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**NAVAL
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MONTEREY, CALIFORNIA

THESIS

**ATOMIC ARMY: THE ROLES OF THE U.S. ARMY IN
AMERICA'S NUCLEAR ENDEAVORS**

by

Seth M. Womack

September 2014

Thesis Advisor:
Second Reader:

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REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE September 2014	3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE ATOMIC ARMY: THE ROLES OF THE U.S. ARMY IN AMERICA'S NUCLEAR ENDEAVORS			5. FUNDING NUMBERS	
6. AUTHOR(S) Seth M. Womack				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB protocol number ___N/A___.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			12b. DISTRIBUTION CODE A	
13. ABSTRACT (maximum 200 words) This thesis examines the roles of the U.S. Army in America's nuclear undertakings. Since 1942, when the Army took responsibility for managing the Manhattan Project, the Army has made many important contributions to America's nuclear endeavors. Its earliest nuclear roles included developing and employing America's first nuclear weapons, executing nuclear counterproliferation missions, investigating the effects of nuclear weapons, and supervising the U.S. atomic energy program. Although the Army's nuclear responsibilities were altered during the early years of the Cold War, it continued to participate in America's nuclear efforts. The Army's Cold War nuclear roles included deploying tactical nuclear weapons, participating in nuclear weapons tests, developing doctrine and reorganizing the Army's units in preparation for a nuclear war, managing a nuclear power program, contributing to the debate on national strategy, and helping to reassure U.S. allies and prevent the proliferation of nuclear weapons. Today, the Army continues to make important contributions to the nation's nuclear endeavors, notably in preparedness for attack forensics and consequence management. U.S. strategic planners must understand the several nuclear functions that the Army has performed throughout history in order to appreciate more fully the relevance of the Army's current nuclear capacities.				
14. SUBJECT TERMS Army, atomic, nuclear, nuclear weapon, Manhattan Project, Manhattan Engineer District, Special Engineer Detachment, Atomic Bomb Investigating Group, Leslie Groves, M65, AFAP, Honest John, Redstone, Jupiter, Lacrosse, Lance, Pershing, Nike Hercules, Spartan, Sprint, ADM, Atomic Demolition Munition, Davy Crockett, FA52, counterproliferation, USANCA, WMD, CBRNE, BMD, AFSWP, Armed Forces Special Weapons Project, Army Nuclear Power Program, ANPP, nuclear forensics, nuclear disablement team, Pentomic, nuclear employment augmentation team			15. NUMBER OF PAGES 147	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU	

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**ATOMIC ARMY: THE ROLES OF THE U.S.
ARMY IN AMERICA'S NUCLEAR ENDEAVORS**

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Major, United States Army
B.A., University of Tennessee, 2003

Submitted in partial fulfillment of the
requirements for the degree of

**MASTER OF ARTS IN SECURITY STUDIES
(DEFENSE DECISION-MAKING AND PLANNING)**

from the

**NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

This thesis examines the roles of the U.S. Army in America's nuclear undertakings. Since 1942, when the Army took responsibility for managing the Manhattan Project, the Army has made many important contributions to America's nuclear endeavors. Its earliest nuclear roles included developing and employing America's first nuclear weapons, executing nuclear counterproliferation missions, investigating the effects of nuclear weapons, and supervising the U.S. atomic energy program. Although the Army's nuclear responsibilities were altered during the early years of the Cold War, it continued to participate in America's nuclear efforts. The Army's Cold War nuclear roles included deploying tactical nuclear weapons, participating in nuclear weapons tests, developing doctrine and reorganizing the Army's units in preparation for a nuclear war, managing a nuclear power program, contributing to the debate on national strategy, and helping to reassure U.S. allies and prevent the proliferation of nuclear weapons. Today, the Army continues to make important contributions to the nation's nuclear endeavors, notably in preparedness for attack forensics and consequence management. U.S. strategic planners must understand the several nuclear functions that the Army has performed throughout history in order to appreciate more fully the relevance of the Army's current nuclear capacities.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAMDC	Army Air and Missile Defense Command
ADA	Air Defense Artillery
ADM	atomic demolition munitions
AEC	Atomic Energy Commission
AFAP	artillery fired atomic projectiles
AFB	Air Force base
AFSWP	Armed Forces Special Weapons Project
ANPP	Army Nuclear Power Program
ASCC	Army Service Component Command
CAS	close air support
CBRN	chemical, biological, radiological, and nuclear
CBRNE	chemical, biological, radiological, nuclear, and explosives
CCE	CBRNE coordination elements
CEW	Clinton Engineer Works
CIC	Counterintelligence Corps
COCOM	combatant command
CW5	chief warrant officer 5
CWMD	combating weapons of mass destruction
DA	Department of the Army
DMZ	demilitarized zone
EOD	explosive ordnance disposal
FA-52	Functional Area 52
FM	field manual
FOA	Field Operating Agency
FORSCOM	U.S. Army Forces Command
GMD	ground-based mid-course defense
GSM	ground sampling mission
HEU	highly enriched uranium
IOC	initial operational capability
ISR	intelligence, surveillance, and reconnaissance

JFLCC	Joint Force Land Component Command
JTF	Joint Task Force
LEU	low enriched uranium
MED	Manhattan Engineer District
MH-1A	Mobile High Power Plant Number 1A
ML-1	Mobile Low Power Plant Number 1
MP	military police
NAC	North Atlantic Council
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCO	non-commissioned officer
NDT	nuclear disablement teams
NEAT	Nuclear Employment Augmentation Team
NNWS	non-nuclear-weapon state
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NTNF	National Technical Nuclear Forensics
OCP	operational command post
OEF-A	Operation Enduring Freedom-Afghanistan
OGMS	Ordnance Guided Missile School
OIF	Operation Iraqi Freedom
OMMCS	Ordnance Missile and Munitions Center and School
OPCON	operational control
PM-2A	Portable Medium Power Plant Number 2A
PM-3A	Portable Medium Power Plant Number 3A
POC	Program of Cooperation
PPG	Pacific Proving Ground
PRC	People's Republic of China
QDR	Quadrennial Defense Review
ROAD	Reorganization Objectives Army Division
ROK	Republic of Korea
SACEUR	Supreme Allied Commander, Europe
SADM	Special Atomic Demolition Munitions

SED	Special Engineer Detachment
SM-1	Stationary Medium Power Plant Number 1
SM-1A	Stationary Medium Power Plant Number 1A
SMDC/ARSTRAT	U.S. Army Space and Missile Defense Command / Army Forces Strategic Command
STIRS	Smart Threads Integrated Radiation Sensors
THAAD	Terminal High Altitude Air Defense
USANCA	U.S. Army Nuclear and Combatting Weapons of Mass Destruction Agency
WAAC	Women's Army Auxiliary Corps
WAC	Women's Army Corps
WMD	Weapons of Mass Destruction
WMD-E	Weapons of Mass Destruction Elimination

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ACKNOWLEDGMENTS

I would like to thank the entire faculty of the National Security Affairs Department and the Naval War College faculty at the Naval Postgraduate School. I would also like to recognize the staff of the Dudley Knox Library, who went out of their way on numerous occasions to help me with my research. There are a number of other faculty members at the Naval Postgraduate School that deserve special attention. Professor Craig Smith is among those who merit such a distinction. He took me on as a student in his independent studies class despite my lack of technical knowledge or experience in the field of nuclear physics. I would also like to thank Professor James Clay Moltz for his advice regarding my thesis and for his outstanding courses covering nuclear and space issues. Professor Helen Anderson deserves special thanks for her invaluable instruction and kind encouragement. Many thanks are also in order for Professor David S. Yost and Professor Zachary S. Davis. These courageous professors took a chance on me by accepting the tremendous burden of advising me throughout the thesis writing process. I would not have succeeded without their direction, diligence, and devotion.

I must also recognize those closest to me, without whom I would not have finished my graduate studies. I would first like to thank my mother and father, Peggy and Curtis, for caring about my education and for persuading me to go to college. My wife, Tera, deserves more recognition than I could ever give her. For years, she has been my tireless supporter, my unwavering fan, and my best friend. She listened to me, encouraged me, took care of me, and put up with me when no one else in the world would have. My mother-in-law, Debbie, has also been a tremendous source of encouragement. Ella Grace deserves special thanks for giving me something wonderful to look forward to besides graduation—becoming a proud father. Most importantly, I would like to thank God for all His blessings and for giving me the courage to try, the patience to continue, and the strength to complete my mission.

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I. INTRODUCTION

A. MAJOR RESEARCH QUESTION

While America's influence in the nuclear age is generally well understood, the contributions of the U.S. Army in America's nuclear undertakings are not quite as obvious. This research project will examine the most significant U.S. nuclear efforts involving the contributions, roles, and views of the U.S. Army. It seeks to answer a simple, yet important, question: What roles has the U.S. Army played in the nation's nuclear endeavors?

B. IMPORTANCE

U.S. strategic planners must understand the various nuclear functions that the Army has performed throughout history in order to evaluate more thoroughly the effectiveness of the Army's current nuclear capacities. An awareness of the Army's past successes and failures in the nuclear field will better prepare defense professionals to meet future challenges, such as advances in science and technology that may produce non-nuclear weapons comparable in destructive power to some nuclear warhead types or that may make nuclear weapons production easier for adversary or "outlier" states to accomplish. Such understanding is also critical for the Army's role in future counterproliferation missions, including planning for military actions in nuclear-armed states. It is imperative that the U.S. Army keep in mind the lessons of the past to evaluate the responsibilities and readiness of its nuclear soldiers continuously, particularly as U.S. policymakers and intelligence officials emphasize the significance of nuclear weapons in U.S. national security.

As the nation's premier land force, the U.S. Army plays an important role in deterring war and defending the nation.¹ Ever since the Soviet Union acquired an atomic arsenal in 1949, the United States has faced a nuclear-armed adversary. In 2009,

¹ Raymond T. Odierno, Chief of Staff of the Army, "CSA Sends-Waypoint #2," e-mail message to U.S. Army personnel, February 21, 2014.

President Barack Obama stated that, despite the peaceful conclusion of the Cold War, the chances of a nuclear attack today are even greater than during that prolonged contest:

In a strange turn of history, the threat of global nuclear war has gone down, but the risk of a nuclear attack has gone up. More nations have acquired these weapons. Testing has continued. Black market trade in nuclear secrets and nuclear materials abound. The technology to build a bomb has spread. Terrorists are determined to buy, build or steal one.²

For decades, policymakers have emphasized the significance of proliferation, nuclear surety, and credible deterrence. Although the Reagan administration regarded the Soviet Union as the nation's biggest threat, it still recognized the dangers of nuclear proliferation.³ Indeed, all presidents since Harry Truman have been preoccupied with the risks of nuclear proliferation. President George H. W. Bush also acknowledged the growing danger of the proliferation of weapons of mass destruction.⁴ In 1993, Secretary of Defense Les Aspin mentioned that increased global trade and advanced technology were contributing to weapons proliferation.⁵ Seven years later President William Clinton added "open borders" to that list,⁶ and in 2002, President George W. Bush proclaimed, "the gravest danger to freedom lies at the crossroads of radicalism and technology."⁷ President Bush's National Security Advisor, Condoleezza Rice, voiced her concerns about Iraq's WMD program, stating, "We don't want the smoking gun to be a mushroom cloud."⁸ The Obama administration made it clear in the 2010 National Security Strategy

² "Remarks by President Barack Obama," White House, April 5, 2009, http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered.

³ White House, *National Security Strategy of the United States*, Office of the Secretary of Defense, January 1988. <http://history.defense.gov/resources/nss1988.pdf>, 5.

⁴ White House, *National Security Strategy of the United States*, Office of the Secretary of Defense, March 1990, <http://history.defense.gov/resources/nss1990.pdf>, 17.

⁵ Les Aspin quoted in James A. Russell, "WMD Proliferation, Globalization, and International Security: Whither the Nexus and National Security?" in *Globalization and WMD Proliferation: Terrorism, Transnational Networks, and International Security*, ed. James A. Russell and James J. Wirtz (New York: Routledge, 2008), 2.

⁶ White House, *A National Security Strategy for a Global Age*, Office of the Secretary of Defense, 2000, <http://history.defense.gov/resources/nss2000.pdf>, 4.

⁷ White House, *The National Security Strategy of the United States of America*, Office of the Secretary of Defense, 2002, <http://history.defense.gov/resources/nss2002.pdf>, 13.

⁸ Rice quoted in Wolf Blitzer, "Search for the 'Smoking Gun,'" *CNN*, January 10, 2003, <http://www.cnn.com/2003/US/01/10/wbr.smoking.gun/>.

that protecting the nation from adversaries armed with nuclear weapons was its number one priority.⁹ In January 2012, Defense Secretary Leon Panetta listed “counter weapons of mass destruction” and “maintain a safe, secure, and effective nuclear deterrent” as two of the military’s 10 primary missions.¹⁰ In January 2014, Defense Secretary Chuck Hagel ordered an extensive review of the military’s nuclear forces after a string of lapses called the reliability of these forces into question.¹¹

Intelligence estimates corroborate policymakers’ views that adversaries armed with nuclear weapons will continue to threaten the security of the United States and its allies. “The time when only a few states had access to the most dangerous technologies is past,” said National Intelligence Director James Clapper in 2014.¹² In his 2013 statement to the Senate Select Committee on Intelligence, Clapper discussed Iran’s nuclear capabilities and the dangers posed by North Korea’s nuclear weapons and proliferation activities. He also warned that traditional nonproliferation efforts would not be as effective in preventing terrorist organizations from seeking WMD technologies as they have been in the past with many states.¹³ The proliferation of nuclear weapons has been recognized as a significant threat to U.S. national security since the Einstein letter to President Roosevelt in 1939. This letter marked the beginning of America’s participation in the international competition to develop nuclear weapons.

⁹ White House, *National Security Strategy*, The White House, May 2010, http://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf, 4.

¹⁰ Leon Panetta, “Sustaining U.S. Global Leadership: Priorities for 21st Century Defense,” U.S. Department of Defense, accessed February 23, 2014, http://www.defense.gov/news/defense_strategic_guidance.pdf, 5.

¹¹ Jim Miklaszewski and Jeff Black, “Defense Secretary Hagel Orders Review of Nuclear Weapons Mission Following Scandals,” *NBC News*, January 23, 2014, http://usnews.nbcnews.com/_news/2014/01/23/22418511-defense-secretary-hagel-orders-review-of-nuclear-weapons-mission-following-scandals?lite.

¹² James R. Clapper, “Statement for the Record: Worldwide Threat Assessment of the U.S. Intelligence Community,” U.S. Senate Select Committee on Intelligence, U.S. Senate, January 29, 2014, <http://www.intelligence.senate.gov/140129/clapper.pdf>, 5.

¹³ James R. Clapper, “Statement for the Record: Worldwide Threat Assessment of the U.S. Intelligence Community,” U.S. Senate Select Committee on Intelligence, U.S. Senate, March 12, 2013, <http://www.intelligence.senate.gov/130312/clapper.pdf>, 6–8.

C. PROBLEMS AND HYPOTHESES

Four issues are likely to emerge in the search for the Army's historical contributions to the nation's nuclear undertakings. First, deconstructing U.S. nuclear history into distinguishable categories of contribution has been difficult in some instances, impossible in others. Throughout America's nuclear past, many individuals and organizations have been responsible for building the nation's nuclear infrastructure, shaping its security strategies, and influencing its policies pertaining to nuclear weapons. Although it is important to understand the specific roles and contributions of the U.S. Army, it is also important not to credit the Army with the accomplishments of others.

Second, when studying an organization as large and diverse as the Army, constructing a uniform view of the Army's role using the opinions and perceptions of its officers has been challenging. The Army is a hierarchical organization that acts with unity of effort; however, it does not think like a monolithic organization. While the Army's "organizational essence" is grounded in land warfighting capacity, the Army is made up of many different branches and functional areas, each consisting of officers that perceive the Army's role differently.¹⁴

Third, the research question contains the term *nuclear endeavors*, which is an intentionally broad term. The Army has contributed to the U.S. nuclear infrastructure—including the national laboratories—but it has also played a role in developing defense strategies and influencing policy over the years. It is the intent of this research to determine the extent of the Army's contributions in all of these categories, even at the expense of sacrificing some detail in explaining each one.

Finally, compared to the volume of theoretical, academic, and strategic studies regarding the roles of nuclear weapons and the reasons for nuclear proliferation, little has been said specifically about the Army's role in the nuclear field. Nevertheless, the literature review provides an analysis of the major historical works relevant to the subject of this research as well as a review of the past professional nuclear debate.

¹⁴ Morton H. Halperin and Priscilla A. Clapp, *Bureaucratic Politics and Foreign Policy*, 2nd ed. (Washington, DC: Brookings Institution Press, 2006), 27, 32–33.

This thesis considered two plausible answers to the research question. The first hypothesis holds that the Army was involved in the establishment of the nation's nuclear infrastructure but that its nuclear role diminished over time as its sister services, particularly the Air Force and the Navy, assumed primary responsibility for the nation's strategic weapons. The Army struggled throughout the Cold War to retain a nuclear function. Its weapons and doctrine were increasingly regarded as impractical, and the service was eventually forced to abandon its atomic arsenal. Today, the Army is attempting to maintain nuclear relevance; however, it does not play as great a role in the nation's nuclear endeavors as the Air Force and the Navy.

The alternative hypothesis suggests that the Army has played a significant role throughout U.S. nuclear history. In addition to supervising the construction of the world's first nuclear weapons and using two of them in combat, the Army played a leading role in developing U.S. strategy and embraced nuclear delivery missions. The Army developed tactical weapons at a time when nuclear warfare appeared to be highly probable, but it was one of the first services (along with the U.S. Marine Corps) to relinquish its nuclear arsenal once the specter of nuclear war seemed to have passed. Although certain facts support elements of the first hypothesis, this thesis has concluded that the Army has taken on an active role in nonproliferation and counterproliferation efforts, in developing nuclear strategy, and that the Army continues to play an important role in the nation's nuclear endeavors.

D. LITERATURE REVIEW

Many historical works concerning the development of nuclear arms begin with accounts of the world's most renowned physics laureate, Albert Einstein, who, upon the recommendation of fellow scientists, signed a letter addressed to Franklin D. Roosevelt warning the President about Germany's interest in uranium, as well as the element's

potential for fueling “extremely powerful bombs of a new type.”¹⁵ Richard Rhodes’s Pulitzer Prize-winning *The Making of the Atomic Bomb* offers a detailed history of the development of the atomic bomb, but the book primarily focuses on the scientists involved in the Manhattan Project, particularly Dr. Leo Szilard.¹⁶ On the other hand, the Senior Fellow for Nuclear Policy for the Federation of American Scientists, Dr. Robert S. Norris, points out that many of the literary works concerning the Manhattan Project overlook the indispensable contributions of General Leslie R. Groves, the Army officer ultimately responsible for the colossal task.¹⁷ “Without Groves’s vision, drive, and administrative ability, it is highly unlikely that the atomic bomb would have been completed when it was,” writes Norris, whose biography of Groves sheds light on the vital role that the general played in the bomb’s development and use.¹⁸

Vincent Jones’s 1985 history of the Manhattan Project reveals the depth of the Army’s involvement in the pursuit of the world’s first successful nuclear weapons program. It shows that, although Army leaders were initially reluctant to pursue nuclear weapons for fiscal reasons, the U.S. Army went on to play a crucial role in the development of the atomic bomb—at a time when it was simultaneously fighting in the largest war of all time.¹⁹

¹⁵ “Albert Einstein to F. D. Roosevelt, August 2, 1939,” in *The Manhattan Project: A Documentary Introduction to the Atomic Age*, ed. Michael B. Stoff, Jonathan F. Fanton, and R. Hal Williams (Philadelphia, PA: Temple University Press, 1991), 18–19. Examples of books concerning the development of nuclear weapons in which Einstein is mentioned near the books’ beginnings include Arthur Holly Compton, *Atomic Quest: A Personal Narrative* (New York: Oxford University Press, 1956), 27; William L. Laurence, *Men and Atoms: The Discovery, the Uses, and the Future of Atomic Energy* (New York: Simon and Schuster, 1959), 56; Robert Jungk, *Brighter than a Thousand Suns: A Personal History of the Atomic Scientists*, trans. James Cleugh (New York: Harcourt, Brace and Company, 1958), 85; Alwyn McKay, *The Making of the Atomic Age* (New York: Oxford University Press, 1984), 43; Leona Marshall Libby, *The Uranium People* (New York: Crane, Russak and Company, 1979), 69; Donald M. Goldstein, Katherine V. Dillon, and J. Michael Wenger, *Rain of Ruin: A Photographic History of Hiroshima and Nagasaki* (Washington, DC: Brassey’s, 1995), 1.

¹⁶ Richard Rhodes, *The Making of the Atomic Bomb* (New York: Simon and Schuster Paperbacks, 1986).

¹⁷ “Norris, Robert Standish,” Federation of American Scientists, accessed November 23, 2013, <http://www.fas.org/press/experts/norris.html>; Robert S. Norris, *Racing for the Bomb: General Leslie R. Groves, The Manhattan Project’s Indispensable Man* (South Royalton, VT: Steerforth Press, 2002), ix.

¹⁸ Norris, *Racing for the Bomb*, x, 545–46.

¹⁹ Vincent C. Jones, *Manhattan: The Army and the Atomic Bomb* (Washington, DC: Center of Military History, 1985), ix, vii, 20–21.

Jones's official history draws upon the earlier work of Richard G. Hewlett and Oscar E. Anderson, Jr., whose book, *The New World, 1939/1946*, also provides a detailed history of the Manhattan Project and serves as the first volume in a series of three official histories concerning the Atomic Energy Commission. *Atomic Shield, 1947/1952*, the second volume in the series, shows the extent of the Army's influence on the nation's nuclear infrastructure during the early years of the Cold War. It also covers the early relationship between the military and the newly established, civilian-led commission and the debate regarding the military services' roles in national nuclear activities. The third volume in the series, however, bears little relevance to the subject of this research.²⁰

Gregg Herken asserts that most Army planners overlooked the implications of nuclear weapons, although his book later provides an example that suggests otherwise. He writes that General George Marshall believed that nuclear warfare would place a greater demand on the support units tasked with supplying combat forces dispersed across the nuclear battlefield.²¹ Herken's description of the Army's perceptions of nuclear weapons during the early stages of the Cold War is not quite as nuanced as David A. Rosenberg's account of the evolution of Army Cold War nuclear strategy. Rosenberg points out that, until 1947, Army leaders—specifically Generals Eisenhower and Groves—were among the few actually aware of the size and composition of the nation's nuclear stockpile.²² Furthermore, throughout the Eisenhower administration, Army officers, such as Generals Ridgway and Taylor were prominent participants in the strategic debate, challenging President Eisenhower's notion of massive retaliation.²³ President John F. Kennedy appointed General Taylor to serve as Chairman of the Joint Chiefs of Staff.

²⁰ Richard G. Hewlett and Oscar E. Anderson, Jr., ed., *The New World, 1939/1946*, vol. 1 of *A History of the United States Atomic Energy Commission* (University Park, PA: Pennsylvania State University Press, 1962); Richard G. Hewlett and Francis Duncan, ed., *Atomic Shield, 1947/1952*, vol. 2 of *A History of the United States Atomic Energy Commission* (University Park, PA: Pennsylvania State University Press, 1969); Richard G. Hewlett and Jack M. Holl, *Atoms for Peace and War 1953–1961: Eisenhower and the Atomic Energy Commission* (Berkeley, CA: University of California Press, 1989).

²¹ Gregg Herken, *The Winning Weapon: The Atomic Bomb in the Cold War, 1945–1950* (New York: Alfred A. Knopf, 1980), 204–205.

²² David Alan Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945–1960," *International Security* 7, no. 4 (1983): 11.

²³ *Ibid.*, 27, 41.

Glenn Hastedt's ninth edition of *American Foreign Policy* provides a brief but somewhat useful discussion of the evolution of U.S. nuclear strategy before and after the Cold War. Hastedt claims, however, that President George W. Bush "introduced preemption" and rejected the notion of nuclear deterrence, assertions that Marc Trachtenberg refutes in his chapter about the history of preemption.²⁴

Throughout the late-1970s and 1980s, defense professionals debated the Army's nuclear capabilities. Major John P. Rose stated in 1980 that the Army's doctrine closely followed national policy throughout much of the Cold War, and he maintained that the Army should be prepared for a tactical nuclear exchange with Soviet forces in Europe.²⁵ "The development of tactical doctrine need not depend upon political leaders," wrote Rose, who went on to say, "Given the nuclear orientation of the Soviet threat, there is no excuse for the lack of concentrated training in tactical nuclear warfare."²⁶

Captain John J. Midgely contended in 1986 that the Army's nuclear weapons were too expensive and of little value. In his view, conventional weapons could perform the same functions as tactical nuclear ones. "The Army has procured weapons which it cannot use," he said, calling for a reduction in tactical nuclear weapons.²⁷ His 1986 book reviews the Army's nuclear policy and concludes, "current Army initiatives appear to be based on a desire to incorporate advanced technology without detailed analysis of its military effectiveness."²⁸

Lieutenant Colonel A. J. Bacevich argued in 1986 that the Army had adopted an inappropriate nuclear role because it faced an organizational crisis of survival in the

²⁴ Glenn P. Hastedt, *American Foreign Policy*, 9th ed. (Boston, MA: Pearson, 2011), 310–12; Marc Trachtenberg, "The Bush Strategy in Historical Perspective," in *Nuclear Transformation: The New U.S. Nuclear Doctrine*, ed. James J. Wirtz and Jeffrey A. Larsen (New York: Palgrave MacMillan, 2005), 9–21.

²⁵ John P. Rose, *The Evolution of U.S. Army Nuclear Doctrine, 1945–1980* (Boulder, CO: Westview Press, 1980), 211, 219.

²⁶ *Ibid.*, 216–17.

²⁷ John J. Midgely, Jr., *Deadly Illusions: Army Policy for the Nuclear Battlefield* (Boulder, CO: Westview Press, 1986), 178–79.

²⁸ *Ibid.*, 184.

1950s.²⁹ Instead of relying on nuclear firepower capabilities as it did, the Army would have been better off by embracing conventional-style intervention, according to Bacevich.³⁰ He believed that the Army's nuclear role in the early Cold War was the result of President Eisenhower's defense strategy.³¹ Bacevich's book, *The Pentomic Era: The U.S. Army between Korea and Vietnam*, traces the evolution of Army doctrine during much of the Cold War and showcases the debate within the service over its role in nuclear warfare.

Today, the debate about whether the Army needs its own nuclear arsenal is over. By the end of the Cold War, Army officers like Lieutenant John D. Skelton were beginning to voice their belief that the Army no longer needed nuclear weapons. In 1991, Skelton held that joint targeting procedures should give the Army a vote in the employment of nuclear weapons, but he believed that the Army's tactical nuclear missions needed to be relinquished to Air Force and Navy control.³² By the early 1990s, a new concept was beginning to emerge. While Leonard Spector believed that military intervention should be a last resort, his 1992 paper for the U.S. Army's Strategic Studies Institute held that "the option of using military force to halt nuclear proliferation should be retained."³³ This implied a possible nuclear-related role for the Army—intervening to halt the spread of nuclear weapons. Although this concept was not entirely new, counterproliferation went on to become a new mission for America's military forces.³⁴

E. METHODS AND SOURCES

Each chapter of this historical study relies heavily on primary and secondary historical sources. Some of the research entailed examining memoirs from participants in

²⁹ A. J. Bacevich, *The Pentomic Era: The U.S. Army between Korea and Vietnam* (Washington, DC: National Defense University Press, 1986), 151–52.

³⁰ *Ibid.*, 152.

³¹ *Ibid.*, 144–45.

³² John D. Skelton, *The Forbidden Weapon: The Employment of Army Tactical Nuclear Weapons* (DTIC no. ADA240197) (Leavenworth, KS: U.S. Army Command and General Staff College, 1991), 38.

³³ Leonard S. Spector, *Deterring Regional Threats from Nuclear Proliferation* (Carlisle, PA: U.S. Army War College, 1992), 19.

³⁴ Secretary of Defense Dick Cheney, *Annual Report to the President and the Congress* (Washington, DC: U.S. Department of Defense, 1993), 18.

the nation's nuclear past, especially those of senior Army officers. General Dwight D. Eisenhower published his war memoirs in 1948,³⁵ General Leslie R. Groves released *Now It Can Be Told: The Story of the Manhattan Project* in 1962, seventeen years after the first nuclear explosion,³⁶ and General Maxwell D. Taylor published *The Uncertain Trumpet* in 1959.³⁷ Official histories, such as the U.S. Army's *Manhattan: The Army and the Atomic Bomb* by Vincent C. Jones and the official history of the Atomic Energy Commission, provided a great deal of information about the Manhattan Project and the nuclear program during the early years of the Cold War.

Many of the details concerning the Army's past deployments of nuclear weapons are available through declassified sources, although details about dates and numbers were difficult to find since much has been redacted and remains classified. Frequently cited published sources include Robert S. Norris's articles—"United States Nuclear Weapons Deployments Abroad, 1950–1977" and "Where They Were," written with William Arkin and William Burr. These sources provide the views of the authors regarding U.S. nuclear weapons deployments throughout Europe and Asia from 1950 to 1977.³⁸

Declassified reporting from the Manhattan Engineer District also reveals the extent of the destruction from the bombs used at Hiroshima and Nagasaki and supplies details about the Atomic Bomb Investigating Group. Unclassified information from Department of the Army manuals, pamphlets, and briefings was helpful when examining the work of the Army's contemporary nuclear soldiers, as were the Army's digital archives, Public Affairs Office publications, and other online sources. Finally, some of the views of Army officers past and present came from reports and research generated from service schools.

³⁵ Dwight D. Eisenhower, *Crusade in Europe* (New York: Doubleday and Company, 1948).

³⁶ Leslie R. Groves, *Now It Can Be Told: The Story of the Manhattan Project* (New York: Harper and Brothers, 1962).

³⁷ Maxwell D. Taylor, *The Uncertain Trumpet* (New York: Harper and Brothers, 1959).

³⁸ Robert Standish Norris, "United States Nuclear Weapons Deployments Abroad, 1950–1977," Public Interest Declassification Board Meetings, U.S. National Archives and Records Administration, accessed February 25, 2014, <http://www.archives.gov/declassified/pidb/meetings/norris-addendum.pdf>; Robert S. Norris, William M. Arkin, and William Burr, "Where They Were," *Bulletin of the Atomic Scientists* 55, no. 6 (1999): 26–35, ProQuest (197945488).

F. THESIS OVERVIEW

The thesis is organized primarily in chronological order, although several sections in the thesis cover concurrent time periods—for example, the section about Cold War deployments to Europe is followed by one discussing deployments to Asia during the same time period. After this introduction, the thesis discusses the Army’s participation in the Manhattan Project. This chapter provides an overview and history of the project and discusses the specific Army organizations involved in the process of building and using the world’s first nuclear weapons. It also considers the views of some of the Army’s senior officers. The next chapter covers the Army’s nuclear activities during the Cold War. It reviews the interservice struggle for nuclear roles, the development of the Army’s nuclear arsenal, and other practical tasks: education, training, testing, and doctrine. The chapter also examines the Pentomic Army and the deployment of the Army’s nuclear weapons to bases in Europe and Asia. The next chapter takes up the end of the Cold War, the changes to the Army’s nuclear forces, and the Army’s nuclear missions today. Finally, the thesis concludes with a summary of the principal findings of the research.

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II. ATOMS FOR WAR: THE U.S. ARMY'S ROLE IN THE MANHATTAN PROJECT

The striking success of this project was made possible by the work and sacrifices of the military personnel.

—J. Robert Oppenheimer³⁹

For many people, hearing the words *Manhattan Project* evokes images of brilliant scientists: Compton, Fermi, Lawrence, Oppenheimer, Szilard, Teller, or Wigner, or leaders of scientific and technological organizations, such as James Conant, the Chairman of the National Defense Research Committee, or Vannevar Bush, Director of the Office of Scientific Research and Development, not U.S. Army soldiers. Many history books that describe the development of nuclear weapons begin with discussions of the acclaimed physicist Albert Einstein, who, upon the recommendation of fellow scientists, in 1939 signed a letter addressed to Franklin D. Roosevelt warning the President of Germany's interest in uranium as well as the element's potential for fueling "extremely powerful bombs of a new type."⁴⁰ Physicist and Nobel laureate Arthur Holly Compton appropriately dedicated his *Atomic Quest: A Personal Narrative* to "many minds and many hands," yet the focus of the author's 1956 book is, admittedly, the group of scientists involved in the creation of atomic weapons.⁴¹ It has been well documented, however, that they were not the only scientists in the world to understand the process of nuclear fission—or its implications.⁴² "Scientists throughout the world launched a comprehensive effort to throw light on the phenomenon of fission," wrote Richard Hewlett and Oscar Anderson, who pointed out that there had been close to one hundred

³⁹ "J. Robert Oppenheimer to Dan Gillespie, October 15, 1945," in *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians*, ed. Cynthia C. Kelly (New York: Black Dog and Leventhal Publishers, 2007), 375.

⁴⁰ "Einstein to Roosevelt," in *The Manhattan Project: A Documentary Introduction to the Atomic Age*, 18–19. Examples of books concerning the development of nuclear weapons in which Einstein is mentioned near the books' beginnings include Compton, *Atomic Quest*, 27; Lawrence, *Men and Atoms: The Discovery, the Uses, and the Future of Atomic Energy*, 56; Jungk, *Brighter than a Thousand Suns: A Personal History of the Atomic Scientists*, 85; McKay, *The Making of the Atomic Age*, 43; Libby, *The Uranium People*, 69; Goldstein, Dillon, and Wenger, 1.

⁴¹ Compton, *Atomic Quest*, i, vi.

⁴² Joseph Cirincione, *Bomb Scare: The History and Future of Nuclear Weapons* (New York: Columbia University Press, 2007), 6.

articles about nuclear fission published worldwide before 1940.⁴³ What is missing in the historical accounts of the Manhattan Project is the integral role played by the U.S. Army in developing the world's first nuclear weapons. Most of these histories fail to capture the full extent of the contributions made by the nation's soldiers.

What made the United States different from other countries and allowed it to become the first to produce nuclear weapons was not its scientific superiority, but its unparalleled industrial capacity, which was harnessed and directed by the U.S. Army to accomplish the most difficult and time-consuming task involved in the development of nuclear weapons—producing enough fissile material to reach critical mass.⁴⁴ Historian Robert S. Norris points out that many of the literary works concerning the Manhattan Project overlook the indispensable contributions of General Leslie R. Groves, the Army officer ultimately responsible for the colossal task.⁴⁵ Although the Army would never have been able to construct a nuclear bomb without the contributions of dedicated and ingenious civilian scientists, engineers, and technicians or the financial support of U.S. taxpayers, historical accounts of the Manhattan Project that fail to mention the U.S. Army's significant role in the development of nuclear weapons are incomplete.

Since the atomic bombing of Hiroshima, nuclear weapons have occupied a prominent position in U.S. foreign policy, and nuclear issues have pervaded much of the world's international relations. It is important to understand clearly how the military—the executor of warfare, nuclear or otherwise—perceives nuclear warfare and the roles of nuclear weapons in the security of the nation and its allies. As an organization, the U.S. Army was slow to explore the possible military applications of nuclear energy but quick to produce nuclear weapons once given the assignment.⁴⁶ Individually, however, the Army's top officers held different views regarding whether the atomic bombs should

⁴³ Hewlett and Anderson, *The New World*, 13.

⁴⁴ Cirincione, *Bomb Scare*, 6–7; U.S. Congress, Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction* (Washington, DC: U.S. Government Printing Office, 1993), 3.

⁴⁵ Norris, *Racing for the Bomb*, ix.

⁴⁶ Jones, *Manhattan*, 19–25.

have been used.⁴⁷ This chapter examines the role of the U.S. Army in America's pursuit of nuclear weapons during World War II. It begins with an overview of the Manhattan Project, followed by a history of the Army's early atomic work. The chapter then discusses the Army personnel and organizations involved in the project, and, finally, it explores the different views held by senior Army officers concerning the world's first atomic weapons.

