	JUL 2017 - MAY 2018

4. TITLE AND SUBTITLE
Fighting Dirty: Supporting the Joint Force in a CBRN Environment

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
MAJ Michael C. Tompkins

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Command and General Staff College
ATTN: ATZL-SWD-GD
Fort Leavenworth, KS 66027-2301

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Advanced Operational Art Studies Fellowship, Advanced Military Studies Program

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for Public Release; Distribution is Unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The US Army has the primary responsibility to provide Chemical, Biologic, Radiological, and Nuclear (CBRN), and Countering Weapons of Mass Destruction (C-WMD) units to the Joint Force. The Chemical Corps has undergone changes in organization and doctrine in response to the threat and national policy. Can the Chemical Corps support the joint force in more than a single theater of operations with forces that simultaneously conduct CBRN defense and C-WMD missions? This monograph explores CBRN support by examining the threat, doctrine and organization, and mission sets of CBRN forces through two case studies. The first case study explores the employment of chemical forces in Operation Desert Storm for CBRN defense. The second case study examines a hypothetical scenario against two near-peer, CBRN-capable adversaries requiring chemical forces support CBRN defense while simultaneously supporting C-WMD. To meet the needs of the joint force, the Army must increase it's active duty chemical forces to respond to realities of the current environment while maintaining strategic depth.

15. SUBJECT TERMS
Chemical Corps; Weapons of Mass Destruction; Chemical Biological, Radiological and Nuclear Weapons; CBRN defense; Countering WMD; 20th CBRNE Command

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			MAJ Michael C. Tompkins
(U)	(U)	(U)	(U)	51	19b. TELEPHONE NUMBER (Include area code)

Monograph Approval Page

Name of Candidate: MAJ Michael C. Tompkins

Monograph Title: Fighting Dirty: Supporting the Joint Force in a CBRN Environment

Approved by:

_____, Monograph Director
G. Stephen Lauer, PhD

_____, Seminar Leader
Eric R. Remoy, COL

_____, Director, School of Advanced Military Studies
James C. Markert, COL

Accepted this 24th day of May 2018:

_____, Director, Graduate Degree Programs
Robert F. Baumann, PhD

Abstract

Fighting Dirty: Supporting the Joint Force in a CBRN Environment by MAJ Michael C. Tompkins, USA, 51 pages.

The US Army has the primary responsibility to provide Chemical, Biologic, Radiological, and Nuclear (CBRN), and Countering Weapons of Mass Destruction (C-WMD) units to the Joint Force. CBRN weapons proliferating among state and non-state actors threaten United States interests. Current policy requires the US Army to support the joint force in two theaters, and that all major campaigns include C-WMD operations. With a recent reduction in the Chemical Corps' force structure, the additional requirement of supporting C-WMD missions, and multiple potential adversaries capable of employing CBRN weapons, can the Chemical Corps support the joint force in more than a single theater of operations with forces that simultaneously conduct CBRN defense and C-WMD missions?

This monograph explores CBRN support by examining the threat, doctrine and organization, and mission sets of CBRN forces through two case studies. The Chemical Corps transformed its doctrine and organization in response to the Cold War threat, and the employment of chemical forces in Operation Desert Storm demonstrates these changes. The second case study examines a potential conflict against two near-peer, CBRN-capable adversaries to assess if the Chemical Corps forces, after recent changes in doctrine and organization, adequately support the joint force.

Meeting current requirements to support the joint forces' CBRN defense and C-WMD operations in two theaters means the Army and the Chemical Corps must assume a significant amount of risk by deploying nearly all of its Regular Army force and drawing heavily out of the National Guard and Army Reserves. This hampers the National Guard's and Army Reserves' ability to provide CBRN forces in support of homeland defense and response requirements. Growing the Regular Army chemical forces combined better positions the Army and the Chemical Corps to meet CBRN defense and C-WMD objectives.

Contents

Acknowledgements

I would like to thank my fellow class mates in Seminar 3 who entertained my crazy ideas about the Chemical Corps and how a future fight in a CBRN environment would look. Without their feedback, I am afraid this monograph would sound more like science fiction.

I owe a big thank you to Mr. Mike Cress at Edgewood Chemical and Biological Center for also hearing my concerns about the Chemical Corps and pointing me in the direction of valuable resources.

Lastly, my spouse Caryn was instrumental in reviewing this monograph and preventing me from using overly technical language. As a veteran Chemical Corps spouse, if she was confused by acronyms or jargon, then the common reader would surely be lost. I thank you for taking your time to support this project and for understanding the importance of it.

Acronyms

BIDS	Biological Integrated Detection System
CBRN	Chemical, Biological, Radiological, Nuclear
CBRNE	Chemical, Biological, Radiological, Nuclear, Explosives
CBIRF	CBRN Incident Response Force
CIA	Central Intelligence Agency
C-WMD	Countering Weapons of Mass Destruction
DOD	Department of Defense
JTF-E	Joint Task Force- Elimination
METT-T	Mission, Enemy, Terrain, Troops available, Time
NATO	North Atlantic Treaty Organization
NIE	National Intelligence Estimate
OIF	Operation Iraqi Freedom
WMD	Weapons of Mass Destruction

Tables

Section 1: Introduction

Gas! GAS! Quick, boys!—An ecstasy of fumbling

Fitting the clumsy helmets just in time,

But someone still was yelling out and stumbling

And flound'ring like a man in fire or lime.—

Dim through the misty panes and thick green light,

As under a green sea, I saw him drowning.

In all my dreams before my helpless sight,

He plunges at me, guttering, choking, drowning.

—Wilfred Owen, "Dulce et Decorum Est"

On April 22, 1915 at the Second Battle of Ypres, a deadly green cloud crept across no-man's land toward the Allies presaging a German attack. When the mist cloud reached Allied trenches, soldiers collapsed to the ground in agony as the chlorine gas seared their eyes and burned the lining of their bronchial tubes. Lying there coughing up a greenish froth speckled in blood as lungs filled with fluid, soldiers eventually drowned on dry land.[1]

The Germans sought to achieve surprise and create a gap in the Allies defenses. Initially this proved true as two divisions collapsed in disarray, leaving a four-mile-wide gap in the Allied defensive line.[2] The Germans did not anticipate the success that the gas attack achieved and were unprepared to exploit the gap. The Allies recovered once the gas dissipated and limited the German advance to just three miles. [3] The battle established a precedent that gas warfare held

[1] Jonathan B. Tucker, *War of Nerves: Chemical Warfare from World War I to Al-Qaeda* (New York, NY: Pantheon Books, 2006), 15.

[2] Tucker, *War of Nerves,* 16.

[3] Brooks E. Kleber and Dale Birdsell, *The Chemical Warfare Service: Chemicals in Combat* (Washington, DC: Center of Military History, 2003), 7-17.

promise as an offensive weapon, thus driving the development of deadlier gasses and more effective delivery methods. Gas warfare, its physical and psychological effects became a hallmark of the First World War. Despite the general disdain for it, countries sought new weapons that achieve physical and psychological effects, and provide the asymmetrical advantage seen from that first use of gas in 1915.[4] Gas warfare, and the introduction of other unconventional weapons like biological and nuclear weapons, changed operational and strategic planning.[5]

Chemical, Biological, Nuclear, and Radiological (CBRN) weapons remain at the forefront of strategic, operational, and tactical objectives and planning considerations. Strategic documents, like the newest National Security Strategy, place the task of "Defend Against Weapons of Mass Destruction" as the first task in the first pillar of the strategy.[6] However, strategic objectives appear disconnected from operational reality due to the Chemical Corps' apparent lack of force structure to simultaneously support the joint force in two theaters of operation.[7]

With multiple potential adversaries capable of employing CBRN weapons in the current environment, the Chemical Corps must also be prepared to support the joint force in two theaters. Given the recent reduction in the Chemical Corps' force structure, the additional requirement of supporting C-WMD missions, and multiple CBRN threats; can the Chemical Corps support the joint force in two theaters with forces that simultaneously conduct CBRN defense and C-WMD missions?

---

[4] Kleber and Birdsell, *The Chemical Warfare Service*, 7-17.

[5] Albert J. Mauroni, *America's Struggle with Chemical-Biological Warfare* (Westport, CT: Praeger, 2000), 7.

[6] Donald J. Trump, *National Security Strategy* (Washington, DC: Government Printing Office, 2017), 8.

[7] US Department of Defense, *Quadrennial Defense Review* (Washington, DC: Government Printing Office, 2014), vi.

The Problem

Weapons of Mass Destruction (WMD), remains an ever-present risk to the United States and its international security partners. Actors pursue WMD to gain international influence and achieve strategic leverage. The consequences of globalism and technological advancements increase access to knowledge, resources, and technologies. This allows adversaries to seek, attain, proliferate, and use WMD.[8] International agreements such as the Chemical Weapons Convention, Biological Weapon Convention, and Nuclear Nonproliferation Treaty, are diplomatic attempts to prevent the spread of CBRN weapons. A large majority of the world's countries have signed and ratified these treaties; however, these treaties lack strong enforcement capabilities and benefit countries that have strong conventional capabilities.[9] Countries and non-state actors, like North Korea, Iran, Syria, and the Islamic State, have shown in recent history that the spread and use of CBRN weapons will continue if the strategic consequences of using CBRN weapons are low or they provide an advantage. An adversary may employ CBRN weapons to exploit vulnerabilities in sustainment and force protection operations, or to undermine the support of key regional partners of US policies and actions.[10]

The 2014 Department of Defense (DOD) Strategy for Countering Weapons of Mass Destruction (C-WMD) describes the role and strategic approach in the DoD's contribution in countering WMD. The strategy is an evolution of a series of national strategies for combating WMD that originated in 2002.[11] The strategy stresses the need to include C-WMD activities into all campaign plans to deny an advantage to an adversary while achieving national strategic

---

[8] US Department of Defense, *Department of Defense Strategy for Countering Weapons of Mass Destruction* (Washington, DC: Government Printing Office, 2014), 1.

[9] Mauroni, *America's Struggle*, 5.

[10] Trump, *National Security Strategy*, 7-8.

