

Averting Armageddon: A Select Review of Recent Literature on Nuclear Proliferation and Terrorism

by

George Michael

The Counterproliferation Papers

USAF Counterproliferation Center

Air University

Maxwell Air Force Base, Alabama

<http://www.au.af.mil/au/awc/awcgate/awc-cps.htm>

Disclaimer

The views expressed in this academic research paper are those of the author and do not reflect the official policy or position of the U.S. government or the Department of Defense. In accordance with Air Force Instruction 51-303, it is not copyrighted, but is the property of the United States government.

Table of Contents

	Page
Author's Biography.....	2
Introduction.....	4
Chapter 1: The History of Nuclear Weapons.....	8
Review of Joseph Cirincione, <i>Bomb Scare: The History and Future of Nuclear Weapons</i>	9
Chapter 2: Nuclear Proliferation.....	19
Dealing with the Bomb: Nonproliferation, Missile Defense, and the Quest to Develop Usable Weapons: Review of Shane J. Maddock, <i>Nuclear Apartheid: The Quest for American Atomic Supremacy from World War II to present</i> , Review of Columba Peoples, <i>Justifying Ballistic Missile Defence: Technology, Security and Culture</i> , and Review of David A. Koplow, <i>Death by Moderation: The U.S. Military's Quest for Useable Weapons</i>	22
Review of Mathew Kroenig, <i>Exporting the Bomb: Technology Transfer and the Spread of Nuclear Weapons</i>	44
Review of Fred Schreier, <i>WMD Proliferation: Reforming the Security Sector to Meet the Threat</i>	52
Chapter 3: Nuclear Terrorism.....	58
Review of Charles D. Ferguson and William C. Potter, <i>The Four Faces of Nuclear Terrorism</i>	60
Review of Brian Michael Jenkins, <i>Will Terrorist Go Nuclear?</i>	67
Review of Michael Levi, <i>On Nuclear Terrorism</i>	72
Review of Jeffrey T. Richelson, <i>Defusing Armageddon: Inside NEST, America's Secret Nuclear Bomb Squad</i>	77
Chapter 4: Looking Ahead.....	82
Review of John Mueller, <i>Atomic Obsession: Nuclear Alarmism from Hiroshima to Al Qaeda</i>	86

Review of Ron Rosenbaum, *How the End Begins: The Road to a Nuclear World War III*.....92

Conclusion:.....101

George Michael's Biography

George Michael received his Ph.D. from George Mason University's School of Public Policy. He is associate professor of nuclear counterproliferation and deterrence theory at the Air War College in Montgomery, Alabama. Previously, he was associate professor at the University of Virginia's College at Wise. Dr. Michael is a veteran of both the U.S. Air Force and the Pennsylvania Air National Guard. He is the author of five books including *Theology of Hate: A History of the World Church of the Creator* (University Press of Florida, 2009) and *Lone Wolf Terror and the Rise of Leaderless Resistance* (University of Vanderbilt Press, 2012). In addition, his articles have been published in *The Chronicle of Higher Education*, *Skeptic*, *Journal of International Security Affairs*, *Journal of Counterterrorism & Homeland Security International Terrorism and Political Violence*, *Small Wars & Insurgencies*, *Defence Studies*, *Joint Forces Quarterly*, *Nonproliferation Review*, *Infinite Energy*, *Military Review*, *Prism*, *Middle East Quarterly*, *Middle East Policy*, *Studies in Conflict & Terrorism*, *Totalitarian Movements and Political Religions*, *Journal of Social, Political, and Economic Studies*, *Culture & Civilization*, *War in History*, *Fortean Times*, *Slavic Military Studies*, *Journal of Church and State*, *Religion Compass*, *Journal of Social, Political, and Economic Studies*, *Patterns of Prejudice*, *Infinite Energy*, *Population and Environment*, *International Studies Review*, *World Future Review*, and the *Fort Worth Star-Telegram*.

Introduction

Since the end of the Cold War, there has been a steady reduction in the nuclear enterprise. Both the US and Russian governments have substantially reduced their nuclear arsenals. Nevertheless, today there is much consternation over the increasing availability of weapons of mass destruction (WMD). A steady dissemination of dual-use equipment enables rogue states or terrorist organizations to produce chemical and biological weapons. Moreover, motivations of terrorists are changing, with modern terrorists likely to be inspired by millenarian and extremist ideologies instead of the secular ideologies that animated earlier terrorists thus increasing their proclivity to use (WMD). With the breakup of the Soviet Union, new concerns arose about the security of nuclear weapons and the greater risk of a black market for WMD, components and related expertise. The Soviet Union's collapse left eighteen thousand nuclear warheads in the hands of leaders of new countries, though there is no evidence that any of these weapons ever left government control.¹

The knowledge of nuclear weaponization is becoming more widespread. Although the hurdles to producing and acquiring nuclear weapons are still formidable, the design and construction problems are being mitigated by advances in computers and commercial equipment. Furthermore, the spread of centrifuge technology and advances in centrifuge designs provide for potentially greater capacity to produce nuclear weapons. Finally, the technology used to produce delivery systems is becoming more readily available as well.²

¹ "The Future of Terrorism," *Discover*, July 2006, p. 37.

² Anthony Cordesman, *The War After the War: Strategic Lessons of Iraq and Afghanistan*. (Washington, D.C.: Center for Strategic and International Studies, 2004), pp. 21-23.

The most worrisome aspect of modern terrorism is the prospect of a radical group obtaining a nuclear weapon. In fact, on the eve of the Nuclear Security Summit in April 2010, U.S. President Barack Obama announced that the prospect of nuclear terrorism was ‘the single biggest threat to U.S. security, both short-term, medium-term and long-term.’³ Likewise, in its final report, the 9/11 Commission reported that the greatest danger that America faced was the threat from terrorists armed with a weapon of mass destruction (WMD).⁴ Echoing these concerns, former CIA Director George Tenet opined that the main threat of WMD was the nuclear one and that al Qaeda was making efforts in that direction.⁵ Writing in 2004, Graham Allison, an authoritative scholar on the topic, stated that in his “own considered judgment, on the current path, a nuclear terrorist attack on America in the decade ahead is more likely than not.”⁶ As an indication of how serious the international community has taken the issue, in 2005, the United Nations created the International Convention for the Suppression of Acts of Nuclear Terrorism.

³ David E. Sanger and William J. Broad, “Leaders Gather for Nuclear Talks as New Threat is Seen,” *The New York Times*, April 11, 2010, <http://www.nytimes.com/2010/04/12/world/12nuke.html>. The Obama administration’s *Nuclear Posture Review* placed the prevention of nuclear terrorism and proliferation as the two issues on the top of the U.S. policy agenda. Department of Defense, *Nuclear Posture Review Report*. (Washington, D.C.: Department of Defense, April 2010).

⁴ *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks Upon the United States*. (New York and London: W.W. Norton & Company, 2004), p. 380.

⁵ George Tenet (with Bill Harlow), *At the Center of the Storm: My Years at the CIA*. (New York: HarperCollins Publishers, 2007), pp. 259-280.

⁶ Allison added, however, that such an eventuality was preventable. Graham Allison, *Nuclear Terrorism: The Ultimate Preventable Catastrophe*. (New York: Times Books, 2004), p. 15. Indeed, the specter of nuclear terrorism has long bedeviled the world. In 1946, J. Robert Oppenheimer, the scientific director of the Manhattan Project was asked at a closed Senate hearing if three or four men could smuggle an atomic bomb into New York and blow up the whole city, he replied “Of course it could be done...” When asked what instrument could be used to detect such a weapon he responded “A screwdriver.” Jeffrey T. Richelson, *Defusing Armageddon: Inside NEST, America’s Secret Nuclear Bomb Squad*. (New York: W.W. Norton & Company Ltd., 2009), p. 1.

Echoing these concerns, the 2010 *Nuclear Posture Review* identifies nuclear proliferation and nuclear terrorism as the two most serious threats to U.S. national security. The two issues are interrelated. This volume contains reviews of some of the notable studies that have examined the issues of nuclear proliferation and terrorism over the past several years. By doing so, it is hoped that readers will come away with a better understanding of some of the important issues surrounding the nuclear enterprise today. The books reviewed were chosen for their topicality and relevance. The reviews are intended to provide readers with synopses of these studies.

Chapter one contains a review of Joseph Cirincione, *Bomb Scare: The History and Future of Nuclear Weapons* which provides a concise overview of the of the world's most destructive weapon. His study documents the nuclear era from the achievements of the early atomic scientists to the non-proliferation efforts of today.

Chapter two focuses on nuclear proliferation. In *Nuclear Apartheid: The Quest for American Atomic Supremacy from World War II to the Present*, Shane J. Maddock, recounts the early efforts to prevent the spread of nuclear weapons. Following that, Columba Peoples examines the political debates surround the controversial Strategic Defense Initiative in *Justifying Ballistic Missile Defence: Technology, Security and Culture*. Next, David A. Koplow examines an anomalous trend in the history of warfare toward the development and use of less destructive weapons in *Death by Moderation: The U.S. Military's Quest for Useable Weapons*. An in depth investigation of the A.Q. Khan network follows in David Albright's *Peddling Peril: How the Secret Nuclear Trade Arms America's Enemies*. Despite concerns over the prospect of a nuclear black market, Matthew Kroenig argues in *Exporting the Bomb: Technology Transfer and the Spread of*

Nuclear Weapons that proliferation is driven by strategic goals and not remunerative motives. Finally, Fred Schreier provides numerous policy recommendations in *WMD Proliferation: Reforming The Security Sector to Meet the Threat*.