A. OVERVIEW OF THE MANHATTAN PROJECT: AN ARMY PERSPECTIVE

The Manhattan Project was a massive undertaking that succeeded in transforming scientific theories into functioning strategic weapons. Physicist Robert Serber of the Manhattan Project aptly described the project's primary mission: "To produce a practical military weapon in the form of a bomb in which the energy is released by a fast neutron chain reaction in one or more of the materials known to show nuclear fission."⁴⁸ The former Chief of Military History for the United States Army Center of Military History, Brigadier General (Ret.) Douglas Kinnard, described the Manhattan Project as "the World War II organization which produced the atomic bombs that not only contributed decisively to ending the war with Japan but also opened the way to a new atomic age."⁴⁹ More specifically, the Manhattan Project was a top secret Army organization that was led, funded, and administered by the United States Army Corps of Engineers' Manhattan Engineer District (MED) and relied upon the efforts of many people—civilians and service members alike—to produce America's first atomic arsenal as well as its initial nuclear infrastructure.

Named after the initial location of the project's temporary headquarters in New York City, the Manhattan Project was led and administered by the U.S. Army.⁵⁰ The

⁴⁷ Norris, *Racing for the Bomb*, 426–27; Robert James Maddox, *Weapons for Victory: The Hiroshima Decision Fifty Years Later* (Columbia, MO: University of Missouri Press, 1995), 140–141; Gar Alperovitz, *The Decision to Use the Atomic Bomb* (New York: Vintage Books, 1995), 334–365, 548.

⁴⁸ Robert Serber, "The Los Alamos Primer," Los Alamos National Laboratory Research Library, U.S. Department of Energy, accessed July 4, 2014, <http://library.lanl.gov/cgi-bin/getfile?00349710.pdf>, 1.

⁴⁹ Jones, *Manhattan*, vii.

⁵⁰ *Ibid.*, 39, 41–44; Hewlett and Anderson, *The New World*, 73–74; Peter Bacon Hales, *Atomic Spaces: Living on the Manhattan Project* (Chicago, IL: University of Illinois Press, 1997), 1.

project spanned four and a half years from the day it was assigned to the Army on June 17, 1942, until the Army transferred control of the nation's nuclear program to the newly established Atomic Energy Commission (AEC) on December 31, 1946.⁵¹ Between November 1939 and October 1940, the U.S. government allocated a mere \$6,000 to the study of nuclear fission, half of which was provided by the U.S. Army; yet by the time World War II was over the U.S. Army had secretly spent \$2 billion on the project—over \$26 billion in today's dollars.⁵² At the beginning of the Manhattan Project, rural Americans were displaced by the Army Corps of Engineers to make room for the creation of three new, secret U.S. cities;⁵³ by the end of the project, the Army Air Force had destroyed two Japanese cities.

Despite its many successes, the Manhattan Project was an incredibly risky and ambitious endeavor. Until the first nuclear test on the morning of July 16, 1945, scientists were still uncertain if the fission chain reaction would result in a global catastrophe, either by consuming the atmosphere or by disrupting Earth's orbital path around the sun.⁵⁴ The gun-type nuclear weapon that devastated Hiroshima on August 6, 1945, named Little Boy, was composed of uranium that had been enriched at a newly constructed secret facility in Oak Ridge, Tennessee.⁵⁵ Before that day, the workings of that particular design were entirely theoretical, as it had never actually been tested.⁵⁶ The first nuclear explosive test, conducted with the code name Trinity near Alamogordo, New Mexico, on July 16, 1945, was the product of a completely different design—an implosion-type device based on plutonium.⁵⁷ The success of the Trinity test paved the way for the Fat Man bomb dropped on Nagasaki three days after the Hiroshima bombing.

⁵¹ Jones, *Manhattan*, 19, 599–600.

⁵² Compton, *Atomic Quest*, 28; Jones, *Manhattan*, 22–23; Laurence, *Men and Atoms*, 61; Hewlett and Anderson, *The New World*, 724. The sum \$26 billion was calculated using The Federal Reserve Bank of Minneapolis's Consumer Price Index Calculator, accessed June 24, 2014, http://www.minneapolisfed.org/community_education/teacher/calc/hist1800.cfm.

⁵³ Hales, *Atomic Spaces*, 50–60.

⁵⁴ Lansing Lamont, *Day of Trinity* (New York: Atheneum, 1985), 129–30.

⁵⁵ Jones, *Manhattan*, 573–538; 522; Laurence, *Men and Atoms*, 103.

⁵⁶ Cirincione, *Bomb Scare*, 10–11.

⁵⁷ Jones, *Manhattan*, 514–18; Cirincione, *Bomb Scare*, 11.

The fuel for the Trinity test and the Fat Man bomb was produced at the project's Hanford site near Richland, Washington.⁵⁸ The Army Corps of Engineers selected this site based on its ideal location; like Oak Ridge, Hanford was in an isolated location near sources of water and electricity.⁵⁹ As with many East Tennesseans, the rural people of Hanford and the surrounding communities were evicted from their homes to make room for the production facilities after Under Secretary of War Robert P. Patterson authorized the Army to purchase or lease the land required for the Manhattan Project.⁶⁰ A similar story unfolded in Los Alamos, New Mexico, where teams of engineers and scientists worked to design the bombs.⁶¹ The Army Corps of Engineers needed a remote location surrounded by high ground; nevertheless, they needed it also to be accessible.⁶² Following the recommendation of J. Robert Oppenheimer, the Army chose the Los Alamos Ranch School and, in one month's time, began introducing demolition and construction equipment into the area in preparation for breaking ground at the new project site.⁶³ Soon, scientists and engineers at Los Alamos were busy designing atomic bombs without knowing for certain if the United States—or anyone, for that matter—could accumulate enough fissile material to initiate an explosive nuclear chain reaction.⁶⁴ At the time, uranium was thought to be extremely rare.

By the beginning of 1943, construction was underway at all three main Manhattan Project sites.⁶⁵ As laborers, scientists, and soldiers continued to arrive at each location, the populations eventually grew to exceed initial expectations. In 1942, only 13,000 people were expected to live at the Oak Ridge site; however, by 1945, Oak Ridge became

⁵⁸ Peter Wyden, *Day One: Before Hiroshima and After* (New York: Simon and Schuster, 1984), 97.

⁵⁹ Robert E. Ficken, "Grand Coulee and Hanford: The Atomic Bomb and the Development of the Columbia River," in *The Atomic West*, ed. Bruce Hevly and John M. Findlay (Seattle, WA: University of Washington Press, 1998), 21; Hewlett and Anderson, *The New World*, 76–77; Hales, *Atomic Spaces*, 44.

⁶⁰ Hales, *Atomic Spaces*, 50–57, 60–65; Ficken, "Grand Coulee and Hanford," 21; Jones, *Manhattan*, 319–21, 328–39, 331–32.

⁶¹ Hales, *Atomic Spaces*, 57–60.

⁶² *Ibid.*, 43.

⁶³ *Ibid.*, 43–44, 57–58.

⁶⁴ Wyden, *Day One*, 97–98.

⁶⁵ Hales, *Atomic Spaces*, 71.

Tennessee's fifth largest city, with approximately seventy-five thousand residents.⁶⁶ Early estimates for the Los Alamos workforce ranged from between 265 to 600 personnel, yet by the end of the war, the Los Alamos population had reached nearly 7,000.⁶⁷ Development plans at the Hanford site in the spring of 1943 called for fewer than a thousand houses and additional dormitory accommodations for 6,500 people; by the summer of 1945, there were 17,500 residents in Richland and over 4,000 houses.⁶⁸ Although the number of workers drastically declined after the Japanese surrendered, the Army officer in charge of the Manhattan Project, Leslie Groves, drew up a plan that would have long-lasting effects. He proposed to streamline atomic operations, continue the production of fissile materials, and increase the nation's nuclear weapons arsenal.⁶⁹ For decades after the end of the war, workers continued development at each of the sites.⁷⁰ The Manhattan Project, which originated as an endeavor to prevent Nazi Germany from being the first country to gain access to the most powerful weapon ever imagined, was responsible for the creation and destruction of cities; it helped to establish new forms of industry, energy, strategy, and policy; and it was a landmark in the international nuclear arms race that began in the late 1930s.

B. HISTORY OF THE MANHATTAN PROJECT: FAST MARCH TO THE BOMB

The U.S. military began funding civilian research into uranium fission as early as January 1940.⁷¹ Once scientists were satisfied that explosive fission was possible and that fissile materials could be amassed, James Conant and Vannevar Bush recommended that the Army be given a more prominent role in the development process.⁷² Just as scientists

⁶⁶ Rachel Fermi and Esther Samra, *Picturing the Bomb: Photographs from the Secret World of the Manhattan Project* (New York: Harry N. Adams, Inc., 1995), 32.

⁶⁷ Carl Abbott, "Building the Atomic Cities: Richland, Los Alamos, and the American Planning Language," in *The Atomic West*, ed. Bruce Hevly and John M. Findlay (Seattle, WA: University of Washington Press, 1998), 93–94.

⁶⁸ *Ibid.*, 95.

⁶⁹ Jones, *Manhattan*, 579–593; Hales, *Atomic Spaces*, 345.

⁷⁰ Hales, *Atomic Spaces*, 71, 341–46.

⁷¹ Laurence, *Men and Atoms*, 61; Jones, *Manhattan*, 21–23.

⁷² Jones, *Manhattan*, 37–38, 73.

were beginning the early stages of uranium enrichment in the summer of 1942, President Franklin D. Roosevelt officially made the U.S. Army responsible for America's atomic program, which came to be known as the Manhattan Engineer District (MED).⁷³ Initially, Colonel James C. Marshall was appointed as the head of the program, and Colonel Kenneth D. Nichols, who was later tasked with developing the MED's gaseous diffusion plant, became the deputy district engineer.⁷⁴ Following frustrating project delays, however, General George C. Marshall and Lieutenant General Brehon B. Somervell replaced Colonel Marshall with a more dynamic officer, Colonel Leslie Groves, on September 17, 1942.⁷⁵

Groves and his team quickly took action. During his first day commanding the MED, Groves ordered his deputy to locate a supply of uranium.⁷⁶ Colonel Nichols immediately departed for New York, where he purchased over twelve hundred tons of uranium ore by the end of the following day.⁷⁷ On September 19, 1942, Colonel Groves met with the head of the War Production Board, Donald Nelson, to receive a higher resource priority rating than had been granted to his predecessor.⁷⁸ According to Groves, despite Nelson's initial reluctance, the Manhattan Project leader was able to secure a higher rating after threatening, "to recommend to the President that the project should be abandoned because the War Production Board was unwilling to co-operate with his wishes."⁷⁹ On September 23, newly-promoted Brigadier General Groves appeared at a meeting convened by Secretary of War Henry Stimson and attended by top defense officials—General George Marshall, the Chief of Staff of the Army, Lieutenant General

⁷³ Compton, *Atomic Quest*, 95.

⁷⁴ *Ibid.*, 105–7; Jones, *Manhattan*, 42.

⁷⁵ Jones, *Manhattan*, 70–75; Stanley Goldberg, "General Groves and the Atomic West: The Making and the Meaning of Hanford," in *The Atomic West*, ed. Bruce Hevly and John M. Findlay (Seattle, WA: University of Washington Press, 1998), 43–44; Hales, *Atomic Spaces*, 33; Norris, *Racing for the Bomb*, 171–72; Wyden, *Day One*, 56.

⁷⁶ Wyden, *Day One*, 57.

⁷⁷ *Ibid.*, 57–58.

⁷⁸ Goldberg, "General Groves," 44.

⁷⁹ Groves, *Now It Can Be Told: The Story of the Manhattan Project*, 22.

Brehon Somervell, Head of Army Service Forces, and Somervell's chief of staff, Major General Wilhelm D. Styer, as well as the heads of national research, Vannevar Bush and James Conant.⁸⁰

Despite his subordinate position in relation to other attendees, Groves abruptly left during the middle of the meeting, went to East Tennessee, and ordered the Real Estate Division of the Corps of Engineers to begin acquiring the nearly sixty square miles needed to build the MED's massive uranium enrichment facilities.⁸¹ The Oak Ridge site in Tennessee, also known as the Clinton Engineer Works (CEW), was the first of three main locations requisitioned by the Corps of Engineers.⁸² Just two weeks after Groves's order, the Corps of Engineers began sending out eviction notices to the Oak Ridge residents, instructing them to vacate their homes as early as the first of December, 1942.⁸³ By February 1943, the MED had also taken full custody of the Los Alamos Ranch School in New Mexico and acquired another 650,000 acres in Hanford, Washington.⁸⁴

For the next two and a half years, an army of physicists, chemists, engineers, construction workers, drivers, technicians, clerical workers, and—among others—Army soldiers worked to develop nuclear weapons before America's enemies were able to do so. Shortly before the MED reached its goal of producing a fission bomb, President Roosevelt passed away on April 12, 1945. Less than two weeks later, Stimson and Groves met with President Harry Truman, who had not been included in discussions about the Manhattan Project prior to that time, to brief him on the status of the nuclear program.⁸⁵ After a meeting between the President and General Marshall that same month, the Army Chief of Staff tasked Groves with developing a list of possible target locations

⁸⁰ Wyden, *Day One*, 58; Goldberg, "General Groves," 45.

⁸¹ Wyden, *Day One*, 58–59; Goldberg, "General Groves," 45.

⁸² Hales, *Atomic Spaces*, 50.

⁸³ *Ibid.*, 53–55.

⁸⁴ *Ibid.*, 57, 43–46; Ficken, "Grand Coulee and Hanford," 21.

⁸⁵ Dennis D. Wainstock, *The Decision to Drop the Atomic Bomb* (Westport, CT: Praeger, 1996), 36–37.

on which to drop the bombs.⁸⁶ General Groves went to work, establishing a targeting committee, selecting target locations, preparing operations plans for the bombings, and, eventually, writing the official directive to drop the atomic bombs.⁸⁷ Whether by the direction of his superiors or simply by his force of character, Groves put the Army in the center of every major component of the atomic bomb project.

General Groves, who believed that the atomic bombs should be used against Japanese cities without advance warning, also provided his advice to the Interim Committee, a group of government officials, scholars, and businessmen assembled by Secretary Stimson to provide information and advice to the President on matters pertaining to the use of nuclear energy.⁸⁸ Groves also informed Secretary Stimson that a group of scientists was growing concerned about the use of the atomic bomb once it became clear that its use was no longer required to defeat Hitler's forces.⁸⁹ At the Interim Committee's meeting on June 21, 1945, members discussed two competing views regarding the first use of the atomic bomb.⁹⁰

One group of scientists, headed by James Franck, opposed the unannounced use of atomic bombs against Japan and urged that the bomb's existence be revealed in a public demonstration.⁹¹ In its report, the group said, "If the United States would be the first to release this new means of indiscriminate destruction upon mankind, she would sacrifice public support throughout the world, precipitate the race of armaments, and prejudice the possibility of reaching an international agreement on the future control of such weapons."⁹²

⁸⁶ Jones, *Manhattan*, 528.

⁸⁷ Jones, *Manhattan*, 528–534; Wainstock, *Decision*, 68.

⁸⁸ Norris, *Racing for the Bomb*, 379, 389; Compton, *Atomic Quest*, 219; Jones, *Manhattan*, 530.

⁸⁹ Compton, *Atomic Quest*, 233.

⁹⁰ Jones, *Manhattan*, 533.

⁹¹ *Ibid.*, 532–33.

⁹² "Report of the Committee on Political and Social Problems, June 11, 1945," in *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians*, ed. Cynthia C. Kelly (New York: Black Dog and Leventhal Publishers, 2007), 288.

Franck's group was challenged by the Interim Committee's scientific panel, whose members concluded that, despite their own internal disagreements regarding how the bomb should be used, they saw "no acceptable alternative to direct military use."⁹³ Ultimately, the views of the Interim Committee's scientific panel and General Groves prevailed. The Interim Committee recommended that the weapons be "used against Japan at the earliest opportunity...without warning."⁹⁴

On July 16, 1945, in the desert near Alamogordo, New Mexico, the U.S. Army supervised humanity's first nuclear explosion. Logistics for the secret test included transporting the massive test device to the range, assembling the test facilities, and gathering the scientists for the Trinity event.⁹⁵ Five days later, Secretary Stimson received a thorough report from General Groves describing the results of the successful atomic test. On July 25, 1945, the President, the Secretary of War, and the Chief of Staff of the Army approved the orders to use atomic bombs on a select group of targets in Japan.⁹⁶ Two months earlier, Groves and a special committee designated the target locations, with the exception of Nagasaki, which was later chosen as a substitute target after Secretary of War Stimson had rejected Groves's repeated proposals to strike Kyoto on the grounds that the ancient city was too culturally significant to destroy.⁹⁷ Additionally, in the months leading up to August 1945, the Army Air Force secretly established, trained, and deployed the 509th Composite Group, the Army's B-29 unit based at Tinian Island, in the Pacific, that was responsible for dropping the atomic bombs on their designated targets.⁹⁸

⁹³ Jones, *Manhattan*, 533; "Science Panel's Report to the Interim Committee, June 16, 1945," in *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians*, ed. Cynthia C. Kelly (New York: Black Dog and Leventhal Publishers, 2007), 290–1.

⁹⁴ Jones, *Manhattan*, 533.

⁹⁵ *Ibid.*, 514.

⁹⁶ Wainstock, *Decision*, 68.

⁹⁷ Jones, *Manhattan*, 528–30.

⁹⁸ *Ibid.*, 519–28.

On August 6, 1945, Little Boy detonated over Hiroshima, creating an explosion equal to nearly 12,500 tons of TNT and killing between 66,000 and 80,000 people.⁹⁹ Japan's emperor, however, did not surrender, and U.S. military and civilian leaders continued to prepare for prolonged hostilities in Asia, including the invasion of Japan's main islands.¹⁰⁰ Three days later, Fat Man destroyed Nagasaki and claimed the lives of between 23,000 and 45,000 people with a yield of nearly 22,000 tons of TNT.¹⁰¹ On August 14, Japanese officials sent a message to President Truman declaring their acceptance of the terms of surrender.¹⁰²

Following the war, the U.S. Army continued to head the nation's atomic program, examining the effects of the bombs in Hiroshima and Nagasaki, investigating the progress of the wartime nuclear programs in Germany and Japan, and gradually taking measures to transform America's wartime atomic operation into a peacetime program.¹⁰³ Within a year's time, President Truman signed the Atomic Energy Act, which created the Atomic Energy Commission, the civilian agency that would assume responsibility for the atomic energy program.¹⁰⁴

Prior to the President's signing of the Atomic Energy Act, General Groves told the Senate Special Committee on Atomic Energy that the Army could "furnish invaluable assistance" to future stewards of America's nuclear program.¹⁰⁵ "Civilian and military personnel who have acquired knowledge and experience on the project should continue to serve to the extent that their services are useful," said Groves.¹⁰⁶ On December 31, 1946, Groves and Nichols met with AEC commissioners at the White House to watch as

⁹⁹ Richard B. Frank, *Downfall: The End of the Imperial Japanese Empire* (New York: Penguin Books, 1999), 285–86.

¹⁰⁰ Frank, *Downfall*, 273–77, 300–3.

¹⁰¹ *Ibid.*, 285–86.

¹⁰² Jones, *Manhattan*, 541–42.

¹⁰³ *Ibid.*, 579–80; Manhattan Engineer District, *The Atomic Bombings of Hiroshima and Nagasaki* (New York: Manhattan Engineer District, June 29, 1946), 1.

¹⁰⁴ Jones, *Manhattan*, 596.

¹⁰⁵ Opening statement of Major General Leslie R. Groves to the Special Committee on Atomic Energy, U.S. Senate, on November 28, 1945 in Groves, *Now It Can Be Told*, 441–2.

¹⁰⁶ *Ibid.*

Truman signed the executive order that transferred peacetime control of the program to the AEC and marked the end of the Manhattan Project.¹⁰⁷ In addition to relinquishing control of the program to the AEC and transferring ownership of 37 military installations to the civilian commission, the Army also provided the new supervisors of the nation's nuclear program with a cadre of nearly 2,000 U.S. troops and 4,000 U.S. government civilian employees to provide continuity to the program, just as Groves had called for a year earlier.¹⁰⁸

C. ARMY PERSONNEL AND ORGANIZATIONS WITHIN THE MED

We became accustomed to administrators and doctors in uniform, Wacs selling sodas and checking groceries, selling postage stamps and cashing checks, and military police with guns guarding fences and gates and keeping our comings and goings under their watchful eyes.

—Bernice Brode, Manhattan Project worker and wife of physicist Robert Brode¹⁰⁹

In addition to the officers and soldiers serving in the Army Corps of Engineers—the organization primarily responsible for the Manhattan Project—and the many Military Policemen (MPs), medical personnel, logisticians, and Signal Corps soldiers working on the Manhattan Project, Army personnel assigned to the MED included members of the Special Engineer Detachment (SED), the Women's Army Corps (WAC) Detachment, the Counterintelligence Corps (CIC) Detachment, and the Atomic Bomb Investigating Group.¹¹⁰ These soldiers were essential to the success of the Manhattan Project, serving in clerical and administrative positions, fulfilling scientific and technical roles, guarding the sensitive facilities, protecting the nation's highest secrets, and providing essential

¹⁰⁷ Jones, *Manhattan*, 599–600.

¹⁰⁸ Hewlett and Anderson, *The New World*, 2.

¹⁰⁹ Bernice Brode, *Tales of Los Alamos: Life on the Mesa 1943–1945* (Los Alamos, NM: Los Alamos Historical Society, 1997), 31; Ruth H. Howes and Caroline L. Herzenberg, *Their Day in the Sun: Women of the Manhattan Project* (Philadelphia, PA: Temple University Press, 1999), 103.

¹¹⁰ Jones, *Manhattan*, vii, 358–359, 377, 395–400, 413, 521; Howes and Herzenberg, *Their Day in the Sun*, 13; Brode, *Tales of Los Alamos*, 32–34; Goldstein, Dillon, and Wenger, *Rain of Ruin*, 8–12; Joseph Albright and Marcia Kunstel, *Bombshell: The Secret Story of America's Unknown Atomic Spy Conspiracy* (New York: Times Books, 1997), 106; “The Atomic Bombings of Hiroshima and Nagasaki,” Report of the Manhattan Engineer District, 1.

resources and services at a time of severe shortages and national rationing.¹¹¹ Near the end of the war, hundreds of military officers and roughly 5,000 enlisted personnel were assigned to the Manhattan Project.¹¹² The following subsections discuss the contributions of some of the Army personnel and organizations serving in the nation's fledgling atomic program.

1. The Special Engineer Detachment

*In scanning the account of the Manhattan Project by our commanding general (Leslie R. Groves, *Now It Can Be Told*) I have not found where SEDs are even mentioned. Clearly we were not the low men on the totem pole. As carved by our commanding general, we were not on the totem at all.*

—Val L. Fitch, former SED soldier¹¹³

By the spring of 1943, as the Manhattan Project continued to expand, MED leaders were beginning to realize that they would soon be faced with shortages in personnel, particularly those with scientific and technical expertise, as the secret nuclear program competed with the regular military's selective service system for new recruits.¹¹⁴ The MED responded to this challenge by establishing a new Army outfit in May 1943 that would be organized under the MED and composed of draftees with valuable technical skills, experience, and education.¹¹⁵ As the year progressed, the MED began recruiting scientists, engineers, mechanics, machinists, technicians, and other skilled personnel from across the nation to fulfill the MED's initial request for nearly 700 soldiers for assignment in the newly established Special Engineer Detachment (SED).¹¹⁶

¹¹¹ Jones, *Manhattan*, 377.

¹¹² Hewlett and Anderson, *The New World*, 2; Jones, *Manhattan*, 359–60.

¹¹³ Val L. Fitch, "Soldier in the Ranks," in *All in Our Time: The Reminiscences of Twelve Nuclear Pioneers*, ed. Jane Wilson (Chicago, IL: The Bulletin of the Atomic Scientists, 1975), 200.

¹¹⁴ Jones, *Manhattan*, 358; J. H. Manley, "Organizing a Wartime Laboratory," in *All in Our Time: The Reminiscences of Twelve Nuclear Pioneers*, ed. Jane Wilson (Chicago: The Bulletin of the Atomic Scientists, 1975), 135; Hewlett and Anderson, *The New World*, 310.

¹¹⁵ Jones, *Manhattan*, 358.

¹¹⁶ Norris, *Racing for the Bomb*, 247; Benjamin Bederson, "SEDs at Los Alamos: A Personal Memoir," in *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians*, ed. Cynthia C. Kelly (New York: Black Dog and Leventhal Publishers, 2007), 181–2; Manley, "Organizing a Wartime Laboratory," 135; Jones, *Manhattan*, 358–59.

Known as “SEDs,” these soldiers served at a number of MED labs, shops, and project sites, including those at Oak Ridge and Los Alamos.¹¹⁷

According to former SED soldier Benjamin Bederson, “The role played by the common U.S. soldier in the development of atomic weapons during World War II is not generally appreciated.”¹¹⁸ Although the service of the SED soldiers has received little attention in many of the accounts of the Manhattan Project, the SEDs played a vital role in the development of America’s first nuclear weapons. At its peak, the SED had over 1,800 soldiers, some with doctoral degrees in science and engineering and nearly 30 percent with undergraduate degrees.¹¹⁹ According to Hewlett and Anderson, scientific leaders at the Los Alamos site had been reluctant to accept additional military personnel; nevertheless, as manpower shortages became more severe, they had no choice but to rely upon the efforts and expertise of the soldier scientists.¹²⁰ By August 1944, a third of the Los Alamos scientific cadre consisted of Army soldiers;¹²¹ the following May, the number of civilian laboratory workers at Los Alamos nearly equaled the number of SEDs working there.¹²² The SEDs worked long hours, six days per week; they conducted regular drills and inspections in addition to their scientific and technical work; they were subject to strict Army regulations; and they were paid enlisted salaries.¹²³ In spite of these requirements, the soldiers of the SED contributed significantly to the Manhattan Project, ensuring that the shorthanded scientific staffs were able to fulfill their duties and produce nuclear weapons before an invasion of Japan’s main islands claimed the lives of even more allied troops.

¹¹⁷ Bederson, “SEDs at Los Alamos,” 181–2; Jones, *Manhattan*, 358–59; Norris, *Racing for the Bomb*, 247.

¹¹⁸ Bederson, “SEDs at Los Alamos,” 181.

¹¹⁹ Norris, *Racing for the Bomb*, 247; Brode, *Tales of Los Alamos*, 30.

¹²⁰ Hewlett and Anderson, *The New World*, 310; Interview with Norman Brown in *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians*, ed. Cynthia C. Kelly (New York: Black Dog and Leventhal Publishers, 2007), 208.

¹²¹ Hewlett and Anderson, *The New World*, 310.

¹²² Manley, “Organizing a Wartime Laboratory,” 135.

¹²³ Brode, *Tales of Los Alamos*, 30; Fitch, “Soldier in the Ranks,” 192; Bederson, “SEDs at Los Alamos,” 182.

2. The Women's Army Corps Detachment

In the summer of 1943, the U.S. government formed another new Army organization, the Women's Army Corps (WAC).¹²⁴ Just two years earlier, as a result of the efforts of Congresswoman Edith Rogers (R-MA) and the influence of General George C. Marshall, Washington approved the establishment of the Women's Army Auxiliary Corps (WAAC), the predecessor of the WAC.¹²⁵ In the foreword of Vera S. Williams's book *WACs: Women's Army Corps*, Colonel (Ret.) Bettie Morden, former WAAC and WAC, observes that the Corps was not created as a social experiment or even as a political maneuver; it was done out of necessity, as there were not enough qualified males available to accomplish the nation's tasks.¹²⁶ The Manhattan Project was no exception. When the amount of work increased significantly in 1943, the Army authorized the establishment of a new unit consisting of seventy-five servicewomen that came to be known as the Manhattan District WAC Detachment.¹²⁷ Ruth Howes and Caroline Herzenberg argue that, without women, including the members of the WAC, the Manhattan Project would not have succeeded.¹²⁸

Female soldiers were assigned to each of the Manhattan Project's three main locations.¹²⁹ The detachments quickly reached their personnel limit; however, as the work load increased, so did the authorizations for additional personnel.¹³⁰ At the Hanford site, a company of WAC soldiers was assigned administrative duties while another section of servicewomen performed production work.¹³¹ By May 1945, nearly half of the

¹²⁴ Judith A. Bellafaire, "The Women's Army Corps: A Commemoration of World War II Service," U.S. Department of Defense, U.S. Army Center of Military History, last modified February 17, 2005, <http://www.history.army.mil/brochures/WAC/WAC.HTM>.

¹²⁵ Ibid; Leisa D. Meyer, *Creating G.I. Jane: Sexuality and Power in the Women's Army Corps during World War II* (New York: Columbia University Press, 1996), 16.

¹²⁶ Vera S. Williams, *WACs: Women's Army Corps* (Osceola, WI: Motorbooks International, 1997), 6.

¹²⁷ "Manhattan District WAC Detachment," U.S. Department of Defense, U.S. Army Center of Military History, accessed June 25, 2014, <http://www.history.army.mil/html/documents/women/wac-manhattan/>; Jones, *Manhattan*, 358.

¹²⁸ Howes and Herzenberg, *Their Day in the Sun*, 4.

¹²⁹ Fermi and Samra, *Picturing the Bomb*, 40; Howes and Herzenberg, *Their Day in the Sun*, 148–49.

¹³⁰ "Manhattan District WAC Detachment."

¹³¹ Howes and Herzenberg, *Their Day in the Sun*, 140–41, 164.

67-member Los Alamos detachment was performing scientific work.¹³² Three months later, 260 WAC soldiers were serving in a number of capacities at the New Mexico site.¹³³ Oak Ridge became the District WAC Detachment's headquarters, performing administrative duties for the servicewomen at six locations across the United States.¹³⁴ By the war's end, over four hundred women were serving in the Manhattan District WAC Detachment.¹³⁵

Although many of the WACs served in clerical or non-technical positions, some of the servicewomen were involved in the scientific and technical aspects of the project.¹³⁶ Private Mary Miller, Ph.D., a chemist who refused promotion despite her credentials and level of responsibility, directed one of the Los Alamos chemistry laboratories.¹³⁷ Second Lieutenant Myrtle Bachelder served simultaneously as a chemist and as a company commander.¹³⁸ J. Robert Oppenheimer commended Private Lynda Speck for her work in neutron energy measurement;¹³⁹ Master Sergeant Elizabeth Wilson assisted with the cyclotron,¹⁴⁰ and architect Miriam White Campbell worked on design drawings for Little Boy.¹⁴¹

As for their performance, a number of top defense officials lauded the wartime service of the WACs. General Douglas MacArthur said that the WACs were his "best soldiers."¹⁴² Major General Wilhelm Styer praised them for their courage and work ethic, Lieutenant General George Kenney recognized the quality of their work and the role they played in the nation's war effort, and Major General Clements McMullen called their

¹³² Howes and Herzenberg, *Their Day in the Sun*, 149.

¹³³ *Ibid.*, 164.

¹³⁴ "Manhattan District WAC Detachment."

¹³⁵ *Ibid.*

¹³⁶ Williams, *WACs*, 53; Howes and Herzenberg, *Their Day in the Sun*, 149; Jones, *Manhattan*, 358.

¹³⁷ Howes and Herzenberg, *Their Day in the Sun*, 149.

¹³⁸ *Ibid.*, 149–50.

¹³⁹ *Ibid.*, 150.

¹⁴⁰ Williams, *WACs*, 53.

¹⁴¹ Howes and Herzenberg, *Their Day in the Sun*, 150–51.

¹⁴² Mattie E. Treadwell, *The Women's Army Corps* (Washington, DC: Office of the Chief of Military History, 1954), 460.

departure “a distinct loss to the command.”¹⁴³ Throughout the entire U.S. war effort, WAC contributions proved critical; nowhere was this more apparent than in the MED. The MED’s WAC Detachment, eventually designated as the 9812th Technical Service Unit, Corps of Engineers, was awarded the Meritorious Service Unit Award for its superior performance of duties.¹⁴⁴ Overall, the WACs not only played a vital role in the development of America’s first nuclear arsenal, but they also left a lasting legacy, which paved the way for the women serving in today’s gender-integrated U.S. Army.¹⁴⁵

3. The Counterintelligence Corps Detachment

We faced the definite possibility that Germany would produce a nuclear weapon before we could. For that reason it was absolutely essential for us to remain as fully informed as possible on German progress in this field.

—Lieutenant General (Ret.) Leslie R. Groves¹⁴⁶

One of the reasons why the Army was chosen to head the U.S. nuclear program was the belief that the Army was the organization best suited to protect the nation’s most sensitive secrets.¹⁴⁷ Early in the Manhattan Project, Assistant Chief of Staff, G-2, Major General George Strong assigned Major John Lansdale as the officer in charge of the MED’s security and counterintelligence operations.¹⁴⁸ As the Manhattan Project grew and the need to protect information became more important, the MED eventually formed an organic Counterintelligence Corps (CIC) Detachment to accomplish two crucial missions: to detect and to prevent both nuclear espionage and the sabotage of nuclear facilities.¹⁴⁹

¹⁴³ Treadwell, *Women’s Army Corps*, 460.

¹⁴⁴ “Manhattan District WAC Detachment.”

¹⁴⁵ Williams, *WACs*, 6; Mary Lou Nosco, “The Last WACs: A Case Study of Women in Leadership Focusing on Women in the Last Direct Commissioning Class of the Women’s Army Corps” (PhD diss., Drake University, 2009), 2–3.

¹⁴⁶ Groves, *Now It Can Be Told*, 185.

¹⁴⁷ Jones, *Manhattan*, 253.

¹⁴⁸ *Ibid.*, 255; Norris, *Racing for the Bomb*, 261.

¹⁴⁹ Jones, *Manhattan*, 256, 260; Norris, *Racing for the Bomb*, 262.

Eventually, the MED's CIC Detachment consisted of eleven offices spread across the United States.¹⁵⁰ In addition to conducting background investigations and issuing security clearances, CIC agents, known as "creeps," conducted surveillance on Manhattan Project employees, tapping telephone lines to listen in on private conversations, snapping photographs with concealed cameras, and eavesdropping with listening devices.¹⁵¹ These agents also went about the project locations incognito, posing as hospitality workers, gamblers, construction workers, bartenders, and bus drivers in order to listen in on the conversations of project workers and thereby both uncover spies and silence loose lips.¹⁵² CIC soldiers also investigated every mechanical breakdown and accident on the project to rule out the possibility of sabotage.¹⁵³

Ultimately, spies were able to steal America's nuclear secrets. This sped the demise of the U.S. nuclear monopoly and laid the foundation for Cold War excesses, such as the persecution of J. Robert Oppenheimer.¹⁵⁴ Joseph Albright and Marcia Kunstel criticize the MED's counterintelligence soldiers, claiming that the military did not conduct effective background checks and pointing out that no case investigated by the CIC Detachment ever resulted in a criminal prosecution.¹⁵⁵ "All three known spies at Los Alamos," the authors write, "had been members of the Communist Party or offshoots of it, yet the CIC wasn't aware of any of their connections."¹⁵⁶ Despite what these critics point to as evidence of the failure of the MED's security measures, the CIC Detachment had many remarkable successes. CIC agents investigated nearly 400,000 workers and 600 companies and scrutinized nearly 100 cases of suspected espionage and 200 cases of sabotage.¹⁵⁷ Although the detachment had a number of noteworthy failures (Klaus Fuchs,

¹⁵⁰ Jones, *Manhattan*, 256, 258; Norris, *Racing for the Bomb*, 261–62.

¹⁵¹ Jones, *Manhattan*, 260; Norris, *Racing for the Bomb*, 263, 268; Wyden, *Day One*, 79.

¹⁵² Norris, *Racing for the Bomb*, 263–64.

¹⁵³ *Ibid.*, 263.

¹⁵⁴ Richard Rhodes, *Dark Sun: The Making of the Hydrogen Bomb* (New York: Simon and Schuster, 1995), 530–59.

¹⁵⁵ Albright and Kunstel, *Bombshell*, 106.

¹⁵⁶ *Ibid.* This reference concerns Klaus Fuchs, David Greenglass, and Theodore Hall.

¹⁵⁷ Norris, *Racing for the Bomb*, 263; Albright and Kunstel, *Bombshell*, 106.