[11] George W. Bush, *National Strategy to Combat Weapons of Mass Destruction* (Washington, DC: Government Printing Office, 2002). This is the first national strategy dedicated specifically to weapons of mass destruction.

objectives. The document also outlines requirements for responding to, and mitigating the effects of WMD, an activity more commonly known as CBRN defense. The Department of Defense must also lead or support C-WMD efforts to dismantle an actor's WMD capabilities.[12] The persistent threat WMD poses to the United States and allied forces necessitates the inclusion of C-WMD efforts in broader plans and operations within the Department of Defense, the United States Government, and international partners. Potential conflicts with state and non-state actors that possess some form of a CBRN weapon requires the joint force to be able to fight and win in the event an adversary uses a weapon of mass destruction.[13]

Writing CBRN doctrine and building organizations to fight that doctrine are unique in comparison to general warfighting or maneuver topics. As evidenced in the new release of the United States Army's new Field Manual 3-0, *Operations*, military theorists such as Carl von Clausewitz, Julian Corbett, and Liddell Hart continue to shape thoughts about the nature and conduct of war and warfighting.[14] Doctrine results from applying those theories to understand historical events and determining relevance to current or near future situations. Creating or amending organizations usually results after an analysis of doctrine and strategic requirements. For CBRN doctrine and organizations, this process is problematic.

CBRN doctrine and organizations are historically influenced by an adversary employing CBRN weapons to achieve an asymmetric advantage during a major offensive operation to defeat the enemy in depth. This is a legacy of the Soviet Union and Deep Operations Theory of Annihilation. Deep Operations Theory of Annihilation was conceptualized by Soviet Army officer Mikhail Tukachevski during the interwar period between World War I and World War II

[12] US Department of Defense, *Countering Weapons of Mass Destruction*, 3.

[13] James Mattis, Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge (Washington, DC: Government Printing Office, 2018), 3, 6.

[14] US Department of the Army, Field Manual (FM) 3-0, *Operations* (Washington, DC: Government Printing Office, 2017), Source Notes-1-3.

after studying how to defeat the defensive lines in World War I. Fellow Soviet Georgii Isserson described the theory as multi-echeloned maneuver that penetrated a linear defensive line and then sought the simultaneous neutralization of the enemy in depth.[15] The Soviets did not use chemical weapons during World War II to support their attacks. However, following the war the Soviets lagged in nuclear weapons development, allowing chemical weapons to become a key component of Soviet tactical and operational doctrine.[16] The Soviets theorized that employing chemical weapons, and later nuclear and biological weapons, was an option to enable the penetration, or to neutralize reserve forces and command nodes.[17]

The US Army organized its chemical forces and doctrine to mitigate and deter the Soviet CBRN capability.[18] Much of the Cold-War era chemical structure and doctrine remains despite the fall of the Soviet Union more than a quarter century ago. The United States and Soviet Union never squared off in major combat in Europe. The Soviet Union left no historical examples of using CBRN weapons on a large scale to support Deep Operations Theory of Annihilation. This makes validating the old, and still current, CBRN defense doctrine difficult, although the United States Army has benefited from many years of exercising the doctrine in training scenarios. The significant difference between Cold-War CBRN operations and today comes from strategy.

The US Army is the only service branch that dedicates full-time specialists to addressing CBRN defense and C-WMD forces. The Navy and Air Force include CBRN defense training for disaster preparedness and consequence management as additional training for select military occupational specialties. The US Marine Corps has CBRN staff warrant officers and specialists, but only has a single CBRN Incident Response Force (CBIRF). The CBIRF supports a Marine

---

[15] Georgii S. Isserson, *The Evolution of Operational Art*, trans. Bruce W. Menning (Fort Leavenworth, KS: Combat Studies Institute Press, 2013), 96-101.

[16] Director of Central Intelligence, *National Intelligence Estimate 11-11-69: Soviet Chemical and Biological Warfare Capabilities* (Washington, DC: Government Printing Office, 1969), 1-3.

[17] Director of Central Intelligence, *Soviet Chemical and Biological Warfare Capabilities,* 3.

[18] Mauroni, *America's Struggle,* 78-79.

Expeditionary Brigade with a battalion sized unit composed of multiple military occupational specialties for CBRN reconnaissance and contaminated casualty treatment. The Marine Corps does not maintain any additional CBRN defense units.[19] As a result, the Army, through its Chemical Corps, often leads the DOD in developing a joint service response to CBRN warfare. The United States Army Chemical Corps directly supports the DOD strategy for C-WMD by providing forces that "identify, prevent, and mitigate the entire range of Chemical, Biological, Radiological, and Nuclear threats;" supporting nonproliferation and counter-proliferation efforts, and CBRN consequence management, and enable Army, Joint and Unified Action Partners to fight and win in a CBRN environment.[20]

The DOD Strategy for C-WMD is driving changes in chemical forces organization and doctrine. In October 2014, the Vice Chief of Staff of the Army approved a force design update that transformed a large part of the Army Chemical Corps' force structure.[21] This update intended to move the corps from a Cold War passive defense focused force to a force capable of countering WMD threats and responding to CBRN hazards.[22] The force design update also reflects current fiscal constraints by enabling the regular Army Chemical Corps forces to meet the former Secretary of Defense Ash Carter's guidance to "do more, without more," and "provide an all-volunteer force that is leaner, adaptive, flexible and offers the President a significant number of options in the event of conflict."[23] Another example of change is Army Training Publication

19 US Marine Corps Forces Command, "Chemical Biological Incident Response Force: History," accessed December 3, 2017, http://www.cbirf.marines.mil/About-CBIRF/History/.

20 US Department of the Army, Department of the Army Pamphlet (DA PAM) 600-3, *Commissioned Officer Professional Development and Career Management* (Washington, DC: Government Printing Office, 2014), 140; James P. Harwell, *Building a Better Force: Regular Army / Reserve Components Integration in the Army Chemical Corps* (Ft. Leavenworth, KS: Army University Press, 2016), 5-10.

21 James P. Harwell, "The CBRN FDU: Building the Future Force Today," *Army Chemical Review* (Summer, 2015): 17.

22 Harwell, "The CBRN FDU," 17-20.

23 Ashton Carter, *Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending* (Washington, DC: Government Printing Office, September 14, 2010).

(ATP) 3-90.40 *Countering Weapons of Mass Destruction*. This manual provides a primary reference for planning, synchronizing, integrating, and executing combined arms countering weapons of mass destruction for tactical-level commanders, staffs, and key agencies.[24] These changes, however, have occurred during a period of competing strategic priorities.

Prior to Operation Iraqi Freedom (OIF), the Chemical Corps focused on providing CBRN passive defense to ensure the survivability and mobility of maneuver forces in a CBRN environment. This entailed reconnaissance for early warning and ensuring mobility, and decontamination of equipment and terrain to preserve combat power. This was a continuation of Cold War thinking about land operations against a CBRN capable adversary in which CBRN support aligned with AirLand Battle and subsequent doctrine applying that concept.[25] Operations in Afghanistan and Iraq forced the regular Army to grow to meet the needs of sustained operations, but the regular Army operational force personnel strength of the Army Chemical Corps dropped despite the force design update. Conversely, the reserve and guard components expanded and now are the sole force provider of some CBRN capabilities. Just over eighty percent of the Chemical Corps' forces reside in the US Army National Guard and Army Reserves.[26]

The competition in strategic priorities has resulted in a Chemical Corps with more capability in terms of equipment but limited by overall size. For example, a Chemical Hazard Response company typically supports a division or a BCT by providing reconnaissance and decontamination. Two of the three operational platoons are dual use platoons, meaning they provide either reconnaissance or decontamination, but not both simultaneously. Reconnaissance supports CBRN defense by enabling freedom of mobility, or supporting C-WMD operations by

[24] US Army Chemical, Biological, Radiological, and Nuclear School, "Doctrine Update," *Army Chemical Review* (Summer, 2016): 35.

[25] Mauroni, *America's Struggle*, 78-79.

[26] Harwell, *Building a Better Force*, 5-10.

detecting, identifying, and assessing potential WMD sites for further exploitation by specialized forces. A platoon cannot concurrently conduct both missions because each requires different equipment and sustainment support. This means that United States forces engaged in large-scale combat operations against a CBRN capable adversary require a significant commitment of Chemical Corps forces to support CBRN defense and C-WMD requirements.[27] A greater commitment of CBRN forces than traditionally employed for just CBRN defense reduces strategic depth provided in the Army Reserve or National Guard forces. A commitment of forces consistent with providing CBRN defense may mean that the joint force lacks support for C-WMD tasks. This leaves the Joint Force Commander evaluating this risk and assuming either risk to protecting the force or risk to achieving strategic objectives.

Methodology

This monograph explores CBRN support by examining the threat, doctrine and organization, and mission sets of CBRN forces through two case studies. Given that much of the current doctrine and organization resulted from the Cold War, the first case study is Operation Desert Storm. The Army developed its doctrine and force structure for Desert Storm at the height of the Cold War, and the Iraqi armed forces appeared as the closest semblance to a Soviet-like CBRN threat. This case study represents the Chemical Corps supporting the joint force commander in a theater of war with forces conducting CBRN defense against a CBRN capable adversary.

The second case study is a hypothetical case using current force structure, doctrine, and strategy against two notional, near-peer future threats. This requires the Chemical Corps to support a Joint Force Commander in two theaters of war against CBRN capable adversaries with forces to simultaneously conduct CBRN defense and C-WMD missions. In comparing the two

[27] Harwell, "The CBRN FDU," 17.

case studies, this monograph describes gaps in mission requirements and the size of the force that prevent the Chemical Corps from supporting the joint force in two theaters against CBRN capable adversaries.

Research for this monograph focused on the analysis and synthesis of primary and secondary source documents to describe the threat, the doctrine and organization development in response to the threat, and the mission requirements of Chemical Corps forces. Unclassified primary sources such as declassified national intelligence estimates (NIE), from the Central Intelligence Agency describe actual and perceived threats from the Soviet Union. An NIE from 1969 provides information about the rapid development and expansion of the Soviet chemical program.[28] Another NIE from 1984 assessed how the Soviets planned to use WMD in a war against the North Atlantic Treaty Organization (NATO).[29]

Primary sources describing the current threat are rare due mostly to classification of much of the material. Congressional testimonies like those from Director of National Intelligence Daniel Coats, Director of Defense Intelligence Agency Lieutenant General Vincent Stewart, and General Curtis Scaparrati, former Commander of United States European Command, describe the intent and the general capabilities of current actors like North Korea, Syria, ISIS, and Russia.[30] The *Defense Strategy for Countering Weapons of Mass Destruction*, United States Army Field Manual 3-101 *Chemical Staffs and Units*, and Joint Publication 3-40 *Countering Weapons of Mass Destruction*, are primary examples of the military's past and present responses to the threat.

Secondary sources, such as the book written by political science professor Joachim Krause, and RAND senior researcher Charles Mallory analyzes Russian declarations in post-Cold

---

[28] Director of Central Intelligence, *National Intelligence Estimate 11-11-69*, 1-3

[29] Director of Central Intelligence, *Special National Intelligence Estimate: The Soviet Offensive Chemical Warfare Threat to NATO* (Washington DC: Government Printing Office, 1984), 7.