Chapter three includes reviews of numerous studies on nuclear terrorism. First, Charles D. Ferguson and William C. Potter identify the possible modes in *The Four Faces of Nuclear Terrorism*. Next, Brian Michael Jenkins examines the likelihood of this potentially catastrophic variant of terrorism in *Will Terrorists Go Nuclear?* After that, Michael Levi discusses the hurdles involved for potential terrorists and what measures could be implemented to prevent such a scenario in *On Nuclear Terrorism*. Finally, in *Defusing Armageddon: Inside NEST, America's Secret Nuclear Bomb Squad*, Jeffrey T. Richelson explores the history of an obscure, but important, agency which operates under the U.S. Department of Energy's National Nuclear Security Administration.

Chapter four looks at the road ahead for nuclear weapons. In *Atomic Obsession: Nuclear Alarmism from Hiroshima to Al Qaeda*, John Mueller makes a contrarian case that our fear of nuclear weapons is overwrought. Proliferation has been limited, he argues, because most states have little desire to possess them. By contrast, in *How the End Begins: The Road to a Nuclear World War III*, Ron Rosenbaum warns that we could be on the cusp of a new era of proliferation that could culminate in a destructive regional nuclear war.

The conclusion provides some policy recommendations to stem the tide of nuclear proliferation and contain the risk of nuclear terrorism. Toward this end is a robust system of consequence management that would enhance the resiliency of the government in the event of a nuclear attack.

Chapter 1: The History of Nuclear Weapons

For over six decades, nuclear weapons have cast a long shadow over international relations. Although nuclear weapons have only twice been used as an instrument of war, they dominated the strategic calculations of the United States and the Soviet Union during the Cold war. Some pessimists, such as Scott D. Sagan, argue that the nuclear stalemate that prevailed during this period was far from certain. A concatenation of events could have precipitated a nuclear exchange that would have destroyed most of the civilizations on the planet. By contrast, Kenneth N. Waltz avers that the existence of nuclear arsenals actually prevented the outbreak of a major war between the two superpowers. In doing so, people were spared a redux of World War II which took over 50 million lives. Rather than be concerned about the prospect of proliferation, Waltz argues that nuclear weapons actually have a stabilizing effect on international relations insofar as they discourage the decision to wage war.⁷

Joseph Cirincione provides a concise history of nuclear weapons. An unabashed arms control advocate, he believes that the world must take advantage of the current window of opportunity to eliminate nuclear weapons. More and more, nations and governments reject the appropriateness of waging war.⁸ Both the United States and Russia have drastically reduced their arsenals since the end of the Cold war. By doing so, they send a clear message that they are serious about carrying out Article 6 of the Non-Proliferation Treaty. Cirincione hopes that this momentum can be carried over to the rest of the world so that they eschew nuclear weapons.

⁷ Scott D. Sagan and Kenneth N. Waltz, *The Spread of Nuclear Weapons: A Debate*. (New York: W.W. Norton & Company, 1997).

⁸ Stephen Pinker, *The Better Angels of Our Nature: Why Violence has Declined*. (New York: Penguin Books, 2012).

Joseph Cirincione, *Bomb Scare: The History and Future of Nuclear Weapons* (New York: Columbia University Press, 2008). Pp.232 \$27.95. ISBN 978-0-231-13511-5.

Originally published in *Defence Studies*, Vol. 12 No. 1 (March 2012), pp. 139-146.

Rising fuel costs and growing concern about global warming have occasioned renewed interest in nuclear power as an alternative energy source giving rise to the so-called 'nuclear renaissance.' One possible consequence of this trend, though, is the potential for the diversion of fissile material into the custody of a rogue state or terrorist group. In fact, on the eve of the Nuclear Security Summit in April 2010, US President Barack Obama announced that the prospect of nuclear terrorism was the greatest national security threat to the United States. In his book, *Bomb Scare: The History and Future of Nuclear Weapons*, Joseph Cirincione, president of the Ploughshares Fund (a public foundation that supports nonproliferation) and a professor at Georgetown University, provides a primer on the history of the world's most destructive weapon and speculates on its future.

The quest to understand the mysteries of the atom was truly an international effort. Cirincione summarizes the scientific breakthroughs leading up to the discovery of fission. The native New Zealander Ernest Rutherford, considered the father of nuclear physics, postulated in 1919 that electrons orbited a small proton-filled nucleus, not unlike planets orbit a star in a solar system. In 1932, the Englishman James Chadwick, discovered that the nucleus also contained neutrons —subatomic particles with no electrical charge. This discovery was crucial because it was later determined that neutrons could be used to destabilize a nucleus, and by doing so cause a chain reaction. Otto Hahn, the German scientist, demonstrated in 1938 that under certain conditions the uranium atom could split, or 'fission', to borrow a term to indicate a similar process

involving cells in biology. The Hungarian physicist Leo Szilard is credited as being the first person to conceptualize the chain reaction, which as a consequence, would release a tremendous amount of energy.

Atomic scientists soon grasped the significance of fission and realized the potential to harness it as a weapon of mass destruction (WMD). As Cirincione explains, the origins of the Manhattan Project can be traced back to early 1941, when Albert Einstein, Leo Szilard, and other prominent physicists sent a letter to President Franklin D. Roosevelt warning that German scientists were working to develop an atom bomb. Shortly thereafter, Roosevelt authorized the project. The first test of a nuclear bomb was conducted at the Trinity Site on 16 July 1945 in New Mexico. Nuclear bombs have been used only twice as a weapon. The first instance occurred over the Japanese city of Hiroshima on 6 August 1945. ‘Little Boy’ was a gun-assembly type of nuclear weapon in which two pieces of weapons grade uranium were rapidly combined to produce a nuclear chain reaction, which resulted in a release of a tremendous amount of energy and destructive capability. A few days later, on 9 August, a second atomic bomb—dubbed ‘fat man’—was detonated over the city of Nagasaki. An implosion-style bomb, its pit contained a subcritical density of weapons grade material surrounded by conventional explosives. When the conventional explosives were detonated, it squeezed the nuclear material to a supercritical density which resulted in the chain reaction. Soon thereafter, the Japanese government surrendered. In his surrender speech, Japanese Emperor Hirohito cited that the ‘new and most cruel bomb [. . .] would not only result in an ultimate collapse and obliteration of the Japanese nation, but also it would lead to the total extinction of human civilization’ if Japan continued to fight.

To contextualize his study, Cirincione sketches the origins of the nonproliferation regime. As the Cold War intensified, the US government increased nuclear weapons production; however, once it was demonstrated that a bomb could be made, it was hard to maintain that monopoly, and the Soviet Union quickly developed its own nuclear capabilities. Faced with the alarming prospect of a nuclear exchange, President Dwight D. Eisenhower sought to stem the tide of proliferation with his ‘Atoms for Peace’ program, which offered nuclear technology to countries for civil purposes if they agreed not to develop nuclear weapons. His proposal led to the creation of the International Atomic Energy Agency (IAEA), which remains the international organization chiefly responsible for encouraging nonproliferation. These efforts notwithstanding, an arms race accelerated between the United States and the Soviet Union and nearly resulted in a full-scale nuclear confrontation during the Cuban Missile Crisis of 1962. After averting a catastrophe, President John F. Kennedy pursued an arms control agenda which his successor, Lyndon B. Johnson, continued, and which eventually resulted in the Nuclear Non-Proliferation Treaty (NPT) of 1968. In essence, the treaty espouses four major principles. First, it recognizes a nuclear monopoly consisting of those countries that possessed the bomb at the time that the treaty was created: the United States, Russia, the United Kingdom, France, and China. Second, signatories to the treaty that are not part of the original monopoly agree not to develop nuclear bombs. In exchange, the nuclear powers agree to help those countries develop nuclear technology that will be used for peaceful purposes, such as generating electrical power. Third, the countries in the nuclear monopoly agree not to provide nuclear weapons to other countries, or assist other countries in developing nuclear bombs. Finally, countries in the nuclear monopoly agree

to work toward nuclear disarmament with the long range goal of the total elimination of nuclear weapons.

The success of the NPT and improving relations between the United States and the Soviet Union encouraged other nonproliferation efforts in the 1970s, including the Strategic Arms Limitation Treaty, and the Anti-Ballistic Missile Treaty. President Ronald Reagan initiated the Strategic Arms Reduction Treaty, which his successor, President George H.W. Bush signed in 1991. As Cirincione makes clear, collectively, these treaties appear to have been successful inasmuch as far fewer countries acquired nuclear weapons than anticipated in the early years of the atomic era.

After recounting the history of the international nonproliferation regime, Cirincione points out some of its current shortcomings. Despite the international nonproliferation regime, Cirincione explains why some countries insist on pursuing nuclear weapons. First, nuclear weapons are the ultimate guarantor of security that can deter any rival state. For internationally isolated countries facing a precarious security environment, such as Israel and North Korea, nuclear weapons may provide a level of protection unavailable through diplomacy or conventional shows of force. This was also the case for apartheid South Africa prior to 1994. Second, owning nuclear weapons confers an element of prestige —France viewed possessing a nuclear arsenal as a way to bolster its stature after losing colonies in Vietnam and Algeria following World War II. Third, domestic politics can drive the pursuit of nuclear weapons. For instance, Dr. A.Q. Khan pressed hard for the Pakistani government to acquire a nuclear arsenal to counter the geopolitical power of India. Likewise, soon after the highly nationalistic Bharatiya Janata Party formed a governing coalition in 1998, the Indian government conducted five

underground nuclear tests, thus demonstrating to the world its nuclear prowess. Fourth, according to the theory of technological determinism, the number of states in possession of nuclear weapons will grow as developing countries acquire the requisite infrastructure and technology for their development. It is also important to note, however, that nuclear weapons are very expensive, and economic drivers influence a country's decision to acquire the bomb. The United States, with the largest economy in the world, spent approximately \$7.5 trillion developing, producing, deploying, and maintaining nuclear weapons from 1940 to 2005. Such outlays are beyond the fiscal means of many states, or determined not to be worth the costs. It is worth mentioning, however, that as nuclear weapons technology becomes more available and developing countries acquire this technology, there is fear that the traditional supply-demand flows might shift.