David Greenglass, Theodore Hall, and George Koval),¹⁵⁸ evidence of the Detachment's successes is found in the dual facts that neither Germany nor Japan was aware of the progress of America's nuclear weapons program and that many of the Manhattan Project's own workers remained ignorant of the organization's ultimate goal until after it was revealed on August 6, 1945, in the President's official press release.¹⁵⁹

The CIC Detachment also had another important success, the ALSOS mission. Originally conceived by Lansdale, ALSOS was the code name of a unit established in the fall of 1943 and led by Counterintelligence officer Lieutenant Colonel Boris T. Pash.¹⁶⁰ The MED provided personnel and supervision for ALSOS, an organization comprising teams of combat troops, scientists, and CIC agents and designed to search Europe in order to locate and seize scientists, nuclear materials, and any evidence regarding enemy nuclear weapons programs.¹⁶¹ ALSOS teams deployed to Italy, France, Belgium, and Germany—sometimes behind enemy lines—and they succeeded in locating and seizing nearly 100 tons of uranium ore along with nuclear equipment, relevant documents, and many prominent German nuclear scientists.¹⁶² Additionally, after receiving information about a suspected German nuclear facility located within the Soviet occupation zone, General Groves coordinated with General Carl Spaatz, the commander of the Army's Strategic Air Forces in Europe, to have the facility destroyed by aerial bombardment.¹⁶³ In his memoir, Groves mentioned, "there was a strong current of opinion in favor of

¹⁵⁸ Moreover, key French scientists revealed information about the development of nuclear weapons to General de Gaulle in July 1944. For details, see Bertrand Goldschmidt, *Pionniers de l'atome* (Paris: Stock, 1987), 265–7. For background on George Koval, see William J. Broad, "An American 'Regular Guy' Was a Russian Top Spy," *The New York Times*, November 11, 2007, http://www.nytimes.com/2007/11/11/world/americas/11iht-agent.5.8289329.html?pagewanted=all&_r=0.

¹⁵⁹ Norris, *Racing for the Bomb*, 267; Jones, *Manhattan*, 538.

¹⁶⁰ Norris, *Racing for the Bomb*, 285; Jones, *Manhattan*, 281, 261. Alsos is a Greek word meaning "sacred grove."

¹⁶¹ Jones, *Manhattan*, 281; Groves, *Now It Can Be Told*, 249; Norris, *Racing for the Bomb*, 285.

¹⁶² "Atomic Rivals and the ALSOS Mission," U.S. Department of Energy, accessed June 26, 2014, <http://www.osti.gov/manhattan-project-history/Events/1942-1945/rivals.htm>; Jones, *Manhattan*, 281–91.

¹⁶³ Norris, *Racing for the Bomb*, 302; Jones, *Manhattan*, 287–88.

continuing” the ALSOS unit; however, the organization that had achieved so much success towards the end of the war in Europe was officially disbanded by mid-October 1945.¹⁶⁴ Nevertheless, ALSOS laid the foundation for modern counterproliferation programs.

4. The Manhattan Project Atomic Bomb Investigating Group

Two days after the Army Air Force dropped Fat Man on Nagasaki, Groves ordered his new deputy, Brigadier General Thomas F. Farrell, to form an investigating group to begin the process of collecting “scientific, technical and medical intelligence in the atomic bomb field from within Japan,” according to a Manhattan Engineer District report.¹⁶⁵ The group, which was tasked to depart as soon as the fighting had ended, was split into three teams: one to investigate Hiroshima, another Nagasaki, and the third to search for information pertaining to Japan’s nuclear program.¹⁶⁶ Within days of Groves’s order, technical personnel waiting in California with their equipment were deployed overseas, and word was quickly spread throughout the military’s highest levels of command that the mission was to take place.¹⁶⁷

Members of Farrell’s investigating teams began arriving in Japan in September 1945, and the teams collected information for over two weeks in Nagasaki and four days in Hiroshima.¹⁶⁸ Information obtained from subsequent studies was later combined with data acquired during the initial investigation to form a final report produced by the Manhattan Engineer District.¹⁶⁹ The report provides a comparison of the two target cities, before and after the bombings; it also describes the effects of the bombs on both

¹⁶⁴ Groves, *Now It Can Be Told*, 248–49.

¹⁶⁵ Manhattan Engineer District. *Atomic Bombings of Hiroshima and Nagasaki*, 1.

¹⁶⁶ *Ibid.*

¹⁶⁷ *Ibid.*, 1–2.

¹⁶⁸ *Ibid.*, 2.

¹⁶⁹ *Ibid.*

structures and people, discusses the various hazards created by an atomic explosion, and offers some general conclusions, primarily, that no evidence of persistent harmful radioactivity was found.¹⁷⁰

This data still serves as a primary source of information about radiation effects, and the bomb damage assessments formed the basis of early theories of nuclear war by strategists, such as Bernard Brodie and Herman Kahn. In addition to investigating the effects of nuclear weapons in Hiroshima and Nagasaki and generating the official report of its findings, the investigating group also discovered five uranium-enrichment cyclotrons, two in Tokyo, two in Osaka, and one in Kyoto.¹⁷¹ Unfortunately, the U.S. Army's destruction of the cyclotrons, which took place as the result of a misunderstanding, deprived U.S. analysts of potentially valuable sources of information; nevertheless, the discovery of Japan's nuclear facilities confirmed U.S. estimates that Japan's nuclear program was too small to produce nuclear weapons.¹⁷²

D. THE VIEWS OF THE SENIOR ARMY OFFICERS

In order to better understand the organization responsible for the construction and employment of the atomic bombs, it is important to examine the beliefs and attitudes of its leaders, the officers whose decisions not only shaped the Manhattan Project but also influenced the development of organizations, such as the U.S. Air Force, the Strategic Air Command, the Central Intelligence Agency, and the North Atlantic Treaty Organization. After all, an officer's character and worldview influence his or her decisions. For instance, according to Vincent Jones, the Army's initial response to proposals to explore the potential military applications of atomic energy "was not generally enthusiastic."¹⁷³ He hypothesizes that the Army's early negative attitude towards nuclear weapons could have been influenced by the fiscal constraints of the 1930s, a time when military dollars

¹⁷⁰ Ibid., 2–34.

¹⁷¹ Jones, *Manhattan*, 586.

¹⁷² Ibid., 585–89.

¹⁷³ As evidence to support his claim that the Army "was not generally enthusiastic" about the prospects of nuclear weapons, the author cites letters, memorandums, and interviews with the participants of meetings discussing the research of fission for military purposes. Jones, *Manhattan*, 20.

were carefully spent on vital resources, and not invested in programs that might not yield results.¹⁷⁴ Other influential Army leaders, such as Dwight Eisenhower expressed concern about the extreme effects that nuclear weapons use would have on cities, which would ultimately have to be rebuilt, as America had resolved to do in war-torn Japan.¹⁷⁵ After World War II, he wrote, “With the evidence of the most destructive war yet waged by the people of the earth about me, I gained increased hope that this development of what appeared to be the ultimate in destruction would drive men, in self-preservation, to find a way of eliminating war.”¹⁷⁶

Perry Smith offers another reason that could explain why the U.S. Army was initially reluctant to pursue nuclear weapons. He points out that the military was the target of harsh criticism during the interwar period due to its affiliation with the defense industries—particularly the ammunition industry—and the role that both the military and armaments manufacturers were alleged to have had concerning U.S. participation in the First World War.¹⁷⁷ “The military leadership, especially within the Army, felt that there was a direct relationship between this pre-World War II criticism and the inability of the military to obtain the funds necessary for a large force when the danger of war increased in the late 1930s,” writes Smith.¹⁷⁸ It is possible that, in addition to worrying about budgetary constraints, Army leaders during the 1930s, not wishing to draw criticism from the public as their predecessors had following World War I, were hesitant to develop relationships with scientists looking to design new weapons, particularly at a time when war appeared imminent on both eastern and western horizons. Nevertheless, once given the assignment in June 1942, the Army quickly went to work and, in a little over three years, produced America’s first nuclear ordnance.

Although the United States had, by the summer of 1945, gained overwhelming advantages over its Asian foe—dominance of the sea and air, an unrivaled industrial

¹⁷⁴ Ibid., 21.

¹⁷⁵ Eisenhower, *Crusade in Europe*, 455–56.

¹⁷⁶ Ibid., 456.

¹⁷⁷ Perry McCoy Smith, *The Air Force Plans for Peace 1943-1945* (Baltimore, MD: The Johns Hopkins Press, 1970), 11.

¹⁷⁸ Ibid., 11–12.

capacity, and the most powerful military alliance in the history of mankind—the Japanese still possessed defensive capabilities, and some intelligence appraisals indicated that the isolation and continued conventional bombardment of Japan would not be sufficient to induce surrender.¹⁷⁹ With an army of two million armed and equipped soldiers in Japan’s main islands, the Japanese had the ability to prolong the war and exact a terrible price on the would-be allied invaders.¹⁸⁰ Official U.S. military estimates predicted that an invasion would result in tens of thousands of U.S. casualties within the first thirty days and that in four months of fighting the number could exceed 120,000.¹⁸¹ Furthermore, the loss of life would not be limited to the armed forces of the belligerent parties. By March 1945, Japanese officials had taken steps to militarize their civilian population, and past operations had revealed that civilian casualties could be expected to be high.¹⁸² A prolonged struggle would have meant greater devastation to the Japanese homeland since allied ground forces would have had to fight for territory in and around villages, urban centers while naval, and air forces would have continued to strike Japan’s cities. An invasion of Japan’s main islands would have been extremely costly in terms of U.S. casualties and the cost of Japan’s reconstruction. Surveys of U.S. public opinion, taken soon after Japan’s surrender, reveal that most Americans supported the decision to drop the atomic bombs.¹⁸³

In regard to the use of the atomic bombs against Japan, what were the views of the Army’s senior officers? Revisionist scholar Gar Alperovitz believes that many U.S. military leaders did not feel that the atomic bombings were necessary.¹⁸⁴ According to Alperovitz, after the Hiroshima and Nagasaki bombings, General Henry “Hap” Arnold expressed the opinion that the atomic bombings were unnecessary and that Japan had

¹⁷⁹ Louis Morton, “The Decision to Use the Bomb,” *Foreign Affairs* 35, no. 2 (1957): 342, <http://www.jstor.org/stable/20031230>.

¹⁸⁰ *Ibid.*

¹⁸¹ Frank, *Downfall*, 137.

¹⁸² *Ibid.*, 188.

¹⁸³ Nina Tannenwald, *The Nuclear Taboo: The United States and the Non-Use of Nuclear Weapons Since 1945* (New York: Cambridge University Press, 2007), 89.

¹⁸⁴ Alperovitz, *Decision*, 334–365.

actually surrendered for other reasons.¹⁸⁵ Alperovitz points out that General Carl A. Spaatz opposed the use of the atomic bombs, as well as the destruction of cities.¹⁸⁶ Later, Spaatz claimed that the nuclear attacks were not necessary and that even without an invasion Japan “would have surrendered without the atomic bomb.”¹⁸⁷ General Curtis LeMay was more specific about the reason for Japan’s surrender. He claimed that, within weeks, the United States would have ended the war “without the Russians entering and without the atomic bomb.”¹⁸⁸ When asked to clarify, LeMay answered, “Yes, with the B-29.”¹⁸⁹ “We were doing the job with incendiaries,” he stated later in life, claiming, “all the atomic bomb did was, in all probability, save a few days.”¹⁹⁰ General Douglas MacArthur also maintained that it was not necessary to use the bombs against Japan.¹⁹¹ On the other hand, General George Marshall went on record after the war supporting Truman’s decision, although evidence suggests that, before the bombings, the Army Chief of Staff did not judge that they were necessary to end the war.¹⁹²

Following the war, General Dwight D. Eisenhower repeatedly said that he had opposed the use of the atomic bomb and said that he had told Secretary of War Henry Stimson about his reservations regarding the bomb.¹⁹³ “I expressed the hope that we would never have to use such a thing against any enemy because I disliked seeing the United States take the lead in introducing into war something as horrible and destructive as this new weapon was described to be,” wrote Eisenhower in his autobiography, describing his discussion with Stimson about the atomic bombs.¹⁹⁴ “Moreover, I

¹⁸⁵ Ibid., 334.

¹⁸⁶ Ibid., 343.

¹⁸⁷ Alperovitz, *Decision*, 344.

¹⁸⁸ Ibid., 336.

¹⁸⁹ Ibid.

¹⁹⁰ Ibid., 340.

¹⁹¹ Ibid., 350.

¹⁹² Ibid., 358–65.

¹⁹³ Ibid., 352–58.

¹⁹⁴ Eisenhower, *Crusade in Europe*, 443.

mistakenly had some faint hope that if we never used the weapon in war other nations might remain ignorant of the fact that the problem of nuclear fission had been solved.”¹⁹⁵

Many of these opinions, however, were offered only after the war, making it necessary to further examine historical evidence to understand how Army officers felt prior to Japan’s surrender, as people often view things differently in retrospect. Robert J. Maddox cautions against blindly accepting the opinions of leaders regarding use of the bombs given *after* the war; rather, he emphasizes the importance of understanding what the leaders were saying before the war’s end.¹⁹⁶ His book reveals that Army Air Force Generals Arnold, Spaatz, LeMay, and Twining not only believed that the atomic bombs were useful, but, contrary to their later statements, they may have also regarded the atomic bombs as responsible for bringing about Japan’s surrender.¹⁹⁷ Maddox argues that soon after the Hiroshima bombing, Arnold boasted about the spectacular headlines that the bombing story had received in the newspapers, and both Spaatz and LeMay were scolded by General George Marshall for telling news reporters that “an invasion will not be necessary” because of the atomic bomb, a weapon they and others believed would render conventional armies obsolete.¹⁹⁸ He also points out that LeMay concurred with the request of Spaatz and Twining on August 9, 1945, to drop a third atomic bomb on Tokyo and that Arnold was aware of this request.¹⁹⁹ Robert Norris points out that it was these very generals who defended the strategic bombings of cities.²⁰⁰ Even Alperovitz mentions that, at one point, LeMay admitted to believing that the decision to use the bombs was a correct one.²⁰¹ “I am certain in my own mind that they significantly

¹⁹⁵ Ibid.

¹⁹⁶ Maddox, *Weapons for Victory*, 140.

¹⁹⁷ Ibid., 140–41.

¹⁹⁸ Ibid., 141.

¹⁹⁹ Ibid., 140–141.

²⁰⁰ Norris, *Racing for the Bomb*, 427.

²⁰¹ Alperovitz, *Decision*, 339.

shortened the war and, therefore, saved lives in the long run,” said LeMay.²⁰² Not long after the war, LeMay became an outspoken advocate of nuclear bombs as head of the new Strategic Air Command.²⁰³

The man responsible for building the bomb, General Leslie Groves, claimed to have had “no qualms of conscience about the making or using of it.”²⁰⁴ According to Robert Norris, Groves maintained this view for the remainder of his life.²⁰⁵ In his 1962 memoir, Groves wrote that he had been extremely disappointed after learning of his assignment to the MED, since he was unimpressed with what he had heard about the size and the nature of the project; however, he concluded the memoir by saying that it had been absolutely necessary for the United States to develop the atomic bomb.²⁰⁶ It is important to note that Groves was not opposed to relinquishing control of the national nuclear program to civilians following the war.²⁰⁷ Speaking before the House Committee on Military Affairs on October 9, 1945, Groves said, “In coming before your committee today we are appealing for an opportunity to give you our existing powers.”²⁰⁸ It must be noted that, in all instances, Army leaders consistently deferred to civilian authority in matters of nuclear policy and strategy. In the end, President Truman was the one who decided to use the bombs against Japan, and, throughout the remainder of his life, he never expressed regret about his decision.²⁰⁹

E. CONCLUSION

After assuming responsibility for the atomic program, the U.S. Army played an integral role in developing and using the United States’ first nuclear weapons. The Army

²⁰² LeMay quoted in Alperovitz, *Decision*, 339.

²⁰³ Rhodes, *Dark Sun*, 560–4.

²⁰⁴ Norris, *Racing for the Bomb*, 426.

²⁰⁵ Norris, *Racing for the Bomb*, 426.

²⁰⁶ Groves, *Now It Can Be Told*, 4, 415.

²⁰⁷ Norris, *Racing for the Bomb*, 461.

²⁰⁸ Groves, *Now It Can Be Told*, 440.

²⁰⁹ “Harry S. Truman to Irv Kupcinet, August 5, 1963,” Harry S. Truman Library and Museum, National Archives and Records Administration, accessed July 4, 2014, http://www.trumanlibrary.org/flip_books/index.php?tldate=1963-07-30&groupid=3707&titleid=&pagenumber=1&collectionid=ihow.

Corps of Engineers acquired the land for the nuclear facilities, oversaw the construction and operation of the sites, and provided secret funding for the program. SED soldiers augmented the shorthanded scientific staffs at the project sites and conducted a range of scientific and technical work. When the MED faced manpower shortages, its leaders relied on soldiers from the Women's Army Corps. While MPs guarded the MED facilities, CIC soldiers worked to safeguard the U.S. nuclear secrets, and Army logisticians kept the sites supplied. Army soldiers who were assigned to the ALSOS teams were also responsible for carrying out some of the nation's first nuclear counterproliferation operations. In August 1945, after the first two operational bombs were completed, soldiers of the Army Air Force's 509th Composite Group dropped them on Japanese cities. Later, Manhattan Project soldiers investigated the effects of the bombs and assembled their findings in an official report, and the Army continued to manage the U.S. peacetime atomic program successfully for over a year before turning it over to civilian authorities. Although the Army would never have been able to accomplish all of these tasks without the contributions of many civilians, it certainly played a significant role in developing, employing, and understanding the nation's first nuclear weapons.

Once the atomic bomb fell on Hiroshima, nuclear weapons became a mainstay in defense planning, foreign policy, domestic politics, and international relations. It is important, therefore, to assess the U.S. military's attitude toward nuclear weapons because of the organization's prominent role in warfighting. Furthermore, understanding the Army's formative attitudes toward nuclear weapons sheds light on Cold War thinking about nuclear weapons and their effects on war and conflict in the modern age. Although the Army was initially hesitant to explore the possibilities of warfighting with nuclear weapons, it was quick to develop them once President Roosevelt placed the Army in charge of the nation's nuclear program. Examining the roles and views of the senior Army officers who were participants in the world's first nuclear war reveals that it took the efforts and support of many officers to develop and use nuclear weapons during World War II, despite the fact that many of those same leaders could not agree on the value of such use.

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III. THE U.S. ARMY'S COLD WAR NUCLEAR ROLES

The Army has no wish to scrap its previous experience in favor of unproven doctrine, or in order to accommodate enthusiastic theorists having little or no responsibility for the consequences of following the courses of action they advocate. While the Army is adapting itself readily to the employment of new weapons and new techniques, nothing currently available or foreseeable in war reduces the essentiality of mobile, powerful ground forces, the only forces which can seize the enemy's land and the people living thereon, and exercise control of both thereafter.

—Excerpt from a letter written to U.S. Secretary of Defense Charles Wilson by Army Chief of Staff Matthew Ridgway in 1955²¹⁰

During the early years of the Cold War, at a time when it appeared that nuclear weapons would soon relegate the armies of the world to nothing more than permanent civil defense forces,²¹¹ the United States Army was relieved of many of its nuclear roles and responsibilities. Yet, the Army's contributions to America's nuclear endeavors did not end with the establishment of the Atomic Energy Commission or the creation of the Department of the Air Force, although these events undoubtedly altered the nuclear roles of the U.S. Army. This chapter examines the Army during the Cold War to determine the extent of its nuclear efforts. After a brief description of the interservice rivalry that took place during the early years of the Cold War, this chapter will examine the Army's tactical nuclear weapons, its contributions to the military's nuclear education, and its involvement in nuclear training and testing. Following that, the chapter will survey Army nuclear doctrine and discuss the deployment of the Army's nuclear weapons. Before concluding, the chapter will discuss the Army Nuclear Power Program and examine some of the views about nuclear weapons held by U.S. Army officers during the Cold War.

²¹⁰ Letter duplicated in Matthew B. Ridgway, *Soldier: The Memoirs of Matthew B. Ridgway* (New York: Harper and Brothers, 1956), 332.

²¹¹ R. B. Forrestal, "Atomic Bombing and Biological Warfare," *Military Review* 30, no. 4 (1950): 92, <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p124201coll1/id/896>.

A. THE ARMY'S FIGHT FOR NUCLEAR WEAPONS

The President said the original mistake in this whole business was our failure to create one single Service in 1947.

—Excerpt from “Memorandum of Conference with President Eisenhower, July 6, 1960”²¹²

During World War II and the immediate post-war years, U.S. advocates of air power redoubled their efforts to organize an independent military service of their own—one that could win the nation’s wars in the air.²¹³ Fighting for organizational independence, Army Air Force leaders made the case that air forces were superior to naval and ground forces, and some suggested that the surface navy had reached its final days.²¹⁴ When the National Security Act of 1947 established the U.S. Air Force as a separate service, the Army lost aircraft, personnel, and its role as the nation’s champion of nuclear warfare. Soon thereafter, the Air Force, the Navy, and the Army began a heated debate about each service’s role in nuclear warfighting.²¹⁵ While funding for the Army steadily declined in the years following World War II, Air Force expenditures continued to grow until the Air Force’s budget nearly equaled those of the Army and the Navy combined.²¹⁶ According to Fred Kaplan, the Air Force, with its Strategic Air Command, came to dominate not just nuclear strategy and doctrine, but all national defense planning.²¹⁷ “Because the atomic bomb seemed well-suited to strategic bombing applications,” explained John Midgley, “the newly-independent Air Force launched a series of attempts to gain primary responsibility for development and delivery of the weapons in the late 1940s.”²¹⁸ The interservice rivalry spawned by the advent of nuclear

²¹² National Security Policy, Arms Control and Disarmament, “Memorandum of Conference with President Eisenhower, July 6, 1960,” Document 107, U.S. Department of State, accessed July 20, 2014, <https://history.state.gov/historicaldocuments/frus1958-60v03/d107>.

²¹³ Smith, *The Air Force Plans for Peace, 1943-1945*, 15; Midgley, *Deadly Illusions*, 5–6.

²¹⁴ Smith, *The Air Force Plans for Peace, 1943-1945*, 15, 60.

²¹⁵ Hewlett and Duncan, *Atomic Shield, 1947/1952*, vol. 2, 5–9.

²¹⁶ Taylor, *The Uncertain Trumpet*, 13–14; Bacevich, *The Pentomic Era*, 16.

²¹⁷ Fred Kaplan, *The Wizards of Armageddon* (Stanford, CA: Stanford University Press, 1991), 40.

²¹⁸ Midgley, *Deadly Illusions*, 5. For more information about Air Force attempts to gain a monopoly on nuclear weapons delivery, see Rosenberg, “The Origins of Overkill,” 22.

weapons and the creation of the U.S. Air Force has received considerable attention in academic and professional literature over the years.²¹⁹

Amidst the interservice struggles for relevance during the early years of the nuclear weapons age, the Army fought to gain access to the very weapons that it had played such an important role in creating. Beginning in January 1946, top Army leaders made the case that the Army should be permitted to develop an arsenal of its own.²²⁰ Army Chief of Staff Dwight Eisenhower sought to convince the Joint Chiefs to allow his service to explore the tactical applications of nuclear weapons and develop “the best kind of Army to build around the all-powerful atomic weapons.”²²¹ The Army’s quest for nuclear weapons was also taken up by Eisenhower’s successors as Chief of Staff. In 1948, General Omar Bradley presented a similar argument to the other service chiefs in response to an attempt by Air Force General Carl Spaatz to wrest control of the joint Armed Forces Special Weapons Project (AFSWP) from the other services, and General J. Lawton Collins advocated for the Army again two years later in order to prevent it from being edged out of the nation’s strategic defense planning altogether.²²²

By 1950, the Army had received orders to procure its own nuclear weapons after President Truman’s loss of faith in the prospects for international control of nuclear weapons following the Soviet Union’s rejection of the U.S.-proposed Baruch Plan for international control of atomic energy, the Soviet support for a Communist coup in Czechoslovakia, and the Soviet blockade of West Berlin. “I am of the opinion we’ll never

²¹⁹ See, for example, Robert M. Farley, *Grounded: The Case for Abolishing the United States Air Force* (Lexington, KY: University Press of Kentucky, 2014), 97–102; Kaplan, *Wizards of Armageddon*, 40; Midgley, *Deadly Illusions*, 5–6; Skelton, *The Forbidden Weapon*, 15–16; Rosenberg, “Origins of Overkill,” 50–61; Alan Cary Maiorano, “The Evolution of United States and NATO Tactical Nuclear Doctrine and Limited Nuclear War Options, 1949–1984” (master’s thesis, Naval Postgraduate School, 1983), 28–30, DTIC (ADA140802); Ingo Trauschweizer, “Nuclear Weapons and Limited War: The U.S. Army in the 1950s,” (Working paper, European University Institute, 2009), 1, <http://hdl.handle.net/1814/11674>; Bret C. Kinman, “The Army before Last: Military Transformation and the Impact of Nuclear Weapons on the U.S. Army during the Early Cold War” (master’s thesis, Naval Postgraduate School, 2004), 6–7, 31–32, <http://hdl.handle.net/10945/1398>; Dean Allard, “Interservice Differences in the United States, 1945–1950: A Naval Perspective,” *Airpower Journal* (1989), <http://www.airpower.au.af.mil/airchronicles/apj/apj89/win89/allard.html>.

²²⁰ Midgley, *Deadly Illusions*, 7.

²²¹ Eisenhower quoted in Midgley, *Deadly Illusions*, 7.

²²² Midgley, *Deadly Illusions*, 8–9.

obtain international control,” President Truman told his advisors in July 1949, adding, “since we can’t obtain international control we must be strongest in atomic weapons.”²²³ This belief was reflected in NSC-68, presented in April 1950.²²⁴ In addition to approving weapons increases in 1949, 1950, and 1952, Truman authorized the development of tactical nuclear weapons and thermonuclear weapons, thus broadening the spectrum of U.S. nuclear capabilities.²²⁵

Although the Army was able to acquire a relatively small arsenal of tactical nuclear weapons from the AEC during the Korean War,²²⁶ the election of President Eisenhower changed the trajectory of U.S. national security strategy and placed the Army firmly on the path to becoming a full-fledged nuclear service. The 1952 presidential election, even more than the establishment of the Department of the Air Force, provided the impetus for the Army to transform itself from a largely conventional force into a nuclear one. Prior to Eisenhower’s ascension to the presidency, Army leaders—including Eisenhower—had fought to prevent the Air Force’s gaining a monopoly on nuclear weapons planning and delivery. After the 1952 election, the Army fought for relevance in the nation’s defense enterprise. In other words, it fought for organizational survival. This struggle, in many ways, influenced the course of the Army’s evolution during the Cold War.

²²³ Truman quoted in Rosenberg, “Origins of Overkill,” 21–22.

²²⁴ Lawrence Freedman, *The Evolution of Nuclear Strategy*, 3rd ed. (New York: Palgrave MacMillan, 2003), 66–67.

²²⁵ Rosenberg, “Origins of Overkill,” 21–24; Stephen M. Younger, *The Bomb: A New History* (New York: HarperCollins Publishers, 2009), 50; Cirincione, *Bomb Scare*, 21; Thomas B. Cochran, William M. Arkin, and Milton M. Hoenig, ed., *U.S. Nuclear Forces and Capabilities*, vol. 1 of *Nuclear Weapons Databook* (Cambridge, MA: Ballinger Publishing, 1984), 6.

²²⁶ Production of the MK-9 Artillery-fired Atomic Projectile (AFAP), designed for the M65 Atomic Cannon (280MM), began in April 1952. See Chuck Hansen, *U.S. Nuclear Weapons: The Secret History* (Arlington, TX: Aerofax, 1988), 172.

The Eisenhower administration believed that defense policies of the previous administration had been dangerously ambitious.²²⁷ Soon after taking office, Eisenhower drafted a letter to a friend, explaining his concerns about the nation's defense spending:

We are trying to bring the total expenditures of the American Government within reasonable limits. This is not because of any belief that we can afford relaxation of the combined effort to combat Soviet communism. On the contrary, it grows out of a belief that our organized, effective resistance must be maintained over a long period of years and that this is possible only with a healthy American economy. If we should proceed recklessly and habitually to create budget deficits year after year, we have with us an inflationary influence that can scarcely be successfully combated. Our particular form of economy could not endure.²²⁸

It was because of the administration's desire for economic prosperity, as well as its faith in nuclear deterrence that it charted a new strategic course and called it the New Look, which placed strategic airpower at the tip of the nation's defense spear.²²⁹ "The result of the Eisenhower review was the emergence of a deeper dependence on nuclear weapons and long-range airpower to deter war," wrote Herman Wolk, an Air Force historian.²³⁰ According to Wolk, instead of maintaining the forces that had borne the brunt of the fighting on the Korean peninsula, Eisenhower chose "to invest more heavily in airpower, especially [the] Strategic Air Command, in large part because that kind of defense could be built for lower cost."²³¹

Eisenhower's national security strategy, outlined in NSC 162/2 in October 1953, explained how the administration intended to provide adequate security for an affordable cost. The document pointed out that the emphasis of the nation's defense posture would be placed "on the capability of inflicting massive retaliatory damage by offensive striking power" while the United States maintained "a sound, strong and growing economy" that

²²⁷ Herman S. Wolk, "The 'New Look,'" *Air Force Magazine* 86, no. 8 (2003): 83, <http://www.airforcemag.com/magazinearchive/pages/2003/august%202003/0803look.aspx>; Russell F. Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (Bloomington, IN: Indiana University Press, 1973), 400.

²²⁸ Eisenhower quoted in Kaplan, *Wizards of Armageddon*, 176.

²²⁹ Wolk, "'New Look,'" 80.

²³⁰ *Ibid.*

²³¹ *Ibid.*

could endure “over the long pull.”²³² On January 12, 1954, Secretary of State John Foster Dulles gave a speech in New York explaining the new strategy.²³³ Dulles said, “The way to deter aggression is for the free community to be willing and able to respond vigorously at places and with means of its own choosing.”²³⁴ Under the Eisenhower administration, Dulles declared, the United States would “depend primarily upon a great capacity to retaliate, instantly, by means and at places of our own choosing.”²³⁵ He continued, “It is now possible to get, and share, more basic security at less cost.”²³⁶

Many Army and Navy leaders disagreed with President Eisenhower’s defense policies.²³⁷ Some thought that the strategy of massive retaliation was not sufficient to deter communist aggression. General Maxwell Taylor wrote, “The ink was hardly dry on the New Look before the episode of the fall of Dien Bien Phu provided a practical test of the efficacy of the New Look strategy and exposed its weakness.”²³⁸ The New Look also meant that the Army would have even less resources—manpower and funding—to defend the nation and its allies from a growing communist threat. By the mid-1950s, Communist regimes had taken over in Russia, Eastern Europe, China, North Vietnam, and North Korea in what seemed to be an existential battle between communism and capitalism.²³⁹ Even Eisenhower recognized the position in which his policies placed the Army and its leaders. “Their role,” said President Eisenhower in 1956, “is rather hazy to many of them.”²⁴⁰ Nevertheless, the Army quickly found ways to use tactical nuclear weapons as tools to deter the nation’s enemies and defend America and its allies with fewer soldiers and less funding. For the remainder of the Cold War, the Army continued

²³² “A Report to the National Security Council by the Executive Secretary on Basic National Security Policy, October 30, 1953,” Federation of American Scientists, accessed July 20, 2014, <http://fas.org/irp/offdocs/nsc-hst/nsc-162-2.pdf>, 5–6.

²³³ Wolk, ““New Look,”” 82; Weigley, *American Way of War*, 403–4.

²³⁴ Dulles quoted in Weigley, *American Way of War*, 404.

²³⁵ *Ibid.*

²³⁶ *Ibid.*

²³⁷ Wolk, ““New Look,”” 82.

²³⁸ Taylor, *Uncertain Trumpet*, 24.

²³⁹ Younger, *Bomb*, 5–6.

²⁴⁰ Eisenhower quoted in Bacevich, *Pentomic Era*, 145.

to develop nuclear weapons and prepare for what some at the time believed was a likely threat to the security of the free world; nuclear war with a global communist front determined to eradicate capitalism and to conquer the free world under the banner of Communism.

B. TACTICAL NUCLEAR WEAPONS: THE ARMY'S SECOND NUCLEAR ARSENAL

This discovery of American scientists can be man's greatest benefit. And it can destroy him. It is against the latter terrible possibility that this nation must prepare or perish. Atomic power will affect the peaceful life of every individual on earth. And it will at the same time affect every instrument and technique of destruction. But the atomic bomb is not alone among the scientific advances that make the possibilities of the future so terrifying. The development of aircraft and rockets and electronics has become equally incredible.

—General George C. Marshall²⁴¹

After the establishment of the Air Force as a separate service removed from the Army its mission of delivering nuclear weapons—which until the early 1950s consisted only of air-deliverable gravity bombs—the U.S. Army began to acquire ground-based nuclear delivery systems.²⁴² The development of the Army's second nuclear arsenal gained momentum in 1950–1951, at the beginning of the Korean War, when the Army received substantial increases in its weapons research and development budget.²⁴³ By 1952, the United States began producing its first tactical nuclear warheads, the MK-9 Artillery Fired Atomic Projectiles (AFAPs).²⁴⁴ From that point until 1991, the U.S. Army once again had a role in the delivery of nuclear weapons.

²⁴¹ George C. Marshall, *General Marshall's Report: The Winning of the War in Europe and the Pacific (Biennial Report of the Chief of Staff of the United States Army, July 1, 1943 to June 30, 1945, to the Secretary of War)* (New York: Simon and Schuster, 1945), 4.

²⁴² Midgley, *Deadly Illusions*, 11–13.

²⁴³ *Ibid.*, 13.

²⁴⁴ Thomas B. Cochran et al., ed., *U.S. Nuclear Warhead Production*, vol. 2 of *Nuclear Weapons Databook* (Cambridge, MA: Ballinger Publishing, 1987), 10; Hansen, *U.S. Nuclear Weapons*, 172.

1. Nuclear Artillery

The U.S. Army's first tactical nuclear weapon system was the M65, a 280mm cannon capable of firing the MK-9 AFAP to a distance of nearly 14 miles.²⁴⁵ Originally conceived by the Army in 1949, the M65 was tested in May 1953 during Operation UPHOT-KNOTHOLE in Nevada, where the MK-9 produced a 15-kiloton explosion.²⁴⁶ Although M65 cannons were eventually deployed to Germany and South Korea, they were all withdrawn by 1962, and both types of ordnance developed for the cannons, the MK-9 and the MK-19 AFAP, were retired from service by 1963.²⁴⁷ Although the M65 provided commanders with an organic nuclear delivery system, the 280mm cannon was too cumbersome for the rapid movement that was thought necessary for successful employment in a nuclear war.²⁴⁸ As a result, the Atomic Energy Commission (AEC) developed nuclear artillery rounds for the military's more maneuverable 155mm and 203mm howitzer artillery pieces, both of which were deployed overseas and maintained throughout the Cold War.²⁴⁹

2. Nuclear Missiles and Rockets

"If you are planning the Grand Strategy for tomorrow's war, you must consider seriously the impact of guided missiles," wrote Major General J. L. Homer, the commander of the U.S. Army's Antiaircraft Artillery and Guided Missile Center, in November 1947.²⁵⁰ "It is now apparent that this weapon may be developed to strike any portion of the globe from any geographical position."²⁵¹ General Homer penned these words a full decade before the Soviets in October 1957 launched *Sputnik I*, the world's

²⁴⁵ Hansen, *U.S. Nuclear Weapons*, 172.

²⁴⁶ Ibid.

²⁴⁷ Norris, Arkin, and Burr, "Where They Were," Appendix B; Terence Roehrig, *From Deterrence to Engagement: The U.S. Defense Commitment to South Korea* (Lanham, MD: Lexington Books, 2007), 188; Cochran et al., *U.S. Nuclear Warhead Production*, 10; Hansen, *U.S. Nuclear Weapons*, 173.

²⁴⁸ Bacevich, *Pentomic Era*, 84.

²⁴⁹ Ibid.; Norris, Arkin, and Burr, "Where They Were," Appendix B; Kinman, "The Army before Last," 42; Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 300–301.

²⁵⁰ J. L. Homer, "Guided Missiles and Future Warfare," *Military Review* 27, no. 8 (1947): 13, <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p124201coll1/id/943>.