[30] Vincent R. Stewart, "Senate Select Committee on Intelligence, Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community," May 11, 2017; Daniel R. Coats, "Senate Armed Service Committee, Statement for the Record: Worldwide Threat Assessment," May 23, 2017; Curtis M. Scaparrotti, "Statement Before the Senate Armed Services Committee," April 16, 2015.

War treaties and Soviet doctrinal employment of chemical weapons in offensive and defensive operations.[31] Center for Strategic and International Studies researches Anthony Cordesman and Khalid Al-Rodhan's book *Iran's Weapons of mass Destruction*, argue the current WMD threat.[32] Al Mauroni, the director of the US Air Force Center for Unconventional Weapons, describes the evolution of US CBRN doctrine and organizations developed during the Cold War in the book *Chemical-Biological Defense: U.S. Military Policies and Decisions in the Gulf War*.[33] Lastly, studies by think tanks like RAND and 38North, give credibility to the potentiality of multiple conflicts requiring CBRN support.[34]

The organization of this monograph reflects the case study methodology. It begins first by exploring the threats during the Cold War and the present. This sets the foundation for a discussion of the Army's and Chemical Corp's response through doctrine and organization. The case study exploring CBRN support during the Gulf War demonstrates the response to the Cold War threat. A hypothetical case study of simultaneous CBRN support in two theaters of operation examines a potential outcome of implementing current threat, strategy, and doctrine. The conclusion discusses gaps observed between the two case studies and potential future solutions.

Section 2: The Threat Past and Present

The Cold War era was a period of high tension regarding CBRN weapons. The main threat to the United States, its forces, and partners, came from the Soviet Union. During their

---

[31] Joachim Krause and Charles K. Mallory, *Chemical Weapons in Soviet Military Doctrine: Military and Historical Experience, 1915-1991* (Boulder, CO: Westview Press, 1992), 141.

[32] Anthony H. Cordesman and Khalid R. Al-Rodhan, *Iran's Weapons of Mass Destruction: The Real and Potential Threat* (Washington, DC: Center for Strategic and International Studies, 2006), 28-30.

[33] Albert J. Mauroni, *Chemical-Biological Defense: U.S. Military Policies and Decisions in the Gulf War* (Westport, CT: Praeger, 1998), 75.

[34] Timothy M. Bonds et al., *Strategy-Policy Mismatch: How the U.S. Army can Help Close Gaps in Countering Weapons of Mass Destruction* (Santa Monica, CA: RAND Corporation, 2014), 3; Rebecca K. C. Hersman, "North Korea, Weapons of Mass Destruction and Instability: Strategic Issues for Managing Crisis and Reducing Risks," *The North Korea Instability Project* (June, 2017), 2.

standoff with North Atlantic Treaty Organization (NATO) countries and the US, the Soviets developed robust Chemical, Biological, and Nuclear programs. Chemical weapons proliferation also found a place in smaller conflicts in the Middle East and East Asia. Presently, countries continue to pursue, produce, and use WMD.

The Soviet Threat

The suggestion of CBRN weapons supporting Soviet Deep Operations Theory of Annihilation drove the United States Army to reexamine its doctrinal concepts and develop new CBRN doctrine. Although the United States and Soviet Union never clashed in large scale-combat, use of these weapons and their effects in smaller conflicts, often with Soviet involvement, added credibility to the threat of CBRN weapons employment in a United States or NATO conflict with the Soviet Union.

Worried about the United States' strength and capabilities, Soviet defense minister, Marshal Georgy Zhukov, declared that the Soviet Union had to be prepared to fight future wars that included the use of weapons of mass destruction.[35] CBRN weapons are a useful means in the Soviet offensive concept of deep operations. Observing the difficulty in breaking the stalemate that linear tactics generated in World War I, Soviet Army officer Georgii Isserson proposed multi-echeloned maneuver that penetrated a linear defensive line and then sought the simultaneous neutralization of the enemy in depth.[36]

To conduct deep operations required superior firepower or an asymmetric capability. Against NATO, in which the Soviets did not have overwhelming conventional firepower, CBRN weapons provided Soviet planners an asymmetric capability capable of assisting in the breakthrough as well as simultaneous neutralization of enemy forces. In theory, this method

[35] Albert J. Mauroni, *Chemical and Biological Warfare: A Reference Handbook* (Santa Barbara, CA: ABC-CLIO, 2003), 60.

[36] Isserson, *The Evolution of Operational Art*, 96-101.

worked best when Soviet forces were well trained to fight in contaminated environments, planners understood CBRN targeting to maximize the effects of the weapon, and the adversary was not prepared to fight in CBRN environment.[37] The Soviets planned with Warsaw Pact members to use chemical weapons in a war with NATO where use was likely to make a critical difference in combat outcomes. Heliborne or amphibious forces, or forces perceived as unprepared for an attack made for likely targets. If there was a reversal or loss of momentum and using chemical weapons increased Soviet chances of success. Thus, the expectation that Warsaw Pact members were unrestrained by Soviet leadership in their decision to use chemical weapons.[38]

Soviet planners also found utility in using CBRN weapons in defensive operations. A preemptive attack by NATO may trigger chemical weapons attacks of NATO airfields, nuclear weapons sites, command and control positions, and major roads and traffic junctions by Soviet and Warsaw Pact states to disrupt and slow NATO operations.[39] If the strikes were successful in delaying or stopping NATO operations, Soviet forces could take the initiative and execute offensive operations. Soviet planners also considered using nuclear weapons as to stop a NATO advance or isolate NATO forces either in conjunction with or independently from chemical weapons.[40] Lastly, the Soviets considered using chemical weapons as a transition between a conventional fight and tactical nuclear exchange to fix NATO forces and slow NATO preparations for a first or second nuclear strike.[41]

To make the threat of CBRN use credible the Soviets expanded development programs and increased the number of CBRN defense units. The Soviet Union established numerous

---

[37] Krause and Mallory, *Chemical Weapons in Soviet Doctrine*, 139-141.

[38] Director of Central Intelligence, *Soviet Offensive Chemical Warfare*, 7.

[39] Krause and Mallory, *Chemical Weapons in Soviet Doctrine*, 141.

[40] Director of Central Intelligence, *Soviet Offensive Chemical Warfare*, 9.

[41] Director of Central Intelligence, *Soviet Offensive Chemical Warfare*, 10.

national level depots that contained chemical, biological, and nuclear weapons equipment and materials. The chemical stockpile may have reached as high as 300,000 metric tons in the mid-1980s.[42] Chemical defense units, or more commonly referred to as Chemical Troops, numbered over 45,000 personnel in the mid-1980s. In comparison, the United States had around 9,000 chemical defense personnel. Chemical Troops primarily focused on decontamination and reconnaissance.[43] These units increased the survivability of Soviet forces attacked with CBRN weapons, or units fighting in conjunction with Soviet CBRN use.

An additional factor that increased the probability for Soviet CBRN weapons use against NATO was that the Soviet Union used chemical weapons in conflicts or provided chemical weapons to allies. Lao and Vietnamese forces employed Soviet trichothecene (a toxin), and possibly nerve, incapacitants, and irritant munitions against H'Mong and Lao resistance forces and villages from 1976-1978.[44] In an attempt to slow Afghan rebel action in the Soviet-Afghan war, the Soviets employed sprays, bombs, rockets, mines, and artillery shells to deliver incapacitants, phosgene, nerve agents, mustard agent, and potentially other hazardous chemicals.[45] The effectiveness of chemical weapons in these instances was questionable, however it showed their willingness to employ CBRN weapons against an unprepared enemy or one that lacked the ability to respond in kind. It also demonstrated the willingness to proliferate or supply allies with the means to wage chemical warfare.

The greatest threat to the United States and its allies was the Soviets' robust nuclear capability. At the height of the Cold War the Soviets had amassed over 40,000 nuclear warheads,

---

[42] Director of Central Intelligence, *Soviet Offensive Chemical Warfare*, 13.

[43] Krause and Mallory, *Chemical Weapons in Soviet Doctrine,* 149.

[44] Director of Central Intelligence, *Special National Intelligence Estimate: Use of Toxins and Other Lethal Chemicals in Southeast Asia and Afghanistan* (Washington DC: Government Printing Office, 1982), 3.

[45] Mauroni, *Chemical and Biological Warfare*, 61.

almost doubling the total of the United States' stockpile during that period.[46] In a war with NATO, the Soviet Union was likely to employ tactical nuclear weapons in an effort to slow or stall NATO initiative, or preempt a NATO nuclear strike.[47] The bombings of Hiroshima and Nagasaki display the destructive capability of nuclear weapons, but the Soviets sought other effects in addition to destruction. Tactical nuclear weapons produce radioactive fallout that extends out larger than the blast radius of the nuclear explosion. The fallout persists at deadly or very hazardous levels for weeks or months. Thus, terrain contaminated with nuclear fallout restricts terrain.[48] Lacking decontamination capability or training in mitigating the risks of fallout, NATO forces risked either separation from lines of communication, or neutralization if surrounded by the fallout of several detonations.

While not described as part of Soviet war plans, the Soviets did research and develop a significant biological warfare capability. Despite signing the Biological Weapons Convention in 1972, the Soviets developed the infrastructure and processes to produce thousands of tons of biological warfare agents per year. These agents included anthrax, smallpox, Marburg virus, and "yellow rain," more commonly known as T-2 mycotoxin. Soviet forces probably employed yellow rain against the mujahedeen rebels during the Soviet-Afghan War.[49] Like Soviet use of chemical weapons, this showed the Soviet's willingness to use biological weapons or supply allies with the means to employ biological warfare agents.

[46] Hans M. Kristensen and Robert S. Norris, "Global Nuclear Weapons Inventories, 1945–2010," *Bulletin of American Scientists* 66, no. 4 (December 12, 2017): 77-83.

[47] Director of Central Intelligence, *Soviet Offensive Chemical Warfare,* 9.

[48] Director of Central Intelligence, *The Soviet Offensive Chemical Warfare,* 9.

[49] Mauroni, *Chemical and Biological Warfare*, 60-61.