The end of the Cold War raised new hopes of nuclear disarmament and nonproliferation. Over the past two decades, the two major nuclear powers —the United States and Russia —have substantially decreased their nuclear stockpiles. Nevertheless, Cirincione identifies a number of remaining proliferation threats. Although the danger of global thermonuclear war has decreased considerably, the threat of nuclear terrorism is now greater than ever. For Cirincione, the problems of proliferation and nuclear terrorism are interrelated. As more countries obtain nuclear arsenals, this increases the likelihood of diversion to hostile non-state entities.

Some observers may find that Cirincione gives short shrift to state-run nuclear programs, as he sees the prospect of nuclear terrorism as the most pressing issue to be resolved. There is understandable concern that state-run nuclear programs are in some countries that do not have the institutional capacity to ensure that weapons do not get into

the wrong hands. To counter the threat of nuclear terrorism, Cirincione calls for greater assistance to those countries that do not have adequate security procedures to protect their own nuclear facilities. Measures such as the Nunn-Lugar sponsored Cooperative Threat Reduction Program should be expanded to prevent fissile material from getting in the wrong hands.

Pakistan is critical to reducing the risk of nuclear terrorism, but is a country beset with a myriad of troubles, including a teetering economy, a lack of investment in infrastructure and education, strained relations with India, sectarian strife between the Sunni majority and the Shia minority, water shortages, and a fragile democracy. If the Islamists succeed, they could transform Pakistan into a major sanctuary and breeding ground of jihadists. Most pressing in this situation is the security of Pakistan's arsenal of nuclear weapons. In 1998, Osama bin Laden's representatives approached the Khan network, but were rebuffed. However, bin Laden fared better with Khan's longtime rivals Sultan Bashiruddin Mahmood and Chaurdiri Abdul Majeed, two retired senior engineers at the Pakistan Atomic Energy Commission. In August 2001, Sultan Bashiruddin Mahmood and Chaurdiri Abdul Majeed had long discussions with bin Laden, Ayman al-Zawahiri, and other AlQaeda officials about the prospect of building WMD.

Cooperation with Russia is crucial to nonproliferation. Despite big cuts in the number of nuclear warheads, nuclear arsenals in the United States and Russia remain large. Many of these weapons are still on high alert, thus the possibility of an accidental unauthorized launch of a warhead remains. In 1995, for example, Russian forces mistook a Norwegian weather rocket for a US submarine-launched ballistic missile which prompted President Boris Yeltsin to open the 'nuclear suitcase' for the first time in the

nuclear age. In order to foster nonproliferation, Cirincione encourages the US government to set an example for the rest of the world by deemphasizing nuclear weapons and continuing the reduction of its nuclear arsenal. According to the Federation of American Scientists, as of 2010, the total US inventory of nuclear weapons is 9,600 warheads of which 2,468 are operational. For Russia, those figures are 12,000 and 4,650 respectively. Since the United States and Russia have redundant nuclear capabilities, he believes reducing their arsenals to 600 total warheads each would not compromise any vital security interests. Cirincione's call to radically reduce the US nuclear arsenal may seem naively optimistic insofar as a robust number of nuclear weapons is necessary to maintain a credible deterrence; yet, inasmuch as America is the recognized leader of international politics, as he points out, a change in US policy is 'a prerequisite to implementing a global transformation'. Unless the United States and Russia stand by Article VI of the NPT and continue to reduce their own nuclear arsenals, nuclear weapons will continue to be considered the currency of great power relations.

Both the United States and Russia have an interest in preventing nuclear terrorism, and both countries have experienced nuclear terrorism scares. In 1995, a team of Chechen rebels planted a crude radiological dispersion device in Ismailovsky Park in Moscow. Although the device contained only a small amount of radioactive material, it nevertheless raised the worrisome prospect of a poor man's nuclear bomb. Similarly, in 2002, the prospect of a radiological 'dirty bomb' scenario made headlines in the United States with the arrest of Jose Padilla. As Cirincione correctly points out, would-be nuclear terrorists will think not unlike the infamous criminal Willie Sutton, who once

explained that he robbed banks because ‘that’s where the money is’. Caring less about a state’s geopolitical orientation, terrorists will go where the nuclear material is.

Some observers fear that a new wave of sub rosa proliferation is under way. Though relatively successful, the non-proliferation regime in place today is still fragile. The prospects for nonproliferation could be enhanced greatly if the programs of North Korea and Iran can be halted.

In the Middle East, unresolved territorial, religious, and political disputes make the region a good candidate for nuclear war. Thus the countries in the area have a strong incentive to work toward disarmament. Cirincione believes that it would be in the best interest of Israel to abandon nuclear weapons, but this is admittedly problematic with the prospect of a nuclear-armed Iran on the horizon. With Iran on the horizon, he favors diplomatic engagement. If Iran were to acquire a nuclear bomb, it could precipitate a regional wave of proliferation in Saudi Arabia, Egypt, and Turkey.

Similarly, North Korea’s pursuit of nuclear weapons has caused trepidation in Japan and South Korea and could prompt a nuclear demonstration effect in North East Asia. Inasmuch as North Korea is isolated and diplomatically weak, sanctions could play a part in persuading that country’s leadership to halt its nuclear program. China, in particular, could play a crucial role in the process, as it does not want its nominal ally destabilizing the region by provoking South Korea and Japan.

A longstanding advocate of nuclear disarmament, it is not surprising that Cirincione is at times critical of US nuclear policy under the direction of President George W. Bush. For instance, he takes issue with the Bush administration’s proposals to research, and possibly develop, new nuclear weapons accompanied with new doctrines

that justify using nuclear weapons against non-nuclear targets. Such policies, Cirincione points out, encouraged Russia and France to develop similar plans, thus setting a bad precedent for nonproliferation. Characterizing the 2003 invasion of Iraq as the ‘world’s first nonproliferation war,’ Cirincione cites three problems with that military operation. First, he maintains that the war was unnecessary because Saddam Hussein neither possessed WMD nor directly threatened the United States. Second, Operation ‘Iraqi Freedom’ proved to be far more costly than predicted, both fiscally and politically, thus negating its applicability as the new prototype of a new nonproliferation strategy. Third, the Bush administration presented the public with a false choice; that is, wage war or face a growing Iraqi threat. Rather, the author believes that the United Nations Special Commission (UNSCOM) inspection regime was working and showing results.

According to Cirincione, the aggressive strategy pursued by the Bush administration had several negative consequences for nonproliferation. First, the war may have increased the threat of nuclear terrorism by enflaming anti-US sentiment around the world, particularly in the Middle East. Second, both Iran and North Korea accelerated their nuclear programs, as those regimes felt imperiled, thus threatening to undermine the nonproliferation regime. Nevertheless, Cirincione sees positive trends, as prominent current and former world leaders endorse the so-called ‘long road to zero’ and envisage a world without nuclear weapon, or at least one in which their numbers continue to diminish. The number of nuclear weapons in the world has steadily declined in large measure from the reduction in the US and Russian arsenals. Moreover, several countries have dismantled or relinquished their nuclear program and weapons, including South Africa, Belarus, Kazakhstan, Libya, and Ukraine. And although the Comprehensive Test

Ban Treaty has not been formally ratified by the U.S. Senate, neither the United States nor Russia has conducted a nuclear test in two decades.

During the 2008 presidential election campaign, Cirincione served as an informal advisor to Senator Barack Obama on nuclear issues. The 2010 Nuclear Posture Review reflects several themes that Cirincione has advocated for years, including more emphasis on nonproliferation efforts, stronger multilateral efforts to enhance arms control, support for the Comprehensive Test Ban Treaty, strengthening US declaratory policy against the use of nuclear weapons against non-nuclear weapons states that are a party to the NPT, no development of new nuclear weapons, a substantial reduction in the number of nuclear warheads, and an overall reduced role for nuclear weapons in US defense strategy. Toward these goals, on 8 April 2010, in Prague, President Obama and Russian President Dmitry Medvedev signed the New START Treaty, which will substantially reduce the number of both US and Russian deployed strategic nuclear warheads.

Over the years, some critics have taken Cirincione to task for his abiding advocacy of nonproliferation, warning that arms control for the sake of arms control could have serious security implications for the United States. Other nuclear countries might take advantage of US efforts to reduce its arsenal by failing to reciprocate, putting America at a nuclear disadvantage. Nevertheless, drawing upon Cirincione's extensive experience in the area of nonproliferation policy, *Bomb Scare* provides a solidly concise overview of the history of nuclear weapons and their current and future challenges. The book will be of interest to students of international relations, defense studies, and nonproliferation.