²⁵¹ Ibid.

first manmade satellite, into orbit and confirmed that the Soviet Union would soon possess the capacity to attack the United States or its allies with nuclear weapons delivered by intercontinental ballistic missiles. Although Homer recognized shortcomings in missile technology in the late 1940s, he said that these were “purely mechanical limitations that research and development may overcome in the future.”²⁵² Homer was not the first Army officer to consider the implications of advances in missile technology. Just months after Japan’s surrender in 1945, Lieutenant Colonel Irving J. Harrell, Jr., an instructor in the Ordnance Department of the Command and General Staff School, published an article stating, “Only time will tell what the future holds for rockets, but future wars will probably see the use of bigger and more efficient rockets in ever-increasing numbers.”²⁵³

In 1953, only a year after the United States began production of the MK-9, the Army acquired its first nuclear missile, the Corporal, which was capable of delivering its W-7 warhead to a target 75 miles away.²⁵⁴ As America’s first operational guided missile, the Corporal represented a breakthrough in U.S. military technology.²⁵⁵ However, like the M65, the Corporal also had its shortcomings; it was liquid-fueled and very large, making it difficult to set up for a timely launch.²⁵⁶ Nevertheless, the Corporal provided the Army with an organic nuclear delivery system with greater range than the M65, and it served as a short-term solution until more advanced systems could be developed.²⁵⁷ The following year, the Army’s Honest John rocket entered into the Initial Operational Capability (IOC) phase.²⁵⁸ Although the Honest John was a heavy, unguided rocket with a range of just over twenty miles, it was solid-fueled and capable of being fired relatively

²⁵² Homer, “Guided Missiles and Future Warfare,” 13.

²⁵³ Irving J. Harrell, Jr., “Development and Employment of Rockets,” *Military Review* 25, no. 8 (1945): 24, <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p124201coll1/id/958>.

²⁵⁴ Bacevich, *Pentomic Era*, 86; Cochran et al., *U.S. Nuclear Warhead Production*, 10.

²⁵⁵ “Corporal Missile (MGM-5),” U.S. Department of Defense, U.S. Army Aviation and Missile Research Development and Engineering Center, July 20, 2014, <http://www.amrdec.army.mil/amrdec/50th/innovation-mgm-5.html>.

²⁵⁶ Bacevich, *Pentomic Era*, 86.

²⁵⁷ *Ibid.*

²⁵⁸ Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 282.

quickly from a truck.²⁵⁹ Soon thereafter, the Army also developed the solid-fueled, air-transportable Little John, which gave ground forces a nuclear delivery system with much greater maneuverability; however, the Little John was limited to a range of only 10 miles.²⁶⁰

As the Little John was being developed, the Army began fielding the Redstone missile while simultaneously working to develop the Jupiter missile, both of which had much longer ranges than the Corporal.²⁶¹ During the mid-1950s, the Jupiter program was the most successful missile program in America. On September 20, 1956, a Jupiter missile achieved a flight distance of 3,300 miles, and it could have placed a satellite into orbit if the Army had been given permission to do so at the time.²⁶² If the U.S. Army had orbited a satellite on that date, the United States would have been the first country to place a satellite into space, a full year before the Soviets succeeded with the orbit of *Sputnik I*. In light of the political pressure arising from *Sputnik I* and *Sputnik II*, as well as problems with the Navy's rocket program, the Army Ballistic Missile Agency was ordered to place a satellite into orbit by March 1958.²⁶³ Less than three months after the order was given, the Army accomplished its mission by using a modified Jupiter-C missile to launch *Explorer I*, America's first satellite, into orbit on January 31, 1958, a month ahead of schedule and seven months prior to the establishment of the National Aeronautics and Space Administration (NASA).²⁶⁴ The Army continued to serve the nation's interests in space by placing additional satellites into orbit until it was obliged to

²⁵⁹ Bacevich, *Pentomic Era*, 94.

²⁶⁰ *Ibid.*

²⁶¹ *Ibid.*, 87–88.

²⁶² "Explorer I," U.S. Department of Defense, U.S. Army Aviation and Missile Life Cycle Management Command, accessed July 20, 2014, <http://history.redstone.army.mil/space-explorer.html>; James Clay Moltz, *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests*, 2nd ed. (Stanford, CA: Stanford University Press, 2011), 88.

²⁶³ "Explorer I."

²⁶⁴ *Ibid.*; "NASA History in Brief," National Aeronautics and Space Administration, accessed August 2, 2014, <http://history.nasa.gov/brief.html>.

hand over its space program to the newly established NASA in 1960.²⁶⁵ Throughout the Cold War, the Army continued its development of rockets and missiles capable of carrying nuclear warhead payloads. In addition to those already mentioned, the Army developed the Sergeant surface-to-surface rocket; the Lacrosse, Lance, Pershing I, and Pershing II surface-to-surface missiles; and the Nike Hercules, Spartan, and Sprint surface-to-air missiles.²⁶⁶

3. Other Nuclear Devices

During the Cold War, the United States also developed a variety of Atomic Demolition Munitions (ADMs) and Davy Crockett recoilless rifles. ADMs first entered the Army's nuclear arsenal in 1954,²⁶⁷ and one of the first tests of an ADM occurred in 1955 during Operation TEAPOT in Nevada.²⁶⁸ Intended to be used as engineering tools to deny an enemy access to specific areas or avenues of approach or to destroy enemy fortifications, ADMs were designed for use by small teams of engineers or special operations forces.²⁶⁹ The smallest ADM,²⁷⁰ known as the Special Atomic Demolition Munition (SADM), weighed approximately 150 pounds and used the 59-pound W-54 warhead. This warhead's two-man emplacement team could select from a range of explosive yields progressing from tens of tons to a thousand tons equivalent of TNT.²⁷¹ Once put into position, ADMs could be detonated by either a timer or a remote device.²⁷² Eventually, Army leaders grew skeptical about the practicality of employing ADMs in a

²⁶⁵ "Explorer I." For more information about the U.S. Army's contributions to the America's space exploration endeavors, see "Pioneering Efforts in Space," U.S. Department of Defense, U.S. Army Aviation and Missile Life Cycle Management Command, accessed July 20, 2014, <http://history.redstone.army.mil/space-pioneer.html>.

²⁶⁶ Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 7–9, 284–97; Hansen, *U.S. Nuclear Weapons*, 195, 189.

²⁶⁷ Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 7.

²⁶⁸ Hansen, *U.S. Nuclear Weapons*, 209.

²⁶⁹ Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 311.

²⁷⁰ Seven different versions of ADM were produced for the military. ADMs were developed for the Army, the Marine Corps, and the Navy. Hansen, *U.S. Nuclear Weapons*, 209–10; Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 7–9.

²⁷¹ Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 38; Hansen, *U.S. Nuclear Weapons*, 210.

²⁷² Hansen, *U.S. Nuclear Weapons*, 209.

conflict and about the utility of being prepared to do so. In 1987, after considering how quickly U.S. forces would need to use ADMs near the demilitarized zone (DMZ) in Korea to prevent them from falling into enemy hands in the event of a North Korean invasion, General Louis Menetrey, the U.S. commander there, said that keeping ADMs near the DMZ was “pretty dumb.”²⁷³ A similar recognition occurred in Europe, where Army planners came to realize that, in the event of an attack by the Warsaw Pact, ADMs would need to be employed in Allied territory at the beginning of a conflict if they were to be used at all.²⁷⁴ Major General William F. Burns (Ret.) noted, “As this realization sank in, such weapons were quietly retired.”²⁷⁵

In 1961, the United States also began to produce recoilless rifles capable of firing a sub-kiloton nuclear warhead to a distance of over a mile for the 120mm version of the recoilless rifle and nearly two and a half miles for the 155mm version.²⁷⁶ The Davy Crockett, as the weapon system was named, was first tested in 1962 during Operation DOMINIC II in Nevada.²⁷⁷ After being launched from an armored personnel carrier, the warhead successfully traveled to its target nearly two miles away and produced a 20-ton yield explosion.²⁷⁸ By 1965, nearly 400 warheads had been produced for the Davy Crockett system.²⁷⁹ As with ADMs, Davy Crockett weapons were deployed to countries throughout the world.²⁸⁰ By 1971, however, the Davy Crockett was completely removed from the U.S. nuclear arsenal.²⁸¹ According to John Midgley, the removal of Davy Crockett recoilless rifles from the Army’s inventory came after commanders serving in

²⁷³ General Menetrey quoted in Terence Roehrig, *From Deterrence to Engagement: The U.S. Defense Commitment to South Korea* (Lanham, MD: Lexington Books, 2007), 190.

²⁷⁴ William F. Burns, “Tactical Nuclear Weapons and NATO: An Introductory Reminiscence,” in *Tactical Nuclear Weapons and NATO*, ed. Tom Nichols, Douglas Stuart, and Jeffrey D. McCausland (Carlisle, PA: Strategic Studies Institute, 2012), xvii–xviii.

²⁷⁵ *Ibid.*, xviii.

²⁷⁶ Hansen, *U.S. Nuclear Weapons*, 198.

²⁷⁷ *Ibid.*

²⁷⁸ *Ibid.*

²⁷⁹ *Ibid.*

²⁸⁰ Norris, Arkin, and Burr, “Where They Were,” Appendix B.

²⁸¹ Hansen, *U.S. Nuclear Weapons*, 198.

Europe had criticized the weapon system, and after practice firings of the Davy Crockett had revealed that the weapons were inaccurate.²⁸²

C. NUCLEAR EDUCATION

Shortly after the turnover to the Atomic Energy Commission, I was designated to organize the Armed Forces Special Weapons Project (AFSWP). This job had its genesis in a conversation I had had with Secretary Patterson following the passage of the Atomic Energy Act.... He said then that he was concerned about how the War Department would be able to fulfill its responsibilities resulting from the development of atomic weapons, and urged me to remain on active duty to handle the problems this would present.

—Lieutenant General (Ret.) Leslie R. Groves²⁸³

Although the Manhattan Project was terminated on December 31, 1946, the U.S. Army's Manhattan Engineer District (MED) lasted until August 1947.²⁸⁴ It was during the MED's final months that Major General Groves organized and commanded the Armed Forces Special Weapons Project (AFSWP), a joint organization created by the civilian leaders of the Army and the Navy.²⁸⁵ The AFSWP was responsible for the development of nuclear technologies for use by the nation's armed forces.²⁸⁶ In April 1947, Groves completed the AFSWP's draft charter and presented it to service chiefs Dwight Eisenhower and Chester Nimitz; three months later, a revised version of Groves's charter was approved.²⁸⁷ "The charter was not everything Groves had hoped for, but at least it gave him a toehold on the operational, as well as the policy side of the atomic weapon effort," wrote historians Richard Hewlett and Francis Duncan.²⁸⁸ "In the special

²⁸² Midgley, *Deadly Illusions*, 112.

²⁸³ Groves, *Now It Can Be Told*, 398.

²⁸⁴ Jones, *Manhattan*, 600.

²⁸⁵ Hewlett and Duncan, *Atomic Shield*, 131.

²⁸⁶ *Ibid.*

²⁸⁷ *Ibid.*

²⁸⁸ *Ibid.*

weapons project he [Groves] could make sure the military services would have the nuclear weapons they needed in time of crisis.”²⁸⁹

Groves also established the AFSWP’s Nuclear Weapons Technical Training Group at Sandia Base near Albuquerque, New Mexico.²⁹⁰ The mission of the Nuclear Weapons Technical Training Group was “to provide training, both resident and non-resident, in support of nuclear weapon training programs worldwide; to be responsive to requests for training services and support required to meet the needs of all DOD components and other cognizant agencies.”²⁹¹ At Sandia Base, officers and noncommissioned officers were trained on the assembly of nuclear bombs.²⁹² “Throughout, the aim was to give each man as much technical information as he could absorb,” remembered Groves.²⁹³ “The whole purpose of the operation was to make absolutely certain that in case of war, or even the threat of war, the Defense Department would have at its instant disposal teams ready and trained to assemble atomic weapons.”²⁹⁴

After Groves’s retirement from the Army, President Truman appointed Major General Kenneth Nichols, the former deputy commander of the Manhattan Project, as the head of the AFSWP on March 11, 1948.²⁹⁵ Later that month, General Eisenhower ordered Nichols to expedite the training of military personnel on the assembly of nuclear weapons in order to ensure that the military was prepared to respond to potential crises.²⁹⁶ At the time, only civilian engineers were capable of assembling the nation’s

²⁸⁹ Hewlett and Duncan, *Atomic Shield*, 131–2.

²⁹⁰ Groves, *Now It Can Be Told*, 399; Eugene V. Sheely, “A Brief History of the Defense Nuclear Weapons School,” *Combating WMD Journal*, no. 6 (2010): 51, <https://www.hsdl.org/?view&did=697744>.

²⁹¹ “Defense Nuclear Weapons School Fiscal Year 2014 Course Catalogue,” U.S. Department of Defense, Defense Threat Reduction Agency, accessed July 13, 2014, <http://www.dtra.mil/docs/documents-dnws/dnws-fy14-course-catalog.pdf?sfvrsn=4>, 4.

²⁹² Groves, *Now It Can Be Told*, 399.

²⁹³ *Ibid.*, 400.

²⁹⁴ *Ibid.*

²⁹⁵ Hewlett and Duncan, *Atomic Shield*, 158.

²⁹⁶ Rhodes, *Dark Sun*, 320.

nuclear weapons.²⁹⁷ By 1953, over 7,000 service members were involved in nuclear weapons training provided by the AFSWP.²⁹⁸ The Nuclear Weapons Technical Training Group, which had been established by the Manhattan Engineer District under Groves's command, later became the Special Weapons School, the predecessor of the Interservice Nuclear Weapons School and, eventually, the Defense Nuclear Weapons School, which still exists today.²⁹⁹ Likewise, key elements of the Defense Nuclear Agency and the Defense Threat Reduction Agency can be traced back to the AFSWP, which was chartered and organized by the Army's Manhattan Engineer District.³⁰⁰

D. NUCLEAR TRAINING

In addition to playing an important role in the establishment of the Nuclear Weapons Technical Training Group, designed to train personnel from each of the military services, the U.S. Army took additional steps to ensure that its soldiers were prepared to fight in a nuclear war. In the 1950s, the U.S. Army's Field Artillery School began training soldiers on the use of nuclear field artillery and missiles.³⁰¹ By 1965, the U.S. Army's Ordnance Guided Missile School (OGMS) at Redstone Arsenal in Alabama had assumed responsibility for managing the Army's nuclear weapons instruction, although the actual training was not conducted at Redstone at that time.³⁰² During the 1970s, however, the Ordnance Missile and Munitions Center and School (OMMCS), OGMS's successor, began conducting nuclear weapons training at Redstone Arsenal.³⁰³ The Army

²⁹⁷ Rhodes, *Dark Sun*, 320; Defense Threat Reduction Agency, *Defense's Nuclear Agency, 1974-1997* (Washington, DC: U.S. Department of Defense, 2002), 13–14, <http://www.dtra.mil/documents/aboutdtra/DefensesNuclearAgency.pdf>.

²⁹⁸ *Defense's Nuclear Agency*, 100.

²⁹⁹ "Defense Nuclear Weapons School Fiscal Year 2014 Course Catalogue," 4.

³⁰⁰ *Ibid*; Sheely, "Defense Nuclear Weapons School," 51.

³⁰¹ "Field Artillery School History," U.S. Department of Defense, U.S. Army Field Artillery School, accessed July 13, 2014, <http://sill-www.army.mil/USAFAS/history.html>.

³⁰² "Installation History 1965," U.S. Department of Defense, U.S. Army Aviation and Missile Life Cycle Management Command, accessed July 13, 2014, <http://history.redstone.army.mil/ihist-1965.html>.

³⁰³ "Installation History 1970," U.S. Department of Defense, U.S. Army Aviation and Missile Life Cycle Management Command, accessed July 13, 2014, <http://history.redstone.army.mil/ihist-1970.html>.

has also conducted nuclear weapons training at Aberdeen Proving Grounds, Maryland; Fort Belvoir, Virginia; and Indian Head, Maryland.³⁰⁴

The Army also participated in large-scale training exercises to evaluate the preparedness of its units and determine the best methods for arraying its forces and conducting operations on a nuclear battlefield. Training for nuclear war was first attempted in 1951 during a joint training event called Exercise SOUTHERN PINE.³⁰⁵ The following year, the Army conducted training that included nuclear scenarios during Exercise SNOW FALL.³⁰⁶ Throughout 1955, the Army executed training exercises FOLLOW ME, BLUE BOLT, and SAGE BRUSH, during which opposing forces exchanged simulated nuclear strikes.³⁰⁷ During Exercise SAGE BRUSH, the largest training exercise to have taken place inside the continental United States since World War II, nearly 110,000 Army soldiers and 30,000 members of the Air Force participated in a battle involving simulated attacks with chemical, biological, and electronic weapons as well as over nineteen megatons-worth of notional nuclear ordnance.³⁰⁸

E. NUCLEAR TESTING

In addition to participating in joint training exercises to improve the military's readiness to fight in a nuclear war, the U.S. Army also took part in the nation's first peacetime nuclear weapons tests, from which the U.S. government gained valuable data concerning nuclear weapons designs and effects. Originally conceived in the summer of 1945, Operation CROSSROADS was a series of two atomic tests at Bikini Atoll in the Marshall Islands in 1946 intended to test the effects of nuclear explosions on naval vessels and other military equipment and to determine the most effective way to use

³⁰⁴ Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 88.

³⁰⁵ Midgley, *Deadly Illusions*, 18; Paul C. Jussel, "Intimidating the World: The United States Atomic Army, 1956–1960" (PhD diss., Ohio State University, 2004), 35, https://etd.ohiolink.edu/!etd.send_file?accession=osu1085083063&disposition=inline.

³⁰⁶ Jussel, "Intimidating the World," 35.

³⁰⁷ Midgley, *Deadly Illusions*, 46–7, 49, 51.

³⁰⁸ Richard P. Weinert, *A History of Army Aviation, 1950-1962, Phase II: 1955–1962* (Fort Monroe, VA: U.S. Army Training and Doctrine Command Historical Office, 1976), <http://www.dtic.mil/dtic/tr/fulltext/u2/a033626.pdf>, 120–21; Midgley, *Deadly Illusions*, 51.

atomic weapons against naval formations.³⁰⁹ In addition to being the first peacetime nuclear explosion, Operation CROSSROADS was also, at that point in history, the nation's largest peacetime military operation ever performed.³¹⁰ Included in the 42,000 personnel involved in the operation were nearly 3,300 U.S. Army soldiers, who were tasked with dropping the first bomb in the test series; collecting air samples; determining weather conditions; providing logistical and signal support; and measuring radiation, equipment damage, and effective range for each of the nuclear explosions.³¹¹ During this \$1.3 billion operation, the Army entered into the health physics and biology field of nuclear weapons when select Army personnel were provided with film badges to monitor their exposure to nuclear radiation.³¹²

In the spring of 1948, the newly-established Atomic Energy Commission (AEC) conducted its first series of nuclear tests during Operation SANDSTONE at the Pacific Proving Ground (PPG) in the Marshall Islands.³¹³ Although the AEC was responsible for the operation, an Army general officer led the task force that conducted the operation, Joint Task Force 7, and the Chief of Staff of the Army was the military's executive agent for the test series.³¹⁴ Over 1,300 Army personnel were involved in Operation SANDSTONE, providing logistical and signal support; managing the task force; constructing test structures, airstrips, and base facilities; and assisting with the experimental scientific aspects of the operation.³¹⁵ Once again, Army personnel were given film badges to determine their radiation exposure.³¹⁶ A 1948 report by the AEC noted that "the measurements made during the [SANDSTONE] tests...furnished a much

³⁰⁹ Defense Nuclear Agency, "Operation CROSSROADS, 1946," U.S. Department of Defense, accessed July 16, 2014, <http://www.dtra.mil/documents/ntr/historical/DNA6032F.pdf>, 17–18.

³¹⁰ *Ibid.*, 17.

³¹¹ *Ibid.*, 17, 160, 164.

³¹² Kevin O'Neill, "Building the Bomb," in *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons since 1940*, ed. Stephen I. Schwartz (Washington, DC: Brookings Institution Press, 1998), 101; Defense Nuclear Agency, "Operation CROSSROADS, 1946," 47, 65, 160–171.

³¹³ Defense Nuclear Agency, "Operation SANDSTONE, 1948," U.S. Department of Defense, accessed July 16, 2014, <http://www.dtic.mil/dtic/tr/fulltext/u2/a139151.pdf>, 1.

³¹⁴ *Ibid.*, 1, 118.

³¹⁵ *Ibid.*, 118.

³¹⁶ *Ibid.*, 2–3.

sounder basis for the understanding of atomic explosions, which is necessary for the further development of atomic weapons.”³¹⁷

The U.S. Army continued to participate in nuclear weapons tests during the 1950s. Army officers were involved in experiments during all five of the nuclear tests constituting Operation RANGER in the early months of 1951.³¹⁸ Nearly 1,400 Army personnel worked to construct base facilities prior to Operation GREENHOUSE in the spring of the same year, and the Army provided logistical support throughout the operation.³¹⁹ During the summer of 1951, the Army sought authorization from the AEC to conduct training and psychological experiments in conjunction with nuclear tests.³²⁰ Although the AEC would not allow soldiers to come within seven miles of a nuclear explosion unless they were entrenched underground, the Army was given permission to establish a camp (codenamed Desert Rock) to observe nuclear explosions and to conduct psychological experiments on soldiers.³²¹ During Operation BUSTER-JANGLE, the U.S. Army conducted “the first in a series of ‘atomic exercises,’” according to a 1995 report by the Advisory Committee on Human Radiation Experiments.³²² Psychologists studied 600 Army personnel during BUSTER-JANGLE,³²³ and military personnel were sent to within 500 yards of nuclear explosion sites only hours after the tests were conducted.³²⁴

³¹⁷ U.S. Atomic Energy Commission, “Atomic Energy Development, 1947–1948,” 42.

³¹⁸ Defense Nuclear Agency, “Operation RANGER: Shots ABLE, BAKER, EASY, BAKER-2, FOX, 25 January–6 February 1951,” U.S. Department of Defense, accessed July 16, 2014, <http://www.dtra.mil/documents/ntpr/historical/1951%20-%20DNA%206022F%20-%20Operation%20RANGER%20-%20Shots%20ABLE,%20BAKER,%20EA.pdf>, 2, 77.

³¹⁹ U.S. Atomic Energy Commission, *Tenth Semiannual Report of the Atomic Energy Commission* (Washington, DC: U.S. Atomic Energy Commission, 1951), 6.

³²⁰ Terrence R. Fehner and F. G. Gosling, *Atmospheric Nuclear Weapons Testing, 1951–1963*, vol. 1 of *Battlefield of the Cold War: The Nevada Test Site* (Washington, DC: U.S. Department of Energy, 2006), 68-70, <http://www.energy.gov/sites/prod/files/DOENTSAtmospheric.pdf>.

³²¹ *Ibid.*, 70; Advisory Committee on Human Radiation Experiments, *Final Report of the Presidential Advisory Committee on Human Radiation Experiments*, 1995, <https://archive.org/stream/advisorycommitte00unit#page/n1/mode/2up>, 460.

³²² Advisory Committee on Human Radiation Experiments, *Final Report of the Presidential Advisory Committee on Human Radiation Experiments*, 459.

³²³ *Ibid.*, 460.

³²⁴ Fehner and Gosling, *Atmospheric Nuclear Weapons Testing*, 72.

For the next series of nuclear tests, named Operation TUMBLER-SNAPPER, the military requested permission from the AEC to place troops much closer to the nuclear explosions than it had in previous tests.³²⁵ The AFSWP proposed positioning troops in trenches located just 7,000 yards from the explosions and maneuvering ground forces near the point of detonation following each test.³²⁶ After some consideration, the AEC approved the AFSWP's request.³²⁷ During TUMBLER-SNAPPER, the Army continued its psychological experiments,³²⁸ and troops positioned 7,000 yards from ground zero left their foxholes to conduct maneuvers near the points of detonation after the explosions.³²⁹ The AEC reported that the TUMBLER-SNAPPER tests were "a fundamental part of the weapons development process and...essential to advancement in this phase of work, both to improve weapon design and performance, and to increase knowledge of the effects of atomic explosions."³³⁰

On November 1, 1952, Joint Task Force 132, designated by President Truman and led by an Army officer, tested the world's first nuclear fusion device during Operation IVY.³³¹ Over 1,300 Army personnel were involved in the operation.³³² They provided logistical and signal support, conducted experiments, and performed radiological safety functions.³³³ In addition to testing a fusion explosion during Operation IVY, the task force also tested a boosted fission bomb.³³⁴ These tests marked an important milestone in the development of more powerful nuclear weapons designs.

³²⁵Fehner and Gosling, *Atmospheric Nuclear Weapons Testing*, 75.

³²⁶ Ibid.

³²⁷ Ibid., 75–76.

³²⁸ Advisory Committee on Human Radiation Experiments, *Final Report of the Presidential Advisory Committee on Human Radiation Experiments*, 462.

³²⁹ Fehner and Gosling, *Atmospheric Nuclear Weapons Testing*, 77–78.

³³⁰ U.S. Atomic Energy Commission, *Major Activities in the Atomic Energy Programs* (Washington, DC: U.S. Atomic Energy Commission, 1952), 13.

³³¹ Joanne Lamm, "The Island is Missing!" U.S. Department of Defense, U.S. Army News Archives, accessed July 16, 2014, http://www.army.mil/article/47341/The_Island_is_Missing_/; Defense Nuclear Agency, "Operation IVY, 1952," U.S. Department of Defense, accessed July 16, 2014, <http://www.dtra.mil/documents/ntp/historical/DNA6036F.pdf>, 209.

³³² Defense Nuclear Agency, "Operation IVY, 1952," 209.

³³³ Ibid.

³³⁴ Ibid., 1.

During America's next series of nuclear tests, named Operation UPGHOT-KNOTHOLE, the AEC permitted the military to position troops even closer than it had during TUMBLER-SNAPPER.³³⁵ Instead of the previous 7,000 yard limit, many troops were allowed to be entrenched only 3,500 yards away from the nuclear explosions, and several dozen Army officers volunteered to be placed in foxholes only 1,500 yards from the blasts.³³⁶ In addition to testing the effects of nuclear explosions on entrenched soldiers during UPGHOT-KNOTHOLE, the Army conducted its third series of psychological experiments, tested its first nuclear artillery round from a 280mm cannon, and participated in large training exercises involving over 13,000 soldiers near ground zero following six of the nuclear explosions in the series.³³⁷ Many of these soldiers were exposed to radioactive fallout, and some required immediate evacuation.³³⁸ Despite the possibility of exposing greater numbers of soldiers to dangerous fallout, the Army decided to continue placing officer volunteers in close proximity to nuclear explosions during Operations TEAPOT in 1955 and PLUMBBOB in 1957; however, the AFSWP denied the Army's request to continue decreasing the distance between soldiers and nuclear explosions.³³⁹

F. NUCLEAR DOCTRINE

It is incumbent upon us all to assist in developing tactics and organization which will make the best use of the capabilities of the tactical atomic weapon. If we believe the advent of nuclear weapons presents an insurmountable problem to the strategist, tactician, and logistician, we have begun to lose the flexibility and imagination without which we are doomed to defeat. If we accept this technological advancement as the greatest challenge in centuries of military operations, we can make this

³³⁵ Fehner and Gosling, *Atmospheric Nuclear Weapons Testing*, 91–93.

³³⁶ *Ibid.*, 93; Advisory Committee on Human Radiation Experiments, *Final Report of the Presidential Advisory Committee on Human Radiation Experiments*, 464.

³³⁷ Fehner and Gosling, *Atmospheric Nuclear Weapons Testing*, 101–2; Advisory Committee on Human Radiation Experiments, *Final Report of the Presidential Advisory Committee on Human Radiation Experiments*, 464.

³³⁸ Fehner and Gosling, *Atmospheric Nuclear Weapons Testing*, 103.

³³⁹ Advisory Committee on Human Radiation Experiments, *Final Report of the Presidential Advisory Committee on Human Radiation Experiments*, 464–5.

force the basis for the preservation of peace—or for victory in war if the need arises.

—Brigadier General William F. Train, U.S. Army Assistant Commandant,
Command and General Staff College³⁴⁰

In John Midgley’s view, the Army was unable to develop “realistic doctrine” for the nuclear battlefield.³⁴¹ He wrote that “doctrinal development became a process of grafting atomic weapons onto the conventional army”³⁴² and that the Army failed to define properly the “tactical requirements”³⁴³ and the “military characteristics of the nuclear battlefield,”³⁴⁴ to understand “the effects of atomic weapons,”³⁴⁵ or to determine whether the Army could “actually conduct a nuclear campaign.”³⁴⁶ According to Midgley, “doctrine was written to demonstrate that the Army could...conduct the types of operations it claimed were necessary while using atomic weapons.”³⁴⁷ In his opinion, “it was the prevention of an Air Force atomic monopoly, rather than a quest for some specific battlefield capability,”³⁴⁸ that drove this process. Although evidence suggests that the Army’s initial efforts to gain access to nuclear weapons were in part the result of inter-service struggles, Midgley’s argument does not explain the Army’s doctrinal and organizational evolution throughout the 1950s and 1960s. In fact, for years after the initial competition for nuclear missions occurred, Army officers and planners wrestled with the hard realities of the nuclear battlefield. Far removed from high politics over strategic doctrine, the Army had no choice but to figure out how to make sense of the extraordinary explosive power available through nuclear weapons.

³⁴⁰ William F. Train, “The Atomic Challenge,” *Military Review* 36, no. 8 (1956): 14, <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p124201coll1/id/749>.

³⁴¹ Midgley, *Deadly Illusions*, 175.

³⁴² *Ibid.*, 14.

³⁴³ *Ibid.*, 31.

³⁴⁴ *Ibid.*, 175.

³⁴⁵ *Ibid.*, 14.

³⁴⁶ *Ibid.*, 14–15.

³⁴⁷ *Ibid.*, 14.

³⁴⁸ *Ibid.*, 2.

The Army did not overlook the characteristics of the nuclear battlefield, nor did it fail to grasp the implications of nuclear weapons; rather, it developed its doctrine based upon notions of what the battlefield would look like given the destructive power of nuclear weapons. “The Army recognized that a dynamic change had occurred in the military environment with the advent of atomic technology,”³⁴⁹ wrote John P. Rose. In his book published in 1980, Rose pointed out that “U.S. Army officers in the 1950s were greatly concerned with the application of atomic firepower”³⁵⁰ and that they questioned not only the changing operational environment but also the composition and role of army units and the nature of joint operations in a nuclear war.³⁵¹

Andrew J. Bacevich also concluded that Army officers were quick to grasp the implications of nuclear weapons.³⁵² “As never before, the Army focused on a simple factor—technology—as the principal determinant of how wars would be fought,” he said.³⁵³ For example, in 1950 Lieutenant General Leslie Groves was quoted as saying, “I anticipate the use of widely dispersed small forces—combat team size and even smaller—their equipment light—their supplies limited—not only air-supported but probably air-transported and air-supplied.”³⁵⁴ General Maxwell Taylor told students at the Command and General Staff College, “The Army is burning its military textbooks to clear away the old and make way for the new.”³⁵⁵ Even Midgley acknowledged, “the tentative steps toward incorporation of atomic weapons which had characterized the 1945–52 period were replaced by bold strides including...new combat doctrine and a fundamental revision of the Army nuclear strategy” and that Army planners “devoted

³⁴⁹ Rose, *The Evolution of U.S. Army Nuclear Doctrine*, 56.

³⁵⁰ *Ibid.*, 55.

³⁵¹ *Ibid.*, 56.

³⁵² Bacevich, *Pentomic Era*, 53–54.

³⁵³ *Ibid.*, 53.

³⁵⁴ Leslie R. Groves quoted in P. H. H. Bryan, “The Ground Offensive in Atomic Warfare,” *Military Review* 30, no. 4 (1950): 110, <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p124201coll1/id/896>.

³⁵⁵ Maxwell Taylor quoted in Bacevich, *Pentomic Era*, 53.

their principal efforts to building units capable of exploiting the effects of battlefield nuclear weapons.”³⁵⁶

Military doctrine is defined as the “fundamental principles that guide the employment of forces.”³⁵⁷ By 1954, the U.S. Army had incorporated principles regarding nuclear weapons as well as lessons learned from the Korean War into its Field Manual 100-5 (FM 100-5).³⁵⁸ This manual prescribed the “integration of atomic firepower”³⁵⁹ with maneuver, and it instructed commanders to “be prepared to rapidly exploit the advantages gained” if the decision was made to use nuclear weapons.³⁶⁰ In addition to describing how to plan for nuclear weapons use, the manual also articulated how commanders should employ their forces in a nuclear attack.³⁶¹ “Plans provide for immediate movement through or around the target area. Exploiting units remain dispersed until the critical moment, then concentrate rapidly, and move to the decisive point to take maximum advantage of surprise and the enemy’s disorganization.”³⁶² FM 100-5 also discussed the employment of nuclear weapons in defensive operations.³⁶³ In conjunction with the development of written doctrine, the Army also participated in a number of large-scale nuclear training exercises, as discussed above, and increased the volume of institutional training focused on nuclear warfare.³⁶⁴

Midgley’s claim that the development of doctrine “became a process of grafting atomic weapons onto the conventional army”³⁶⁵ overlooks the fact that the Army

³⁵⁶ Midgley, *Deadly Illusions*, 31.

³⁵⁷ U.S. Department of Defense, *Joint Publication 1: Joint Warfare of the Armed Forces of the United States* (Washington, DC: U.S. Department of Defense, 2000), vi.

³⁵⁸ Trauschweizer, “Nuclear Weapons and Limited War,” 4.

³⁵⁹ “Field Manual 100-5, Field Service Regulations: Operations, September 1954,” U.S. Department of Defense, Department of the Army, Combined Arms Research Library Digital Library, accessed July 28, 2014, <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p4013coll9/id/79>, 2.

³⁶⁰ *Ibid.*, 3.

³⁶¹ *Ibid.*, 96.

³⁶² *Ibid.*

³⁶³ *Ibid.*, 125.

³⁶⁴ William R. Van Cleave and S. T. Cohen, *Tactical Nuclear Weapons: An Examination of the Issues* (New York: Crane Russak, 1978), 5.

³⁶⁵ Midgley, *Deadly Illusions*, 14.

drastically restructured its forces—twice—in response to nuclear-related changes in national strategy.³⁶⁶ The Army’s Pentomic divisions—restructured Army divisions consisting of five (penta) battle groups armed with nuclear (atomic) weapons and designed primarily for nuclear combat but intended to operate effectively on both the nuclear and nonnuclear battlefield—were developed to correspond to President Eisenhower’s New Look and its emphasis on nuclear deterrence and smaller conventional forces.³⁶⁷ Likewise, following President Kennedy’s directive to reform the Army into an organization better suited for nonnuclear conflicts,³⁶⁸ the Army responded by developing the Reorganization Objectives Army Division (ROAD).³⁶⁹ ROADS typically consisted of three brigades armed with both nuclear and conventional weapons, and they were capable of being tailored to meet operational demands.³⁷⁰ Like the Pentomic divisions, ROADS were intended to be dual-capable, but they were designed specifically for nonnuclear warfare.³⁷¹ Furthermore, the Army published its 1954 doctrine guiding nuclear operations (FM 100-5) after the Army had already participated in a number of nuclear weapons effects tests, as described above, and also after it had begun to acquire nuclear weapons.³⁷² Thus, the development of doctrine was not carried out without considering the effects of nuclear weapons, nor was it undertaken merely to justify the procurement of nuclear weapons or other equipment. The Army developed its nuclear doctrine to guide the employment of its forces in nuclear operations, and it was responsive to the changing demands of both national security and national strategy.

³⁶⁶ David S. Yost, “The History of NATO Theater Nuclear Force Policy: Key Findings from the Sandia Conference,” *Journal of Strategic Studies* 15, no. 2 (1992): 242, doi: 10.1080/01402399208437482; Van Cleave and Cohen, *Tactical Nuclear Weapons*, 5–6.

³⁶⁷ Bacevich, *Pentomic Era*, 106–8; Robert A. Doughty, “The Evolution of U.S. Army Tactical Doctrine, 1946–76,” *Leavenworth Papers*, no. 1 (1979): 16–18, 22, <http://carl.army.mil/download/csipubs/doughty.pdf>.

³⁶⁸ Van Cleave and Cohen, *Tactical Nuclear Weapons*, 6.

³⁶⁹ Doughty, “Evolution of U.S. Army Tactical Doctrine,” 21.

³⁷⁰ *Ibid.*, 21–22.

³⁷¹ *Ibid.*

³⁷² Trauschweizer, “Nuclear Weapons and Limited War,” 4.

G. NUCLEAR DEPLOYMENTS

Due to the significant threat facing U.S. allies in Europe and the Asia-Pacific region, the growing U.S. reliance on nuclear weapons during the Cold War, and the limited range of America's early nuclear delivery systems, the United States thought it necessary to deploy nuclear weapons and their components overseas in order to deter communist aggression, assure U.S. allies regarding the genuineness of U.S. security commitments, and defend U.S. allies against possible attacks.³⁷³ Even before the Army acquired its second nuclear arsenal, the United States had already begun the overseas deployment of nonnuclear components of nuclear weapons.³⁷⁴ Not long after the Army received its first generation of tactical nuclear weapons—the 280mm atomic cannon, the Corporal missile, and the Honest John rocket³⁷⁵—it reportedly began to deploy them to countries throughout Europe as well as to South Korea and Japan.³⁷⁶

1. Europe

On April 4, 1949, the United States, Canada, and ten Western European countries established NATO in an effort to improve collective defense and regional stability.³⁷⁷ This peacetime military alliance was the first that the United States had ever entered into outside of the Western Hemisphere, and it marked a significant break from a U.S.