Threats in the Middle East and Asia

The Soviet Union presented the most significant and credible WMD threat, but other states throughout the Middle East and Asia sought to develop WMD programs or use WMD. Iran and Iraq both used chemical weapons during the Iran-Iraq war between 1983-1988. Iraq began developing a chemical weapons capability in the 1970s and by the 1980s had a substantial program. Iraq employed mustard and sarin to repel waves of Iranian troops.[50] Iran did not have a chemical weapons program prior to Iraq's use against Iranian soldiers. With help from European firms and covert programs, Iran produced enough lethal agents to supply their own weapons by 1987 and employed their own chemical weapons against Iraq in 1987 and 1988.[51] Iraq and Iran also sought biological warfare capabilities because of their war. Iran produced and stockpiled small amounts of mycotoxins from 1982 through the end of the Iran-Iraq war in 1988.[52] Iraq began a biological warfare program in 1986 and produced anthrax and botulinum toxin.[53]

Chemical and biological warfare in the Middle East was not limited to Iraq and Iran. During the Yemeni civil war from 1962-1970, Egyptian forces employed Soviet provided nerve and mustard agents against royalist forces, killing an estimated 1,000 Yeminis.[54] Egypt continued to improve their CBRN weapons programs in subsequent years. Syria possessed a strong industrial infrastructure to produce indigenous chemical precursors and chemical agents.[55] This historical evidence demonstrates the need for planners to consider CBRN defense in potential conflicts in the Middle East.

---

[50] Mauroni, *Chemical and Biological Warfare*, 69.

[51] Cordesman and Al-Rodhan, *Iran's Weapons of Mass Destruction*, 27-28.

[52] Cordesman and Al-Rodhan, *Iran's Weapons of Mass Destruction*, 52.

[53] Mauroni, *Chemical and Biological Warfare*, 151.

[54] Mauroni, *Chemical and Biological Warfare*, 148.

[55] Mauroni, *Chemical and Biological Warfare*, 67-68.

In Asia, North Korea may have been developing an offensive chemical weapons capability since the 1960s. Attempting to gain an asymmetric advantage over South Korea and the United States, North Korea further invested in their chemical capabilities after witnessing the utility of chemical weapons in the Iran-Iraq war. China developed a nuclear weapons program, and potentially chemical and biological weapons programs. Pakistan, in response to India's establishment of an offensive chemical program, probably developed one as well.[56] The significant Soviet threat as well as the proliferation and use of CBRN weapons elsewhere in the world presented a challenging security environment for military and political leaders. Whether in Europe deterring Soviet aggression or conducting operations elsewhere in the world against Soviet supported regimes, US forces needed dedicated CBRN forces to ensure mission success.

Present Threats

Current political efforts to combat the proliferation of WMD, such as arms control agreements, are important components to the overall National Strategy for Countering WMD. Arms control and counterproliferation agreements are vital to establishing a global norm that does not seek to produce or use WMD. However, those nations that have state-of-the-art conventional munitions, like precision-guided bombs, do not require CBRN weapons for an edge. These countries drive other countries to adopt morally acceptable conventional weapons, while ignoring the factors that drive some actors to pursue WMD. Nations that cannot afford billion-dollar conflicts will exert all efforts to achieve their nation's goals with the lowest number of casualties and lowest consumption of equipment. Chemical and biological agents can speed up that process and allow them to reach that end goal. Nuclear weapons provide a regime legitimacy and international power. Countries will continue to develop WMD programs and weapons when achieving policy objectives outweigh political risks.

[56] Mauroni, *Chemical and Biological Warfare*, 62-66.

North Korea

North Korea's investment in their WMD programs to achieve an asymmetric advantage over US and Republic of Korea forces are a major threat to US policy and interests. In 2015, the Director of National Intelligence Worldwide Threat Assessment stated, "[b]ecause of deficiencies in their conventional military forces, North Korean leaders are focused on developing missile and WMD capabilities, particularly building nuclear weapons."[57] The recent suspected use of a chemical warfare agent in an assassination, and the rapid pace of nuclear and ballistic missile tests have escalated tensions on the peninsula to new heights.

North Korea's chemical capability is well established. The regime produces chemical weapons in line with their philosophy of "juche," or self-sufficiency.[58] While their initial chemical capability was a product of Soviet support, North Korea no longer requires external expertise or resources for chemical weapons production. According to former United States Forces Korea Commander, General Curtis Scaparrotti, North Korea possess "one of the world's largest stockpiles."[59] Assessments suspect North Korea to possess an inventory of 2,500 to 5,000 tons of chemical warfare agents with the ability to add 12,000 tons during a period of crisis.[60] The hundreds of Short Range Ballistic Missiles in North Korea's inventory are capable of delivering hundreds of liters of chemical agent to any target on the Korean peninsula.[61]

Significant intelligence gaps remain concerning North Korea's biological weapons program. The country is a party to the Biological and Toxic Weapons Convention and the Geneva

---

[57] James Clapper, "Senate Select Committee on Intelligence, Statement for the Record on the Worldwide Threat Assessment of the US Intelligence Community," February 16, 2015.

[58] Joseph S. Bermudez Jr., "Overview of North Korea's NBC Infrastructure," *The North Korea Instability Project* (June, 2017): 7.

[59] Scaparrotti, "Statement Before the Senate Armed Services Committee," April 16, 2015.

[60] Republic of Korea Ministry of National Defense, "2010 Defense White Paper" (Seoul, Republic of Korea, 2010), 32.

[61] Elanor Albert, "North Korea's Military Capabilities," *Council on Foreign Relations* (January 3, 2018).

Protocol, however assessments from South Korea and reports from defectors signal that North Korea may have a clandestine biological weapons production capability.[62] North Korean academic and life sciences research, as well as the industrial infrastructure and knowledge to produce biological weapons, lend credibility to assessments that North Korea possesses the knowledge and infrastructure to pursue a biological weapons program.[63] South Korean reports assess that North Korea has researched and produced biological weapons agents such as anthrax, smallpox, pest (more commonly known as plague), and hemorrhagic fever viruses.[64] Unlike chemical weapons, open source reporting fails to confirm or strongly suggest that North Korea has biological weapons ready to employ against United States and Republic of Korea targets. If North Korea does have an active program, then these unknowns allow North Korea to gain tactical and strategic surprise over the United States and Republic of Korea

North Korea's growing nuclear arsenal and missile delivery systems are increasingly able to threaten US vital interests in the region, and even the United States homeland nuclear developments pose the greatest strategic challenge for the United States and Republic of Korea. North Korea maintains a comprehensive nuclear weapons research, development, test, and production infrastructure. Through their nuclear power industry, North Korea independently mines uranium and enriches the uranium or nuclear power waste to produce militarily significant quantities of Plutonium (Pu)-239 and highly enriched uranium.[65]

The regime has demonstrated the technical knowledge to create a nuclear bomb and seeks the capability to deliver that bomb to a target. On September 3, 2017, North Korea conduced a sixth nuclear test claiming the device detonated was a hydrogen bomb. The Comprehensive Test

---

[62] International Crisis Group, "North Korea's Chemical and Biological Weapons Programs," *Asia Report*, no. 167 (June 18, 2009): I, accessed February 6, 2018, https://www.crisisgroup.org/asia/north-east-asia/korean-peninsula/north-korea-s-chemical-and-biological-weapons-programs.

[63] Bermudez, "North Korea's NBC Infrastructure," 14.

[64] Republic of Korea Ministry of National Defense, "2010 Defense White Paper," 32.

[65] Bermudez, "North Korea's NBC Infrastructure," 20.

Ban Treaty Organization was unable to verify the claim; however, they still estimated the yield of the detonation to be greater than 100 kilotons of TNT.[66] For comparison, the atomic bomb "Little Boy" that the United States dropped on Hiroshima, Japan had a yield of 15 kilotons of TNT. [67]

On November 29, 2017, North Korea tested the Hwasong-15 Intercontinental Ballistic Missile (ICBM). The test demonstrated that North Korea continues to cross milestones in their delivery capabilities that may one day allow the regime to threaten targets in the United States homeland with a sizeable nuclear warhead.[68] In addition to the Hwasong-15, North Korea has a sizeable inventory of nuclear capable Medium Range Ballistic Missiles (MRBM) and Submarine Launched Ballistic Missiles (SLBM) that threaten United States interests and forces in the region.[69] The ballistic missile capability in conjunction with nuclear detonation tests constitutes a credible nuclear threat to United States interests and poses significant challenges to a military confrontation with North Korea.

Iran, ISIS, and Syria

During the Cold War, the major concern was a state's WMD program. Technical and resource challenges made it difficult for non-state actors to develop a program. Acquiring a weapon from the black market or by theft was more likely. Advancements in technology, the access to information, and current events in the Middle East demonstrate state and non-state actors employing chemical weapons.

In 2006 and 2007, insurgents in Iraq operating as part of al-Qaeda in Iraq, the predecessor to the Islamic State in Iraq and Syria (ISIS), deliberately turned to chlorine to gain an asymmetric advantage. Insurgents sought to attack vulnerable government facilities or population centers. The

---

[66] Albert, "North Korea's Military Capabilities."

[67] Everett Rosenfeld, "How North Korea's Latest Test Compares to Past Atomic Blasts," CNBC, September 4, 2017.

[68] Albert, "North Korea's Military Capabilities."

[69] Albert, "North Korea's Military Capabilities."

insurgents drove delivery trucks laden with large chlorine tanks up to coalition bases where they used conventional explosives to rupture tanks, attempting to kill United States forces by spreading a chlorine cloud over the base.[70] ISIS, a non-state actor, more recently demonstrated the ability to manufacture or acquire chemical weapons, and used them on a limited basis. ISIS employed chlorine, sulfur mustard, and potentially sarin fifty-two times from 2014 to 2015 in Northern Iraq and Syria.[71]

Syrian forces have used chemical weapons several times against opposition forces in Syria. After using nerve agents in several attacks, Syria signed the Chemical Weapons Convention treaty, declared its stockpile, and began the destruction of that stockpile in 2013. Despite signing the CWC, which requires states to destroy stockpiles and vow not to use or produce chemical weapons, Syria used chemical weapons against rebels and in neighborhoods sympathetic to rebels as recent as April 2017.[72] This means Syria withheld some of its stockpile or covertly retained the knowledge and infrastructure to manufacture chemical warfare agents. Regardless, their recent use shows their willingness to employ chemical weapons against an adversary unprepared to respond to chemical weapons.

Iran continues to pursue missiles capable of carrying a chemical, biological, or nuclear warhead, but the status of Iran's chemical, biological, or nuclear efforts is less known. There is little proof that the chemical weapons program that began in response to Iraq's use of chemical weapons in the 1980s remains still active. The infrastructure to produce chemical or biological

---

[70] Patrick R. Terrell, "North Korean Collapse: Weapons of Mass Destruction use and Proliferation Challenges," *The North Korea Instability Project* (June, 2017): 8.

[71] Vincent R. Stewart, "Senate Select Committee on Intelligence, Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community," May 11, 2017; Eric Schmitt, "ISIS Used Chemical Arms at Least 52 Times in Syria and Iraq, Report Says," *New York Times*, November 21, 2016, accessed February 3, 2018, https://www.nytimes.com/2016/11/21/world/middleeast/isis-chemical-weapons-syria-iraq-mosul.html.