Chapter 2: Nuclear Proliferation

For a few short years, the United States enjoyed a monopoly on nuclear weapons. But once it was demonstrated that the power of the atom could be harnessed as a weapon of war, it was well-nigh impossible to maintain exclusive possession. Prior to, during, and after the war, scientists in several countries had been working in the field of nuclear physics. And some of these countries had programs to develop a nuclear bomb, including Germany, Japan, the United States, and the Soviet Union. Ahead of U.S. intelligence estimates, the Soviet Union detonated its first nuclear bomb in 1949. Several prominent British scientists worked on the Manhattan Project. After the war, England decided that it wanted nuclear weapons for its arsenal and in 1952, that country detonated its first atomic bomb. The British were followed by the French in 1960. An important milestone was reached in 1964 when China detonated its first nuclear bomb. This was the first instance in which a non-western country had acquired a bomb. Initially, the Soviet Union assisted China in its efforts to develop a bomb. However, that support was withdrawn after the Sino-Soviet split. Nevertheless, the Chinese were still able to develop a bomb on their own.

India detonated a nuclear bomb for so-called peaceful purposes in 1974. Supposedly, small nuclear weapons could be used to build tunnels and for other excavation projects. In 1998, however, India dropped the pretense of having nuclear bombs for peaceful purposes and detonated another bomb. It was hoped that this would impress upon her regional rivals, China and Pakistan, that India was a force to be reckoned with. From the perspective of Pakistan, this decision was quite provocative. So two weeks later, Pakistan detonated its first nuclear weapon in a series of tests. Dr.

Abdel Qadeer Khan is credited as being the father of Pakistan's bomb as well as one of the most notorious proliferators in the world.

Although Israel never officially announced that it has a nuclear arsenal, it is an open secret that the country has one. Adopting a policy of nuclear ambiguity, Israel never signed the Non-Proliferation Treaty. The Israeli nuclear bomb was developed probably sometime in 1967. For a while, Israel collaborated with South Africa to develop nuclear weapons. There is a strong suspicion that the two countries jointly carried out a nuclear test off a South African coast on the Indian Ocean in 1979.

Finally, North Korea entered the nuclear club in 2006. The initial test though, was not impressive, as the bomb had a very low yield and was considered by some analysts to have been a dud. Nevertheless, the North Koreans detonated another nuclear weapon in May 2009.

Despite these instances of proliferation, there are signs of hope. First, nuclear weapons have not proliferated as extensively as the pessimists feared. President John F. Kennedy once lamented that by 1975, there might be twenty nuclear powers with all the associated liabilities that would go along with that proposition. But today, the nuclear club includes only nine members.

Second, there have actually been some nuclear rollbacks. For instance, in 1989, South African President F.W. de Klerk decided to begin disbanding his country's nuclear program. In 1994, after the country conducted its first multi-racial election, the new government, led by Nelson Mandela, decided not to continue the nuclear program. President Mandela did not think that they were necessary for his nation's defense.

Moreover, he thought that the move would be a good gesture to other countries in Africa to forswear the development of nuclear weapons.

Finally, there has been great progress in the area of bilateral arms control efforts between the United States and Russia. According to the provisions of the New START Treaty ratified in 2011, both the United States and Russia will reduce their arsenals of deployed nuclear weapons to 1,550 warheads. This marks a substantial reduction from the levels maintained during the height of the cold war. What is more, it sends a clear signal to the rest of the world that both countries are committed to abiding by Article Six of the Non-Proliferation Treaty which mandates that the nuclear powers work toward the long-range goal of the total elimination of nuclear weapons. Although this might sound far-fetched, prominent statesmen have endorsed that proposal including the late president Ronald Reagan and the former Soviet President Mikhail Gorbachev who first expressed these aspirations at a summit in Reykjavík in Iceland in early 1986. More recently, in a 2008 op-ed, George Shultz, William Perry, Henry Kissinger and Sam Nunn proposed a plan that would eliminate all of the world's nuclear weapons.⁹ Taken together, these measures could greatly reduce the risk of nuclear war.

⁹ William J. Perry, Gorge P. Shultz, Henry A. Kissinger, and Senator Sam Nunn, "Toward a Nuclear-Free World," *The Wall Street Journal*, January 18, 2008, p. A13.

Dealing with the Bomb: Nonproliferation, Missile Defense, and the Quest to Develop Usable Weapons

Shane J. Maddock, *Nuclear Apartheid: The Quest for American Atomic Supremacy from World War II to the Present*. Chapel Hill, NC: The University of North Carolina Press. 392 pp; \$35.00. ISBN: 978-0807833551

Columba Peoples, *Justifying Ballistic Missile Defence: Technology, Security and Culture*. Cambridge University Press. 299 pp; \$33.00. ISBN: 978-0521130417

David A. Koplow, *Death by Moderation: The U.S. Military's Quest for Useable Weapons*. New York: Cambridge University Press. 263 pp; \$29.99. ISBN: 978-0521135344

Originally published in *International Studies Review*, Vol. 14 (2012), pp. 157-164.

In recent months, the US government has elevated the stature of nonproliferation in the realm of international affairs. For instance, on April 8, 2010, in Prague, U.S. President Barack Obama and Russian President Dmitry Medvedev signed the New START Treaty. Quickly ratified, the treaty will drastically reduce the number of both U.S. and Russian deployed strategic nuclear warheads. Non-proliferation and the prevention of nuclear terrorism also received the highest priority in the 2010 *Nuclear Posture Review*. These initiatives are the latest in a long chain of U.S. efforts since 1945 to come to grips with the enormous destructive power of nuclear weapons. Three recent books examine different aspects of this conundrum.

In his study, *Nuclear Apartheid: The Quest for American Atomic Supremacy from World War II to the Present*, Shane J. Maddock, a professor of history at Stonehill College, examines Washington's efforts to limit the spread of nuclear weapons since 1945. Having an abiding faith America's industrial might and technological innovation, both Presidents Franklin D. Roosevelt and Harry S. Truman believed that the United States could maintain a nuclear monopoly for many years. To a certain degree, their faith

in the nuclear monopoly made sense on scientific and geopolitical grounds. During World War II, the United States was in an advantageous position vis-à-vis other countries to build an atomic bomb, as the country possessed the world's largest industrial base, a geographic location beyond the reach of enemy bombers, and an unparalleled body of nuclear scientists, many of whom fled Hitler's new order in Europe. By contrast, the Axis Powers, along with the Soviet Union and Britain, could not afford to divert resources to a hypothetical weapon while they were in the throes of an existential conflict. Moreover, the territories of all of these countries were subject to invasion and repeated bombings, which rendered large scale research facilities vulnerable to destruction.

Not long after the war, several leading Manhattan Project scientists, including J. Robert Oppenheimer, Leo Szilard, and Glenn T. Seaborg, warned that continuing the U.S. monopoly indefinitely was unrealistic. Once it was demonstrated that a bomb could be made, it was hard to maintain the nuclear monopoly. The Soviet Union detonated its first atomic bomb in 1949. Upping the ante, the United States detonated the first hydrogen bomb in the Southern Pacific Ocean in November 1952. Almost a year later, the Soviet Union followed with its first fusion bomb in August 1953. In order to stem the tide of proliferation, arms control supporters argued for a regime of international control of nuclear technology. To that end, President Dwight D. Eisenhower introduced his Atoms for Peace program which offered nuclear technology to countries for civil purposes if they agreed not to develop nuclear weapons. His proposal led to the creation of the International Atomic Energy Agency (IAEA), which remains as the international organization chiefly responsible for encouraging nonproliferation. Despite his efforts, he

failed to develop an effective nonproliferation policy during his presidency, as the Atoms for Peace initiative left open the prospect that nuclear technology and material could be diverted to weapons programs.

Cold War antagonisms made nuclear arms control problematic, as both sides viewed the other with great suspicion. Early in the Cold War, both superpowers exploited nuclear technology for inter-alliance purposes often with little regard for strategic consequences. Maintaining inter-alliance solidarity was paramount. During the war, several prominent British scientists worked on the Manhattan Project. After the war, England decided that it wanted nuclear weapons for its arsenal and in 1952 that country detonated its first atomic bomb. With World War II still fresh in mind, German rearmament was highly controversial. The prospect of a nuclear-armed West Germany greatly alarmed the Soviet leadership. Firmly ensconced in NATO, Bonn eventually decided to forgo nuclear weapons. France, however, under the leadership of Charles De Gaulle, decried the superpowers' monopoly on nuclear weapons. After assuming power in 1958, he quickly set a course for French independence in nuclear affairs which eventually resulted in the creation of the *force de frappe* (strike force), which detonated a nuclear weapon in 1960. Just a few years later in 1964, an important milestone was reached when China detonated its first nuclear weapon—the first instance in which a non-western country had acquired the bomb. Initially, the Soviet Union assisted China, but that support was withdrawn after the Sino-Soviet split in the late 1950s.

As Maddock explains, the process of decolonization which commenced shortly after World War II, laid the groundwork for the ensuing regime of nuclear exclusivity. Initially, both U.S. and Soviet leaders dismissed concerns of nuclear proliferation in the

third world, as they doubted that developing countries could produce sophisticated weapons. According to Maddock, the ideology underpinning nuclear apartheid was based on notions of American “exceptionalism,” an abiding faith in technology, and racial and gender stereotypes. In this framework, certain countries were deigned “unfit” for the responsibility of nuclear technology, as they were regarded as less civilizationally advanced. Supposedly, an element of racism influenced U.S. perceptions, as Asian, African, and Latin American states were believed to lack the capacity for reason and could not be trusted to hold nuclear weapons. As the Indian diplomat, V.M. Trivedi, once opined, the nuclear weapons club mirrored political and racial division in the global arena as a system which he described as “nuclear apartheid.” This arrangement, as Maddock explains, put the United States at the top, followed by its NATO allies and later, Israel, with the post-colonial world consigned to the bottom. According to Maddock, nonproliferation efforts served a strategic imperative, that is, to maintain a uniquely powerful position for the U.S. in the international system.