³⁷³ Elbridge A. Colby, "U.S. Nuclear Weapons Policy and Policymaking: The Asian Experience," in *Tactical Nuclear Weapons and NATO*, ed. Tom Nichols, Douglas Stuart, and Jeffrey D. McCausland (Carlisle, PA: Strategic Studies Institute, 2012), 78–79.

³⁷⁴ Robert S. Norris, William M. Arkin, and William Burr, "Where They Were," *Bulletin of the Atomic Scientists* 55, no. 6 (1999): 27, <http://bos.sagepub.com/content/55/6/26.full>.

³⁷⁵ Midgley, *Deadly Illusions*, 13.

³⁷⁶ Norris, Arkin, and Burr, "Where They Were," Appendix B. According to Norris, Arkin, and Burr, nuclear weapons were deployed to a number of locations throughout the Pacific—Guam, Hawaii, Japan, Johnston Island, Kwajalein, Midway, Okinawa, the Philippines, the Republic of Korea, and Taiwan; however, only Guam, Hawaii, Johnston Island, and Midway were publically recognized as hosts of U.S. nuclear weapons by the Department of Defense at the time. Little information is available about U.S. nuclear deployments to many of the countries in the Pacific region other than that pertaining to South Korea and Japan.

³⁷⁷ "The North Atlantic Treaty," North Atlantic Treaty Organization, accessed June 2, 2014, http://www.nato.int/cps/en/natolive/official_texts_17120.htm; "Milestones: 1949–1952," U.S. Department of State, Office of the Historian, accessed June 2, 2014, <https://history.state.gov/milestones/1945-1952/>.

tradition of isolation dating back to George Washington’s presidency.³⁷⁸ Article 5 of the North Atlantic Treaty commits members to act “to restore and maintain the security of the North Atlantic area” in the event of an attack and states that “an armed attack against one...shall be considered an attack against them all.”³⁷⁹ Since that time, nuclear weapons have played an important role in the alliance. Some European countries relied on the growing U.S. nuclear arsenal to deter Soviet aggression even before NATO was established.³⁸⁰ “It is certain that Europe would have been Communized, like Czechoslovakia, and London under bombardment some time ago but for the deterrent of the atomic bomb in the hands of the United States,” remarked Winston Churchill just days before the North Atlantic Treaty was signed.³⁸¹ Moreover, many of the Europeans in favor of the alliance sought accession to the North Atlantic Treaty specifically for the purpose of obtaining from the United States a guarantee to use its nuclear weapons to defend Europe.³⁸² Soon after NATO was formed, the United States formally committed its nuclear arsenal to the defense of the alliance.³⁸³ Thereafter, the United States used its nuclear arsenal to deter all forms of aggression against—and coercion of—its European allies throughout the Cold War, and it has continued to do so since.³⁸⁴

From the early years of the Cold War, the United States has also maintained an on-shore arsenal of nuclear weapons in Europe. In 1950, President Harry Truman authorized the deployment of 89 sets of non-nuclear components of nuclear weapons to Great Britain.³⁸⁵ According to Norris, Arkin, and Burr, between 1954 and 1963, the

³⁷⁸ “Milestones: 1949–1952”; “Washington’s Farewell Address to the People of the United States,” Senate Document No. 106-21, Senate History, U.S. Senate, accessed June 2, 2014, <http://www.gpo.gov/fdsys/pkg/GPO-CDOC-106sdoc21/pdf/GPO-CDOC-106sdoc21.pdf>, 26–29. In his speech, President Washington warned Americans of the dangers of forming permanent alliances with European nations.

³⁷⁹ “The North Atlantic Treaty.”

³⁸⁰ David S. Yost, “Strategic Stability in Europe,” *The Nonproliferation Review* 20, no. 2 (2013): 208–9, doi: 10.1080/10736700.2013.804317.

³⁸¹ Winston Churchill quoted in David S. Yost, “The U.S. Debate on NATO Nuclear Deterrence,” *International Affairs* 87, no. 6 (2011): 1402, doi:10.1111/j.1468-2346.2011.01043.x.

³⁸² Yost, “U.S. Debate,” 1402.

³⁸³ Yost, “Strategic Stability in Europe,” 208–9.

³⁸⁴ *Ibid.*, 236.

³⁸⁵ Norris, Arkin, and Burr, “Where They Were,” 27.

United States deployed a variety of nuclear weapons to eight European NATO countries: Belgium, France, Greece, Italy, the Netherlands, Turkey, the United Kingdom, and West Germany.³⁸⁶ Whether U.S. nuclear weapons have ever been deployed in France remains open to debate. The topic remains highly sensitive. French scholars have been unable to reach conclusive findings.³⁸⁷ Germany alone has hosted as many as 21 different types of U.S. nuclear weapons since the mid-1950s.³⁸⁸ Furthermore, according to research based on a declassified but heavily redacted report drafted and released by the U.S. Department of Defense, it is clear that nuclear weapons were deployed to a number of other countries, although it is not publically known which countries those were.³⁸⁹ Nevertheless, most of the Army's nuclear weapons systems—artillery pieces, missiles, rockets, recoilless rifles, and ADMs—were deployed to Europe.³⁹⁰

In October 1957, the Soviet Union successfully launched its *Sputnik I* satellite into orbit. As a result of this event, the United States began to enter into nuclear sharing arrangements, which came to be known as Programs of Cooperation (POCs), with select allies in an effort to give them a more prominent role in nuclear deterrence as well as their own defense.³⁹¹ POCs were bilateral agreements whereby either the United States would provide nuclear delivery systems, support, and training on those systems or allies would agree to allow the United States to base nuclear weapons and their components in their country or provide personnel and systems to deliver U.S. nuclear weapons.³⁹² Under the arrangements, the United States military would maintain custody of the nuclear

³⁸⁶ Norris, Arkin, and Burr, "Where They Were," 29.

³⁸⁷ See, for example, Olivier Pottier, "Les armes nucléaires américaines en France, 1952–1966," in *Histoire de l'armement nucléaire*, Cahier no. 8 (Vincennes: Centre d'études d'histoire de la Défense, 1998).

³⁸⁸ Norris, Arkin, and Burr, "Where They Were," 29.

³⁸⁹ *Ibid.*, Appendix B.

³⁹⁰ *Ibid.*

³⁹¹ Yost, "U.S. Debate," 1403; Norris, Arkin, and Burr, "Where They Were," 29–30.

³⁹² Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 94; Norris, Arkin, and Burr, "Where They Were," 29–30; Yost, "U.S. Debate," 1403–4.

weapons until authorized by the President to transfer them to U.S. allies in the event of war.³⁹³

David Yost provides a number of reasons why the United States decided to enter into such arrangements, to reassure its allies of its defense commitments,³⁹⁴ to share with others the political burdens that come with incorporating nuclear weapons into a defense posture,³⁹⁵ and to enhance deterrence and “transatlantic cohesion.”³⁹⁶ By providing nuclear weapons to its allies, the United States also removed one of the incentives for nuclear proliferation.³⁹⁷ Since the POCs began, the United States has continued to share its nuclear responsibilities with some of its NATO allies. The NATO Allies affirmed the value of these arrangements in their 2012 Deterrence and Defense Posture Review, which states that NATO is committed to remaining “a nuclear alliance for as long as nuclear weapons exist” and that the North Atlantic Council (NAC) “will task the appropriate committees to develop concepts for how to ensure the broadest possible participation of Allies concerned in their nuclear sharing arrangements.”³⁹⁸ Throughout the 1960s and early 1970s, nearly 40 percent of the U.S. nuclear stockpile in Europe was earmarked for wartime use by its allies.³⁹⁹ The United States has had POC agreements with Belgium, Canada, Germany, Greece, Italy, the Netherlands, Turkey, and the United Kingdom.⁴⁰⁰ Many of the weapons systems provided for allied use were those developed for the Army.⁴⁰¹

³⁹³ Yost, “U.S. Debate,” 1403–4; Paul Schulte, “Tactical Nuclear Weapons in NATO and beyond: A Historical and Thematic Examination,” in *Tactical Nuclear Weapons and NATO*, ed. Tom Nichols, Douglas Stuart, and Jeffrey D. McCausland (Carlisle, PA: Strategic Studies Institute, 2012), 42.

³⁹⁴ Yost, “U.S. Debate,” 1403.

³⁹⁵ *Ibid.*, 1404.

³⁹⁶ *Ibid.*, 1406.

³⁹⁷ Schulte, “Tactical Nuclear Weapons,” 43.

³⁹⁸ “Deterrence and Defense Posture Review, 20 May, 2012,” North Atlantic Treaty Organization, accessed August 28, 2014, http://www.nato.int/cps/en/natolive/official_texts_87597.htm?mode=press_release, paragraph 12.

³⁹⁹ Norris, Arkin, and Burr, “Where They Were,” 29–30.

⁴⁰⁰ Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 94.

⁴⁰¹ Schulte, “Tactical Nuclear Weapons,” 42.

In 1960, the number of U.S. nuclear weapons in NATO countries reached nearly 3000; 11 years later, the United States had approximately 7,300 nuclear weapons stationed in NATO countries.⁴⁰² Since that time, the number of U.S. nuclear weapons in Europe has steadily declined. Today, published reports state that there are roughly 200 U.S. tactical nuclear weapons (B61 gravity bombs) based in five NATO European countries—Belgium, Germany, Italy, the Netherlands, and Turkey.⁴⁰³ Despite the relatively low numbers of European-based U.S. nuclear weapons, the United States continues to maintain its POC agreements with certain NATO members.⁴⁰⁴

Looking back on the history of the Cold War, Major General (Ret.) William F. Burns remarked, “NATO’s bet on the utility of tactical nuclear weapons as a deterrent apparently paid off.”⁴⁰⁵ The Army’s European-based nuclear arsenal, however, provided a number of benefits beyond simply deterring an attack by Warsaw Pact countries. Paul Schulte points out that the tactical nuclear weapons that were deployed to Europe were much less expensive than the cost of standing up large conventional NATO forces would have been.⁴⁰⁶ “The long-term effects of lower military expenditure and smaller conscript armies helped generate the economic and cultural buoyancy which was such a Western competitive advantage in the Cold War,” Schulte says.⁴⁰⁷ Another benefit of the Army’s nuclear weapons is related to the nuclear sharing arrangements established between the United States and West Germany, where many of the Army’s nuclear weapons were shared with West Germany, including Lance, Nike Hercules, and Pershing missiles; 155mm and 203mm howitzers; and ADMs.⁴⁰⁸ According to David Yost, these and other arrangements provided strong incentives for West Germany to accede to the Treaty on

⁴⁰² Norris, Arkin, and Burr, “Where They Were,” 29.

⁴⁰³ Hans M. Kristensen and Robert S. Norris, “U.S. Nuclear Forces, 2014,” *Bulletin of the Atomic Scientists* 70, no. 1 (2014): 92, doi: 10.1177/0096340213516744. Since 1991, the U.S. Army has not had a nuclear weapons delivery mission, and after that date, all of the Army’s nuclear weapons were removed from overseas bases and destroyed.

⁴⁰⁴ Norris, Arkin, and Burr, “Where They Were,” 30.

⁴⁰⁵ Burns, “Tactical Nuclear Weapons,” xv.

⁴⁰⁶ Schulte, “Tactical Nuclear Weapons,” 22.

⁴⁰⁷ Ibid.

⁴⁰⁸ Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 95.

the Non-Proliferation of Nuclear Weapons (NPT) as a non-nuclear-weapon state (NNWS).⁴⁰⁹

The deployment of U.S. tactical nuclear weapons also helped with assurance and alliance cohesion. In 1985, Manfred Wörner, then the West German Defense Minister, shared his views about the importance of U.S. nuclear weapons when he acknowledged, “We will have to continue to rely on the American nuclear umbrella.”⁴¹⁰ The following year, former U.S. Secretary of Defense James Schlesinger said, “Nuclear weapons provide the glue that has held the Western alliance together.”⁴¹¹ Opinion polls of West Europeans also reveal that many U.S. allies during the Cold War had more faith in the United States to uphold its collective defense obligations than they had in fellow European NATO countries.⁴¹² Furthermore, in the late 1980s, U.S. defense secretaries indicated that the basing of U.S. troops in Europe, a vital component of NATO’s deterrent posture, could be contingent on the basing of U.S. tactical nuclear weapons there;⁴¹³ thus, the deployment of tactical nuclear weapons provided deterrence benefits beyond the deterrence value of the weapons themselves. Although it is impossible to determine the extent to which the Army’s nuclear weapons contributed to the longevity and security of NATO, it is fair to say that the Army and its nuclear weapons did play important roles in NATO’s security during the Cold War.

2. South Korea

On July 27, 1953, the United Nations Command’s Senior Delegate, Lieutenant General William Harrison, signed the 1953 Armistice Agreement, ending the Korean War.⁴¹⁴ South Korean President Syng-man Rhee, concerned that the withdrawal of

⁴⁰⁹ Yost, “U.S. Debate,” 1405.

⁴¹⁰ Manfred Wörner quoted in David S. Yost, “Assurance and U.S. Extended Deterrence,” *International Affairs* 85, no. 4 (2009): 761, <http://hdl.handle.net/10945/38369>.

⁴¹¹ Yost, “U.S. Debate,” 1406.

⁴¹² Yost, “Assurance,” 765.

⁴¹³ Yost, “U.S. Debate,” 1406.

⁴¹⁴ “Transcript of the Armistice Agreement for the Restoration of the South Korean State (1953),” National Archives and Records Administration, accessed August 3, 2014, <http://www.ourdocuments.gov/doc.php?doc=85&page=transcript>.

300,000-plus U.S. troops would leave his country vulnerable to subsequent communist aggression, asked the United States to continue to assist in the defense of the Republic of Korea (ROK).⁴¹⁵ Within a few months, the nations signed the ROK-U.S. Mutual Defense Treaty, which went into effect in November 1953.⁴¹⁶ The treaty stipulated that both countries would “develop appropriate means to deter” an attack and “act to meet” an attack against either country in the Pacific theater.⁴¹⁷ It also authorized the United States to “dispose...forces” in South Korea as long as both parties consented.⁴¹⁸ For over 60 years, the United States has upheld its pledge to deter common enemies and to defend South Korea. During the immediate post-Armistice period, the United States made its promise credible in three important ways: it maintained an initial force large enough to assist in the defense of South Korea and the modernization of the ROK military, it preserved a long-term military presence based in South Korea to serve as a trip wire in the event of an attack, and it eventually deployed tactical nuclear weapons to South Korea.⁴¹⁹

The deployment of U.S. nuclear weapons to South Korea began in 1958, after the United Nations Command released a statement indicating that the introduction of additional weapons into North Korea nullified the 1953 Armistice Agreement, which proscribed “the introduction into Korea of reinforcing combat aircraft, armored vehicles, weapons, and ammunition.”⁴²⁰ There were several further reasons why the United States

⁴¹⁵ Republic of Korea Ministry of National Defense, *ROK-US Alliance and USFK* (Seoul: Republic of Korea Ministry of National Defense, 2002), 28, 36–37; Lee Jae-Bong, “U.S. Deployment of Nuclear Weapons in 1950s South Korea and North Korea’s Nuclear Development: Toward Denuclearization of the Korean Peninsula,” *The Asia-Pacific Journal* 8, no. 3 (2009), http://www.japanfocus.org/-lee-jae_bong/3053.

⁴¹⁶ Republic of Korea Ministry of National Defense, *ROK-US Alliance and USFK*, 28, 36–37.

⁴¹⁷ “1953 Mutual Defense Treaty, USFK SOFA Documents,” U.S. Department of Defense, accessed June 2, 2014, <https://www.usfk.mil/usfk/sofa.1953.mutual.defense.treaty>, 76.

⁴¹⁸ *Ibid.*

⁴¹⁹ Republic of Korea Ministry of National Defense, *ROK-US Alliance and USFK*, 28, 36–37; Jae-Bong, “U.S. Deployment of Nuclear Weapons.”

⁴²⁰ Roehrig, *From Deterrence to Engagement*, 186–8; Peter Hayes, *Pacific Powderkeg: American Nuclear Dilemmas in Korea* (Lexington, MA: Lexington Books, 1991), 34; “Armistice Agreement for the Restoration of the South Korean State (1953),” National Archives and Records Administration, 100 Milestone Documents, accessed June 2, 2014, <http://www.ourdocuments.gov/doc.php?flash=true&doc=85&page=transcript>.

decided to deploy nuclear weapons to South Korea. The United States wanted to reduce its defense spending, improve its combined defenses on the peninsula, and demonstrate the credibility of its pledge to defend South Korea against possible future attacks.⁴²¹

President Dwight D. Eisenhower authorized the deployment of nuclear weapons to South Korea, and, by the end of his administration, the United States had deployed 600 to the peninsula; the second largest stockpile of U.S. nuclear weapons in Asia (the largest one was in Okinawa).⁴²² By 1967, the U.S. deployment of nuclear weapons to the Korean Peninsula had reached the highest level in history, that is, 949 weapons.⁴²³ According to the *Nuclear Weapons Databook*, the United States also established nuclear sharing agreements with South Korea, specifically concerning nuclear-armed Honest John rockets, Nike Hercules missiles, 203mm howitzers, and 155mm howitzers.⁴²⁴ In addition to these weapons systems, the U.S. Army reportedly secretly deployed Sergeant rockets, 280mm cannons, and ADMs.⁴²⁵ The basing of these weapons in South Korea was not officially made public until 1975.⁴²⁶ Between 1967 and 1977, the United States gradually reduced its Pacific land-based nuclear arsenal by over half. By 1977, South Korea was the only Asian country to have U.S. nuclear weapons based on its soil, and it remained as such until December 1991, when all U.S. nuclear weapons were removed from South Korea following a September 1991 decision by President George H.W. Bush.⁴²⁷

According to Terence Roehrig, “For much of the period of the U.S.-ROK alliance, nuclear weapons based in Korea were an important part of the U.S. defense

⁴²¹ Roehrig, *From Deterrence to Engagement*, 187.

⁴²² Norris, Arkin, and Burr, “Where They Were,” 30.

⁴²³ Norris, “United States Nuclear Weapons Deployments Abroad, 1950–1977.”

⁴²⁴ Cochran, Arkin, and Hoenig, *U.S. Nuclear Forces and Capabilities*, 94–95.

⁴²⁵ Roehrig, *From Deterrence to Engagement*, 188–9.

⁴²⁶ *Ibid.*, 189.

⁴²⁷ Norris, Arkin, and Burr, “Where They Were,” 30–31; Norris, “United States Nuclear Weapons Deployments,” *Pacific Ashore*; President George H. W. Bush, “Address to the Nation on Reducing U.S. and Soviet Nuclear Weapons, September 27, 1991,” George Bush Presidential Library and Museum, Texas A&M University, accessed May 18, 2014, http://bushlibrary.tamu.edu/research/public_papers.php?id=3438&year=1991&month=9; Wade L. Huntley, “Speed Bump on the Road to Global Zero,” *The Nonproliferation Review* 20, no. 2 (2013): 317–18, doi: 10.1080/10736700.2013.799945.

commitment.”⁴²⁸ He points out that these deployments not only contributed to deterrence but also helped to prevent South Korea from developing its own nuclear arsenal.⁴²⁹ According to researcher Peter Hayes, by 1971, President Park Chung-hee had “lost faith in the reliability of the U.S. nuclear umbrella and began to develop a home grown bomb, even though the United States still had hundreds of nuclear weapons in Korea.”⁴³⁰ After Communist forces overran Saigon in 1975, the ROK government signaled that it would develop its own nuclear weapons if the United States were to renege on its commitment to defend South Korea with nuclear weapons.⁴³¹ The following year, Secretary of State Henry Kissinger threatened to dissolve the bilateral alliance and remove U.S. troops and nuclear weapons from the peninsula if the ROK government did not abandon its nuclear weapons program.⁴³² Kissinger’s threat was sufficient, and the South Korean government relinquished its pursuit of a domestic nuclear weapons program.⁴³³ This episode in Cold War history reveals that South Korea did in fact value its alliance with the United States, especially the troops and tactical nuclear weapons that were based on its soil as part of the U.S. defense commitment. Army doctrine, training, logistics, and expertise were essential to the successful execution of the nuclear mission—to reassure Seoul and deter aggression from North Korea.

3. Japan

In December 1954, in response to growing tensions between the United States and the People’s Republic of China (PRC) over the Taiwan straits, President Eisenhower authorized the deployment of non-nuclear components of nuclear weapons to U.S. bases in Japan and complete nuclear weapons to the island of Okinawa.⁴³⁴ The non-nuclear components remained in Japan until June 1965. However, the United States maintained

⁴²⁸ Roehrig, *From Deterrence to Engagement*, 186.

⁴²⁹ Ibid.

⁴³⁰ Hayes, *Pacific Powderkeg*, 56–57.

⁴³¹ Jae-Bong, “U.S. Deployment of Nuclear Weapons.”

⁴³² Ibid.; Hayes, *Pacific Powderkeg*, 57.

⁴³³ Hayes, *Pacific Powderkeg*, 57; Jae-Bong, “U.S. Deployment of Nuclear Weapons.”

⁴³⁴ Norris, Arkin, and Burr, “Where They Were,” 30.

an arsenal of complete nuclear weapons in Okinawa until 1972, when the island was formally returned to Japanese control.⁴³⁵ The Okinawa-based weapons consisted of a variety of Army, Navy, and Air Force nuclear weapons.⁴³⁶ Between 1954 and 1972, as many as 19 different types of U.S. nuclear weapons were based in Okinawa.⁴³⁷ According to Robert Norris, there were more U.S. nuclear weapons stationed on Okinawa between 1961 and 1971 than at any other location in the Pacific theater, and at the peak of nuclear deployments to Okinawa, in 1967, there were 1,287 nuclear weapons stationed there.⁴³⁸

On January 19, 1960, the United States and Japan signed the Treaty of Mutual Cooperation and Security between Japan and the United States of America.⁴³⁹ According to Wade Huntley, since that time, “the U.S. threat to respond with nuclear weapons to any attack on Japan has been the implicit backbone of the U.S. security commitment to Japan.”⁴⁴⁰ Similar to the ROK-U.S. Mutual Defense Treaty, the Japan-U.S. Security Treaty states that “an armed attack against either Party in the territories under the administration of Japan” would constitute a threat to the other and stipulates that each would “act to meet the common danger.”⁴⁴¹ Despite the removal of non-nuclear components from Japan in 1965, the United States continued to use bases and ports in Japan to transport nuclear weapons in the Pacific region, a practice authorized in a secret appendix to the 1960 Security Treaty, according to Robert Norris, William Arkin, and William Burr.⁴⁴² Although Japan has been under the protection of the U.S. nuclear umbrella since the end of World War II, the practice of basing U.S. nuclear weapons in Okinawa has long since been abandoned. According to Peter Hayes, U.S. strategists

⁴³⁵ Norris, Arkin, and Burr, “Where They Were,” 29–31.

⁴³⁶ *Ibid.*, 30.

⁴³⁷ *Ibid.*, 29.

⁴³⁸ Norris, “United States Nuclear Weapons Deployments,” Pacific Ashore.

⁴³⁹ “Japan-U.S. Security Treaty,” Ministry of Foreign Affairs of Japan, accessed June 4, 2014, <http://www.mofa.go.jp/region/n-america/us/q&a/ref/1.html>.

⁴⁴⁰ Huntley, “Speed Bump on the Road to Global Zero,” 309–10.

⁴⁴¹ “Japan-U.S. Security Treaty.”

⁴⁴² Norris, Arkin, and Burr, “Where They Were,” 31.

eventually came to realize that the nuclear weapons stationed in South Korea and aboard naval vessels could serve to reassure Japanese leaders that the United States had adequate nuclear forces in the Pacific region, thus eliminating the need to station nuclear weapons on Japanese soil.⁴⁴³ Nevertheless, U.S. Army stewardship of nuclear weapons formed a vital link in the alliance to defend Japan—and helped to ensure that Japan would have no incentive to develop its own nuclear arsenal.

H. NUCLEAR POWER

In a chronology of important events, Alice Buck mentions in her history of the Atomic Energy Commission (AEC) the Shippingport Atomic Power Station, “the world’s first full-scale nuclear power plant,” which became fully operational on December 23, 1957; however, her historical account of the AEC does not include any references to the first nuclear power plant to provide electricity to a commercial power grid.⁴⁴⁴ That feat was achieved in an interagency effort by the AEC and the U.S. Army as part of an enterprise called the Army Nuclear Power Program (ANPP).⁴⁴⁵ This nuclear milestone was reached at Ft. Belvoir, Virginia, using the Stationary Medium Power Plant Number 1 (SM-1), the U.S. Army’s first nuclear reactor, which went critical eight months before the Shippingport Atomic Power Station achieved full power.⁴⁴⁶ Three years after the SM-1 went online, the U.S. Army Corps of Engineers assumed complete responsibility for the reactor, which was used to produce electricity, conduct research, and train military personnel from each of the four armed services.⁴⁴⁷ During the first year that the Army was responsible for the SM-1, the ANPP trained 92 military nuclear reactor operators at

⁴⁴³ Hayes, *Pacific Powderkeg*, xxxvi.

⁴⁴⁴ Alice Buck, *The Atomic Energy Commission* (Washington, DC: U.S. Department of Energy, 1983), 25, <http://energy.gov/sites/prod/files/AEC%20History.pdf>.

⁴⁴⁵ Julia LeDoux and Phil Shubert, “Fort Belvoir Nuclear Revisited in April 2011,” *Combating WMD Journal*, no. 8 (2012): 19, <https://www.hsdl.org/?view&did=720436>; William A. Macon, Jr., “Nuclear Power Plants on Military Installations: ‘A Think Piece,’” *Combating WMD Journal*, no. 5 (2010): 41, <https://www.hsdl.org/?view&did=697747>.

⁴⁴⁶ U.S. Department of Energy, “Highly Enriched Uranium: Striking a Balance,” Federation of American Scientists, accessed July 12, 2014, <http://fas.org/sgp/othergov/doe/heu/>, 147.

⁴⁴⁷ U.S. Atomic Energy Commission, *Report to Congress, Major Activities in the Atomic Energy Programs* (Washington, DC: U.S. Atomic Energy Commission, 1960), 132.

Fort Belvoir.⁴⁴⁸ Emery Chase, a graduate of the Army's reactor training program and former executive officer of the Mobile High Power Plant Number 1A (MH-1A), remembered, "We produced a cadre of operators and engineers that safely operated [nuclear power] plants for decades."⁴⁴⁹ From its inception until the SM-1 was deactivated, the U.S. Army Corps of Engineers successfully supervised operations at the facility for over sixteen years.⁴⁵⁰

In 2006, the Department of Energy released a draft version of a historical report entitled "Highly Enriched Uranium: Striking a Balance," which contains information about the ANPP and its accomplishments.⁴⁵¹ The report states that the ANPP "pioneered many technical innovations" and was exclusively responsible for developing nuclear power systems for all four military services.⁴⁵² The accomplishments of the ANPP are quite remarkable considering that, during the early years of the AEC, the Commission's General Advisory Committee was unsure how much time or money would be required to develop the technology to provide "useful power from nuclear energy."⁴⁵³ In 1952, the Army began a study exploring the military applications of nuclear reactors and provided the study's results to the Joint Chiefs of Staff the following year.⁴⁵⁴ The Joint Chiefs and the Secretary of Defense, Charles Wilson, decided to make the Army responsible for the development of the military's nuclear power plants.⁴⁵⁵ By 1954, the AEC and the U.S. Army had established the ANPP in order to lead the military's nuclear power efforts and to explore ways of using atomic energy to provide heat and electricity to remote military

⁴⁴⁸ U.S. Atomic Energy Commission, *Report to Congress*, 132.

⁴⁴⁹ LeDoux and Shubert, "Fort Belvoir Nuclear," 19–20.

⁴⁵⁰ *Ibid.*, 19.

⁴⁵¹ Steven Aftergood and Frank N. von Hippel, "The U.S. Highly Enriched Uranium Declaration: Transparency Deferred but Not Denied," *Nonproliferation Review* 14, no. 1 (2007): 149, doi: 10.1080/10736700601178630; "Highly Enriched Uranium."

⁴⁵² "Highly Enriched Uranium," 145. It must be noted that the ANPP's responsibility for developing nuclear power systems did not include those related to propulsion or aerospace application.

⁴⁵³ U.S. Atomic Energy Commission, *Report to Congress, Fourth Semiannual Report* (Washington, DC: U.S. Atomic Energy Commission, 1948,) 43–46.

⁴⁵⁴ Macon, "Nuclear Power Plants on Military Installations," 43.

⁴⁵⁵ *Ibid.* As previously stated, this did not include nuclear power systems used for propulsion or aerospace applications.

installations.⁴⁵⁶ Soon thereafter, the ANPP began producing and operating functional nuclear power reactors.

The ANPP lasted for two and a half decades, from 1954 to 1979; during the ANPP's existence, the Army Corps of Engineers built, operated, and eventually deactivated nine nuclear power plants.⁴⁵⁷ In addition to the success of the SM-1 reactor, the ANPP was also responsible for a number of other nuclear accomplishments. The Portable Medium Power Plant Number 2A (PM-2A) was the first reactor ever to be deployed, operated, and later redeployed; the PM-3 was the first to desalinate sea water; and the Mobile Low Power Plant Number 1 (ML-1) was the first land mobile nuclear power plant.⁴⁵⁸

The ANPP designed and produced a number of different types of reactors, including pressurized water reactors, boiling water reactors, and gas cooled reactors. Some were classified as mobile—others were either portable or stationary. Many of the reactors used highly enriched uranium (HEU), but the MH-1A was fueled with low enriched uranium (LEU).⁴⁵⁹

The ANPP established nuclear power plants at locations across the world. Although some of the reactors were located in the continental United States, in states, such as Idaho, Virginia, and Wyoming, the PM-2A was set up in Greenland; the SM-1A was constructed at Fort Greely, Alaska; and the PM-3A was established at the Naval Air Facility in McMurdo, Antarctica.⁴⁶⁰ Perhaps the ANPP's most remarkable nuclear power plant, however, was the MH-1A, which was placed aboard a renovated World War II

⁴⁵⁶ Hewlett and Holl, *Atoms for Peace and War 1953–1961*, 519–20; Macon, “Nuclear Power Plants on Military Installations,” 41–42.

⁴⁵⁷ “Highly Enriched Uranium,” 145; “Sturgis,” U.S. Department of Defense, U.S. Army Corps of Engineers, accessed July 12, 2014, <http://www.nab.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/10470/Article/11581/sturgis.aspx>. It should be noted that the U.S. Army continues to maintain an Army Reactor Program, as well as a Fast Burst Reactor (FBR) at White Sands Missile Range, New Mexico. See Macon, “Nuclear Power Plants on Military Installations,” 42.

⁴⁵⁸ “Highly Enriched Uranium,” 146.

⁴⁵⁹ *Ibid.*, 146–7.

⁴⁶⁰ *Ibid.*

liberty ship named the *Sturgis* and sent to provide electrical power in the Panama Canal in 1968.⁴⁶¹

Despite the ANPP's numerous successes, it was terminated in 1979.⁴⁶² Although the Army still maintains a reactor program to this day, William A. Macon, a former program manager, wrote in 2010, "the Army has not been involved with any new reactor projects for over 40 years."⁴⁶³ "Given the Army's reliance on energy, disruption of critical power and fuel supplies would harm the Army's ability to accomplish its missions," warned Macon, an advocate of reviving the Army's nuclear power program. Macon pointed out that "where the Army successfully used land-based nuclear power once before, the Army could help make it happen again."⁴⁶⁴ In 2001, Macon coauthored an article with Robert A. Pfeffer entitled "Nuclear Power: An Option for the Army's Future." They argued that the growing scarcity of fuel and potable water coupled with the Army's increasing dependence on technology and logistical support underscores the need to develop portable nuclear reactors to support the nation's deployed military forces.⁴⁶⁵

I. VIEWS OF U.S. ARMY OFFICERS

Throughout my service as Chief of Staff three great tasks confronted me: First, to preserve the spirit and pride of an Army which top-level efforts steadily sought to reduce to a subordinate place among the three great services that make up our country's shield; second, to deploy this waning strength in such a way that ground combat units would be as effective as possible in the event of war; and third, to lay the foundations for a totally different Army than any we have known to date—an Army trained, equipped, and organized to fight and win in an atomic war.

—General Matthew B. Ridgway, Former Army Chief of Staff⁴⁶⁶

⁴⁶¹ "Highly Enriched Uranium," 146.

⁴⁶² Hewlett and Holl, *Atoms for Peace and War*, 520; Macon, "Nuclear Power Plants on Military Installations," 42.

⁴⁶³ Macon, "Nuclear Power Plants on Military Installations," 42–43.

⁴⁶⁴ *Ibid.*, 41, 45.

⁴⁶⁵ Robert A. Pfeffer and William A. Macon, Jr., "Nuclear Power: An Option for the Army's Future," *Army Logistician* 33, no. 5 (2001): 4–8, <http://www.alu.army.mil/alog/issues/SepOct01/Final.pdf>.

⁴⁶⁶ Ridgway, *Soldier*, 296. For more information about the views of Army officers regarding nuclear weapons and warfare than those discussed herein, see Rose, *The Evolution of U.S. Army Nuclear Doctrine* and Bacevich, *Pentomic Era*.

The views of Army officers regarding nuclear weapons during the Cold War were as divergent as their opinions concerning the use of nuclear weapons against Japan. Army officers did not see eye to eye on the potential use of nuclear weapons against enemy targets during the Korean War, nor did they all agree on how the Army should organize itself to fight in possible nuclear wars of the future. It should be noted once again that it is impossible to assemble from the opinions of officers a general Army viewpoint; nevertheless, certain trends regarding the Army's body of thought can, to some extent, be gleaned from the evidence found in memoirs, professional journals, and works of military history.

U.S. leaders, both civilian and military, were forced to confront in Asia, for the first time during the Cold War, an important strategic question: Should the United States use nuclear weapons to put an end to the limited conflict on the Korean Peninsula? Although both General Douglas MacArthur and General Matthew Ridgway, MacArthur's replacement, had requested permission to use nuclear weapons during the conflict,⁴⁶⁷ not all military officers believed that such measures were necessary.⁴⁶⁸ Some even thought that doing so would put the U.N. troops in greater jeopardy and destroy the legitimacy of the American war effort. The Chairman of the Joint Chiefs of Staff, General Omar N. Bradley, believed as late as February 1953 that the situation was not yet dire enough to warrant the use of nuclear weapons.⁴⁶⁹ Ridgway's successor, General James A. Van Fleet, told the Senate Appropriations Committee in March 1953 that he did not think that nuclear weapons should be used in Korea.⁴⁷⁰ General J. Lawton Collins, the Army Chief of Staff, was also opposed to using nuclear weapons against targets in China, even if doing so would have assisted U.N. troops in Korea.⁴⁷¹ He believed that nuclear weapons

⁴⁶⁷ Conrad C. Crane, "To Avert Impending Disaster: American Military Plans to Use Atomic Weapons during the Korean War," *Journal of Strategic Studies* 23, no. 2 (2000): 79, doi: 10.1080/01402390008437791.

⁴⁶⁸ Richard K. Betts, *Nuclear Blackmail and Nuclear Balance* (Washington, DC: The Brookings Institution, 1987), 36.

⁴⁶⁹ *Ibid.*, 38.

⁴⁷⁰ Harold B. Hinton, "Ammunition Ample to Repel Reds in Korea, Says Wilson," *New York Times*, March 7, 1953, ProQuest (112573795).