[72] National Public Radio, "U.N. Watchdog: Syrian Government Responsible for April Sarin Gas Attack," *NPR*, accessed November 3, 2017, http://www.npr.org/sections/thetwo-way/2017/10/27/560335242/u-n-watchdog-syrian-government-responsible-for-april-sarin-gas-attack.

weapons, however, does remain. Some US intelligence agencies have speculated that China may have supplied Iran with some chemical weapons in the mid-1990s. Others state that Iran produced and weaponized chemical weapons as recent as 2001.[73] As a member of the Treaty on the Nonproliferation of Nuclear Weapons, Iran's nuclear energy efforts generate speculation of nuclear weapons research and production. Assessments of ballistic missiles procured and tested indicate Iran's pursuit to obtain the ability to deliver a nuclear, biological, or chemical warhead.[74]

A Resurgent Russia

Russia remains a major CBRN threat. Russia possesses one of the largest stockpiles of nuclear weapons, approximately 2,000 total warheads.[75] The development and testing of Ground-Launched Cruise Missiles violates the Intermediate-Range Nuclear Forces treaty that Russia is party to. Russia assisted in negotiating the Syrian government's agreement to the CWC and declaration of its chemical weapons stockpile for destruction, but the Syrian regime continues to use chemical weapons. Russia's involvement in Syria raises concerns about Russia's perceived support for chemical weapons attacks by the Syrian leadership.[76] Russia, however, ratified the Chemical Weapons and Biological Weapons Treaties following the fall of the Soviet Union. As a result, they declared and destroyed or are in the process of destroying those weapons.[77]

Section 3: Cold War Era Case Study

The Army and the Chemical Corps responded to the Soviet threat by making significant changes in doctrine and organization. Through the development of the theory of AirLand battle, the Chemical Corps had to adjust the way it supported the maneuver force. Operation Desert

---

[73] Cordesman and Al-Rodhan, *Iran's Weapons of Mass Destruction*, 28-30.

[74] Cordesman and Al-Rodhan, *Iran's Weapons of Mass Destruction*, 28-30.

[75] Kristensen and Norris, "Global Nuclear Weapons Inventories," 77-83.

[76] Mauroni, *Chemical and Biological Warfare*, 218.

[77] Albert J. Mauroni, *Countering Weapons of Mass Destruction: Assessing the U.S. Government's Policy* (London: Rowman and Littlefield, 2016), 34.

Storm, in anticipation of WMD use by Saddam Hussein, represented an application of those changes in doctrine and organization to an actual threat.

Chemical Corps Doctrine and Organization: 1989

Following the Vietnam War, the Army underwent a reduction in forces. Recognizing the threat that Soviet conventional forces posed to the United States and its' interests, and the general distaste of chemical and biological weapons from the public and politicians, efforts began that sought to disband the Chemical Corps.[78] As TRADOC struggled with how to defend NATO in the event of a Soviet invasion, new evidence of Soviet chemical and biological weapons programs surfaced. Deficiencies in the Army's organization, equipment and doctrine resulted in forces unprepared to defend themselves from, or fight in, a CBRN environment. This led to the decision to reinstate the Chemical Corps. The regular Army reactivated and activated a total of twenty-eight chemical companies between 1979 and 1989. The Chemical Corps published new doctrine that nested with the concepts of AirLand Battle and FM 100-5.[79] Chemical units focused less on technical aspects of CBRN weapons employment and more on supporting maneuver through reconnaissance, decontamination, and smoke obscuration.

There were five types of operational chemical companies. Four were attached to a corps headquarters for CBRN defense of corps support units and areas, or for supporting the corps' main effort. The corps received decontamination support from a Decontamination Company, motorized reconnaissance from a NBC Reconnaissance Company, and obscuration from a Motorized Smoke Generator Company or Mechanized Smoke Generator Company. The total number of companies a corps needed depended on factors like the mission and terrain.[80]

---

[78] Mauroni, *America's Struggle*, 78-79.

[79] Mauroni, *America's Struggle*, 90-92.

[80] Richard P. Craig and John F. Gallen, "The Corps Chemical Brigade—its Capabilities, its Employment," *The Army Chemical Review* (July 1990): 29.

The fifth type of company, a dual-purpose Chemical Company (Smoke/Decontamination), was assigned to a maneuver division. The type of division (heavy, light, or armored) the company was supporting dictated the company's equipment. For example, a chemical company assigned to a tank or mechanized division comprised of mechanized smoke and large decontamination apparatuses for decontaminating tanks and tracked vehicles.[81] Technical Escort Companies conducted more technical operations such as the transportation of CBRN material or weapons, and mitigated hazards from threat CBRN material or munitions. These companies, a specialized and strategic asset, were not typically part of a division's scheme of maneuver for offensive or defensive operations, and therefore, held at the theater level.[82]

To assist with command and control of chemical companies, planners attached one or more chemical battalion headquarters to a division or corps. This was a best practice if more than two companies (including the division chemical company) were part of the division's or corps' operations. A chemical battalion provided command and control for two to five companies to meet the division or corps commander's intent. When the situation required multiple battalions, the corps received an attached chemical brigade headquarters. The brigade headquarters provided command, control, and sustainment support for two to five chemical battalions, ensured divisions had their requested support, and oversaw CBRN defense in the corps area.[83] The AirLand Battle concept recommended that a chemical brigade support a corps regardless of other circumstances.[84]

The Army's doctrine for CBRN defense changed with the reestablishment and restructuring of the Chemical Corps, the evolving threat of the Soviet Union, and AirLand Battle.

---

[81] US Department of the Army, Field Manual (FM) 3-101, *Chemical Staffs and Units* (Washington, DC: Government Printing Office, 1989), A-II-5 - A-II-9.

[82] Albert J. Mauroni, *Chemical-Biological Defense*, 74-75.

[83] US Department of the Army, FM 3-101, A-II-2 - A-II-4.

[84] US Department of the Army, Field Manual (FM), 100-15, *Corps and Division Operations* (Washington, DC: Government Printing Office, 1988), Chapter 1.

A series of studies called Combined Arms in a Nuclear/Chemical Environment, or CANE, conducted in the mid to late-1980s, emphasized the psychological isolation and physical degradation felt by soldiers as they attempted to perform individual and group combat operations wearing protective clothing and masks. These studies also quantified the increases in time to mount an offensive, the overall decrease in combat strength and the increased difficulties leaders faced trying to command their forces in a chemical environment.[85] Instead of being experts in the technical aspects of CBRN weapons and their employment, the Chemical Corps changed its mindset. Supporting maneuver units to fight outnumbered and win by preserving combat power and ensuring their survivability against all CBRN hazards became the Chemical Corps' focus.

To better support the maneuver force, the Chemical Corps wrote a series of manuals, and provided input to other manuals that outlined the priorities of contamination avoidance, protection, and decontamination. This approach departed from previous manuals in that the Chemical Corps viewed CBRN warfare as a condition or environment, not as a separate mission.[86] The new approach projected maneuver units to conduct operations in a CBRN environment with or without chemical support. Previous expectations were that decontamination operations occurred immediately after contamination. The new approach meant that a contaminated, or "dirty," unit continued to fight "dirty" until the fight was over or undergo decontamination as close to the forward line of troops as possible and return to the fight.[87]

Cold War Case Study

Two examples from the Cold War era display how the threat and doctrine influenced the chemical forces organization to support the joint force commander. The first comes from III Corps planning exercises in 1989 and 1990. The task organization of this exercise followed from

[85] Mauroni, *America's Struggle*, 4.

[86] Mauroni, *America's Struggle*, 78-79.

[87] Mauroni, *America's Struggle*, 78-79.

the employment recommendations in Field Manuals 3-101, *Chemical Staffs and Units*, and 100-15, *Corps and Division Operations*. During these exercises III Corps employed one chemical brigade to oversee CBRN defense in the corps area and to provide additional assistance to divisions in accordance with the III Corps commander's intent. The chemical brigade oversaw one chemical battalion that provided command and control for four chemical companies.[88] Chemical brigade and battalion headquarters companies are staffs, but not operational units that execute tactical tasks in support of the concept of maneuver. The chemical company, therefore, becomes the main point of discussion for CBRN support to maneuver forces.

Including the organic chemical company each of III Corps' six maneuver divisions, III Corps totaled ten chemical companies. Since Soviet doctrine included the targeting of rear areas (command and control nodes, lines of communication, supply depots), support units that operate in rear areas will also require chemical support. III Corps, including supporting divisions and separate brigades, needed CBRN support for eleven divisions and brigades.[89] Through the generic application of doctrine, III Corps exercised ten chemical companies as sufficient to support the corps' CBRN defense needs.

III Corps planning exercises demonstrated CBRN companies supporting divisions, however they had reflected a potential operational environment. As a second example indicative of Cold War doctrine and organization, Operation Desert Storm reflects METT-T assessments for task organization against an actual enemy. Desert Storm occurred after the fall of the Soviet Union, and therefore after the Cold War, but the doctrine and organization developed at the height of the Cold War remained unchanged. Unlike the III Corps organization for an exercise, the task organization in Desert Storm reflected METT-T considerations of an adversary with a

[88] Craig and Gallen, "The Corps Chemical Brigade," 29-30.

[89] Craig and Gallen, "The Corps Chemical Brigade," 30.

known CBRN weapons capability and prior use. The task organization also included the additional complexity of provisioning chemical warfare support to an attached allied division.

VII Corps included five total maneuver divisions, four divisions from the United States and one from Great Britain. The division from Great Britain did not have an organic or attached chemical company and relied on CBRN defense support from VII Corps. The total number of divisional chemical companies was four. VII Corps received eight other chemical companies for supporting the corps' support and sustainment elements as well as supporting maneuver divisions when required.[90] The VII Corps, therefore, needed twelve chemical companies to support the corps' CBRN defense priorities.

XVIII Airborne Corps consisted of five maneuver divisions. Four US maneuver divisions deployed with their organic divisional chemical company. The fifth maneuver division, a French division possessed a decontamination capability but no CBRN reconnaissance element. The corps headquarters directed assets from a US company to support the French Division.[91] XVIII Airborne Corps received eight other chemical companies under its task organization for a total of twelve chemical companies. The corps possessed seventeen total divisions, support brigades, and regiments to needing CBRN support.[92] In total, the XVIII Airborne Corps required twelve chemical companies for its CBRN defense needs.

For command and control purposes, both corps had one chemical battalion each. VII Corps task organized their battalion to 1st Infantry Division and it provided command and control of the five chemical companies supporting the maneuver divisions. XVIII Airborne Corps did not task organize their battalion to directly support a division. Unlike the III Corps exercise mentioned previously, a chemical brigade was not part of the task organizations of either corps.

---

[90] Mauroni, *Chemical-Biological Defense*, 190.