The Cuban Missile Crisis of 1962 brought the superpowers to the brink of nuclear war. Averting a catastrophe, President John F. Kennedy redoubled efforts for an arms control agenda fearing the prospect of runaway proliferation musing that he felt “haunted by the feeling that by 1970 ... there may be ten nuclear powers instead of four, and by 1975, fifteen or twenty.” His successor, Lyndon B. Johnson, envisaged a two-tier system in which alliance partners would have tightly-controlled access to nuclear weapons, while the rest of the world pledged nuclear abstinence. This scheme found expression in the subsequent Nuclear Non-Proliferation Treaty for which he laid the groundwork.

In essence, Maddock argues that the Nuclear Non-Proliferation Treaty of 1968 codified the system of nuclear apartheid. The treaty espouses four major principles. First, it recognizes a nuclear monopoly consisting of those countries that possessed the bomb at the time that the treaty was created (i.e., the United States, the Soviet Union, the United Kingdom, France, and China). Second, signatories to the treaty that are not part of the original monopoly, agree not to develop nuclear weapons. In exchange—in what came to be known as the grand bargain—the nuclear powers agree to help those countries develop nuclear technology that will be used for peaceful purposes, such as generating electrical power. Third, the countries in the nuclear monopoly agree not to provide nuclear weapons to other countries, or assist other countries in developing nuclear weapons. Finally, countries in the nuclear monopoly agree to work toward nuclear disarmament with the long range goal of the total elimination of nuclear weapons.

Over all, Maddock avers that “little good has come from U.S. nonproliferation efforts, and few lessons have been learned.” As he sees it, nonproliferation failed because both Washington and Moscow subordinated control of nuclear proliferation to other security considerations. Such policies were viewed as hypocritical by the non-nuclear powers. Several countries, including India, Pakistan, and more recently, North Korea and Iran have rebelled against this exclusivity.

Overall, Maddock’s research is impressive and thorough. His pessimism, however, strains credulity. Considering how long the bomb has been around, it is amazing that the overwhelming majority of countries have decided not to pursue its acquisition. Despite initial fears of widespread proliferation in the nuclear age, relatively few countries actually seek to acquire the bomb. Beyond the recognized nuclear club,

only four countries have acquired the bomb—Israel, India, Pakistan, and North Korea. Today, 189 countries are signatories to the Nuclear Non-Proliferation Treaty, which one would be hard-pressed not to characterize as a great success.

Maddock is more convincing in his arguments over the economic costs of nuclear weapons procurement and potential environmental hazards of nuclear power. As he points out, the nuclear arms race drained the treasuries of both the United States and the Soviet Union. Bloated defense budgets were unsustainable for the modest Soviet economy and eventually contributed to that country's economic and political collapse. According to some estimates, the United States, spent approximately \$7.5 trillion developing, producing, deploying, and maintaining nuclear weapons from 1940 to 2005, an astronomical figure even for the world's largest economy. As John Mueller argued in his book *Atomic Obsession: Nuclear Alarmism from Hiroshima to Al Qaeda* (2010), most countries eschew nuclear weapons for a variety of reasons including their exorbitant cost and limited utility. Amid the growing concern over global warming and energy shortages, nations are searching for cleaner alternatives to burning fossil fuels to generate electrical power. For his part, Maddock argues that cheap and safe nuclear power is a phantasm. Presciently, the simultaneous reactor containment failures in Japan in March 2011 will only reinforce this image.

Besides nonproliferation, ballistic missile defense (BMD) has been proffered as a vehicle to counter the threat of nuclear weapons. In his book, *Justifying Ballistic Missile Defence: Technology, Security and Culture*, Columba Peoples, a lecturer in International Relations at the University of Bristol, examines the politics of this weapons system

through the prism of “Critical Security Studies,” a new field which draws upon the analytical framework of the Critical Theory of the Frankfurt School of Social Research.

Several factors combine to make BMD a highly controversial proposition, including its questionable operational feasibility, the enormous price tag associated with its development, and its potentially destabilizing effect on arms control and nuclear relations between the United States and Russia. As a result, at times the program has been somewhat of a hard sell. According to Peoples, proponents of missile defense have consistently articulated and reiterated “common sense” understandings of technology that parallel broader narratives of social and technological themes in America. By “common sense,” Peoples refers to the Gramscian notion that denotes a kind of taken for granted view in a particular society of what the world is and how it works. Peoples contends that these common sense understandings of technology have been consistently employed by missile defense advocates to insulate the program from criticism. By doing so, Peoples argues, these advocates legitimate BMD, which arguably does little to enhance U.S. or global security, but rather, favors sectional political and industrial interests thus sustaining America’s immense defense infrastructure in the post-Cold War era.

An abiding confidence in science—more specifically engineering—has long guided American industrial development. This “instrumentalist” approach—in which technology can be harnessed to improve the human condition—has deep roots in America. Even architects of the U.S. Constitution such as Thomas Jefferson and Benjamin Franklin and early inventors such as Robert Fulton, came to believe that technology could be used as an instrument to secure the advancement and survival of the nascent republic. That said, Peoples identifies an undercurrent of the somewhat more

cautious “substantivist” view at play as well in which technology could attain an autonomous quality beyond the control of human agency. Fordist automation, while certainly productive, could also be stultifying and soul-destroying. More ominously, after World War II, the specter of nuclear Armageddon cast a long shadow over America and called into question the unbridled enthusiasm over technology. In the popular culture, Stanley Kubrick’s motion picture *Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb* (1964) carried the logic of the nuclear era to a parodied extreme. More seriously, the 1983 television drama *The Day After* depicted a somber future in the aftermath of a global nuclear war. At times during the Cold War, America’s optimistic view of technology was inverted in mirror imagery in which the Soviet Union was depicted as a totalitarian leviathan that was almost machine-like in quality that threatened to enslave the world.

Using sample arguments, Peoples demonstrates that advocates relied upon instrumentalist precepts to make their case for missile defense. Furthermore, this view was supplemented by references to America’s preeminent technological heritage. Shortly after America had developed a nuclear bomb, the idea of a systematic defense against such weapons was proposed. Chief among the proponents was Edward Teller recognized as the father of the hydrogen bomb. *The Gaither Report* (1957), which Teller empanelled, enthused that U.S. technology could be used to entirely offset Soviet advances in missile technology. Advocates argued that the further development of both offensive and defensive weapons was both a desirable and necessary measure. The launching of the Soviet satellite—Sputnik 1—in October 1957 served as a catalyst to redouble American efforts on nuclear delivery systems and possible defensive measures.

President Ronald Reagan's Star Wars speech delivered on 23 March 1983 finally placed BMD front and center on the political agenda. Evoking America's technological heritage, the popular president exhorted the scientific community to answer the call to BMD. He expressed optimism and faith in America's technological capacity to rise to the challenge of missile defense. Key representatives of the scientific community, however, were split on the viability of missile defense, as critics such as Hans Bethe, Herbert York, and Richard Garwin remained unconvinced. In a skillful maneuver, Reagan managed to co-opt and defuse the alarmism of the nuclear freeze movement by framing missile defense as a way in which to avoid nuclear Armageddon.

The U.S. military has long favored a capital-intensive force. A penchant for technology and a growing aversion to casualties combine to form a military heavily reliant upon technologically advanced weapon systems. The putative success of the U.S. Army's Patriot anti-missile system in striking down Iraqi Scud missiles during the 1991 Gulf War was viewed as a validation of BMD in some quarters. The end of the Cold War, however, lessened the urgency of missile defense, as America's chief adversary disintegrated. Nevertheless, the much vaunted "revolution in military affairs" raised the salience of technology and was the catalyst behind the "transformation" of the U.S. military during the 1990s and 2000s.

After languishing after the end of the Cold War, the administration of George W. Bush resurrected missile defense. In December 2001, President Bush withdrew the United States from the 1972 Anti-Ballistic Missile Treaty with Russia in order to move forward with missile defense. Keith B. Payne, a leading nuclear strategist and leader of a think tank called the National Institute for Public Policy, argued that post-Cold War

nuclear proliferation had rendered traditional Cold War deterrence and arms control anachronistic. Payne was a key architect of the 2002 *Nuclear Posture Review* a DoD document which advanced a “new triad” consisting of both nuclear and non-nuclear strike capabilities on one point of the triangle, a second point emphasizing active and passive defenses on another, and finally, a third point encompassing a responsive nuclear infrastructure to include labs, plants, and the personnel that build and maintain the new triad. To some critics, the scheme of the new triad suggested a dangerous proclivity to use nuclear weapons along with conventional weapons as part of a more flexible strategy of warfare besides the traditional role of deterrence.

At times, Peoples’ postmodern analysis is tiresome and needlessly verbose. Nevertheless, he illustrates how supporters have been able to frame the debate surrounding BMD to rally support for a program of questionable viability. As he points out, despite the program’s lofty goals, many in the scientific community are highly skeptical of the program’s reliability. What is more, the contentious program is very expensive and over time, has been prone to huge cost overruns. Despite these drawbacks, BMD retains a high priority on the U.S. defense agenda.