⁴⁷¹ Betts, *Nuclear Blackmail*, 35.

would not have been effective against the well-entrenched communist forces. “Before we use them,” he warned, “we had better look to our air defense. Right now we present ideal targets for atomic weapons in Pusan and Inchon.”⁴⁷²

Although the Army’s top leaders were not all able to agree on nuclear weapons use during the Korean War, the Asian conflict may have contributed to a consensus among Army officers regarding the future of warfare. Not only did the Korean War prove that limited wars could still be fought in the nuclear weapons age, but it also revealed that, while possession of nuclear weapons might help to deter certain forms of aggression, it would not enable the United States to compel its adversaries to meet its demands on every occasion. In certain situations, U.S. involvement in nonnuclear conflicts would continue to be necessary. While each of the military services continued to prepare for nuclear war, the Army did so with the belief that it would most likely continue to fight in nonnuclear conflicts similar to the one in Korea. As David Yost points out, “Army leaders considered nuclear war a remote possibility in comparison to conventional combat.”⁴⁷³ This belief was already widely held by most Army officers as early as the mid-1950s,⁴⁷⁴ and it was maintained throughout the Cold War. In his 1956 memoir, General Ridgway told of warning Secretary of Defense Charles Wilson that the global communist front’s greatest strength “lay in the overwhelming power of its huge land forces, and for this reason it might well refrain from initiating the use of the nuclear weapon.”⁴⁷⁵ This same concern was still evident years later as General Bernard W. Rogers, who served as the Supreme Allied Commander, Europe (SACEUR) from 1979 to 1987, thought that NATO should be prepared to defeat the Soviet Union and its allies in a conventional conflict.⁴⁷⁶

Another topic of debate among Army officers dealt with the size of the forces necessary to fight and win in a nuclear war. Eisenhower’s New Look was designed to

⁴⁷² J. Lawton Collins quoted in Betts, *Nuclear Blackmail*, 39.

⁴⁷³ Yost, “History of NATO Theater Nuclear Force Policy,” 242.

⁴⁷⁴ Doughty, “Evolution of U.S. Army Tactical Doctrine,” 17.

⁴⁷⁵ Ridgway, *Soldier*, 318.

⁴⁷⁶ Yost, “History of NATO Theater Nuclear Force Policy,” 232.

reduce the size of conventional forces by replacing manpower with firepower. “The threat of the atomic bomb may well reduce the size of units in combat,” said General Groves, whose prediction complemented Eisenhower’s defense policies.⁴⁷⁷ “I do not see how large armies can be supported in combat,” Groves said.⁴⁷⁸ General Omar Bradley, however, rejected this assumption. “It would be premature for any planners to attempt to substitute atomic weapons for sound balanced forces,” argued Bradley in 1952.⁴⁷⁹ “Actually, no matter how many atomic weapons or bombs the collective NATO defense may eventually have on hand, there will always be a need for sufficient ground strength to force the enemy to concentrate the attack.”⁴⁸⁰ Many Army leaders reckoned that more soldiers would be required to field an army configured for the nuclear battlefield rather than a traditional army designed for conventional warfare alone, a notion that ran counter to the rationale of the New Look.⁴⁸¹ In the early 1950s, General James Gavin considered the logistical difficulties that combat units would face on a nuclear battlefield.⁴⁸² In his memoirs, he recalled, “One over-all conclusion stood out clearly, although for several years it was the basis of considerable argument: more rather than less manpower would be required to fight a nuclear war successfully.”⁴⁸³ General Ridgway also thought that more soldiers would be needed for a nuclear war and provided a number of reasons for this belief:

The complex new weapons themselves—the atomic cannon, rockets, and guided missiles—require far more men to serve and maintain than did the simpler field pieces of World War II and Korea. The prospect of sudden and enormous casualties, inflicted by the enemy with his own new weapons, makes necessary the training of replacements in great numbers for the dead, and a medical establishment larger than ever to care for the sick and wounded. In the main, though, the changing shape of the battlefield itself sets the requirements for more men....Penetrations of

⁴⁷⁷ Groves quoted in P. H. H. Bryan, “The Ground Offensive in Atomic Warfare, 110.”

⁴⁷⁸ Ibid.

⁴⁷⁹ Omar Bradley quoted in Kaplan, *Wizards of Armageddon*, 182.

⁴⁸⁰ Ibid.

⁴⁸¹ Doughty, “Evolution of U.S. Army Tactical Doctrine,” 17.

⁴⁸² James M. Gavin, *War and Peace in the Space Age* (New York: Harper and Brothers, 1958), 136–9.

⁴⁸³ Ibid., 139.

armored and airborne forces in the battle areas of the future may well extend two hundred miles or even more in depth, and only by great dispersion, in the wars of the future, will ground elements be able to survive.⁴⁸⁴

Perhaps the most contentious issues affecting the Army's officer corps—as well as the source of the most salient disagreements between the U.S. Army and its civilian leaders—during the Eisenhower administration were the President's New Look policies and his strategy of massive retaliation. Russell Weigley notes that Army leaders were among those most opposed to Eisenhower's strategy, and that General Ridgway was the first prominent military officer to speak out against massive retaliation.⁴⁸⁵ In his memoirs, Ridgway described a discussion he had with Secretary Wilson, during which he explained his views about the strategy:

My belief was simply this—that we must possess the power of swift and devastating retaliation. At the same time we must possess the capability for selective retaliation, the capacity to use one arm, or two, or all three—land, sea, and air combined—to apply whatever degree of force a particular situation demanded. The belief seemed to prevail that it was enough to hold the threat of the A and H bomb over the head of a trembling world. No thinking soldier can accept this view. No honest student of military history could believe that the nuclear bomb alone was that key to quick and easy victory which mankind has sought since wars began.⁴⁸⁶

If Ridgway was the first prominent military officer to voice his concerns about President Eisenhower's policies, General Taylor, Ridgway's successor, was perhaps the most vocal. Like Ridgway, he held that the U.S. military needed a more balanced force posture.⁴⁸⁷ During a Senate subcommittee hearing in 1958, General Taylor testified that the Army was not sufficiently prepared to meet communist aggression.⁴⁸⁸ He later wrote, "It is my belief that Massive Retaliation as a guiding strategic concept has reached a dead

⁴⁸⁴ Ridgway, *Soldier*, 296–7.

⁴⁸⁵ Weigley, *American Way of War*, 418.

⁴⁸⁶ Ridgway, *Soldier*, 274.

⁴⁸⁷ Richard W. Stewart, ed., *American Military History*, vol. 2 of *The United States Army in a Global Era, 1917–2003* (Washington, DC: U.S. Army Center of Military History, 2005), 252, <http://www.history.army.mil/books/AMH-V2/PDF/Chapter09.pdf>.

⁴⁸⁸ Weigley, *American Way of War*, 421.

end and that there is an urgent need for a reappraisal of our strategic needs.” Taylor pointed to limited wars in China, Greece, Hungary, Korea, Malaya, the Middle East, Taiwan, and Vietnam as proof that the threat of massive retaliation alone could not prevent conflicts from arising.⁴⁸⁹

General Taylor proposed a new strategy, which he called Flexible Response, designed to provide the Commander in Chief with more options than the two that had been available under the strategy of Massive Retaliation, either nuclear war or retreat.⁴⁹⁰ “The new strategy would recognize that it is just as necessary to deter or win quickly a limited war as to deter general war,” he explained.⁴⁹¹ “Otherwise, the limited war which we cannot win quickly may result in our piecemeal attrition or involvement in an expanding conflict which may grow into the general war we all want to avoid.”⁴⁹² It should be noted that he wrote these words five years before Congress passed the Gulf of Tonkin Resolution and propelled the United States even further into a prolonged, expanding conflict that claimed the lives of over 58,000 U.S. service members. It also deserves to be mentioned that Flexible Response was adopted by NATO as the organization’s strategy in December 1967⁴⁹³ and that it remained NATO’s strategy throughout the Cold War.⁴⁹⁴

The disagreements arising over President Eisenhower’s defense policies led to profound changes in the Army’s leadership. After voicing their concerns, both Ridgway and Taylor retired from the Army, although Taylor eventually returned to active military service under the Kennedy administration.⁴⁹⁵ General James Gavin, the Army’s Director of Research and Development, also retired after becoming frustrated with what he

⁴⁸⁹ Taylor, *Uncertain Trumpet*, 5–6.

⁴⁹⁰ *Ibid.*

⁴⁹¹ *Ibid.*, 6–7.

⁴⁹² *Ibid.*, 7.

⁴⁹³ J. Michael Legge, *Theater Nuclear Weapons and the NATO Strategy of Flexible Response* (Santa Monica, CA: The Rand Corporation, 1983), 7–9.

⁴⁹⁴ Yost, “U.S. Debate,” 1405.

⁴⁹⁵ Stewart, *American Military History*, 235; Weigley, *American Way of War*, 421.

perceived as a general decline in the Army under the Eisenhower administration.⁴⁹⁶ It should be noted, however, that despite their concerns over President Eisenhower's policies, senior Army leaders did not attempt to undermine presidential authority or challenge the primacy of civilian leadership.⁴⁹⁷

J. CONCLUSION

During the early years of the Cold War, the U.S. Army fought to keep from being excluded from the nuclear arsenal that it had helped to create during World War II. After Eisenhower left the Army for the Oval Office, the U.S. Army competed with its fellow military services for resources and relevance. Despite the drastic changes experienced by the Cold War Army regarding its nuclear responsibilities, it continued to participate in the nation's nuclear endeavors, exploring new ways to advance the nation's interests and to provide security to the United States and its allies. By acquiring tactical nuclear weapons, the Army regained a role in the delivery of nuclear weapons in 1952. While some of the Army's earliest nuclear weapons were too unwieldy to be of much use on the battlefield and others were simply impractical, a few of the Army's weapons systems represented cutting edge technology at the time of their development. The Corporal Missile was America's first operational guided missile, and the Army used modified Jupiter-C missiles to launch the nation's first satellites into orbit.

The Army played a leading role in the development of the Armed Forces Special Weapons Project and the Nuclear Weapons Technical Training Group, forerunners of today's Defense Threat Reduction Agency and Defense Nuclear Weapons School. It also played an important role in the nation's first nuclear weapons tests, from which the United States gathered important data concerning nuclear weapons and their effects, thus enabling America to develop smaller, more efficient, and more powerful nuclear weapons (as well as less powerful tactical nuclear weapons). The Army also studied how nuclear weapons would affect troops operating on a nuclear battlefield.

⁴⁹⁶ Donald Alan Carter, "Eisenhower Versus the Generals," *The Journal of Military History* 71, no. 4 (2007): 1194–5, <http://www.jstor.org/stable/30052791>.

⁴⁹⁷ *Ibid.*, 1171.

To better prepare U.S. soldiers to fight the wars of the future, Army officers engaged in an extensive theoretical debate about how nuclear weapons would alter warfare as well as how the Army should organize itself and conduct operations during a nuclear war. The Army created nuclear doctrine, which it incorporated into its military education system. It also completely reorganized the composition of its divisions on two separate occasions in response to changing national strategies.

The Army partnered with the AEC to build and operate nuclear power reactors as part of the Army Nuclear Power Program (ANPP). Within the ANPP, the Army pioneered a number of technological innovations and became the first organization to supply electricity to a commercial power grid using a nuclear power reactor. The Army operated a total of nine nuclear reactors during the Cold War and provided power reactors and training to the other military services.

In addition to these nuclear efforts, the Army also helped to change national strategy. As discussed in the previous chapter, the Army played an important role in the development of nuclear weapons. These weapons then became the centerpiece of President Eisenhower's strategy of Massive Retaliation as well as NATO's strategy. General Ridgway and General Taylor, who both thought that Eisenhower's strategy relied too heavily on nuclear weapons, each spoke out against it in an effort to have it replaced with a more balanced national security strategy. According to historian Ingo Trauschweizer, "Taylor initiated a debate on limited war and helped shift the emphasis of national strategy from reliance on nuclear deterrence to flexible response."⁴⁹⁸ Even General Taylor believed that his efforts to change national strategy were influential. In his *Swords and Ploughshares*, he recalled drafting a policy paper entitled "A National Military Program."⁴⁹⁹ "I believe that it [the paper] had some influence in bringing the Eisenhower Administration in its late years to introduce some flexibility into the national strategy," wrote Taylor.⁵⁰⁰ Although Army leaders were unable to achieve the changes they had hoped for during Eisenhower's presidency, Taylor's strategy of Flexible

⁴⁹⁸ Trauschweizer, "Nuclear Weapons and Limited War," 1.

⁴⁹⁹ Taylor, *Swords and Ploughshares*, 165–6.

⁵⁰⁰ *Ibid.*, 166.

Response was eventually adopted by the Kennedy administration. Furthermore, in 1967, Flexible Response became NATO's official strategy,⁵⁰¹ and it remained as such for the remainder of the Cold War.⁵⁰²

In addition to enhancing deterrence and helping to reassure U.S. allies, the Army also played an important role in nuclear nonproliferation. Aside from deterring nuclear war, the prevention of further nuclear proliferation by U.S. allies was perhaps one of the most important accomplishments of the Cold War. U.S. security guarantees and the deployment of the Army's soldiers and tactical nuclear weapons certainly played a significant role in stemming the proliferation of nuclear weapons among America's allies.

⁵⁰¹ Legge, *Theater Nuclear Weapons and the NATO Strategy of Flexible Response*, 7–9.

⁵⁰² Yost, "U.S. Debate," 1405.

IV. THE U.S. ARMY'S CONTEMPORARY NUCLEAR ROLES

“We can now take steps in response to these dramatic developments,” proclaimed President George H. W. Bush in 1991, referring to the changes taking place in Eastern Europe and the Soviet Union in the early 1990s, “steps that can help the Soviet peoples in their quest for peace and prosperity. More importantly, we can now take steps to make the world a less dangerous place than ever before in the nuclear age.”⁵⁰³

When the President made these comments, he was announcing drastic unilateral changes in the nation's nuclear posture, and the elimination of the U.S. Army's nuclear weapons was among those changes. While the Army no longer has organic nuclear weapons, the service still contributes significantly to America's nuclear endeavors. This chapter examines the missions and capabilities of the personnel and organizations within the Army that provide those contributions, thus illuminating the Army's contemporary nuclear roles. The chapter begins with a brief discussion of the redeployment since the late 1960s of many of the nation's nuclear weapons and the impact of the nuclear initiatives of 1991. It then considers the opinions of several officers regarding the Army's nuclear capabilities and provides a description of the Army personnel and organizations that play a part in the nation's nuclear endeavors today.

A. REDEPLOYMENT AND ELIMINATION

By the late 1960s, the United States was in the process of reducing the total number of its deployed nuclear weapons. In 1967, over 3,200 on-shore weapons in the Pacific theater were spread across five locations, but after 1967, these numbers steadily declined.⁵⁰⁴ During the next 10 years, the United States reduced its Pacific land-based nuclear arsenal by over half. By the end of the 1970s, South Korea was the only Asian country to have U.S. nuclear weapons based on its soil, and it remained as such until

⁵⁰³ Bush, “Address to the Nation on Reducing U.S. and Soviet Nuclear Weapons.”

⁵⁰⁴ Norris, “United States Nuclear Weapons Deployments Abroad, 1950–1977.”

1991.⁵⁰⁵ U.S. nuclear weapons deployments to NATO European countries reached an all-time high of over 7,300 weapons in 1971 before the United States similarly began to reduce its stockpiles in Europe.⁵⁰⁶ In a parallel development, while the United States was reducing its nuclear weapons stockpiles abroad, the Canadian government also disbanded and withdrew the one Surface-to-Surface Missile Battery, the Canadian Army's only nuclear unit, which had been armed with U.S.-made Honest John rockets and U.S.-owned nuclear warheads and had served near Hemer, Germany, until July 1970.⁵⁰⁷

Although the United States had already begun to reduce the size of its nuclear arsenals abroad during the last two decades of the Cold War, President George H.W. Bush made a decision prior to the collapse of the Soviet Union that would result in even greater reductions in U.S. overseas nuclear deployments and drastically alter the U.S. Army's nuclear role in the nation's defense establishment. On September 27, 1991, President Bush announced his plan: "I am therefore directing that the United States eliminate its entire worldwide inventory of ground-launched short-range, that is, theater nuclear weapons. We will bring home and destroy all of our nuclear artillery shells and short-range ballistic missile warheads."⁵⁰⁸ The President's decision ultimately meant that the Army would no longer have organic nuclear warfighting capabilities. Over the course of the next several years, the U.S. Army redeployed its nuclear weapons and transferred them to the U.S. Department of Energy for elimination.⁵⁰⁹ By the mid-1990s, the first U.S. military service ever to acquire nuclear weapons had become one of the first two services within the U.S. Department of Defense without an atomic arsenal.⁵¹⁰

⁵⁰⁵ Norris, Arkin, and Burr, "Where They Were," 30–31, <http://bos.sagepub.com/content/55/6/26.full>; Norris, "Nuclear Weapons Deployments Abroad"; Jonathan D. Pollack, *No Exit: North Korea, Nuclear Weapons and International Security* (New York: Routledge, 2011), 46.

⁵⁰⁶ Norris, "Nuclear Weapons Deployments Abroad."

⁵⁰⁷ John Clearwater, *Canadian Nuclear Weapons: The Untold Story of Canada's Cold War Arsenal* (Toronto: Dundurn Press, 1998), 153–175.

⁵⁰⁸ Bush, "Address to the Nation on Reducing U.S. and Soviet Nuclear Weapons."

⁵⁰⁹ James Demyanovich, "Army Role in the U.S. Nuclear Capability," *Combating WMD Journal*, no. 3 (2009): 39, <https://www.hsdl.org/?view&did=698896>.

⁵¹⁰ Demyanovich, "Army Role in the U.S. Nuclear Capability," 39. The United States Marine Corps also used to have nuclear weapons. See "Frequently Asked Questions," U.S. Department of Defense, *The Nuclear Matters Handbook Expanded Edition*, accessed August 16, 2014, http://www.acq.osd.mil/ncbdp/nm/nm_book_5_11/faq.htm, Q26.

B. THE VIEWS OF ARMY OFFICERS

Although the U.S. Army is a hierarchical organization that acts with unity of effort, the opinions of those who serve within the Army can vary greatly from one person to the next. Since there have been no rigorous studies conducted to determine Army officers' views on nuclear weapons issues, it is impossible to offer any systematic or conclusive judgments regarding their views about nuclear weapons. Any attempt to determine the opinions of the Army's officers concerning nuclear weapons matters must be based on fragmentary evidence provided by the few Army officers who have published their views; nevertheless, it is worthwhile to take note of some of the available publications.

Within the ranks of Army officers, there were supporters as well as critics of President Bush's nuclear initiatives in 1991. For some, the decision to eliminate ground-launched non-strategic nuclear weapons probably came as no surprise. In February 1991, seven months before the President's announcement, Lieutenant Colonel John D. Skelton wrote that the Army no longer needed to retain its nuclear weapons.⁵¹¹ Skelton argued that the threat of nuclear war had been greatly reduced, that the Army's nuclear arsenal was extremely costly in terms of both money and manpower, and that the Army should eliminate its weapons and rely upon the Navy and the Air Force to deliver nuclear weapons in support of ground forces in the event of a nuclear war.⁵¹² In contrast, Captain Daniel S. Roper, writing in 1993, said that the President's decision had "resulted in a less flexible U.S. nuclear posture and...potentially weakened the future deterrent capability of U.S. forces at a time when it is most needed."⁵¹³ He maintained that the removal of its organic nuclear weapons left the Army vulnerable to attacks by adversaries armed with nuclear weapons, and he questioned the effectiveness of nuclear fire support from naval and air forces.⁵¹⁴

⁵¹¹ Skelton, *The Forbidden Weapon*, 38.

⁵¹² *Ibid.*, 34–39.

⁵¹³ Daniel S. Roper, "The Impact of the Presidential Nuclear Initiative on Deterrence and the United States Army," *The Land Warfare Papers*, no. 16 (1993): 16.

⁵¹⁴ *Ibid.*, 2.

General Colin Powell believed that the Army's nuclear arsenal was no longer necessary. In early September 1991, acting upon the orders of the President while serving as the Chairman of the Joint Chiefs of Staff, General Powell, along with the Secretary of Defense and the Joint Chiefs of Staff, worked out the measures that would make up Bush's Presidential Nuclear Initiatives.⁵¹⁵ "Within days, we had developed a proposal that far exceeded the elimination I had urged of artillery-launched nukes," recalled Powell in his 1995 autobiography. "The scope was sweeping. Get rid of short-range nuclear weapons, like the Army's Lance missiles."⁵¹⁶ Less than a year and a half after Bush's announcement, Powell reported that the elimination of the Army's nuclear weapons had resulted in "significant" savings.⁵¹⁷ Throughout his career, Powell had been exposed to nuclear weapons, taught how to use them, and faced with the prospects of their use.⁵¹⁸ In fact, one of his first missions upon entering the Army had been to guard an atomic cannon in Germany.⁵¹⁹ Reflecting on his career in 2010, Powell remarked, "The more I got into nuclear weapons, the more I realized these weapons must never be used."⁵²⁰

Recently, soldiers within the Army's nuclear community have written about the service's role in nuclear operations. Chief Warrant Officer 5 (CW5) Stephen A. Gomes alluded to the importance of the Army contributions to joint offensive nuclear planning in an article for the *Combating WMD Journal*.⁵²¹ "Should deterrence fail and the nuclear option be invoked," wrote Gomes, "the ground commander...would still be responsible for what happens on the ground and how the use of nuclear weapons may affect the

⁵¹⁵ Colin L. Powell, *My American Journey* (New York: Random House, 1995), 541; Colin Powell, *Chairman of the Joint Chiefs of Staff Report on the Roles, Missions, and Functions of the Armed Forces of the United States* (Washington, DC: U.S. Department of Defense, 1993), II-3.

⁵¹⁶ Powell, *My American Journey*, 541.

⁵¹⁷ Powell, "Report on the Roles, Missions, and Functions of the Armed Forces of the United States," II-4.

⁵¹⁸ *Nuclear Tipping Point*, directed by Ben Goddard (2010, Nuclear Security Project), DVD. This video is also available at <http://www.nucleartippingpoint.org/film/film.html>.

⁵¹⁹ *Ibid.*

⁵²⁰ *Ibid.*

⁵²¹ Stephen A. Gomes, "Tactical Nuclear Weapons in the Cold War Era...A Blast from the Past," *Combating WMD Journal*, no. 3 (2009): 55, <https://www.hsdl.org/?view&did=698896>.

scheme of maneuver.”⁵²² LTC James Demyanovich also recognized the importance of joint nuclear management, adding that the Army’s status as a non-nuclear weapons service placed it in a position to offer objective recommendations regarding nuclear force planning.⁵²³

C. THE ARMY’S CONTEMPORARY NUCLEAR ROLES

Although the post-Cold War Army has not been equipped with organic nuclear delivery systems, this has not stopped the service from participating in the nation’s nuclear endeavors. In the years immediately following the collapse of the Soviet Union, the U.S. Army’s nuclear forces continued to adapt and evolve to satisfy the needs of the nation and to prepare for the challenges of the future. During the early 1990s, as the Army’s nuclear weapons were being eliminated, Army leaders decided to maintain a group of officers proficient in nuclear weapons matters and dedicated specifically to nuclear operations.⁵²⁴ These officers came to make up the Army’s Functional Area 52 (FA-52, Nuclear and Counterproliferation), a functional group that continues its work to this day.⁵²⁵

The remainder of this chapter examines the Army’s contemporary nuclear roles. The next section describes FA-52, its purposes, and the various ways in which FA-52 officers serve their nation. The following two sections discuss the U.S. Army Nuclear and Combating Weapons of Mass Destruction Agency (USANCA) and the nuclear components of the 20th Chemical, Biological, Radiological, Nuclear, and Explosives Command. Finally, before concluding, this chapter considers the Army organizations dedicated to air and missile defense, the 100th Missile Defense Brigade and three Army Air and Missile Defense Commands (AAMDCs).

⁵²² Gomes, “Tactical Nuclear Weapons,” 55.

⁵²³ Demyanovich, “Army Role,” 42.

⁵²⁴ *Ibid.*, 39.

⁵²⁵ *Ibid.*

1. Functional Area 52 (Nuclear and Counterproliferation)

Today, the Army's nuclear officers are organized under the Operations Support functional category FA-52, a functional area managed by the Department of the Army's Deputy Chief of Staff for Operations, Plans, and Training.⁵²⁶ The mission of this functional area is "to provide technical advice and support in developing national and military strategy, plans and policy recommendations to Army, Combatant Command, Department of Defense, and Interagency leadership in nuclear related Combating WMD mission areas."⁵²⁷ To accomplish this mission, officers within FA-52 must be proficient in five functional competencies, which include "strategy, plans, policy and operations; research, development and capabilities; doctrine, education and training; modeling and simulation; and combating WMD."⁵²⁸ This means that FA-52 officers must apply their skills and knowledge across a broad range of nuclear issues.

The Nuclear and Counterproliferation Functional Area takes numerous steps to ensure that its officers are prepared to meet the many challenges inherent in such a demanding career field. First, the functional area actively seeks officers with academic degrees in mathematics, science, and engineering or with experience in fields pertaining to combating weapons of mass destruction.⁵²⁹ As part of the selection process, applicants are required to possess the aptitude necessary to complete advanced civilian schooling since FA-52 provides all of its officers with an opportunity to pursue advanced degrees in the fields of science, intelligence, or other disciplines related to weapons of mass destruction.⁵³⁰ Furthermore, its officers must complete the Army's Nuclear and Counterproliferation Officer Course in order to become qualified as FA-52 officers.⁵³¹

⁵²⁶ Department of the Army Headquarters, *Department of the Army Pamphlet 600-3: Commissioned Officer Professional Development and Career Management* (Washington, DC: Department of the Army Headquarters, 2010), 271.

⁵²⁷ "FA-52 Nuclear and Counterproliferation Functional Area," U.S. Army, U.S. Army Human Resources Command, accessed May 11, 2014, <https://www.hrc.army.mil/Officer/FA-52%20Nuclear%20and%20Counterproliferation%20Functional%20Area>.

⁵²⁸ D.A. Pamphlet 600-3, 271.

⁵²⁹ Ibid., 273.

⁵³⁰ Ibid., 273–74.

⁵³¹ Ibid., 274.

The FA-52 qualification course is taught by the USANCA at the Defense Threat Reduction Agency's Defense Nuclear Weapons School located at Kirtland Air Force Base in Albuquerque, New Mexico.⁵³² During the 176 hours of course training, the Army's nuclear officers receive instruction on subjects, such as the U.S. nuclear weapons program and stockpile, nuclear surety, counterproliferation programs, homeland defense, and issues pertaining to chemical, biological, radiological, and nuclear weapons.⁵³³ The Nuclear and Counterproliferation Functional Area's accession, training, and education process provides the Department of Defense with a valuable cadre of nuclear experts at a level unmatched by other services.⁵³⁴

Although there are several organizations within the Army to which many FA-52 officers are typically assigned, Nuclear and Counterproliferation officers also serve in many joint, combined, and interagency organizations. FA-52 officers are assigned to several geographical and functional Combatant Commands (COCOMs), such as Pacific Command, European Command, Northern Command, Special Operations Command, and Strategic Command. FA-52 officers also serve as advisors in the U.S. Mission to NATO. Joint and Interagency assignments include various intelligence organizations as well as the Defense Threat Reduction Agency, the Office of the Joint Chiefs of Staff, the Office of the Secretary of Defense, the Department of Homeland Security, and the Department of Energy. Furthermore, within the Department of the Army (DA), Nuclear and Counterproliferation officers serve in the DA Headquarters as well as in organizations, such as the USANCA and the 20th Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Command, both of which are discussed below.

⁵³² "The Defense Nuclear Weapons School Fiscal Year 2014 Course Catalog," 4, 41.

⁵³³ *Ibid.*, 41.

⁵³⁴ "Report of the Joint Defense Science Board/Threat Reduction Advisory Committee Task Force on the Nuclear Weapons Effects National Enterprise, June 2010," U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Defense Science Board, accessed May 13, 2014, <http://www.acq.osd.mil/dsb/reports/ADA523661.pdf>, 20; "Report of the Defense Science Board Task Force on Nuclear Deterrence Skills, September 2008," U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Defense Science Board, accessed May 13, 2014, <http://www.acq.osd.mil/dsb/reports/ADA487983.pdf>, 40.

2. U.S. Army Nuclear and CWMD Agency

The U.S. Army Nuclear and CWMD Agency (USANCA) is a field operating agency (FOA) under the management and guidance of the Department of the Army's Deputy Chief of Staff for Operations, Plans, and Training.⁵³⁵ The agency's mission is to provide "nuclear and combating weapons of mass destruction (CWMD) planning and execution expertise for the implementation of Army CWMD strategy and policy at the Corps level and above in order that the Army meet Joint operational requirements in achieving national objectives to combat weapons of mass destruction (WMD)."⁵³⁶ The origins of the USANCA date back to the early years of the Cold War. Its earliest predecessor, the Office of Special Weapons Development, was established in 1952 and was eventually replaced in sequence by the U.S. Army Nuclear Group, the Combat Developments Command Nuclear Agency, the U.S. Army Nuclear Agency, the U.S. Army Nuclear and Chemical Agency, and finally, in 2008, by the U.S. Army Nuclear and Combating Weapons of Mass Destruction Agency.⁵³⁷

Although the agency is comprised of a total of only 34 DA civilians and Army officers proficient in CWMD,⁵³⁸ it is responsible for performing 11 key tasks, each one with a number of requisite subtasks, and the Department of the Army has authorized the USANCA to communicate directly with any U.S. government organization or official that it deems necessary in the performance of its duties.⁵³⁹ One of the agency's most important tasks is to enhance the survivability of forces operating in chemical, biological, radiological, and nuclear (CBRN) environments.⁵⁴⁰ To accomplish this task, the USANCA provides design criteria for Army equipment, reviews the specifications for

⁵³⁵ Department of the Army, *Army Regulation 10-16: U.S. Army Nuclear and Combating Weapons of Mass Destruction Agency* (Washington, DC: Department of the Army Headquarters, 2008), 4.

⁵³⁶ *Ibid.*, 1.

⁵³⁷ Dirk Plante, Andrae Brooks, and Stephen A. Gomes, "USANCA Breaks Ground on New Facility at Fort Belvoir," *Combating WMD Journal*, no. 2 (2008): 4, <https://www.hsdl.org/?view&did=698893>.

⁵³⁸ Rob Manning, "Combating Weapons of Mass Destruction: 'Making the World Safer,'" U.S. Army, last modified March 20, 2013, http://www.army.mil/article/99153/Combating_Weapons_of_Mass_Destruction___Making_the_World_Safer_/.

⁵³⁹ Department of the Army, *Army Regulation 10-16*, 1-4.

⁵⁴⁰ *Ibid.*, 2.

new systems, and provides recommendations on systems development and testing to ensure that new equipment is capable of operating in CBRN environments.⁵⁴¹ The agency also coordinates with the Office of the Surgeon General to establish nuclear and radiological survivability criteria for soldiers.⁵⁴²

Another important task that the USANCA is required to perform is to “support the Army’s capability to plan for the Joint employment of nuclear weapons as well as conventional attacks on nuclear related facilities.”⁵⁴³ In order to carry out this responsibility, the agency must be prepared to deploy Nuclear Employment Augmentation Teams (NEATs) to provide nuclear planning support to Army Service Component Commands (ASCCs) and Joint Force Land Component Commands (JFLCCs).⁵⁴⁴ NEATs are ad hoc teams of two to twelve personnel consisting of Army officers and DA civilians from USANCA, who, once deployed, come under the operational control (OPCON) of the supported component command.⁵⁴⁵ The teams serve as a source of knowledge regarding nuclear targeting and effects; they are capable of supporting training, planning, exercises, and operations; and they can augment supported commands for extended durations.⁵⁴⁶

3. 20th Chemical, Biological, Radiological, Nuclear, and Explosives Command

Headquartered at Aberdeen Proving Grounds, Maryland, the 20th Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Command, formerly known as the 20th Support Command, is a subordinate command of U.S. Army Forces

⁵⁴¹ “Report of the Defense Science Board Task Force on Nuclear Weapons Effects Test, Evaluation, and Simulation, April 2005,” U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Defense Science Board, accessed May 14, 2014, <http://www.acq.osd.mil/dsb/reports/ADA434656.pdf>, 19; *Army Regulation 10-16*, 2–3.

⁵⁴² Department of the Army, *Army Regulation 10-16*, 3.

⁵⁴³ *Ibid.*, 1.

⁵⁴⁴ *Ibid.*

⁵⁴⁵ Bruce D. Brandes and Stephen A. Gomes, “Nuclear Targeting and the Nuclear Employment Augmentation Team (NEAT),” *Combating WMD Journal*, no. 9 (2013): 26, <https://www.hsdl.org/?view&did=737266>.

⁵⁴⁶ *Ibid.*, 25–26; Department of the Army, *Army Regulation 10-16*, 1.

Command (FORSCOM).⁵⁴⁷ Its missions include preparing and deploying CBRNE forces, exercising command and control during CBRNE operations in support of Joint and Army force commanders, supporting homeland defense, and maintaining links with necessary federal and state CBRNE assets.⁵⁴⁸ The command was created in 2004 to enable the Army to manage its CBRNE assets more efficiently by placing all of the Army's CBRNE units under one centralized headquarters.⁵⁴⁹ In 2006, the Department of Defense increased the responsibilities of the 20th CBRNE Command. That year's Quadrennial Defense Review (QDR) Report called for the development of capabilities that would "enable it to serve as a Joint Task Force capable of rapid deployment to command and control WMD elimination and site exploitation missions by 2007."⁵⁵⁰

In addition to its Operational Command Post (OCP), which is capable of deploying and serving as the headquarters of the Joint Task Force (JTF) for WMD Elimination (WMD-E), the 20th CBRNE also has two other deployable assets that provide nuclear expertise to supported commands: CBRNE Coordination Elements (CCEs) and Nuclear Disablement Teams (NDTs).⁵⁵¹ CCEs consist of chemical, nuclear, and explosive ordnance disposal (EOD) officers and soldiers, intelligence and communications personnel, and, if necessary, health and environmental experts.⁵⁵² These elements are capable of augmenting component command staffs; providing technical CBRNE expertise; and reaching back to other U.S. defense, scientific, and technological experts for information if necessary.⁵⁵³

⁵⁴⁷ "20th Support Command (CBRNE), Stand-To Archive," U.S. Army, accessed May 16, 2014, <http://www.army.mil/standto/archive/2009/03/11/>.

⁵⁴⁸ "20th CBRNE Command," U.S. Army, accessed May 16, 2014, <http://www.army.mil/20thcbrne>.

⁵⁴⁹ U.S. Army, "20th Support Command (CBRNE); PAO, 20th Support Command (CBRNE), "U.S. Army 20th Support Command (CBRNE) Organization/Transformation," *Combating WMD Journal*, no. 1 (2007): 32, <https://www.hsdl.org/?view&did=697751>.

⁵⁵⁰ U.S. Department of Defense, *Quadrennial Defense Review Report*, February 6, 2006, http://www.defense.gov/home/features/2014/0314_sdr/qdr/docs/Report20060203.pdf, 52.

⁵⁵¹ PAO, 20th Support Command (CBRNE), "U.S. Army 20th Support Command (CBRNE) Organization/Transformation," 31–32.

⁵⁵² *Ibid.*, 33.

⁵⁵³ *Ibid.*, 31–33.

Nuclear Disablement Teams consist of eleven personnel with various occupational specialties; a typical team is made up of six FA-52 officers, one EOD officer, one health physics officer, one health physics non-commissioned officer (NCO), and two chemical NCOs.⁵⁵⁴ NDTs have two fundamental missions. As their name suggests, the primary mission of the NDTs is to assess the nuclear weapons production infrastructure of nuclear proliferators and, if necessary, disable said infrastructure.⁵⁵⁵ Their secondary mission is to support the National Technical Nuclear Forensics (NTNF) Ground Sampling Mission (GSM) by deploying as a member of an interagency task force to an explosion site involving either nuclear or radiological weapons in order to collect samples for forensics testing.⁵⁵⁶

NDTs are equipped with Smart Threads Integrated Radiation Sensors (STIRS), which consist of a variety of detectors that can be mounted on vehicles or aerial platforms or, in the case of man-portable variants, carried by soldiers.⁵⁵⁷ Other equipment includes secure communication devices, handheld computers, spectrum analysis equipment, cameras, personal protective equipment, vehicles, respiration equipment, and breaching tools.⁵⁵⁸ In regard to their primary mission, NDTs are trained and equipped to conduct reconnaissance of a target location, gain entry into nuclear facilities, conduct assessments to determine the level of production and sophistication, seize sensitive nuclear materials and equipment, and temporarily disable key facilities.⁵⁵⁹ In situations where disassembly of nuclear facilities is deemed necessary, NDTs will be relieved-in-place, most likely by a government contractor capable of handling such a large-scale undertaking.⁵⁶⁰

⁵⁵⁴ Bret Kinman and Matthew Armstrong, "Heisenberg in Action: A Year Plus in the Life of the Nuclear Disablement Teams," *Combating WMD Journal*, no. 8 (2012): 22–23, <https://www.hsdl.org/?view&did=720436>.