[91] Mauroni, *Chemical-Biological Defense*, 82.

[92] Mauroni, *Chemical-Biological Defense*, 189.

Seventeen of twenty-six regular Army companies, or about 65% of the total Army Chemical Corps strength, deployed for Operation Desert Storm. In comparison, nine of the Army's sixteen divisions and cavalry regiments deployed, around 56%. The organic divisional chemical companies did not meet the expected needs given the high threat and perceived low training status. Divisions arriving to theater continued to request additional decontamination capability in preparation of the ground invasion.[93] With more than half of the regular Army's chemical forces deployed any further deployments challenged the Army's readiness for a contingency in any other geographic location. To fulfill the corps' requests, seven additional companies came from the guard and reserve components over a span of about four months during the build-up of forces for Operation Desert Storm.[94] This time-period needed to bring in additional CBRN enablers occurred in permissive conditions in Saudi Arabia.

To summarize, the above examples reflect Cold War doctrine and planning applied toward an adversary expected to employ CBRN weapons. Exercises like III Corps' generated the expectation that divisional chemical companies with limited augmentation from other companies provided adequate CBRN defense support for a corps. Operation Desert Storm required twelve chemical companies to support each corps due to poor training of units and the high CBRN threat that Iraq presented. This value of twelve companies per corps for CBRN defense is the baseline criteria for comparison with the subsequent hypothetical case study.

Section 4: Hypothetical Case Study

During the Cold War era, the United States military and political leadership faced the prospect of military operations in Europe, the Middle East, and Asia against adversaries that possessed CBRN weapons. Today, United States' military and political leadership still confront the threat of CBRN weapons in those same regions. States continue to modernize, develop, or

[93] Mauroni, *Chemical-Biological Defense*, 74.

[94] Mauroni, *Chemical-Biological Defense*, 190.

acquire CBRN weapons, delivery systems, or their underlying technologies. State and non-state actors continue to use chemical weapons in the Levant against military, rebel, and civilian targets. A CBRN-capable North Korea complicates matters on the Korean Peninsula.

Chemical Corps Doctrine and Organization: 2017

Following the end of the Cold War and Desert Storm, questions arose about the future role of CBRN weapons. In 1993, Defense Secretary Les Aspin led an initiative to develop a counterproliferation policy intended to prevent or reduce the threat of an adversary using CBRN weapons against the United States military. Counter-proliferation efforts to protect United States forces and interests in a confrontation with an adversary armed with CBRN weapons include activities that span the full range of the United States government activities. These include the use of military power to protect forces and interests, intelligence collection and analysis, and support to diplomacy, arms controls, and export controls.[95] Despite the initiative, few changes occurred in the Chemical Corps' forces or doctrine between the wars in Iraq.

The war in Iraq in 2003 raised the requirement to reorganize and refocus the Chemical Corps' organization. Under the objective of finding and eliminating Iraq's suspected Chemical, Biological, and Nuclear programs, the Army and the Chemical Corps lacked specialized forces in large enough numbers or a standing organization for executing strategic C-WMD missions. The solution was the creation of an ad hoc organization. The 75th Exploitation Task Force had the responsibility for investigating and exploiting any suspected WMD sites.[96] The ad hoc nature of the 75th meant they faced significant challenges from the lack of doctrine, training, communications, organization, and equipment.[97] This served as a catalyst to establish a command

[95] Mauroni, *Chemical and Biological Warfare*, 218.

[96] Judith Miller, "A Nation at War: In the Field / 75th Exploitation Task Force; Smoking Gun Still Proves Elusive," *New York Times*, April 2, 2003.

[97] J. B. Burton, F. John Burpo, and Elmore F. Smoak, "CBRNE Task Forces," *Army Chemical Review* (Summer, 2015): 16.

for managing Army C-WMD operations, change the design of the Chemical Corps' forces, and update doctrine for C-WMD missions to support operations in an increasing threat environment.

In 2004, the Army established the 20th Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Command as the first step toward updating the Army's chemical forces. The 20th CBRNE headquarters is capable of rapid deployment to function as a joint task force command for C-WMD operations. In addition to the majority of the Regular Army Chemical and Explosive Ordinance Disposal (EOD) forces, the command includes Army personnel and Department of the Army civilians in highly specialized CBRNE niche capabilities like Nuclear Disablement Teams and the Chemical, Biological, Radiological, Nuclear, and Explosives Analytical and Remediation Activity.[98]

The 20th CBRNE Command established a framework to begin to develop and exercise doctrine and procedures, support whole of government C-WMD efforts, and support Homeland Response missions. However, for the Army to meet the national policy obligation that all major plans include C-WMD operations, the Chemical Corps required changes in its operational forces. In the immediate aftermath of the invasion of Iraq, most of the Chemical Corps' forces, equipped and trained for CBRN defense, supported C-WMD and consequence management activities.[99] The Vice Chief of Staff of the Army approved a force design update in October 2014 that transformed a large part of the Army Chemical Corps' force structure. This transformation displays the corps' evolution from a Cold War passive defense focused force to a force capable of countering the full range of WMD threats and CBRN hazards.[100]

The update's most significant change occurred in the restructuring of the standard CBRN company. In the Cold War era, this was the Smoke/Decon company assigned to a division. Obscuration is no longer a capability provided by the Chemical Corps. However, the expanded

[98] Burton, Burpo, and Smoak, "CBRNE Task Forces," 17.

[99] Harwell, "The CBRN FDU," 23.

[100] Harwell, "The CBRN FDU," 18.

definition of CBRN to include Toxic Industrial Material threats on the battlefield, and the addition of C-WMD tasks, increased the requirement for reconnaissance and decontamination elements. The CBRN Hazard Response company is a dual-purpose company composed of reconnaissance, both mounted and dismounted, and decontamination capability.

The mounted reconnaissance platoon supports the maneuver commander's CBRN defense needs for contamination avoidance and early warning. The other platoons in the company are dual-purposed for dismounted reconnaissance and decontamination. The addition of advanced detection and identification equipment enables dismounted reconnaissance platoons to conduct sensitive site assessments and initial identification of WMD agents and related precursors in support of C-WMD operations.[101] These elements possess the capability to simultaneously conduct dismounted reconnaissance and operational decontamination. Operational decontamination reduces the level of contamination to a level that allows a force to continue with their assigned mission, but they must continue to wear protective equipment.[102] If tasked with providing thorough decontamination, the platoon cannot concurrently conduct reconnaissance.[103] In a forward deployed situation, this structure allows the maneuver commander to employ CBRN assets that best support the mission.

The National Guard and Army Reserve also modified their chemical forces during the force design update. Some companies converted to CBRN Hazard Response companies and fill CBRN defense or C-WMD requirements that the active force cannot support. The reserve components assumed sole responsibility for providing heavy decontamination, and biological detection capabilities through Area Support and Biological Detection companies.[104] These units

[101] Harwell, "The CBRN FDU," 24.

[102] US Department of the Army, Army Doctrine Reference Publication (ADRP) 1-02, *Terms and Military Symbols* (Washington, DC: Government Printing Office, 2017), 1-70.

[103] Harwell, "The CBRN FDU," 24.

[104] Harwell, *Building a Better Force,* 25.

are better equipped to supporting CBRN defense objectives in rear areas like ports of debarkation, command posts, and logistics staging areas.

The establishment of the 20th CBRNE along with the update changed the nature of CBRN support to the maneuver commander. Previously, divisions possessed an assigned chemical company equipped to support that division's unique mission set. Divisions now do not own chemical companies. The 20th CBRNE exerts administrative and operational control of chemical companies. For training support purposes, companies remain aligned with a division.[105] This allows a division to habitually train with a CBRN Hazard Response company. However, that same company may not deploy with the division depending on the requirements 20th CBRNE must manage.

Modifications to Technical Escort companies increased the ability of Technical Escort to support maneuver commanders in their C-WMD missions at lower echelons. By adding sustainment capability at the company headquarters, Technical Escort companies operate without the requirement for a Technical Escort battalion.[106] Instead of being only a theater or corps asset, planners may task organize Technical Escort elements to support division or brigade C-WMD tasks.

CBRN brigades and battalions also underwent a few modifications to meet the new demands of conducting C-WMD and CBRN defense. Reductions in division headquarters staff strained the ability of division CBRN staff to support sustained operations. CBRN battalion staffs grew to meet the new sustainment requirements of chemical companies and to support the division commander by providing technical expertise and command experience on the employment of CBRN forces.[107] Table 1 depicts the total force structure for the Chemical Corps'

[105] Burton, Burpo, and Smoak, "CBRNE Task Forces," 8.

[106] Harwell, "The CBRN FDU: Building the Future Force Today," 17

[107] Harwell, "The CBRN FDU," 18.

companies, battalions, and brigades and shows the size disparity of the National Guard and Reserve components compared with the Regular Army.

Table 1. Current Numbers of CBRN Companies

Unit Description	Regular Army	National Guard	Army Reserves	Total
CBRN Brigade	1	2	1	4
CBRN Battalion	5	7	10	22
CBRN Company (Hazard Response	15	15	16	46
CBRN Company (Area Support)	0	14	10	24
CBRN Company (BIDS)	0	0	10	10
CBRNE Company (Technical Escort)	6	0	0	6

Source: Data from B. Burton, F. John Burpo, and Elmore F. Smoak, "CBRNE Task Forces," *Army Chemical Review* (Summer, 2015): 9-13; James P. Harwell, 2015, "The CBRN FDU: Building the Future Force Today," *Army Chemical Review* (Summer, 2015): 17-20.

The Chemical Corps' changes in force structure reflected the current threat environment and policy guidance, but doctrine remained unchanged since Desert Storm. Units now possessed a capability to support C-WMD tasks, however doctrine focused on CBRN defense. The Chemical Corps tackled the task of reviewing or writing new CBRN doctrine, as well as providing inputs to doctrine of other branches of the Army and services. Notably, the Chemical Corps supported the writing of doctrine that outlines how the Army supports the joint force's C-WMD strategic objectives, describes the employment of new capabilities like dismounted

reconnaissance, and provides guidance for the employment and responsibilities of CBRN commands.[108]

Army Training Publication (ATP) 3-90.40 *Countering Weapons of Mass Destruction*, a new manual published in 2017, provides a necessary doctrinal link for maneuver forces to conduct C-WMD operations. The manual is a reference for planning, synchronizing, integrating, and executing combined arms countering weapons of mass destruction for tactical-level commanders, staffs, and key agencies.[109] The need for and publication of the manual indicates the Army's recognition that C-WMD, in large-scale combat, is not strictly the responsibility of Special Operations Forces or intergovernmental partners.