The enormous destructive capacity of nuclear weapons, notwithstanding, their feasibility is quite limited in a world in which a strong nuclear taboo prevails. Historically, militaries have sought to maximize potential lethality of their arsenals, but wanton destruction, much less nuclear “overkill,” is wildly inappropriate for the multitude of counterinsurgencies and military operations other than war (MOOTW) that predominate today. In recent years, an anomalous trend in the history of warfare toward the development and use of less destructive weapons is discernable. David A. Koplow, a

professor of law at Georgetown University Law Center and director of the Center for Applied Legal Studies, examines this trend in his book *Death by Moderation: The U.S. Military's Quest for Useable Weapons*. Koplow identifies numerous categories of weapons that exemplify this trend.

At the heart of this transformation are precision-guided munitions (PGMs), which reduce the zone of lethality by effectively concentrating a lower volume of explosives on a target. According to Koplow, the precision bombing raid on two bridges in the area of Hanoi in May 1972, inaugurated this approach and transformed the way in which modern wars would be fought. Through these raids, the U.S. bombers were able to interdict vital traffic routes faster than the North Vietnamese could repair them. Nevertheless, the innovation came too late to alter the outcome of the Vietnam War.

Despite substantial reductions, nuclear weapons remain an integral part of the U.S. military arsenal. In a controversial proposal, the administration of George W. Bush considered developing low-yield nuclear weapons that could be brought to bear on a variety of targets. Nuclear earth penetrators, or “bunker buster” bombs, could be used to destroy well-fortified targets burrowed beneath the earth’s surface or in caves. Such low-level nuclear weapons could also be used to destroy caches of biological and chemical weapons. The feasibility of this approach, however, is less than certain insofar as a sustained duration of intense heat is necessary to destroy such weapons. A nuclear blast, while intense, may not produce enough enduring heat to get the job done. Moreover, the shock wave could have the unintended effect of spreading the contaminants to the surrounding countryside.

Over the past two decades, an international opprobrium has developed against land mines. International conventions, such as the 1997 Ottawa Mine Ban Treaty, have sought to prohibit their use. As Koplow points out, the human toll of land mines is substantial; roughly 20,000 persons—mostly civilians—are killed or maimed by these devices each year. Many are deployed then forgotten, thus rendering these hidden killers as “weapons of mass destruction in slow motion.” Furthermore, the law of armed conflict calls for the principle of discrimination, that is, weapons should be targeted exclusively at combatants or those that support them. The indiscriminate nature of land mines, some argue, violates this precept. Nevertheless, some proponents argue that anti-personnel land mines, such as those deployed near the South-North Korean border, serve legitimate military purposes. Through their deployment, land mines could channelize a blitzkrieg invasion and thus bolster the defense. To overcome the international opprobrium, the U.S. military has developed a variety of “smart” landmines that can self-destruct, self-neutralize, and self-deactivate under certain conditions and after a certain length of time has elapsed.

The increasing exploration and exploitation of space has raised the specter of anti-satellite (ASAT) warfare. But even in the realm of space, more usable ASAT weapons have been developed. Such weapons would eschew overly destructive measures, such as nuclear explosions, and instead seek to inflict more localized effects through the use of ASAT such as miniature “space mines.” Also under development are laser ASAT that would use directed energy against enemy targets in space.

Finally, the last category that Koplow examines encompasses nonlethal weapons (NLW) which include a variety of instruments, including Taser stun guns, slippery foam,

sticky foam, malodorants, acoustic weapons, and even variants of pepper spray. Such NLW are often appropriate for MOOTW, which have increased over the years. For instance, calmative potions could be used in hostage situations to sedate everyone involved in the incident—both terrorists and victims alike—allowing rescuers to swoop in without facing gunfire. Authorities in these situations are often self-deterred from using lethal force, but NLW allows for greater flexibility.

Koplow identifies several trends that are driving the expansion of more usable weapons. First is a loss of faith in the efficacy of deterrence the purpose of which is to dissuade or prevent a potential adversary from committing a particular action for fear of the potential consequences that one could impose. Self-deterrence results from the hesitancy to inflict the pains of war on an adversary who impugns the credibility of the deterrent. Greater usability connotes greater credibility, as potential adversaries come to believe that the United States can exercise greater discretion and precision in its military operations and are thus less constrained by worries of overkill. In this vein, the term “tailored deterrence” has gained currency, suggesting the use of more discrete packets of military force in response to varying provocations and threats.

Second, an aversion to casualties makes it more difficult to marshal political support for military operations. Less lethal weapons, though, result in fewer casualties and are thus less likely to offend the sensibilities of the domestic population in the United States and the international community. A third factor is the mission expansion that has occurred since the end of the Cold War, as the U.S. military is frequently called upon to participate in a number of peacekeeping and humanitarian missions besides fighting wars. A fourth factor is the increasing prevalence of asymmetric warfare, such as terrorism and

urban insurgences. Effects-based operations, which combine military and non-military methods to achieve a particular effect, constitute a fifth factor. NLW are often suited for such MOOTW deployments. A sixth factor involves budgetary limitations on the development of expensive weapons systems that entail long development and procurement periods to be brought online. Proportionality—inflicting the appropriate amount of destruction on a target—is the seventh factor. The ubiquity of the media and evolving sensibilities on the appropriateness of the state-sanctioned violence have been driving this trend. Finally, an abiding faith in technology, long characteristic in the American ethos, is the last factor in the drive toward more useable weapons.

As far as his own preferences on usability are concerned, Koplow's endorsements are mixed. He approves of PGMs because they limit collateral damage. Likewise, he approves of non-lethal weapons on humanitarian grounds. Anti-satellite weapons, though, set a dangerous precedent, as America has the most to lose from the militarization of space. Currently, U.S. armed forces are much dependent upon satellites for communications and targeting, which renders their instruments more vulnerable to the disruption. The use of low-yield nuclear weapons is discouraged as well. Violating the "nuclear taboo" would send the wrong message to other nations and could encourage them to pursue the acquisition of nuclear weapons thus undermining U.S. nonproliferation efforts. His views on antipersonnel land mines are mixed. On the one hand self-deactivating and/or self-neutralizing APLs are attractive from a humanitarian perspective. However, in order to ban the more destructive "dumb" mines, all mines would have to be included in international conventions in order to realistically gain a global consensus against their use. By continuing to deploy such weapons, the United

States in effect legitimates their use, thus providing poorer countries to continue to deploy more potentially-harmful “dumb” mines without such deactivating features.

As Koplow observes, over the years, Western democracies developed a “casualty allergy” both in terms of receiving and inflicting pain. Fears of “mission creep” that could lead to a protracted deployment of U.S. forces, inhibits escalation as well. This hesitancy loomed large in the Weinberger-Powell Doctrine which proclaimed that the U.S. military would only wage war when vital national interests were at stake, a clear mission was articulated, an exit strategy was set, and when both public and governmental support was forthcoming. Arguably, the ubiquity and pervasiveness of the media—the “CNN effect”—works to restrain the use of force as well. To threaten force that is wildly out of synch with what would be considered proportionate retaliation by contemporary norms, many inhibit the other side from fully carrying out the use of force. A more modulated spectrum of force allows the military to tailor an armed response appropriate to the adversary in a manner more consistent with the just war doctrine of proportionality. Such weapons are deliberately less powerful, less lethal, and less destructive than their predecessor. As a result, collateral damage can be greatly reduced. It also is less likely to alienate the population and makes subsequent reconstruction and nation-building efforts less challenging. Less destruction facilitates building a robust civil society after hostilities have ended. All in all, Koplow seems sanguine about the trend toward usability, quoting the *Washington Post* columnist Shankar Vedantam who once quipped, “don’t send a lion to catch a mouse.”

Koplow sees both positive and negative consequences of the trend toward useable weapons, which have demonstrated their effectiveness in accomplishing military

missions. Inasmuch as such weapons inflict fewer casualties, they have humanitarian benefits as well. Their effectiveness also enables the military to prosecute wars more quickly thus limiting the duration of destruction and carnage. Their effect on deterrence, however, is mixed. On the one hand, some argue that their greater credibility is more likely to deter potential adversaries. On the other hand, as far as self-deterrence is concerned, such weapons have the potential to create a moral hazard whereby the United States is much less constrained in waging war. Also, there is the problem of proliferation of these weapons. Currently, the United States is the world's leading arms merchant. However, this market dominance is not iron-clad. Eventually, other countries will follow suit.

What these weapons share in common is gravitation toward "usability." That is, "they enable the user to target a person, place, or thing with greater precision and to project a hostile effect in a more discrete, temporary, circumscribed manner." This desire to create a kinder and gentler military force, however, is not without consequence. In fact, Koplow argues that this development may actually disinhibit the U.S. military from applying force more often. Previously, the United States was "self-deterred" from using its weapons because of the notion of overkill. The great destructiveness of certain weapons inhibited their use. Greater usability implies that the United States will resort to force more frequently. The analog to domestic police operations is instructive. When nonlethal weapons are implemented by police agencies, studies have found that the use of lethal force drops significantly; however, this is accompanied by a sharp increase in the use of force by police using NLW. Moreover, NLW tends to increase exposure to innocent civilians. Finally, an increasing frequency in the resort to violence in global

conflict runs the risk of escalation and the expansion of the conflict. As a consequence, the trend toward less lethal, but more useable weapons, is not without pitfalls.

David Albright. *Peddling Peril: How the Secret Nuclear Trade Arms America's Enemies*. New York: Free Press, 2010. 304 pp., \$27.00 paper. ISBN: 978-1-416-54931-4.

Originally published in *Terrorism and Political Violence*, Vol. 23 No. 5 (Fall 2011), pp. 845-848.