⁵⁵⁵ Kinman and Armstrong, "Heisenberg in Action," 22.

⁵⁵⁶ *Ibid.*

⁵⁵⁷ *Ibid.*, 22–23.

⁵⁵⁸ Bret Kinman and Paul Argo, "More than Just Breaking Things...The 20th Support Command Nuclear Disablement Teams in Action," *Combating WMD Journal*, no. 6 (2010): 17–18, <https://www.hsdl.org/?view&did=697744>; Kinman and Armstrong, "Heisenberg in Action," 22–23.

⁵⁵⁹ Kinman and Armstrong, "Heisenberg in Action," 23.

⁵⁶⁰ Kinman and Argo, "Nuclear Disablement Teams in Action," 19.

4. Air and Missile Defense

In addition to the Army's nuclear roles mentioned above, the Army also provides another capability relevant to the nation's nuclear endeavors—air and missile defense. Although there are no FA-52 officers serving in either the 100th Missile Defense Brigade or the AAMDCs, these organizations serve to protect the nation and its allies from attacks with nuclear-armed ballistic and cruise missiles. While the former is a national missile defense organization, the latter are theater-oriented organizations.⁵⁶¹

The 100th Missile Defense Brigade is headquartered in Colorado Springs, Colorado, but the organization's ground-based mid-course defense (GMD) interceptor units are located at Fort Greely, Alaska, and Vandenberg Air Force Base (AFB), California.⁵⁶² The 100th Brigade is a subordinate unit of the U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ARSTRAT), headquartered at the Redstone Arsenal in Alabama.⁵⁶³ SMDC/ARSTRAT serves as the Army Service Component Command (ASCC) to U.S. Strategic Command.⁵⁶⁴ The brigade primarily consists of air defense National Guard soldiers serving on full-time status and military police, who guard the installation in Alaska.⁵⁶⁵ Although the mission of the 100th Missile Defense Brigade is a difficult one, its mission statement is quite simple: defend the United States against ballistic missiles.⁵⁶⁶ This mission is similar to one given to the Army in 1969, when Congress approved the short-lived Safeguard

⁵⁶¹ "100th Missile Defense Brigade," U.S. Army, U.S. Army Space and Missile Defense Command/Army Forces Strategic Command, accessed May 15, 2014, <http://www.smdc.army.mil/2008/100thMDB.asp>; "About Us," U.S. Army, 32nd Army Air and Missile Defense Command, accessed May 15, 2014, <https://www.bliss.army.mil/32nd/About32.html>.

⁵⁶² "100th Missile Defense Brigade," U.S. Army, U.S. Army Space and Missile Defense Command/Army Forces Strategic Command.

⁵⁶³ "SMDC/ARSTRAT Operations," U.S. Army, accessed May 15, 2014, <http://www.smdc.army.mil/2008/SpaceBMD.asp>.

⁵⁶⁴ "Organization," U.S. Army, accessed May 15, 2014, <http://www.army.mil/info/organization/unitsandcommands/commandstructure/>.

⁵⁶⁵ "100th Missile Defense Brigade," U.S. Army, U.S. Army Space and Missile Defense Command/Army Forces Strategic Command.

⁵⁶⁶ *Ibid.*

Program, in which the U.S. Army deployed Spartan and Sprint missiles in 1975 to North Dakota, at America's first ABM site.⁵⁶⁷

The 100th Missile Defense Brigade's approximately 30 to 40 GMD interceptors, developed by Boeing et al. beginning in 1998, rely on solid fuel, three-stage rocket engines to launch kinetic kill vehicles into space, where, if successful, they collide with and destroy inbound ballistic missiles during the mid-course phase of the missile's flight.⁵⁶⁸ The system acquires targets using flight data obtained from U.S. systems on land, at sea, and in space.⁵⁶⁹ As of 2014, there have been eight successful test interceptions using the GMD system.⁵⁷⁰ One such test occurred on December 10, 2008, when soldiers of the 49th Missile Defense Battalion, 100th Brigade, launched an interceptor based at Vandenberg AFB from their Fire Direction Center in Alaska.⁵⁷¹ This test provided valuable data useful to enhance America's missile defense network.⁵⁷²

The Army also has three AAMDCs dedicated to supporting combatant commands overseas: the 32nd AAMDC, the 94th AAMDC, and the 10th AAMDC. The 32nd AAMDC, headquartered at Fort Bliss, Texas, is a subordinate command of U.S. Army Forces Command (FORSCOM) and consists of four Air Defense Artillery (ADA) brigades: the 11th ADA, the 31st ADA, the 69th ADA, and the 108th ADA.⁵⁷³ The command's mission is "to conduct joint and combined air and missile defense operations

⁵⁶⁷ "First ABM Site in the Free World," U.S. Department of Defense, accessed August 16, 2014, <http://www.smhc.army.mil/2008/about.asp>.

⁵⁶⁸ "Ground-based Midcourse Defense (GMD) System Overview," Defense, Space & Security, Boeing, accessed May 16, 2014, <http://www.boeing.com/boeing/defense-space/space/gmd/index.page>; "Ground-based Midcourse Defense Backgrounder," Defense, Space & Security, Boeing, accessed May 16, 2014, http://www.boeing.com/assets/pdf/defense-space/space/gmd/docs/GMD_overview.pdf; Master Sgt. Mike R. Smith, "Soldiers Intercept, Destroy Ballistic Missile in Space," U.S. Army, accessed May 16, 2014, <http://www.army.mil/article/14968/soldiers-intercept-destroy-ballistic-missile-in-space/>.

⁵⁶⁹ "Ground-based Midcourse Defense Backgrounder," Defense, Space & Security, Boeing.

⁵⁷⁰ "Ground-based Midcourse Defense (GMD) System Overview," Defense, Space & Security, Boeing.

⁵⁷¹ Smith, "Soldiers Intercept, Destroy Ballistic Missile in Space."

⁵⁷² Ibid.

⁵⁷³ "About Us," U.S. Army, 32d Army Air and Missile Defense Command."

in support of the war fighting combatant commander.”⁵⁷⁴ To accomplish this mission, the command is prepared to deploy its brigades overseas to support Army and joint component commands within 72 hours of notification.⁵⁷⁵ Both the 94th and the 10th AAMDCs are based overseas. The 94th AAMDC is headquartered at Fort Shafter, Hawaii, and falls under the command of U.S. Army Pacific;⁵⁷⁶ the 10th AAMDC, a subordinate command of U.S. Army Europe, is located in Kaiserslautern, Germany.⁵⁷⁷

Each of the AAMDCs serving under active Army commands is equipped with Patriot missiles.⁵⁷⁸ Developed by Raytheon, Patriots are ground-launched, long-range, high-altitude missiles capable of destroying ballistic missiles, cruise missiles, and aircraft carrying nuclear warheads (or other payloads) and can function either independently or as components of a more robust network of missile defense systems.⁵⁷⁹ The 32nd AAMDC also has two batteries in the 11th ADA Brigade equipped with Terminal High Altitude Area Defense (THAAD) systems.⁵⁸⁰ Like the GMD system, the THAAD can use data from sea-based Aegis platforms, satellites, and land-based sensors.⁵⁸¹ The THAAD can also be linked with other missile defense systems, such as Patriot batteries.⁵⁸² It is capable of intercepting ballistic missiles both within and beyond the Earth’s atmosphere,

⁵⁷⁴ “Our History,” U.S. Army, 32d Army Air and Missile Defense Command, accessed May 17, 2014, <https://www.bliss.army.mil/32nd/History.html>.

⁵⁷⁵ “About Us,” U.S. Army, 32d Army Air and Missile Defense Command.

⁵⁷⁶ “94th Army Air and Missile Defense Command,” U.S. Army, accessed May 17, 2014, <http://www.94aamdc.army.mil/index.html>; “Subordinate Commands,” U.S. Army Pacific, U.S. Army, accessed May 17, 2014, http://www.usarpac.army.mil/subordinate_commands.asp.

⁵⁷⁷ “Units and Commands,” U.S. Army Europe, U.S. Army, accessed May 17, 2014, <http://www.eur.army.mil/organization/units.htm>; “Contact Us,” U.S. Army, 10th AAMDC, accessed May 17, 2014, <http://www.eur.army.mil/10thAAMDC/contact.html>.

⁵⁷⁸ “Imperial,” U.S. Army, 11th ADA, Brigade, accessed May 17, 2014, <https://www.bliss.army.mil/11thADA/index.html>; “1-1 Air Defense Artillery (Regiment),” U.S. Army, accessed May 17, 2014, <http://www.usarj.army.mil/organization/1-1ada/>; “About Us,” U.S. Army, 10th AAMDC, accessed May 17, 2014, <http://www.eur.army.mil/10thAAMDC/about.html>.

⁵⁷⁹ “Patriot, Raytheon Company,” Raytheon, accessed May 17, 2014, <http://www.raytheon.com/capabilities/products/patriot/>.

⁵⁸⁰ “CG Visits Lockheed Martin’s THAAD Program in Sunnyvale, CA,” U.S. Army, 32d Army Air and Missile Defense Command, accessed May 17, 2014, https://www.bliss.army.mil/32nd/News/030612_Sunnyvale.html.

⁵⁸¹ “THAAD,” Lockheed Martin Corporation, accessed May 17, 2014, <http://www.lockheedmartin.com/us/products/thaad.html>.

⁵⁸² *Ibid.*

and it has successfully intercepted its targets during each of its eleven tests.⁵⁸³ THAAD systems are also deployable. In April 2013, the 4th ADA Regiment became the first THAAD battery to deploy overseas, when it was sent to Guam to defend against potential missile attacks from North Korea.⁵⁸⁴

D. CONCLUSION

Neither the end of the Cold War nor the 1991 Presidential Nuclear Initiatives obviated the need for the Army to continue to be a part of the nation's nuclear endeavors. These events simply altered the Army's nuclear roles. Although the Army no longer has its own organic nuclear weapons, America's premier land service continues to strive to improve a number of aspects of the nation's nuclear capabilities. The missions and capabilities of the organizations described in this chapter highlight the significant contributions that the Army continues to make to America's nuclear endeavors.

The Army's FA-52 officers provide U.S. government organizations with an unparalleled source of knowledge and expertise regarding Army operations and nuclear weapons. USANCA works to support the nation's CWMD objectives, enhance the survivability of U.S. military forces, and augment ASCCs and JFLCCs to assist in the development of joint nuclear and conventional operational plans. The 20th CBRNE Command is capable of serving as the nation's JTF for WMD-E, providing CBRNE expertise to component commanders, disabling nuclear infrastructure, and participating in sampling missions to support nuclear forensics operations in the event of a radiological or nuclear attack. Furthermore, despite the controversies surrounding America's ballistic missile defense policies, the Army uses its air and missile defense capabilities to protect the United States, its allies, and designated locations and facilities from nuclear-armed

⁵⁸³ "Lockheed Martin Receives \$3.9 Billion THAAD Production Contract," Lockheed Martin Corporation, accessed May 17, 2014, <http://www.lockheedmartin.com/us/news/press-releases/2013/september/mfc-092313-lm-receives-thaad.html>.

⁵⁸⁴ "Lockheed Martin Receives \$3.9 Billion THAAD Production Contract"; Gordon Arthur, "THAAD Commander Says Guam Placement Providing Lessons for Future Deployments," *IHS Jane's Defence Weekly*, February 26, 2014, <http://www.janes.com/article/34703/thaad-commander-says-guam-placement-providing-lessons-for-future-deployments>.

ballistic missiles, cruise missiles, and aircraft, and the Army has also become involved in policy discussions related to ballistic missile defense.⁵⁸⁵

Despite the numerous nuclear-related capabilities that the Army currently provides, the Army can continue to improve in at least two areas. Within the U.S. military, the Army can work to enhance the capabilities of its general purpose forces.⁵⁸⁶ Combating WMD during a major conflict in places, such as Northeast Asia, Southwest Asia, or South Asia would require a capacity to conduct prolonged, large-scale CWMD operations,, one far exceeding the level currently offered by the Army's CBRNE forces. A second area of improvement concerns the capabilities of U.S. allies and security partners. Here too the Army can play an important part in CWMD. By providing U.S. allies and partners with special training and equipment, the Army can build greater capacity among America's allies and security partners to prevent and counter the proliferation of WMD, mitigate the dangers of CBRNE attacks, and manage the consequences of attacks should they occur.⁵⁸⁷ Just as the Army adapted to meet the nation's defense needs during World War II, the Cold War, and the post-Cold War period, the U.S. Army's nuclear-focused assets now must continually prepare to respond to threats as they evolve.

⁵⁸⁵ See *Statement before the Committee on Armed Services Strategic Forces Subcommittee, U.S. Senate*, 113th Cong., 2nd sess. (2014) (statement of Lieutenant General David L. Mann, Commanding General, U.S. Army Space and Missile Defense Command/ Army Forces Strategic Command and Joint Functional Component Command for Integrated Missile Defense), accessed August 16, 2014, http://www.armed-services.senate.gov/imo/media/doc/Mann_04-02-14.pdf.

⁵⁸⁶ Juan Cuadrado, "USANCA's Senior Leaders Transition, the 7th Annual Combating WMD Conference, and Recent Army Documents on Capabilities for Countering WMD," *Combating WMD Journal*, no. 9 (2013): 1-2, <https://www.hsdl.org/?view&did=737266>.

⁵⁸⁷ *Ibid.*, 2.

V. CONCLUSION: THE ARMY'S NUCLEAR ROLES

Historical evidence suggests that, since 1942, the U.S. Army has made many important contributions to America's nuclear undertakings, although its nuclear roles have evolved over the years. To begin with, the Army played an integral role in the development and use of the world's first nuclear weapons. During World War II, the U.S. Army not only administered and funded America's secret nuclear weapons program, but it also allocated vital Army personnel to speed the development process. Writing about the Manhattan Project, historian Vincent Jones observed, "During the course of this unprecedented undertaking, the Army had a significant role in orchestrating almost every aspect of atomic development,—from the design, construction, and operation of large-scale production plants to strategic planning for the employment of the atomic bomb."⁵⁸⁸

While scientific expertise was a critical component of America's nuclear weapons program, scientific knowhow alone was not sufficient to produce nuclear weapons. Uranium enrichment and plutonium production required a level of industrial capacity that few nations during World War II (and even during the Cold War) were capable of achieving. The U.S. Army exploited America's industrial and scientific capabilities during World War II by assembling and managing a massive workforce for the Manhattan Project, overseeing the construction of the infrastructure needed to develop nuclear weapons, and putting them both to use to achieve a common goal, the rapid development of weapons unmatched in their destructive potential. Without the contributions of Army personnel during World War II, it is unlikely that the United States would have been able to develop nuclear weapons as efficiently and promptly as it did.

In addition to playing an important role in the development and use of America's first nuclear weapons, the Army also took on a number of other important nuclear roles. Army personnel were responsible for carrying out some of the nation's first counterproliferation operations. Soldiers of the Manhattan Engineer District also conducted investigations to measure the physical and health effects of the nuclear

⁵⁸⁸ Jones, *Manhattan*, 602.

weapons used against Japan to end the war. Furthermore, the Army continued to supervise America's peacetime nuclear program for over a year after the war before it was finally turned over to the Atomic Energy Commission.

Although its nuclear responsibilities were significantly altered during the early years of the Cold War, the Army continued to participate in America's nuclear endeavors. The Army fielded, deployed, maintained, and trained on the employment of a variety of tactical nuclear weapons systems, including nuclear-capable artillery pieces, rockets, and missiles. The Army helped to develop the organizations that were forerunners of the modern-day Defense Threat Reduction Agency and the Defense Nuclear Weapons School. It took part in many of America's nuclear tests, from which the United States gained valuable information that it later used to develop more sophisticated nuclear and conventional weapons. The Army also took measures to prepare for a nuclear war by developing nuclear doctrine, reorganizing its forces, and taking measures to defend the homeland against nuclear attacks. Additionally, the Army managed its own nuclear power program, became involved in the development of nuclear strategy, and helped to reassure U.S. allies and prevent the proliferation of nuclear weapons.

Clearly, the Army took on many different nuclear roles during World War II and the Cold War. Perhaps what is most impressive about the Army's contributions to America's nuclear endeavors during this period is that it was able to take on these nuclear responsibilities during a period when the organization was also involved in a number of other important conventional engagements. The Army assisted in the development of nuclear weapons at a time when it was simultaneously engaged in fighting the largest war the world has ever known. It developed missiles and rockets capable of delivering nuclear warheads while it was fighting North Korean and Chinese forces on the Korean Peninsula. Finally, the Army maintained forward-deployed arsenals of tactical nuclear weapons in both Europe and Asia despite its heavy involvement in the Vietnam War.

Following the end of the Cold War, the U.S. Army's nuclear roles continued to evolve. Today, the Army's nuclear officers provide the Department of Defense with a cadre of soldiers versed in the technical and strategic aspects of nuclear weapons. The Army also currently maintains units dedicated to combatting and eliminating WMD;

understanding and limiting CBRNE effects; participating in nuclear forensics; conducting nuclear counterproliferation missions; developing operational plans involving nuclear weapons; and defending against attacks using nuclear-armed ballistic missiles, cruise missiles, and aircraft. Although these functions have received relatively little attention when compared with the Army's conventional roles in Iraq, Afghanistan, and other volatile countries, the Army's contemporary nuclear roles are significant, particularly given the nuclear threats that have emerged in recent years.⁵⁸⁹

A. HOW NUCLEAR WEAPONS HAVE CHANGED THE ARMY

Although the research conducted for this study focused primarily on determining the extent of the Army's contributions to the nation's nuclear endeavors, it has also revealed the interdependent relationship between the Army and nuclear weapons. While the Army has played a significant role in the evolution of U.S. nuclear weapons and strategies, the Army's evolution has also been strongly influenced by nuclear weapons and the strategies developed because of their existence. Nuclear weapons first altered the course of the Army's development by removing the need to invade Japan's main islands during World War II, thus shortening the war, eliminating the need for a larger land force, and increasing the role of air power in warfare.

The Eisenhower administration's nuclear strategy and defense policies resulted in four important changes to the Army. First, the Army was drastically reduced in size after the Korean War. Without nuclear weapons to deter Soviet aggression in Central Europe, it is possible that the United States would have attempted to maintain a much larger land force in Europe than it did. Second, the U.S. military services that had traditionally served as America's dominant defense institutions—the Army and the Navy—found themselves competing for roles and funding with the U.S. Air Force, which was given a more prominent role in the nation's defense under the Eisenhower administration. The

⁵⁸⁹ Although Operation Iraqi Freedom resulted in regime change in Iraq and may be remembered most for its counterinsurgency aspects, it began as the largest WMD counterproliferation operation in history. "Our mission is clear," said President George W. Bush in March 2003, "to disarm Iraq of weapons of mass destruction, to end Saddam Hussein's support for terrorism, and to free the Iraqi people." See "President Discusses Beginning of Operation Iraqi Freedom," National Archives and Records Administration, accessed September 3, 2014, <http://georgewbush-whitehouse.archives.gov/news/releases/2003/03/20030322.html>.

third change to the Army brought about by the advent of nuclear weapons was the creation and implementation of the Pentomic concept. Under President Eisenhower, the Army received, maintained, and deployed tactical nuclear weapons; it also reorganized its forces in order to meet the presumed demands of the nuclear battlefield.

Finally, disagreements over the roles of land forces and nuclear weapons in defense strategy resulted in significant changes to the Army's leadership. General Matthew Ridgway, a highly respected officer with an impressive military resume, retired from the Army after serving as the Chief of Staff when he was not reappointed by President Eisenhower over a disagreement regarding the Commander-in-Chief's defense strategy.⁵⁹⁰ General Maxwell Taylor, another respected war veteran, also retired from the Army after opposing the strategy of Massive Retaliation as the Army's Chief of Staff, although he later returned to active duty during the Kennedy administration.⁵⁹¹ Even General James Gavin, the Chief of Army Research and Development, retired from the Army because of Eisenhower's defense policies.⁵⁹²

Nuclear weapons continued to influence the Army's evolution even after President Eisenhower left office. Under President Kennedy, the Army once again implemented sweeping changes to its organization. The Army's ROAD concept was developed in response to directives by President Kennedy, which corresponded to his views regarding nuclear weapons and the prospects for non-nuclear war.

Nuclear weapons also had another important effect on the Army during the 1960s. The focus on technology and nuclear weapons during President Eisenhower's time in office coupled with the radical changes to the Army's organization brought about as a result of different defense strategies left the Army somewhat unprepared for the conflict in Vietnam. "As the Army became more and more concerned with nuclear warfare in the

⁵⁹⁰ Richard Stewart, ed., *The United States Army in a Global Era, 1917–2003*, vol. 2 of *American Military History* (Washington, DC: Center of Military History, 2005), 235, <http://www.history.army.mil/books/AMH-V2/PDF/Chapter08.pdf>.

⁵⁹¹ William Gardner Bell, *Commanding Generals and Chiefs of Staff, 1775-2005: Portraits and Biographical Sketches of the United States Army's Senior Officer* (Washington, DC: Center of Military History, 2005), 134, <http://www.history.army.mil/books/CG&CSA/Taylor-MD.htm>; Carter, "Eisenhower Versus the Generals," 1195.

⁵⁹² Carter, "Eisenhower Versus the Generals," 1194–5.

late 1950s, its interest in counterinsurgency and unconventional warfare waned,” wrote Major Robert A. Doughty.⁵⁹³ “By the beginning of the 1960s, the U.S. Army was not prepared in doctrine or equipment for conducting counterinsurgency operations.”⁵⁹⁴ Historian Ingo Tauschweizer noted, “Following its reforms, the army had become a competent deterrent force in Europe, but it was unprepared for combat operations in Vietnam.”⁵⁹⁵

By helping to create nuclear weapons, the U.S. Army sowed the seeds of its own drastic post-war reduction (in terms of both its size and its status). Although the Army eventually regained its role as a nuclear-capable force, it suffered through a period of radical changes to its organization, and it eventually lost several of its most accomplished leaders because of their views regarding the Army’s role in future wars. After being subjected to all of these changes, the Army went up against an enemy in Vietnam for which it was not prepared, one that could neither be deterred with nuclear weapons nor defeated with superior technology. When examining the Army’s past nuclear roles, it would be a mistake to study the extent of the Army’s influence on America’s nuclear programs without also considering the role that nuclear weapons have played in shaping the Army.

B. FOR THE COMMON DEFENSE

The United States has maintained a long tradition of severely reducing its post-bellum military forces. In 1993, Chairman of the Joint Chiefs of Staff Colin Powell pointed out the pitfalls of continuing this tradition:

Throughout the Roaring Twenties and the Great Depression that followed, maintaining a strong military was never a national priority. And we paid for it. We paid when totalitarian governments began their expansionist aggression, aggression that might have been deterred by the existence of strong U.S. forces. We paid at Pearl Harbor, and at Kasserine Pass in North Africa. When World War II ended in victory, we repeated our

⁵⁹³ Doughty, “Evolution of U.S. Army Tactical Doctrine,” 25.

⁵⁹⁴ Ibid.

⁵⁹⁵ Tauschweizer, “Nuclear Weapons and Limited War,” 23.

mistake. Again we failed to keep our forces ready, and we again paid the price in Korea, in the awful retreat to the Pusan perimeter.⁵⁹⁶

Throughout the Eisenhower administration, the United States relied on its nuclear arsenal to deter aggression while drastically reducing its spending on conventional defenses. During this period, the U.S. Army was significantly reduced in size, primarily because President Eisenhower did not envision the United States becoming involved in another large, protracted land war. Nevertheless, U.S. leaders gradually decided in the 1960s that such a conflict was necessary in Vietnam. Once again, U.S. troops, especially ground troops, paid dearly for the nation's unpreparedness.

Today, after over a decade of conflict in Afghanistan, Iraq, the Philippines, and elsewhere, the U.S. Army is once again being reduced. In February 2014, Defense Secretary Chuck Hagel announced plans to cut defense spending, reduce the size of the U.S. Army to pre-World War II levels, and retire the U.S. fleet of A-10 aircraft.⁵⁹⁷ The reason why the Department of Defense is pursuing such reductions is spelled out clearly in the 2014 Quadrennial Defense Review (QDR): "Our forces will no longer be sized to conduct large-scale prolonged stability operations."⁵⁹⁸ While reducing the size of the ground forces, the Department of Defense plans to "protect key capability areas," specifically cyber; missile defense; nuclear deterrence; space; air; sea; precision strike; Intelligence, Surveillance, and Reconnaissance (ISR); and counter terror and special operations.⁵⁹⁹ By not including *land* as one of its key capability areas, the Department of Defense appears to be taking a page from President Eisenhower's book of strategy. While the QDR specifies that the size of the ground forces will be reduced, it also states that the

⁵⁹⁶ Powell, "Chairman of the Joint Chiefs of Staff Report on the Roles, Missions, and Functions of the Armed Forces of the United States," I-11. Others have likewise stated that the United States Army was unprepared for the Korean War. See Doughty, "Evolution of U.S. Army Tactical Doctrine," 7; Trauschweizer, "Nuclear Weapons and Limited War," 2-3.

⁵⁹⁷ Nick Simeone, "Hagel Outlines Budget Reducing Troop Strength, Force Structure," *American Forces Press Service*, February 24, 2014, <http://www.defense.gov/news/newsarticle.aspx?id=121703>; Thom Shanker and Helene Cooper, "Pentagon Plans to Shrink Army to Pre-World War II Level," *The New York Times*, February 23, 2014, http://www.nytimes.com/2014/02/24/us/politics/pentagon-plans-to-shrink-army-to-pre-world-war-ii-level.html?_r=1.

⁵⁹⁸ U.S. Department of Defense, *Quadrennial Defense Review 2014*, accessed August 24, 2014, http://www.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf, vii.

⁵⁹⁹ *Ibid.*, x-xi.

equipment of the Air Force and the Navy will be modernized, and it specifically refers to the purchase of Joint Strike Fighters, aircraft that have dubious potential for providing ground forces with effective Close Air Support (CAS). While it is clearly the preference of current U.S. leaders to rely on strike technology to fight the nation's future wars, it should be noted that superior technology would not always ensure military victory. Following the Korean War, General Taylor drafted a letter to General Ridgway, in which he discussed the limitations of employing sophisticated military equipment during that conflict:

An outstanding impression from the operations in Korea has been the ineffectiveness or inapplicability of many of our modern weapons to the requirement of the Korean type of limited war. I refer particularly to the weapons of the Air Force, the Navy and the Armor, to which certain other Army weapons and equipment may be added. The enemy, terrain, and weather combined to nullify in a large measure much of the costly equipment assembled during and after World War II in preparation for a possible World War III....To these restrictions we added the subjective factor of our own reluctance to use atomic and other special weapons in which we have been investing a large part of the military budget. The absence of an opponent prevented the useful employment of much of our air and naval strength. Except for the MIG's in the northwest corner of the peninsula, there was no airborne enemy to combat. Similarly, at sea the mightiest war ships of the world were obliged to occupy themselves with shelling relatively unimportant targets ashore, or with maintaining a blockade against negligible enemy naval forces.⁶⁰⁰

In 1989, Carl Builder predicted that the next major war would probably “not be a naval or air war” but that it might “stress the Army capabilities to the point that its preparations and competency are once again brought into question.”⁶⁰¹ He anticipated that such wars of the future might be “characterized by the services as ‘third world’ or ‘low intensity’ conflicts...but that [they] could, nevertheless, leave the Army gasping and sweating just to keep from falling on its face.”⁶⁰² In describing one of his predicted future

⁶⁰⁰ Taylor, *Uncertain Trumpet*, 15–16.

⁶⁰¹ Carl H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis* (Baltimore, MD: The Johns Hopkins University Press, 1989), 130.

⁶⁰² *Ibid.*, 131.

wars, Builder provided an accurate depiction of both Operation Enduring Freedom-Afghanistan (OEF-A) and Operation Iraqi Freedom (OIF).

Just because current U.S. leaders do not anticipate the United States participating in another large-scale prolonged stability operation does not necessarily mean that the United States will always be able to avoid becoming involved in such an operation. Past U.S. leaders have made reductions to the military based on similar assumptions. The conflicts in Korea, Vietnam, Iraq, and Afghanistan should serve as reminders that even though the United States military possesses overwhelming technological advantages over its adversaries, these cannot guarantee that the United States will be able to deter or compel its adversaries on every occasion.

Another feature of the 2014 QDR that is particularly salient is its focus on nuclear deterrence, which seemingly conflicts with the administration's stated goal of "reducing the role of U.S. nuclear weapons in U.S. national security strategy."⁶⁰³ Deemphasizing nuclear weapons, which the United States and its NATO Allies have sought to do over the years, will require greater attention to conventional forces. Given the current fiscal constraints on defense spending, U.S. leaders will need to make difficult decisions regarding the composition of America's conventional military forces. Before any decisions are made, those leaders should carefully consider the lessons of the past. War is sometimes unavoidable, and, when it occurs, it often requires the United States to deploy land forces. While technology can provide the U.S. military with remarkable advantages over its adversaries, it may not always guarantee U.S. military victory. Furthermore, as more advanced military systems are introduced onto the battlefield over time, the United States will need to maintain an army of soldiers trained to perform in increasingly challenging environments. Gone are the days when citizens could take up muskets in defense of their country. Now, the United States must maintain a land force that is trained rigorously and kept proficient in the full range of battlefield contingencies, including those involving nuclear weapons. Drastic post-conflict reductions and pre-conflict expansions prevent the Army from maintaining such a state of readiness. While many

⁶⁰³ U.S. Department of Defense, *Nuclear Posture Review Report* (Washington, DC: U.S. Department of Defense, 2010), iii.

people prefer to downplay the role of nuclear weapons in future conflict, some countries appear to be moving in the opposite direction, increasing the likelihood that U.S. armed forces will be required to respond to nuclear threats. It is time for the United States to reevaluate its tradition of post-conflict downsizing of the military. It is expensive to maintain a large, capable ground force; nevertheless, that is the price that the leader of the free world must pay in order to “remain the greatest force for freedom and security that the world has ever known.”⁶⁰⁴

⁶⁰⁴ Quote from Barack Obama’s introductory letter in the Department of Defense’s “Sustaining U.S. Global Leadership: Priorities for 21st Century Defense, January 2012,” U.S. Department of Defense, accessed August 24, 2014, http://www.defense.gov/news/defense_strategic_guidance.pdf.

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LIST OF REFERENCES

- “Albert Einstein to F. D. Roosevelt, August 2, 1939.” In *The Manhattan Project: A Documentary Introduction to the Atomic Age*, edited by Michael B. Stoff, Jonathan F. Fanton, and R. Hal Williams. Philadelphia, PA: Temple University Press, 1991.
- Abbott, Carl. “Building the Atomic Cities: Richland, Los Alamos, and the American Planning Language.” In *The Atomic West*, edited by Bruce Hevly and John M. Findlay. 90–115. Seattle, WA: University of Washington Press, 1998.
- Advisory Committee on Human Radiation Experiments. *Final Report of the Presidential Advisory Committee on Human Radiation Experiments*. 1995. <https://archive.org/stream/advisorycommitte00unit#page/n1/mode/2up>.
- Aftergood, Steven, and Frank N. von Hippel. “The U.S. Highly Enriched Uranium Declaration: Transparency Deferred but Not Denied.” *Nonproliferation Review* 14, no. 1 (2007): 149–161, doi: 10.1080/10736700601178630.
- Albright, Joseph, and Marcia Kunstel. *Bombshell: The Secret Story of America’s Unknown Atomic Spy Conspiracy*. New York: Times Books, 1997.
- Allard, Dean. “Interservice Differences in the United States, 1945–1950: A Naval Perspective.” *Airpower Journal* (1989). <http://www.airpower.au.af.mil/airchronicles/apj/apj89/win89/allard.html>.
- Alperovitz, Gar. *The Decision to Use the Atomic Bomb*. New York: Vintage Books, 1995.
- Arthur, Gordon. “THAAD Commander Says Guam Placement Providing Lessons for Future Deployments.” *IHS Jane’s Defence Weekly*, February 26, 2014. <http://www.janes.com/article/34703/thaad-commander-says-guam-placement-providing-lessons-for-future-deployments>.
- Aspin, Les, quoted in James A. Russell. “WMD Proliferation, Globalization, and International Security: Whither the Nexus and National Security?” In *Globalization and WMD Proliferation: Terrorism, Transnational Networks, and International Security*, edited by James A. Russell and James J. Wirtz. 1–13. New York: Routledge, 2008.
- Bacevich, A. J. *The Pentomic Era: The U.S. Army between Korea and Vietnam*. Washington, DC: National Defense University Press, 1986.
- Bederson, Benjamin. “SEDs at Los Alamos: A Personal Memoir.” In *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians*, edited by Cynthia C. Kelly. New York: Black Dog and Leventhal Publishers, 2007.

- Bellafaire, Judith A. "The Women's Army Corps: A Commemoration of World War II Service." U.S. Department of Defense. U.S. Army Center of Military History. Last modified February 17, 2005. <http://www.history.army.mil/brochures/WAC/WAC.HTM>.
- Betts, Richard K. *Nuclear Blackmail and Nuclear Balance*. Washington, DC: The Brookings Institution, 1987.
- Brandes, Bruce D., and Stephen A. Gomes. "Nuclear Targeting and the Nuclear Employment Augmentation Team (NEAT)." *Combating WMD Journal*, no. 9 (2013): 25–27. <https://www.hsdl.org/?view&did=737266>.
- Broad, William J. "An American 'Regular Guy' Was a Russian Top Spy." *The New York Times*, November 11, 2007. <http://www.nytimes.com/2007/11/11/world/americas/11iht-agent.5.8289329.html?pagewanted=all&r=0>.
- Brode, Bernice. *Tales of Los Alamos: Life on the Mesa 1943–1945*. Los Alamos, NM: Los Alamos Historical Society, 1997.
- Brown, Interview with Norman in *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians*, edited by Cynthia C. Kelly. New York: Black Dog and Leventhal Publishers, 2007.
- Buck, Alice. *The Atomic Energy Commission*. Washington, DC: U.S. Department of Energy, 1983. <http://energy.gov/sites/prod/files/AEC%20History.pdf>.
- Builder, Carl H. *The Masks of War: American Military Styles in Strategy and Analysis*. Baltimore, MD: The Johns Hopkins University Press, 1989.
- Burns, William F. "Tactical Nuclear Weapons and NATO: An Introductory Reminiscence." In *Tactical Nuclear Weapons and NATO*, edited by Tom Nichols, Douglas Stuart, and Jeffrey D. McCausland. xiii–xix. Carlisle, PA: Strategic Studies Institute, 2012.
- Bush, President George H. W. "Address to the Nation on Reducing U.S. and Soviet Nuclear Weapons." September 27, 1991, George Bush Presidential Library and Museum, Texas A&M University. Accessed May 18, 2014. http://bushlibrary.tamu.edu/research/public_papers.php?id=3438&year=1991&month=9.
- . "National Security Strategy of the United States, March 1990." National Security Strategy, Office of the Secretary of Defense. Accessed February 23, 2014. <http://history.defense.gov/resources/nss1990.pdf>.
- Carter, Donald Alan. "Eisenhower Versus the Generals." *The Journal of Military History* 71, no. 4 (2007): 1169–1199. <http://www.jstor.org/stable/30052791>.