Hypothetical Case Study

The United States military has not executed large-scale land operations against a WMD-capable adversary since Operation Iraqi Freedom in 2003. Since then, changes in policy and the threat led to changes in force structure and doctrine. Adversaries continue proliferating and using chemical weapons in the volatile Middle East, and WMD threats from adversaries in East Asia give credibility to a scenario in which the United States military conducts C-WMD and CBRN defense operations, simultaneously, against two notional near-peer future threats.

Developing a hypothetical case study requires stating some assumptions of future conditions, but these assumptions arise from the current threat environment. Near-peer adversaries like North Korea and Iran, possess WMD programs and the capability to use CBRN weapons. War is the product of a rapid escalation of threats between the US and North Korea resulting from failed diplomatic talks, or Iranian closure of the Straits of Hormuz to weaken the

[108] US Army Chemical, Biological, Radiological, and Nuclear School, "Doctrine Update," *Army Chemical Review* (Summer, 2016): 35.

[109] US Army Chemical, Biological, Radiological, and Nuclear School, "Doctrine Update," 35.

Saudi position in the Middle East. These situations do not afford US planners the opportunity for a long build-up of forces in each theater, like the six months prior to Operation Desert Storm.

Programs in each country include multiple sites for production, bulk storage, and raw materials for production, as well as technical knowledge found in personnel and documents. Faced with an existential threat, North Korea and Iran will use CBRN weapons and the doctrine to support offensive or defensive operations against United States forces. The potential for the proliferation of North Korea or Iran's WMD programs and CBRN weapons to non-state actors and black-market opportunists is high during and after major combat operations. Since the United States Army currently has three total corps, only one corps headquarters deploys to each theater to be the joint task force command or the land component command. These assumptions are necessary to establish the CBRN support requirements for two theaters of operation.

The Gulf War case study showed that CBRN defense support requirements during large scale combat operations is higher than doctrinal allocations. The reasons for this are the combination of the threat, and the training proficiency of US forces to conduct operations in a CBRN environment. Doctrinally, each corps and maneuver division receive an attached chemical company. The demand for CBRN reconnaissance and decontamination during major offensive or defensive operations exceeds a company's capabilities. Major command posts, logistics staging areas, air fields and sea ports in the joint area of operations are likely targets and require more than one chemical company per corps or joint task force.

Large scale combat operations against North Korea resembles the task organization of Operation Desert Storm for CBRN defense support. This scenario requires at least one corps with five maneuver divisions and seven separate brigades or commands supporting the corps. This corps therefore needs twelve chemical companies to provide CBRN defense support. One company is a BIDS (Biological Integrated Detection System), company providing stationary biological surveillance of major sea ports and air ports in South Korea. Three of the companies are area support companies providing terrain and thorough decontamination of rear areas and

corps support units. The remaining seven companies are Hazard Response companies supporting the five maneuver divisions with reconnaissance and operational decontamination. To help command and control the companies, the corps has two CBRN battalion headquarters attached.

The largest difference between Operation Desert Storm and this hypothetical case is the new requirement of conducting C-WMD operations. In the United States' first attempt at conducting C-WMD operations in Operation Iraqi Freedom, one of the major failures was the inability of the maneuver forces to coordinate with the 75th WMD Exploitation Task Force. The limited resources of the 75th prevented them from responding as quickly as maneuver forces hoped. Maneuver forces, not wanting to lose momentum in the attack, failed to secure potentially sensitive sites and wait for the 75th. This allowed for looting by local Iraqi forces and insurgents before the 75th arrived to exploit the site.[110] In this hypothetical scenario looters, insurgents, or other non-state actors stealing WMD technology or weapons means United States forces failed to achieve the nonproliferation policy objective.

Ensuring freedom of maneuver and momentum for maneuver forces requires allocating CBRN forces to maneuver forces for supporting C-WMD tasks. This helps avoid the "waiting" problem experienced in Operation Iraqi Freedom. The question is, can the twelve companies already attached for CBRN defense simultaneously conduct C-WMD? While Hazard Response companies can support C-WMD operations, the high demand for CBRN defense support in large scale combat prevents those companies from also supporting C-WMD operations. An adversary likely has multiple research and development, scale-up production, full production, and storage facilities for each category of CBRN weapons.[111] Therefore, the corps needs more chemical assets in addition to the twelve attached for CBRN defense.

[110] Mauroni, *Countering Weapons of Mass Destruction*, 236.

[111] Bermudez, "North Korea's NBC Infrastructure," 11, 16, 23.

Doctrine does not provide a planning ratio for the number of chemical companies per the number of WMD sites. Using the Cold War case study of Operation Desert Storm, a corps requires twelve chemical companies for CBRN defense. To concurrently support C-WMD operations, therefore, it is an appropriate assumption that a corps requires double the amount of companies. However, the actual number is not arbitrary and is based on the size and scope of the sites as well as the threat from enemy forces or insurgents. For example, large sites like nuclear enrichment facilities, consist of many multistoried buildings which requires multiple CBRN assets over several weeks to thoroughly assess and exploit. A study by the RAND Corporation suggests a ratio of one chemical company per large site.[112]

North Korea and Iran possess multiple WMD sites of varying size and complexity. One open source estimates forty-five high-priority sites for North Korea. The total number of locations associated with the DPRK program exceeds one hundred.[113] Another source associates over forty sites with Iran's program.[114] Due to intelligence gaps, some of these sites may not have WMD and additional sites may also exist. It is unrealistic to expect a CBRN company per large site. Such a ratio requires forty-five Hazard Response companies for North Korea. The number of Hazard Response companies in the total force is forty-six. However, there are factors that reduce the total number of assets needed. Units bypass empty sites or wait until after major combat operations to exploit sites with little material to secure. Attached and organic CBRN reconnaissance assets help commanders prioritize sites by assessing them to determine if they require further analysis from specialized forces. The joint force will confront many of these sites

[112] Bonds et al., *Strategy-Policy Mismatch*, 62. The table uses the hazard response platoons from a maneuver support company for its ratio. Hazard response platoons are the predecessor to current dual-purpose recon/decon platoons in Hazard Response companies with two platoons per company. The graph depicts ten platoons per five sites, therefore one company per site.

[113] Bonds et al., *Strategy-Policy Mismatch*, 103.

[114] Nuclear Threat Initiative, "Iran Facilities," last modified July, 2017, accessed March 8, 2016, http://www.nti.org/learn/countries/iran/facilities/.

while in contact with North Korean and Iranian forces. Maneuver commanders bypass sites in which stopping, securing the site, and waiting for limited chemical assets is a greater risk to mission success than continuing decisive action against North Korean or Iranian forces.

The ever-present fog and friction of battle complicate the simple things that military forces do, like finding and killing the enemy. The addition of C-WMD operations will increase the fog and friction of the battlefield. Attaching a command element like the 20th CBRNE HQ assists the corps headquarters with prioritizing, coordinating, and managing C-WMD operations and assets. Attached to the 20th CBRNE for executing technical CBRN tasks in support of C-WMD operations are a third CBRN battalion, five more Hazard Response chemical companies, and two Technical Escort companies.

The total number of CBRN assets supporting one corps or joint task force conducting large-scale combat operations against North Korea is one CBRNE command, three chemical battalions and nineteen chemical companies. CBRN support in the second theater of operations against Iran requires and identical force. The total Chemical Corps force requirement is two CBRNE commands, six chemical battalions, and thirty-eight chemical companies. Four of the companies are Technical Escort, twenty-four are Hazard Response, eight are Area Support, and two are BIDS. Notably, referencing Table 1, these requirements consume 200% of the Army's CBRNE command headquarters, 28% of the Chemical Corps battalions, 66% of Technical Escort companies, and 52% of the Hazard Response companies.

Section 5: Recommendations and Conclusion

Comparing the case studies shows that the Chemical Corps is struggling to balance its CBRN defense and C-WMD responsibilities. The prospect of large-scale combat in Eastern Europe forced the Chemical Corps to adapt from a technical force to a force focused on supporting maneuver forces. CBRN defense was the major objective for CBRN forces in Operation Desert Storm, and the Chemical Corps was able to meet its responsibilities. However,

because of policies developed following Operation Iraqi Freedom that require the joint force to conduct C-WMD operations in two theaters, the Chemical Corps recognized that it lacked the technical capability for supporting C-WMD operations. The Chemical Corps spent several years following Operation Iraqi Freedom reorganizing the branch and rewriting doctrine to be more technical and support C-WMD operations. As the strategic emphasis has shifted to large-scale combat with adversaries possessing offensive or defensive WMD programs, the Chemical Corps lacks the force structure to fulfill simultaneous CBRN defense and C-WMD support requirements for the joint force in two theaters of operation.

The case study on Operation Desert Storm demonstrated the application of chemical units conducting CBRN defense in support of a corps. Each corps needed twelve chemical companies for the CBRN defense requirements expected by the threat the Iraqi military posed and the substandard training level of US forces tasked with operating in a CBRN environment. When compared with a hypothetical case study looking at the application of CBRN units, the expectation is each corps needs twelve chemical companies for CBRN defense requirements. This appears adequate given that nation states continue to have offensive programs and the training proficiency of US forces in operating in a CBRN environment remains questionable.[115]

Corps in Operation Desert Storm did not conduct C-WMD operations, but corps today must do so. Based on twelve chemical companies supporting CBRN defense, a corps that must also conduct C-WMD operations requires an additional twelve companies, or twenty-four total chemical companies. The hypothetical case study, which adjusts for METT-C, shows that a corps requires nineteen chemical companies for the conduct of CBRN defense and C-WMD operations. To support two-theater strategic guidance requires thirty-eight companies.

[115] Government Accounting Office, *Army Training: Efforts to Adjust Training Requirements Should Consider the use of Virtual Training Devices*, (Washington, DC: Government Printing Office, 2016), 16-17. One brigade noted that they lacked the resources to train, another acknowledged that CBRN training is a priority, but guidance to conduct it is unclear.

The US Army Chemical Corps appears capable of providing thirty-eight companies given its total strength of eighty-six companies. More than half of the total companies remain non-deployed to support a train-ready-deploy cycle for continuous operations. However, the heavy dependence on Hazard Response and Technical Escort companies, and CBRNE commands challenges the notion that the Chemical Corps can realistically support expectations.

Currently, only fifteen Hazard Response companies are in the active component. Deploying in support one of one theater requires twelve companies, thus consuming nearly all Regular Army Hazard Response companies. This also assumes that all companies are 100% manned, trained, and equipped. The requirement of twenty-four total Hazard Response companies places a heavy emphasis on the National Guard and Army Reserve to provide additional Hazard Response companies, as well as all required BIDS and Area Support companies. This is a serious consideration for operational and strategic planning. Responding to a crisis, or rapid escalation of hostilities leading to war, depletes the number of available Regular Army chemical units. Heavy reliance on the National Guard and Army Reserve detracts from their directed missions to support state and national domestic response and defense.