The end of the Cold War raised new hopes of nuclear disarmament and nonproliferation. Although the two major nuclear powers—the United States and Russia—have substantially decreased their nuclear stockpiles, a new wave of sub rosa proliferation is under way. David Albright, the president and founder of the Institute for Science and International Security (ISIS) examines this disturbing trend in *Peddling Peril: How the Secret Nuclear Trade Arms America's Enemies*.

Despite initial fears of widespread proliferation in the nuclear age, only ten countries are known to have developed nuclear weapons. Furthermore, to date, 189 countries have signed the 1968 Nuclear Non-Proliferation Treaty, which effectively created a nuclear monopoly consisting of those countries that possessed weapons at that time—i.e., Britain, China, France, the Soviet Union, and the United States. Signatories to the treaty agree to eschew nuclear weapons in exchange for technology and expertise that enable them to develop civil nuclear programs. One loophole to this regime, though, is the ease with which nuclear materials can be diverted from civil programs to military purposes.

The current wave of proliferation depends greatly on smuggling and subterfuge. Those countries entering the “nuclear club” over the past thirty years have done so almost exclusively through illicit trade. Previously, countries were inhibited from developing nuclear weapons programs due to insufficient technical infrastructure. However, as more and more countries undergo industrialization concomitant with the diffusion of technology and knowledge, such hurdles are now more likely to be

surmounted. Many countries, previously dismissed as developing nations, now have sophisticated manufacturing and machine tool capabilities. Moreover, in a global economy, dual-use technologies circulate around the world along with the scientific personnel who design and use them.

A central figure in the nuclear black market was Dr. Abdul Qadeer Khan, a Pakistani scientist who studied and worked in Western Europe. Shortly after the 1971 Indo-Pakistani war, Khan, an ardent Pakistani nationalist, implored Prime Minister Zulfikar Ali Bhutto to develop a nuclear bomb to counter India's regional power. Impressed with the young scientist, Bhutto supported his efforts. Working as a scientist at the Physical Dynamic Research Laboratory (a subcontractor for URENCO) in the Netherlands in the 1970s, Khan obtained access to classified information on centrifuge technology and manufacturing techniques on how to produce highly enriched uranium (HEU) for nuclear weapons. The Pakistan Atomic Energy Commission launched a secret operation in Europe—with Khan leading the way—to purloin gas centrifuge information and technology from European firms. He dispatched dozens of buyers to Europe, Japan, and North America to procure the necessary items.

Skillfully assembling the required parts from a variety of sources, Khan produced a nuclear program for Pakistan. Khan copied the stolen centrifuge plans and built a simpler composite design suitable for Pakistan. It included parts imported from a variety of private companies in numerous countries. Many of Khan's purchases were actually legal insofar as export controls on nuclear facilities and equipment were in their infancy in the 1970s. To avoid suspicion, Khan often placed orders through intermediary firms that obscured the final destination and recipient.

Geopolitics favored Khan's nuclear ambitions as well. Sharing a common adversary in India, in 1976, Pakistan commenced nuclear cooperation with China, which provided the former with blueprints for building a nuclear weapon along with 50 kilograms of weapons-grade uranium. In return, Pakistan provided China with knowledge on advanced centrifuge technology obtained in Europe. These efforts came to fruition in May 1998, when Pakistan conducted two underground tests of nuclear bombs.

Pakistan benefitted from the improvement of technology around the world, but money was the glue that held the network together. Various rogue states and pariah countries became part of Khan's network. For example, during the late Apartheid era, faced with both a hostile international environment and domestic turmoil, the South African government endeavored to become self-sufficient in national defense, which included the development of a nuclear weapon program. In South Africa, Khan found a suitable supplier whose government was loath to pass laws that might constrain smuggling in support of its own nuclear aspirations; yet, just before Apartheid was formally dismantled, the South African government voluntarily relinquished its weapons program. Other countries benefitted from Pakistan's underground program. North Korea is also believed to have worked with centrifuge designs provided by Khan. Still, the viability of North Korea's program remains in question insofar as the first test of its much vaunted nuclear bomb in 2006 amounted to a "fizzle." A second test in 2009 though was reported to have been a modest improvement.

The Middle East was an important region in Khan's transnational network. With Pakistan's assistance, Iran developed an advanced gas centrifuge program, which may soon be ready to produce material necessary for nuclear weapons. Khan also sold his

services to Saddam Hussein whose regime sought to build a nuclear weapon on the cusp of the first Gulf War in 1990. However, the bomb was not completed in time for the war and as a consequence of Iraq's defeat in 1991, the U.N. Security Council imposed a cease-fire agreement that required Iraq to dismantle its nuclear weapons program.

Even more worrisome is the prospect of the terrorist group al Qaeda obtaining a nuclear weapon from Pakistan. In 1998, Osama bin Laden's representatives approached the Khan network, but were rebuffed. However, bin Laden fared better with Khan's longtime rivals Sultan Bashiruddin Mahmood and Chaurdiri Abdul Majeed, two retired senior engineers at the Pakistan Atomic Energy Commission. In August 2001, the two had long discussions with bin Laden, Ayman al-Zawahiri, and other Al Qaeda officials about the prospect of building WMD. Not long after 9/11, Pakistani authorities placed Mahmood and Majeed under house arrest.

Eventually, international efforts thwarted Khan's clandestine network. In early 2000, the CIA and Britain's MI-6 determined that Khan was the focal point of illicit nuclear proliferation around the world. A covert project to assist Libya in developing a nuclear program unraveled Khan's network. Increasingly isolated for his sponsorship of international terrorism, Libyan leader Muammar Qaddafi began working with Khan after the U.N. Security Council imposed an air and arms embargo on Libya in 1992 for refusing to extradite two Libyans accused of carrying out the 1988 bombing of Pan Am 103 over Lockerbie, Scotland. The intelligence agencies penetrated the network and traced much of Khan's export business to Dubai, a Middle Eastern city with lax export laws. In October 2003, CIA operatives tracked the shipment of centrifuge parts from a factory in Malaysia destined to Libya via Dubai. In Dubai, the cargo was transferred to

the BBC China, a ship owned by a German firm. En route to Libya, Italian authorities, accompanied by U.S. and British intelligence officials, boarded the vessel and seized the centrifuge parts along with documentation which was used to prosecute Khan and members of his network. Soon thereafter, Libya agreed to cease its nuclear weapon program in exchange for the United States and Britain agreeing to end the international sanctions that were choking the Libyan economy.

Albright argues that suppliers are the first line of defense in the struggle against nuclear proliferation. Working together, industry and government can do much to stop the spread of dangerous technologies, though it is often difficult to convince countries to cooperate and plug the gaps in their regulations about what technology should and should not be sold. Other first lines of defense include the Nuclear Non-Proliferation Treaty, domestic and international export controls, diplomacy, corporate vigilance, and international inspections. If these fail, the last line of defense consists of military attacks, intelligence operations, and cargo seizures. The U.S. Department of Commerce, Albright argues, would be a good candidate to lead a cooperative effort to counter the spread of nuclear technology insofar as the agency has experience with the intricacies of export control laws and has a staff trained to effectively communicate with firms. This book provides an interesting expose´ of the subterranean world of the nuclear black market, and will be of interest to students of counterproliferation.

Matthew Kroenig, *Exporting the Bomb: Technology Transfer and the Spread of Nuclear Weapons* by. Cornell University Press, 2010, 233 pp., \$22.95

Originally published by the Air Force Research Institute, (on-line review), October 13, 2010, http://afri.au.af.mil/review_full.asp?id=102.

In recent years, the nuclear aspirations of North Korea and Iran have stoked fears that a new wave of proliferation is underway. Such fears have raised the salience of arms control, as the U.S. government has sought to strengthen treaties and multilateral agreements to stem the spread of nuclear technology and materials. Matt Kroenig, an assistant professor of government at Georgetown University, examines the conditions which give rise to sensitive nuclear assistance between nations. Contrary to the common perception that the current wave of proliferation is fueled by a profit motive, he argues that assistance is motivated almost exclusively by strategic considerations.

Kroenig propounds a “strategic theory of nuclear proliferation” which posits that countries provide nuclear assistance to other countries that serve their foreign policy objectives. To be sure, some states may reap some economic benefits by transferring nuclear assistance; however, Kroenig argues that such transfers are not very profitable and are thus driven mainly by perceived national interests. Sensitive nuclear assistance, as he defines it, can take three forms: support to nonnuclear weapon states in the design and construction of nuclear weapons, the transfer of weapons-grade fissile material to nonnuclear weapon states, and assistance in the construction of facilities that can produce weapons-grade fissile material.

According to his theory, power-projecting states have more to lose from proliferation and are thus loath to transfer sensitive nuclear technology and expertise. By contrast, non-power-projecting states lack the ability to project power and thus incur

fewer strategic costs when an aspirant state acquires nuclear weapons. Put another way, nuclear proliferation constrains the conventional military capabilities of power-projecting states, but is largely inconsequential to non-power-projecting states insofar as proliferation does little to alter their strategic positions.