- Cheney, Secretary of Defense Dick. *Annual Report to the President and the Congress*. Washington, DC: U.S. Department of Defense, 1993.
- Churchill, Winston, quoted in David S. Yost. “The U.S. Debate on NATO Nuclear Deterrence.” *International Affairs* 87, no. 6 (2011): 1401–1438. doi: 10.1111/j.1468-2346.2011.01043.x.
- Cirincione, Joseph. *Bomb Scare: The History and Future of Nuclear Weapons*. New York: Columbia University Press, 2007.
- Clapper, James R. “Statement for the Record: Worldwide Threat Assessment of the U.S. Intelligence Community.” U.S. Senate Select Committee on Intelligence. U.S. Senate, March 12, 2013. <http://www.intelligence.senate.gov/130312/clapper.pdf>.
- . “Statement for the Record: Worldwide Threat Assessment of the U.S. Intelligence Community.” U.S. Senate Select Committee on Intelligence. U.S. Senate, January 29, 2014. <http://www.intelligence.senate.gov/140129/clapper.pdf>.
- Clearwater, John. *Canadian Nuclear Weapons: The Untold Story of Canada’s Cold War Arsenal*. Toronto: Dundurn Press, 1998.
- Cochran, Thomas B., William M. Arkin, and Milton M. Hoenig, ed. *U.S. Nuclear Forces and Capabilities*, vol. 1 of *Nuclear Weapons Databook*. Cambridge, MA: Ballinger Publishing, 1984.
- Cochran, Thomas B., William M. Arkin, Robert S. Norris, and Milton M. Hoenig, ed. *U.S. Nuclear Warhead Production*, vol. 2 of *Nuclear Weapons Databook*. Cambridge, MA: Ballinger Publishing, 1987.
- Colby, Elbridge A. “U.S. Nuclear Weapons Policy and Policymaking: The Asian Experience.” In *Tactical Nuclear Weapons and NATO*, edited by Tom Nichols, Douglas Stuart, and Jeffrey D. McCausland. 75–105. Carlisle, PA: Strategic Studies Institute, 2012.
- Colin Powell. “Chairman of the Joint Chiefs of Staff Report on the Roles, Missions, and Functions of the Armed Forces of the United States.” February 1993.
- Compton, Arthur Holly. *Atomic Quest: A Personal Narrative*. New York: Oxford University Press, 1956.
- Crane, Conrad C. “To Avert Impending Disaster: American Military Plans to Use Atomic Weapons during the Korean War.” *Journal of Strategic Studies* 23, no. 2 (2000): 72–88. doi: 10.1080/01402390008437791.
- Cuadrado, Juan. “USANCA’s Senior Leaders Transition, the 7th Annual Combating WMD Conference, and Recent Army Documents on Capabilities for Countering

- WMD.” *Combating WMD Journal*, no. 9 (2013): 1–2. <https://www.hsdl.org/?view&did=737266>.
- Defense Nuclear Agency. “Operation CROSSROADS, 1946.” U.S. Department of Defense. Accessed July 16, 2014. <http://www.dtra.mil/documents/ntpr/historical/DNA6032F.pdf>.
- . “Operation IVY, 1952.” U.S. Department of Defense. Accessed July 16, 2014. <http://www.dtra.mil/documents/ntpr/historical/DNA6036F.pdf>, 209.
- . “Operation RANGER: Shots ABLE, BAKER, EASY, BAKER-2, FOX, 25 January–6 February 1951.” U.S. Department of Defense. Accessed July 16, 2014. <http://www.dtra.mil/documents/ntpr/historical/1951%20-%20DNA%206022F%20-%20Operation%20RANGER%20-%20Shots%20ABLE,%20BAKER,%20EA.pdf>.
- . “Operation SANDSTONE, 1948.” U.S. Department of Defense. Accessed July 16, 2014. <http://www.dtic.mil/dtic/tr/fulltext/u2/a139151.pdf>.
- Defense Threat Reduction Agency. *Defense’s Nuclear Agency, 1974-1997*. Washington, DC: U.S. Department of Defense, 2002. <http://www.dtra.mil/documents/aboutdtra/DefensesNuclearAgency.pdf>.
- Defense, Space & Security, Boeing. “Ground-based Midcourse Defense (GMD) System Overview.” Accessed May 16, 2014. <http://www.boeing.com/boeing/defense-space/space/gmd/index.page>.
- . “Ground-based Midcourse Defense Backgrounder.” Accessed May 16, 2014. http://www.boeing.com/assets/pdf/defense-space/space/gmd/docs/GMD_overview.pdf.
- Demyanovich, James. “Army Role in the U.S. Nuclear Capability.” *Combating WMD Journal*, no. 3 (2009): 39–42, <https://www.hsdl.org/?view&did=698896>.
- Department of the Army Headquarters. *Army Regulation 10-16: U.S. Army Nuclear and Combating Weapons of Mass Destruction Agency*. Washington, DC: Department of the Army Headquarters, 2008.
- . *Department of the Army Pamphlet 600-3: Commissioned Officer Professional Development and Career Management*. Washington, DC: Department of the Army Headquarters, 2010.
- Doughty, Robert A. “The Evolution of U.S. Army Tactical Doctrine, 1946–76.” *Leavenworth Papers*, no. 1 (1979): 1–63. <http://carl.army.mil/download/csipubs/doughty.pdf>.
- Eisenhower, Dwight D. *Crusade in Europe*. New York: Doubleday and Company, 1948.

- Farley, Robert M. *Grounded: The Case for Abolishing the United States Air Force*. Lexington, KY: University Press of Kentucky, 2014.
- Federal Reserve Bank of Minneapolis, The. "Consumer Price Index Calculator." Accessed June 24, 2014. [http://www.minneapolisfed.org /community education/teacher/calc/hist1800.cfm](http://www.minneapolisfed.org/community_education/teacher/calc/hist1800.cfm).
- Federation of American Scientists. "Norris, Robert Standish." Accessed November 23, 2013. <http://www.fas.org/press/experts/norris.html>.
- . "A Report to the National Security Council by the Executive Secretary on Basic National Security Policy, October 30, 1953." Accessed July 20, 2014. <http://fas.org/irp/offdocs/nsc-hst/nsc-162-2.pdf>.
- Fehner, Terrence R., and F. G. Gosling. *Atmospheric Nuclear Weapons Testing, 1951–1963*, vol. 1 of *Battlefield of the Cold War: The Nevada Test Site*. Washington, DC: U.S. Department of Energy, 2006. <http://www.energy.gov/sites/prod/files/DOENTSAtmospheric.pdf>.
- Fermi, Rachel, and Esther Samra. *Picturing the Bomb: Photographs from the Secret World of the Manhattan Project*. New York: Harry N. Adams, Inc., 1995.
- Ficken, Robert E. "Grand Coulee and Hanford: The Atomic Bomb and the Development of the Columbia River." In *The Atomic West*, edited by Bruce Hevly and John M. Findlay. 21–38. Seattle, WA: University of Washington Press, 1998.
- Fitch, Val L. "Soldier in the Ranks." In *All in Our Time: The Reminiscences of Twelve Nuclear Pioneers*, edited by Jane Wilson. 189–200. Chicago, IL: The Bulletin of the Atomic Scientists, 1975.
- Forrestal, R. B. "Atomic Bombing and Biological Warfare." *Military Review* 30, no. 4 (1950): 89–93. <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p124201coll1/id/896>.
- Frank, Richard B. *Downfall: The End of the Imperial Japanese Empire*. New York: Penguin Books, 1999.
- Freedman, Lawrence. *The Evolution of Nuclear Strategy*, 3rd ed. New York: Palgrave MacMillan, 2003.
- Gavin, James M. *War and Peace in the Space Age*. New York: Harper and Brothers, 1958.
- Goldberg, Stanley. "General Groves and the Atomic West: The Making and the Meaning of Hanford." In *The Atomic West*, edited by Bruce Hevly and John M. Findlay. 39–89. Seattle, WA: University of Washington Press, 1998.

- Goldschmidt, Bertrand. *Pionniers de l'atome*. Paris: Stock, 1987.
- Goldstein, Donald M., Katherine V. Dillon, and J. Michael Wenger. *Rain of Ruin: A Photographic History of Hiroshima and Nagasaki*. Washington, DC: Brassey's, 1995.
- Gomes, Stephen A. "Tactical Nuclear Weapons in the Cold War Era...A Blast from the Past." *Combating WMD Journal*, no. 3 (2009): 43–55. <https://www.hSDL.org/?view&did=698896>.
- Groves, Leslie R., quoted in P. H. H. Bryan. "The Ground Offensive in Atomic Warfare." *Military Review* 30, no. 4 (1950): 106–110. <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p124201coll1/id/896>.
- Groves, Leslie R. *Now It Can Be Told: The Story of the Manhattan Project*. New York: Harper and Brothers, 1962.
- Hales, Peter Bacon. *Atomic Spaces: Living on the Manhattan Project*. Chicago, IL: University of Illinois Press, 1997.
- Halperin, Morton H., and Priscilla A. Clapp. *Bureaucratic Politics and Foreign Policy*, 2nd ed. Washington, DC: Brookings Institution Press, 2006.
- Hansen, Chuck. *U.S. Nuclear Weapons: The Secret History*. Arlington, TX: Aerofax, 1988.
- Harrell, Irving J., Jr. "Development and Employment of Rockets." *Military Review* 25, no. 8 (1945): 24–28. <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p124201coll1/id/958>.
- Harry S. Truman Library and Museum. National Archives and Records Administration. "Harry S. Truman to Irv Kupcinec, August 5, 1963." Accessed July 4, 2014. http://www.trumanlibrary.org/flip_books/index.php?tldate=1963-07-30&group_id=3707&titleid=&pagenumber=1&collectionid=ihow.
- Hastedt, Glenn P. *American Foreign Policy*, 9th ed. Boston, MA: Pearson, 2011.
- Hayes, Peter. *Pacific Powderkeg: American Nuclear Dilemmas in Korea*. Lexington, MA: Lexington Books, 1991.
- Herken, Gregg. *The Winning Weapon: The Atomic Bomb in the Cold War, 1945–1950*. New York: Alfred A. Knopf, 1980.
- Hewlett, Richard G., and Francis Duncan. *Atomic Shield, 1947/1952*, vol. 2 of *A History of the United States Atomic Energy Commission*. University Park, PA: Pennsylvania State University Press, 1969.

- Hewlett, Richard G., and Jack M. Holl. *Atoms for Peace and War 1953–1961: Eisenhower and the Atomic Energy Commission*. Berkeley, CA: University of California Press, 1989.
- Hewlett, Richard G., and Oscar E. Anderson, Jr., ed. *The New World, 1939/1946*, vol. 1 of *A History of the United States Atomic Energy Commission*. University Park, PA: Pennsylvania State University Press, 1962.
- Hinton, Harold B. “Ammunition Ample to Repel Reds in Korea, Says Wilson.” *New York Times*, March 7, 1953. ProQuest (112573795).
- Homer, J. L. “Guided Missiles and Future Warfare.” *Military Review* 27, no. 8 (1947): 13–20. <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p124201coll1/id/943>.
- Howes, Ruth H., and Caroline L. Herzenberg. *Their Day in the Sun: Women of the Manhattan Project*. Philadelphia, PA: Temple University Press, 1999.
- Huntley, Wade L. “Speed Bump on the Road to Global Zero.” *The Nonproliferation Review* 20, no. 2 (2013): 305–338. doi: 10.1080/10736700.2013.799945.
- “J. Robert Oppenheimer to Dan Gillespie, October 15, 1945.” In *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians*, edited by Cynthia C. Kelly. New York: Black Dog and Leventhal Publishers, 2007.
- J. H. Manley. “Organizing a Wartime Laboratory.” In *All in Our Time: The Reminiscences of Twelve Nuclear Pioneers*, edited by Jane Wilson. 126–141. Chicago: The Bulletin of the Atomic Scientists, 1975.
- Jae-bong, Lee. “U.S. Deployment of Nuclear Weapons in 1950s South Korea and North Korea’s Nuclear Development: Toward Denuclearization of the Korean Peninsula.” *The Asia-Pacific Journal* 8, no. 3 (2009). http://www.japanfocus.org/-lee-jae_bong/3053.
- Jones, Vincent C. *Manhattan: The Army and the Atomic Bomb*. Washington, DC: Center of Military History, 1985.
- Jungk, Robert. *Brighter than a Thousand Suns: A Personal History of the Atomic Scientists*, trans. James Cleugh. New York: Harcourt, Brace and Company, 1958.
- Jussel, Paul C. “Intimidating the World: The United States Atomic Army, 1956–1960.” PhD diss., Ohio State University, 2004. https://etd.ohiolink.edu/!etd.send_file?accession=osu1085083063&disposition=inline.
- Kaplan, Fred. *The Wizards of Armageddon*. Stanford, CA: Stanford University Press, 1991.

- Kinman, Bret C. "The Army before Last: Military Transformation and the Impact of Nuclear Weapons on the U.S. Army during the Early Cold War." Master's thesis, Naval Postgraduate School, 2004. <http://hdl.handle.net/10945/1398>.
- Kinman, Bret, and Matthew Armstrong. "Heisenberg in Action: A Year Plus in the Life of the Nuclear Disablement Teams." *Combating WMD Journal*, no. 8 (2012): 22–26. <https://www.hsdl.org/?view&did=720436>.
- Kinman, Bret, and Paul Argo. "More than Just Breaking Things... The 20th Support Command Nuclear Disablement Teams in Action." *Combating WMD Journal*, no. 6 (2010): 17–19. <https://www.hsdl.org/?view&did=697744>.
- Kristensen, Hans M., and Robert S. Norris. "U.S. Nuclear Forces, 2014." *Bulletin of the Atomic Scientists* 70, no. 1 (2014): 85–93. doi: 10.1177/0096340213516744.
- Lamm, Joanne. "The Island is Missing!" U.S. Department of Defense. U.S. Army News Archives, Accessed July 16, 2014. http://www.army.mil/article/47341/The_Island_is_Missing__/.
- Lamont, Lansing. *Day of Trinity*. New York: Atheneum, 1985.
- Laurence, William L. *Men and Atoms: The Discovery, the Uses, and the Future of Atomic Energy*. New York: Simon and Schuster, 1959.
- LeDoux, Julia, and Phil Shubert. "Fort Belvoir Nuclear Revisited in April 2011." *Combating WMD Journal*, no. 8 (2012): 19–21. <https://www.hsdl.org/?view&did=720436>.
- Legge, J. Michael. *Theater Nuclear Weapons and the NATO Strategy of Flexible Response*. Santa Monica, CA: The Rand Corporation, 1983.
- Libby, Leona Marshall. *The Uranium People*. New York: Crane, Russak and Company, 1979.
- Lockheed Martin Corporation. "Lockheed Martin Receives \$3.9 Billion THAAD Production Contract." Accessed May 17, 2014. <http://www.lockheedmartin.com/us/news/press-releases/2013/september/mfc-092313-lm-receives-thaad.html>.
- . "THAAD." Accessed May 17, 2014. <http://www.lockheedmartin.com/us/products/thaad.html>.
- Macon, William A. Jr. "Nuclear Power Plants on Military Installations: 'A Think Piece.'" *Combating WMD Journal*, no. 5 (2010): 41–45. <https://www.hsdl.org/?view&did=697747>.
- Maddox, Robert James. *Weapons for Victory: The Hiroshima Decision Fifty Years Later*. Columbia, MO: University of Missouri Press, 1995.

- Maiorano, Alan Cary. "The Evolution of United States and NATO Tactical Nuclear Doctrine and Limited Nuclear War Options, 1949–1984." DTIC (ADA140802). Master's thesis, Naval Postgraduate School, 1983.
- Manhattan Engineer District. *Atomic Bombings of Hiroshima and Nagasaki*. New York: Manhattan Engineer District, June 29, 1946.
- Manning, Rob. "Combating Weapons of Mass Destruction: 'Making the World Safer.'" U.S. Army. Last modified March 20, 2013. http://www.army.mil/article/99153/Combating_Weapons_of_Mass_Destruction___Making_the_World_Safer_/.
- Marshall, George C. *General Marshall's Report: The Winning of the War in Europe and the Pacific (Biennial Report of the Chief of Staff of the United States Army, July 1, 1943 to June 30, 1945, to the Secretary of War)*. New York: Simon and Schuster, 1945.
- McKay, Alwyn. *The Making of the Atomic Age*. New York: Oxford University Press, 1984.
- Menetrey. Quoted in Terence Roehrig. *From Deterrence to Engagement: The U.S. Defense Commitment to South Korea*. Lanham, MD: Lexington Books, 2007.
- Meyer, Leisa D. *Creating G.I. Jane: Sexuality and Power in the Women's Army Corps during World War II*. New York: Columbia University Press, 1996.
- Midgely, John J. Jr. *Deadly Illusions: Army Policy for the Nuclear Battlefield*. Boulder, CO: Westview Press, 1986.
- Miklaszewski, Jim, and Jeff Black. "Defense Secretary Hagel Orders Review of Nuclear Weapons Mission Following Scandals." *NBC News*, January 23, 2014. http://usnews.nbcnews.com/_news/2014/01/23/22418511-defense-secretary-hagel-orders-review-of-nuclear-weapons-mission-following-scandals?lite.
- Ministry of Foreign Affairs of Japan. "Japan-U.S. Security Treaty." Accessed June 4, 2014. <http://www.mofa.go.jp/region/n-america/us/q&a/ref/1.html>.
- Moltz, James Clay. *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests*. 2nd ed. Stanford, CA: Stanford University Press, 2011.
- Morton, Louis. "The Decision to Use the Bomb." *Foreign Affairs* 35, no. 2 (1957): 334–353. <http://www.jstor.org/stable/20031230>.
- National Aeronautics and Space Administration. "NASA History in Brief." Accessed August 2, 2014. <http://history.nasa.gov/brief.html>.

- National Archives and Records Administration. "President Discusses Beginning of Operation Iraqi Freedom." Accessed September 3, 2014. <http://georgewbush-whitehouse.archives.gov/news/releases/2003/03/20030322.html>.
- . "Transcript of the Armistice Agreement for the Restoration of the South Korean State (1953)." Accessed August 3, 2014. <http://www.ourdocuments.gov/doc.php?doc=85&page=transcript>.
- . 100 Milestone Documents. "Armistice Agreement for the Restoration of the South Korean State (1953)." Accessed June 2, 2014. <http://www.ourdocuments.gov/doc.php?flash=true&doc=85&page=transcript>.
- National Security Policy, Arms Control and Disarmament. "Memorandum of Conference with President Eisenhower, July 6, 1960." Document 107. U.S. Department of State. Accessed July 20, 2014. <https://history.state.gov/historicaldocuments/frus1958-60v03/d107>.
- Norris, Robert S. *Racing for the Bomb: General Leslie R. Groves, The Manhattan Project's Indispensable Man*. South Royalton, VT: Steerforth Press, 2002.
- Norris, Robert S., William M. Arkin, and William Burr. "Where They Were." *Bulletin of the Atomic Scientists* 55, no. 6 (1999): 26–35. ProQuest (197945488).
- Norris, Robert Standish. "United States Nuclear Weapons Deployments Abroad, 1950–1977." Public Interest Declassification Board Meetings, U.S. National Archives and Records Administration. Accessed February 25, 2014. <http://www.archives.gov/declassified/pidb/meetings/norris-addendum.pdf>.
- North Atlantic Treaty Organization. "Deterrence and Defense Posture Review, 20 May, 2012." Accessed August 28, 2014. http://www.nato.int/cps/en/natolive/official_texts_87597.htm?mode=pressrelease.
- . "The North Atlantic Treaty." Accessed June 2, 2014. http://www.nato.int/cps/en/natolive/official_texts_17120.htm.
- Nosco, Mary Lou. "The Last WACs: A Case Study of Women in Leadership Focusing on Women in the Last Direct Commissioning Class of the Women's Army Corps." PhD diss., Drake University, 2009.
- Nuclear Tipping Point*, directed by Ben Goddard. 2010. Nuclear Security Project. DVD. <http://www.nucleartippingpoint.org/film/film.html>.
- O'Neill, Kevin. "Building the Bomb." In *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons since 1940*, edited by Stephen I. Schwartz. 33–104. Washington, DC: Brookings Institution Press, 1998.

- Panetta, Leon. "Sustaining U.S. Global Leadership: Priorities for 21st Century Defense." U.S. Department of Defense. Accessed February 23, 2014. http://www.defense.gov/news/defense_strategic_guidance.pdf.
- PAO, 20th Support Command (CBRNE). "U.S. Army 20th Support Command (CBRNE) Organization/Transformation." *Combating WMD Journal*, no. 1 (2007): 31–35. <https://www.hsdl.org/?view&did=697751>.
- Pfeffer, Robert A., and William A. Macon, Jr. "Nuclear Power: An Option for the Army's Future." *Army Logistician* 33, no. 5 (2001): 4–8. <http://www.alu.army.mil/alog/issues/SepOct01/Final.pdf>.
- Plante, Dirk, Andrae Brooks, and Stephen A. Gomes. "USANCA Breaks Ground on New Facility at Fort Belvoir." *Combating WMD Journal*, no. 2 (2008): 3–4. <https://www.hsdl.org/?view&did=698893>.
- Pollack, Jonathan D. *No Exit: North Korea, Nuclear Weapons and International Security*. New York: Routledge, 2011.
- Pottier, Olivier. "Les armes nucléaires américaines en France, 1952–1966." In *Histoire de l'armement nucléaire*, Cahier no. 8. 37–60. Vincennes: Centre d'études d'histoire de la Défense, 1998).
- Powell, Colin. *Chairman of the Joint Chiefs of Staff Report on the Roles, Missions, and Functions of the Armed Forces of the United States*. Washington, DC: U.S. Department of Defense, 1993.
- Powell, Colin L. *My American Journey*. New York: Random House, 1995.
- Raytheon. "Patriot, Raytheon Company." Accessed May 17, 2014. <http://www.raytheon.com/capabilities/products/patriot/>.
- "Report of the Committee on Political and Social Problems, June 11, 1945." In *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians*, edited by Cynthia C. Kelly. New York: Black Dog and Leventhal Publishers, 2007.
- Republic of Korea Ministry of National Defense. *ROK-US Alliance and USFK*. Seoul: Republic of Korea Ministry of National Defense, 2002.
- Rhodes, Richard. *Dark Sun: The Making of the Hydrogen Bomb*. New York: Simon and Schuster, 1995.
- . *The Making of the Atomic Bomb*. New York: Simon and Schuster Paperbacks, 1986.

- Rice, quoted in Wolf Blitzer. "Search for the 'Smoking Gun.'" *CNN*, January 10, 2003. <http://www.cnn.com/2003/US/01/10/wbr.smoking.gun/>.
- Ridgway, Matthew B. *Soldier: The Memoirs of Matthew B. Ridgway*. New York: Harper and Brothers, 1956.
- Roehrig, Terence. *From Deterrence to Engagement: The U.S. Defense Commitment to South Korea*. Lanham, MD: Lexington Books, 2007.
- Roper, Daniel S. "The Impact of the Presidential Nuclear Initiative on Deterrence and the United States Army." *The Land Warfare Papers*, no. 16 (1993): 1–24.
- Rose, John P. *The Evolution of U.S. Army Nuclear Doctrine, 1945–1980*. Boulder, CO: Westview Press, 1980.
- Rosenberg, David Alan. "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945–1960." *International Security* 7, no. 4 (1983): 3–71.
- Schulte, Paul. "Tactical Nuclear Weapons in NATO and beyond: A Historical and Thematic Examination." In *Tactical Nuclear Weapons and NATO*, edited by Tom Nichols, Douglas Stuart, and Jeffrey D. McCausland. 13–74. Carlisle, PA: Strategic Studies Institute, 2012.
- "Science Panel's Report to the Interim Committee, June 16, 1945." In *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians*, edited by Cynthia C. Kelly. New York: Black Dog and Leventhal Publishers, 2007.
- Serber, Robert. "The Los Alamos Primer." Los Alamos National Laboratory Research Library, U.S. Department of Energy. Accessed July 4, 2014. <http://library.lanl.gov/cgi-bin/getfile?00349710.pdf>.
- Shanker, Thom, and Helene Cooper. "Pentagon Plans to Shrink Army to Pre-World War II Level." *The New York Times*, February 23, 2014. http://www.nytimes.com/2014/02/24/us/politics/pentagon-plans-to-shrink-army-to-pre-world-war-ii-level.html?_r=1.
- Sheely Eugene V. "A Brief History of the Defense Nuclear Weapons School." *Combating WMD Journal*, no. 6 (2010): 51–52. <https://www.hsdl.org/?view&did=697744>.
- Simeone, Nick. "Hagel Outlines Budget Reducing Troop Strength, Force Structure." *American Forces Press Service*, February 24, 2014. <http://www.defense.gov/news/newsarticle.aspx?id=121703>.

- Skelton, John D. *The Forbidden Weapon: The Employment of Army Tactical Nuclear Weapons*. DTIC no. ADA240197. Leavenworth, KS: U.S. Army Command and General Staff College, 1991.
- Smith, Mike R. "Soldiers Intercept, Destroy Ballistic Missile in Space." U.S. Army. Accessed May 16, 2014. <http://www.army.mil/article/14968/soldiers-intercept-destroy-ballistic-missile-in-space/>.
- Smith, Perry McCoy. *The Air Force Plans for Peace 1943–1945*. Baltimore, MD: The Johns Hopkins Press, 1970.
- Spector, Leonard S. *Deterring Regional Threats from Nuclear Proliferation*. Carlisle, PA: U.S. Army War College, 1992.
- Stewart, Richard W. ed. *American Military History*, vol. 2 of *The United States Army in a Global Era, 1917–2003*. Washington, DC: U.S. Army Center of Military History, 2005. <http://www.history.army.mil/books/AMH-V2/PDF/Chapter09.pdf>.
- . *The United States Army in a Global Era, 1917–2003*, vol. 2 of *American Military History*. Washington, DC: Center of Military History, 2005. <http://www.history.army.mil/books/AMH-V2/PDF/Chapter08.pdf>.
- Tannenwald, Nina. *The Nuclear Taboo: The United States and the Non-Use of Nuclear Weapons Since 1945*. New York: Cambridge University Press, 2007.
- Taylor, Maxwell D. *The Uncertain Trumpet*. New York: Harper and Brothers, 1959.
- Trachtenberg, Marc. "The Bush Strategy in Historical Perspective." In *Nuclear Transformation: The New U.S. Nuclear Doctrine*, edited by James J. Wirtz and Jeffrey A. Larsen. 9–21. New York: Palgrave MacMillan, 2005.
- Train, William F. "The Atomic Challenge." *Military Review* 36, no. 8 (1956): 4–14. <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p124201coll1/id/749>.
- Trauschweizer, Ingo. "Nuclear Weapons and Limited War: The U.S. Army in the 1950s." Working paper, European University Institute, 2009. <http://hdl.handle.net/1814/11674>.
- Treadwell, Mattie E. *The Women's Army Corps*. Washington, DC: Office of the Chief of Military History, 1954.
- U.S. Army Europe. U.S. Army. "Units and Commands." Accessed May 17, 2014. <http://www.eur.army.mil/organization/units.htm>.
- U.S. Army. "1-1 Air Defense Artillery (Regiment)." Accessed May 17, 2014. <http://www.usarj.army.mil/organization/1-1ada/>.

- . 10th AAMDC, “About Us.” Accessed May 17, 2014. <http://www.eur.army.mil/10thAAMDC/about.html>.
- . 10th AAMDC. “Contact Us.” Accessed May 17, 2014. <http://www.eur.army.mil/10thAAMDC/contact.html>.
- . 11th ADA, Brigade. “Imperial.” Accessed May 17, 2014. <https://www.bliss.army.mil/11thADA/index.html>.
- . “20th CBRNE Command.” Accessed May 16, 2014. <http://www.army.mil/20thcbrne>.
- . “20th Support Command (CBRNE). Stand-To Archive.” Accessed May 16, 2014. <http://www.army.mil/standto/archive/2009/03/11/>.
- . 32d Army Air and Missile Defense Command. “About Us.” Accessed May 17, 2014, <https://www.bliss.army.mil/32nd/About32.html>.
- . 32d Army Air and Missile Defense Command. “CG Visits Lockheed Martin’s THAAD Program in Sunnyvale, CA.” Accessed May 17, 2014, https://www.bliss.army.mil/32nd/News/030612_Sunnyvale.html.
- . 32d Army Air and Missile Defense Command. “Our History.” Accessed May 17, 2014, <https://www.bliss.army.mil/32nd/History.html>.
- . “94th Army Air and Missile Defense Command.” Accessed May 17, 2014. <http://www.94aamdc.army.mil/index.html>.
- . “Organization.” Accessed May 15, 2014. <http://www.army.mil/info/organization/unitsandcommands/commandstructure/>.
- . “SMDC/ARSTRAT Operations.” Accessed May 15, 2014. <http://www.smdc.army.mil/2008/SpaceBMD.asp>.
- . U.S. Army Human Resources Command. “FA-52 Nuclear and Counter proliferation Functional Area.” Accessed May 11, 2014. <https://www.hrc.army.mil/Officer/FA-52%20Nuclear%20and%20Counterproliferation%20Functional%20Area>.
- . U.S. Army Pacific. “Subordinate Commands.” Accessed May 17, 2014. http://www.usarpac.army.mil/subordinate_commands.asp.
- . U.S. Army Space and Missile Defense Command/Army Forces Strategic Command. “100th Missile Defense Brigade.” Accessed May 15, 2014. <http://www.smdc.army.mil/2008/100thMDB.asp>.

- U.S. Atomic Energy Commission. *Major Activities in the Atomic Energy Programs*. Washington, DC: U.S. Atomic Energy Commission, 1952.
- . *Report to Congress, Fourth Semiannual Report*. Washington, DC: U.S. Atomic Energy Commission, 1948.
- . *Report to Congress, Major Activities in the Atomic Energy Programs*. Washington, DC: U.S. Atomic Energy Commission, 1960.
- . *Tenth Semiannual Report of the Atomic Energy Commission*. Washington, DC: U.S. Atomic Energy Commission, 1951.
- U.S. Congress. Office of Technology Assessment. *Technologies Underlying Weapons of Mass Destruction*. Washington, DC: U.S. Government Printing Office, 1993.
- U.S. Department of Defense. “1953 Mutual Defense Treaty, USFK SOFA Documents.” Accessed June 2, 2014. <https://www.usfk.mil/usfk/sofa.1953.mutual.defense.treaty.76>.
- . Defense Threat Reduction Agency. “Defense Nuclear Weapons School Fiscal Year 2014 Course Catalogue.” Accessed July 13, 2014. <http://www.dtra.mil/docs/documents-dnws/dnws-fy14-course-catalog.pdf?sfvrsn=4,4>.
- . Department of the Army. “Field Manual 100-5. Field Service Regulations: Operations, September 1954.” Combined Arms Research Library Digital Library, Accessed July 28, 2014. <http://cgsc.contentdm.oclc.org/cdm/ref/collection/p4013coll9/id/79>.
- . “First ABM Site in the Free World.” Accessed August 16, 2014. <http://www.smdc.army.mil/2008/about.asp>.
- . “Frequently Asked Questions.” The Nuclear Matters Handbook Expanded Edition. Accessed August 16, 2014. http://www.acq.osd.mil/ncbdp/nm/nm_book_5_11/faq.htm.
- . *Joint Publication 1: Joint Warfare of the Armed Forces of the United States*. Washington, DC: U.S. Department of Defense, 2000.
- . *Nuclear Posture Review Report*. Washington, DC: U.S. Department of Defense, 2010.
- . Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. Defense Science Board. “Report of the Defense Science Board Task Force on Nuclear Deterrence Skills, September 2008.” Accessed May 13, 2014. <http://www.acq.osd.mil/dsb/reports/ADA487983.pdf>.

- . Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. Defense Science Board. “Report of the Defense Science Board Task Force on Nuclear Weapons Effects Test, Evaluation, and Simulation, April 2005.” Accessed May 14, 2014. <http://www.acq.osd.mil/dsb/reports/ADA434656.pdf>.
- . Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. Defense Science Board. “Report of the Joint Defense Science Board/Threat Reduction Advisory Committee Task Force on the Nuclear Weapons Effects National Enterprise, June 2010.” Accessed May 13, 2014. <http://www.acq.osd.mil/dsb/reports/ADA523661.pdf>.
- . *Quadrennial Defense Review Report*, February 6, 2006. http://www.defense.gov/home/features/2014/0314_sdr/qdr/docs/Report20060203.pdf.
- . *Quadrennial Defense Review 2014*. Accessed August 24, 2014. http://www.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf.
- . “Sustaining U.S. Global Leadership: Priorities for 21st Century Defense, January 2012.” Accessed August 24, 2014. http://www.defense.gov/news/defense_strategic_guidance.pdf.
- . U.S. Army Aviation and Missile Life Cycle Management Command. “Pioneering Efforts in Space.” Accessed July 20, 2014. <http://history.redstone.army.mil/space-pioneer.html>.
- . U.S. Army Aviation and Missile Life Cycle Management Command. “Explorer I.” Accessed July 20, 2014. <http://history.redstone.army.mil/space-explorer.html>.
- . U.S. Army Aviation and Missile Life Cycle Management Command. “Installation History 1965.” Accessed July 13, 2014. <http://history.redstone.army.mil/ihist-1965.html>.
- . U.S. Army Aviation and Missile Life Cycle Management Command. “Installation History 1970.” Accessed July 13, 2014. <http://history.redstone.army.mil/ihist-1970.html>.
- . U.S. Army Aviation and Missile Research Development and Engineering Center. “Corporal Missile (MGM-5).” July 20, 2014. <http://www.amrdec.army.mil/amrdec/50th/innovation-mgm-5.html>.
- . U.S. Army Center of Military History. “Manhattan District WAC Detachment.” Accessed June 25, 2014. <http://www.history.army.mil/html/documents/women/wac-manhattan/>.
- U.S. Department of Defense. U.S. Army Corps of Engineers. “Sturgis.” Accessed July 12, 2014. <http://www.nab.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/10470/Article/11581/sturgis.aspx>.

- . U.S. Army Field Artillery School. “Field Artillery School History.” Accessed July 13, 2014. <http://sill-www.army.mil/USAFAS/history.html>.
- . Weapons of Mass Destruction Training and Education. “The Defense Nuclear Weapons School Fiscal Year 2014 Course Catalog.” Accessed May 13, 2014. <http://www.dtra.mil/docs/documents-dnws/dnws-fy14-course-catalog.pdf?sfvrsn=4,4,41>.
- U.S. Department of Energy. “Atomic Rivals and the ALSOS Mission.” Accessed June 26, 2014. <http://www.osti.gov/manhattan-project-history/Events/1942-1945/rivals.htm>.
- . “Highly Enriched Uranium: Striking a Balance.” Federation of American Scientists. Accessed July 12, 2014. <http://fas.org/sgp/othergov/doe/heu/>.
- U.S. Department of State. Office of the Historian. “Milestones: 1949–1952.” Accessed June 2, 2014, <https://history.state.gov/milestones/1945-1952/>.
- Van Cleave, William R., and S. T. Cohen. *Tactical Nuclear Weapons: An Examination of the Issues*. New York: Crane Russak, 1978.
- Wainstock, Dennis D. *The Decision to Drop the Atomic Bomb*. Westport, CT: Praeger, 1996.
- Weigley, Russell F. *The American Way of War: A History of United States Military Strategy and Policy*. Bloomington, IN: Indiana University Press, 1973.
- Weinert, Richard P. *A History of Army Aviation, 1950-1962, Phase II: 1955–1962*. Fort Monroe, VA: U.S. Army Training and Doctrine Command Historical Office, 1976. <http://www.dtic.mil/dtic/tr/fulltext/u2/a033626.pdf>.
- White House. *A National Security Strategy for a Global Age*. Office of the Secretary of Defense, 2000, <http://history.defense.gov/resources/nss2000.pdf>.
- . *National Security Strategy*. White House, May 2010. http://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf.
- . *National Security Strategy of the United States*. Office of the Secretary of Defense, January 1988. <http://history.defense.gov/resources/nss1988.pdf>.
- . *National Security Strategy of the United States*. Office of the Secretary of Defense, March 1990. <http://history.defense.gov/resources/nss1990.pdf>.
- . “Remarks by President Barack Obama.” April 5, 2009. http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered.

- . *The National Security Strategy of the United States of America*. Office of the Secretary of Defense, 2002. <http://history.defense.gov/resources/nss2002.pdf>.
- William Gardner Bell, *Commanding Generals and Chiefs of Staff, 1775-2005: Portraits and Biographical Sketches of the United States Army's Senior Officer*. Washington, DC: Center of Military History, 2005. <http://www.history.army.mil/books/CG&CSA/Taylor-MD.htm>.
- Williams, Vera S. *WACs: Women's Army Corps*. Osceola, WI: Motorbooks International, 1997.
- Wolk, Herman S. "The 'New Look,'" *Air Force Magazine* 86, no. 8 (2003): 80–83. <http://www.airforcemag.com/magazinearchive/pages/2003/august%202003/08031ook.aspx>.
- Wörner, Manfred, quoted in David S. Yost. "Assurance and U.S. Extended Deterrence." *International Affairs* 85, no. 4 (2009): 755–780. <http://hdl.handle.net/10945/38369>.
- Wyden, Peter. *Day One: Before Hiroshima and After*. New York: Simon and Schuster, 1984.
- Yost, David S. "Strategic Stability in Europe." *The Nonproliferation Review* 20, no. 2 (2013): 205–245. doi: 10.1080/10736700.2013.804317.
- . "The History of NATO Theater Nuclear Force Policy: Key Findings from the Sandia Conference." *Journal of Strategic Studies* 15, no. 2 (1992): 228–261. doi: 10.1080/01402399208437482.
- Younger, Stephen M. *The Bomb: A New History*. New York: HarperCollins Publishers, 2009.

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