Reducing strategic risk in deploying a high percentage of active Hazard Response companies, necessitates a larger active Chemical Corps force and the removal of bureaucratic obstacles to enable rapid deployment of the National Guard and Reserve. Adding more Hazard Response companies to the Regular Army gives operational and strategic planners more options. The joint force may not have the luxury of time to build-up forces in a permissive environment like in Operation Desert Storm. Time is of less concern when deploying an active duty company. Growing the active force also maintains strategic depth for the Army by preserving enough National Guard and Reserve forces to fulfill homeland missions and provides time to the National Guard and Reserves to activate, train, and deploy units to replace or augment deployed active duty units.

The hypothetical case study also identifies the requirement for an additional CBRNE command to augment the one that currently exists. Under the current organization, deployment in the event of the two-theater requirement forces a difficult priority decision between theaters and assets. The solution recommended here is the creation of another CBRNE command in the National Guard or Reserve. Given that 80% of the Chemical Corps' capacity lies outside of the active components, it is logical for the reserve components to have a command. This requires more growth and has the benefit of improving homeland response and consequence management requirements that the National Guard and Reserve components fulfill.

In the absence of increasing CBRN detection and decontamination capabilities in the other services, the Chemical Corps will remain the sole provider of CBRN forces for the joint force. The hypothetical case study shows that the Chemical Corps lacks sufficient forces to meet all its requirements. Maneuver and support forces in all military branches must train on individual and collective CBRN tasks to preserve combat power when limited CBRN support is supporting other units. Every Army battalion has decontamination equipment as part of their Table of Organization and Equipment. Establishing unit procedures and training with this equipment reduces decontamination requirements from chemical units. Using organic decontamination equipment also assists commanders retain combat power by returning contaminated vehicles to the fight sooner instead of waiting for support from a chemical unit. Failure to achieve proficiency to react and operate in a CBRN environment is a failure to prevent soldiers gasping for air and reaching hopelessly for life just as soldiers did in the trenches at the Second Battle of Ypres in 1915.

The US Army Chemical Corps is rich with capable and adaptable Soldiers. The Chemical Corps' innovation and survivability through 100 years of history is a testament to this. Dragon Soldiers will continue to adapt to obstacles and create solutions that achieve their assigned mission. However, the total number of Regular Army Hazard Response and Technical Escort companies places the Chemical Corps in a vulnerable position. Meeting current strategic,

operational, and tactical requirements to support the joint forces' CBRN defense and C-WMD operations in two theaters forces the Army and the Chemical Corps to must assume a significant amount of risk. Deployments in two-theaters causes a difficult priority decision between theaters and assets. Growing the Regular Army chemical forces combined with decreasing the dependence on chemical forces for CBRN defense will better position the Army and the Chemical Corps to meet CBRN defense and C-WMD objectives.

Bibliography

Primary Sources

Burton, J. B., F. John Burpo, and Elmore F. Smoak. "CBRNE Task Forces." *Army Chemical Review* (Summer, 2015): 8-13.

Bush, George W. *National Strategy to Combat Weapons of Mass Destruction*. Washington, DC: Government Printing Office, 2002.

Carter, Ashton. *Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending.* Washington, DC: Government Printing Office, September 14, 2010.

Clapper, James. “Senate Select Committee on Intelligence, Statement for the Record on the Worldwide Threat Assessment of the US Intelligence Community.” February 16, 2015.

Coats Daniel R, "Senate Armed Service Committee, Statement for the Record: Worldwide Threat Assessment." May 23, 2017.

Director of Central Intelligence. *Special National Intelligence Estimate: The Soviet Offensive Chemical Warfare Threat to NATO*. Washington, DC: Government Printing Office, 1984.

———. *National Intelligence Estimate Number 11-11-69: Soviet Chemical and Biological Warfare Capabilities.* Washington, DC: Government Printing Office, 1969.

———. *Special National Intelligence Estimate: Use of Toxins and Other Lethal Chemicals in Southeast Asia and Afghanistan.* Washington DC: Government Printing Office, 1982.

Government Accounting Office, *Army Training: Efforts to Adjust Training Requirements Should Consider the use of Virtual Training Devices.* Washington, DC: Government Printing Office, 2016.

Isserson, Georgii S. *The Evolution of Operational Art*. Translated by Bruce W. Menning. Fort Leavenworth, KS: Combat Studies Institute Press, 2013.

Kan, Shirley A. *China and Proliferation of Weapons of Mass Destruction and Missiles: Policy Issues*. Washington, DC: Congressional Research Service, 2015.

Mattis, James. *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge*. Washington, DC: Government Printing Office, 2018.

Scaparrotti, Curtis M. “Statement Before the Senate Armed Services Committee.” April 16, 2015.

Stewart, Vincent R. “Senate Armed Services Committee, Statement for the Record. Worldwide Threat Assessment.” 2015.

Trump, Donald J. *National Security Strategy*. Washington, DC: Government Printing Office, 2017.

US Department of the Army. Army Doctrine Reference Publication (ADRP) 1-02, *Terms and Military Symbols*. Washington, DC: Government Printing Office, 2017.

———. Field Manual (FM) 3-0, *Operations*. Washington, DC: Government Printing Office, 2017.

———. Field Manual (FM) 3-101, *Chemical Staffs and Units*. Washington, D.C.: Government Printing Office, 1989.

———. Field Manual (FM) 100-15, *Corps and Division Operations*. Washington, D.C.: Government Printing Office, 1988.

———. Department of the Army Pamphlet (DA PAM) 600-3, *Commissioned Officer Professional Development and Career Management.* Washington, DC: Government Printing Office, 2012.

US Marine Corps Forces Command. "Chemical Biological Incident Response Force: History." Accessed 12/3/2017. http://www.cbirf.marines.mil/About-CBIRF/History/.

US Army Chemical, Biological, Radiological, and Nuclear School. "Doctrine Update." *Army Chemical Review* (Summer, 2016), 35.

US Department of Defense. *Department of Defense Strategy for Countering Weapons of Mass Destruction*. Washington, DC: Government Printing Office, 2014.

———. *Quadrennial Defense Review*. Washington, DC: Government Printing Office, 2014.

Secondary Sources

Albert, Elanor. "North Korea's Military Capabilities." *Council on Foreign Relations* (January 3, 2018).

Bermudez, Joseph S. Jr. "Overview of North Korea's NBC Infrastructure." *The North Korea Instability Project* (June, 2017).

Bonds, Timothy M., Eric V. Larson, Derek Eaton, and Richard E. Darilek. *Strategy-Policy Mismatch: How the U.S. Army can Help Close Gaps in Countering Weapons of Mass Destruction*. Santa Monica, CA: RAND Corporation, 2014.

Cordesman, Anthony H. and Khalid R. Al-Rodhan. *Iran's Weapons of Mass Destruction: The Real and Potential Threat*. Washington, DC: Center for Strategic and International Studies, 2006.

Craig Richard P. and John F. Gallen, “The Corps Chemical Brigade—its Capabilities, its Employment.” *The Army Chemical Review* (July 1990).

Federation of American Scientists. *Russian/Soviet Nuclear Doctrine*2000.

Harwell, James P. *Building a Better Force: Regular Army / Reserve Components Integration in the Army Chemical Corps*. Ft. Leavenworth, KS: Army University Press, 2016.

———. “The CBRN FDU: Building the Future Force Today.” *Army Chemical Review* (Summer, 2015): 23-26

Hersman, Rebecca K. C. "North Korea, Weapons of Mass Destruction and Instability: Strategic Issues for Managing Crisis and Reducing Risks." *The North Korea Instability Project* (June, 2017).

International Crisis Group. "North Korea's Chemical and Biological Weapons Programs." *Asia Report*, no. 167 (June 18, 2009): i. Accessed February 6, 2018, https://www.crisisgroup.org/asia/north-east-asia/korean-peninsula/north-korea-s-chemical-and-biological-weapons-programs.

Kleber, Brooks E. and Dale Birdsell. *The Chemical Warfare Service: Chemicals in Combat*. United States Army in World War II. Washington, DC: Center of Military History, 2003.

Krause, Joachim and Charles K. Mallory. *Chemical Weapons in Soviet Military Doctrine: Military and Historical Experience, 1915-1991*. Boulder, CO: Westview Press, 1992.

Kristensen, Hans M. and Robert S. Norris. “Global Nuclear Weapons Inventories, 1945–2010.” *Bulletin of the Atomic Scientists* 66, no. 4 (December 2017): 77-83.

Mauroni, Albert J. *Countering Weapons of Mass Destruction: Assessing the U.S. Government's Policy*. London: Rowman & Littlefield, 2016.

———. *Chemical and Biological Warfare: A Reference Handbook*. Santa Barbara, CA: ABC-CLIO, 2003.

———. *America's Struggle with Chemical-Biological Warfare*. Westport, CT: Praeger, 2000.

———. *Chemical-Biological Defense: U.S. Military Policies and Decisions in the Gulf War*. Westport, CT: Praeger, 1998.

Miller, Judith. "A Nation at War: In the Field / 75th Exploitation Task Force; Smoking Gun Still Proves Elusive." *New York Times*, April 2, 2003.

National Public Radio. “U.N. Watchdog: Syrian Government Responsible for April Sarin Gas Attack.” *NPR*. Accessed November 3, 2017. http://www.npr.org/sections/thetwo-way/2017/10/27/560335242/u-n-watchdog-syrian-government-responsible-for-april-sarin-gas-attack.

Nuclear Threat Initiative. “Iran Facilities.” Last modified July, 2017. Accessed March 8, 2016. http://www.nti.org/learn/countries/iran/facilities/.

Peters, Robert. "A New Approach to Eliminating North Korean Weapons of Mass Destruction is Needed." *The North Korea Instability Project* (June, 2017).

Republic of Korea Ministry of National Defense. "2010 Defense White Paper." Seoul, ROK: 2010.

Rosenfeld, Everett. "How North Korea's Latest Test Compares to Past Atomic Blasts." *CNBC* September 4, 2017.

Swain, Richard M. "Filling the Void: The Operational Art and the U.S. Army." In *Operational Art: Developments in the Theory of War*. Edited by B. J. B. McKercher and Michael Hennessey, 147-172. Westport, CT: Praeger, 1996.

Terrell, Patrick R. "North Korean Collapse: Weapons of Mass Destruction use and Proliferation Challenges." *The North Korea Instability Project* (June, 2017).

Tucker, Jonathan B. *War of Nerves: Chemical Warfare from World War I to Al-Qaeda*. New York, NY: Pantheon Books, 2006.