Superpower states, because they possess power-projecting capabilities, Kroenig argues, are opposed to nuclear proliferation for a variety of reasons. First, proliferation deters military intervention by power-projecting states that must calculate the risks of escalation to include the exchange of nuclear attacks. Related to that, proliferation reduces the effectiveness of coercive diplomacy in that it undermines the credibility of the threat to use force. Proliferation can also trigger regional instability by emboldening the new nuclear states to pursue policies that threaten the regional interests of power-projecting states. Moreover, proliferation has the potential of ensnaring the power-projecting states in regional disputes. Further, alliance structures can be undermined by proliferation insofar, as it reduces the value of security guarantees causing allies to question if their powerful patron will come to their defense if they are threatened by a nuclear power. In that vein, as the late French President Charles de Gaulle's once mused, would Washington be willing to trade New York for Paris in the event of a Soviet attack? Proliferation also tends to dissipate the strategic attention of power-projecting states insofar as they are compelled to reappropriate their strategic attention to new and potential nuclear weapon states. Finally, proliferation can spur further proliferation resulting in a nuclear domino effect.

Conceivably, proliferation could be useful to the power-projecting states insofar as it would allow them to wash their hands of the burden of providing international

security to a host of nations; however, Kroenig counters that the ability to project military power is a valuable commodity in the anarchic environment of international politics, thus power-projecting states are reluctant to convey nuclear weapons technology and knowledge. Although proliferation could unburden powerful states of providing security to allies and clients, Kroenig avers that it would also deprive them of much of their power and influence as well.

Inasmuch as proliferation is still a rare occurrence, Kroenig concedes that sweeping generalizations on its patterns can be somewhat facile. Nevertheless, he advances three conditions under which states are more likely to provide nuclear assistance. First, power-projecting states are less likely than non-power-projecting states to provide sensitive nuclear assistance to other countries. Second, states are more likely to provide sensitive nuclear assistance to those states with which they share a common enemy; by doing so, a nuclear state can impose strategic costs on a rival state. Finally, states that are vulnerable to superpower pressure are less likely to provide sensitive nuclear assistance.

To buttress his theory, Kroenig focuses on several case studies. First, he examines French assistance to Israel. Notwithstanding resistance from the U.S. government, France provided crucial assistance to Israel which enabled that country to develop a nuclear weapons program. Both France and Israel shared a common adversary in Gamal Abdel Nasser's Egypt. In the early postwar era, France was conducting a counterinsurgency campaign in Algeria against the FLN (Front de Libération Nationale), which Egypt assisted. At that time, Egypt was the leader of a coalition of Arab states arrayed against Israel. Although the Kennedy administration sought to dissuade Israel

from acquiring the bomb, a nuclear-armed France was not vulnerable to superpower pressure and felt no compunctions about assisting Israel. Inasmuch as France sought to curtail the geopolitical influence of Egypt, the French government saw strategic benefits to a nuclear-armed Israel.

For a while, the Soviet Union assisted China in the latter's nuclear ambitions by constructing a plutonium facility and a nuclear enrichment plant in addition to providing the prototype of a nuclear weapon. In the early part of the Cold War, the U.S. was the Soviet Union's overriding concern. Although the Soviet Union certainly had the capability to project military power into China in the early postwar era, it nevertheless identified the U.S. as its principle adversary and determined that assisting China was worth the strategic costs. However, this assistance was evanescent, as the Soviet Union under Khrushchev eventually determined that a nuclear-armed China would be counter to Soviet regional interests in Asia. By the late 1960s, the Soviet Union had reversed its position and even contemplated using military force to attack China's fledging nuclear arsenal.

From the mid-1980s to the early 1990s, China collaborated with Pakistan on nuclear development. Specifically, China provided Pakistan with blueprints for building a nuclear weapon along with 50 kilograms of weapon-grade uranium. In return, A.Q. Khan provided China with knowledge on advanced centrifuge technology that he had purloined in Europe. Both countries shared common adversaries including India and the Soviet Union. A nuclear-armed regional power, China was not influenced by either U.S. or Soviet/Russian pressure.

Some countries have been dissuaded from providing sensitive or acquiring nuclear assistance due to superpower pressure. Argentina, for example, which developed plutonium reprocessing capability, had the potential to export sensitive nuclear materials and technology, but never exercised this option. A signatory to the U.S-led Inter-American Treaty of Reciprocal Assistance, in 1985, Argentina contemplated providing Libya with plutonium reprocessing facilities, but reversed this agreement after the U.S. government exerted pressure. Similarly, Taiwan anchored in a defense alliance with the U.S., ultimately decided to forgo the development of a nuclear weapons program amid strong resistance from the U.S. government.

Explicitly rejecting economic theories of proliferation, Kroenig argues that states convey sensitive nuclear assistance based on strategic considerations. Notwithstanding denials from Pakistani officials, Kroenig points out that A.Q. Khan's proliferation activities were at the least implicitly endorsed by the Pakistani government. Khan's network was implicated in providing assistance to several countries, including Iran, Libya, China, and North Korea. Consistent with Kroenig's thesis, Pakistan is not a power-projecting country and was not under substantial superpower pressure during the period of proliferation. After the Soviet-Afghan War, Pakistani leaders felt abandoned by the U.S. Moreover, as a result of the Pakistani government's decision to detonate nuclear weapons in 1998, the U.S. government and international governmental organizations, such as the World Bank and the IMF, imposed sanctions on Pakistan. Thus Pakistan no longer felt beholden to the U.S. In the immediate years prior to 9-11, Pakistan viewed the U.S. as a rival and thus saw its proliferation activities as strengthening the America's rivals in Iran, Libya, and North Korea. By assisting these pariah states, Pakistan imposed

strategic costs on the U.S. Not until December 2003, with the seizure of the BBC *China*—a vessel that was caught red-handed surreptitiously carrying centrifuge parts supplied by the Khan network en route to Libya—did the Pakistani government finally halt its proliferation. By that time, Pakistan was an integral part of America’s coalition in the global war on terror.

Kroenig seeks to reconcile the so-called pessimist and optimist schools of nuclear proliferation. The former maintains that proliferation is dangerous because it increases the likelihood of nuclear conflict, while the latter counters that proliferation actually has a stabilizing effect because its deterrence effect inhibits the escalation of international conflict. For his part, Kroenig submits that it is a matter of strategic perspective—proliferation is bad for power-projecting states and may actually be good for non-power-projecting states.

Looking ahead, Kroenig observes that China, which once advocated nuclear proliferation to the third world, has since become a strong supporter of non-proliferation, as that country rises to regional preeminence in Asia. Conversely, Russia, which during the Cold War was usually adamantly opposed to proliferation, has suffered a diminution of its power-projecting capabilities and is now more willing to provide nuclear assistance to other countries, such as Iran. Optimistically, Kroenig found no evidence that non-sensitive civilian nuclear cooperation contributes to the spread of nuclear weapons, thus suggesting that the grand bargain of the Nuclear Non-Proliferation Treaty was successful. He found that NPT-member states were less likely to acquire nuclear weapons than those states that are not members of the NPT. Signatories to the treaty agree to eschew nuclear weapons in exchange for technology and expertise that enable them to develop nuclear

programs for civil purposes. One loophole to this regime, though, is the ease with which nuclear materials can be diverted from civil programs to military purposes.

A formidable methodologist, Kroenig marshals an impressive database and conducts a systematic analysis to support his hypotheses, though he seems to gloss over some important trends in proliferation. For instance, he gives short shrift to the economic incentives fueling proliferation. For example, North Korea's assistance to Syria, which transpired not long after the Israeli Air Force's raid on a nuclear complex in Syria in September 2007, would appear to be driven primarily by money. Likewise, financial considerations appear to loom large in Russia's assistance to Iran's nuclear program. And although the Pakistani government may have perceived strategic gains as part of A.Q. Khan's proliferation activities, money was still the glue that held his network together which extended over the Middle East, Western Europe, China, Malaysia, North Korea, and South Africa. Skillfully assembling the required parts from a variety of sources, Khan produced a nuclear program for Pakistan. He was not dependent on a sole source for the development of the Pakistani bomb. Such piecemeal acquisition of nuclear capability dilutes the responsibility of countries involved in proliferation, and thus may not figure prominently in their strategic calculations. Moreover, in a global economy, dual-use technologies circulate around the world along with the scientific personnel who design and use them. The current wave of proliferation depends greatly on smuggling and subterfuge involving private firms which might not always receive the closest scrutiny from governments.

Also, with the growing concern over nuclear terrorism, the strategic calculations of both power-projecting and non-power-projecting states could change in the future. In

order to prevent such an eventuality, in 2005, the UN established the International Convention for the Suppression of Acts of Nuclear Terrorism, which seeks to prevent the export of sensitive nuclear technology, most notably, uranium enrichment and plutonium processing technology. Nuclear terrorism could target a variety of countries, not just power-projecting states. In fact, as Frederick Iklé observed in his book, *Annihilation from Within: The Ultimate Threat of Nations*, many states in the developing world have weak civil societies and could effectively implode in the event of a nuclear strike against one or two of their major cities.

These quibbles aside, Kroenig's study is well-researched and cogently presented. It will be of interest to students of international relations, arms control, and counterproliferation.

Fred Schreier, *WMD Proliferation: Reforming The Security Sector to Meet the Threat*. Washington, D.C.: Potomac Books, Inc. 341 pp; \$60.00. ISBN: 9781597974219

Originally published in *Terrorism and Political Violence*, Vol. 23 No. 3 (Summer 2011), pp. 475-477.

Throughout history, technological, political, and social changes have increased the disruptive potential of terrorism. For example, the introduction of dynamite was a catalyst for the anarchist movement, which launched bombing campaigns in Europe and America in the early twentieth century. The Treaty of Versailles, which championed self-determination after World War I, and the exhaustion of the imperial powers after World War II, spurred guerilla movements in the third world, which sought to liberate subjects living under the yoke of colonialism. Today, a steady dissemination of dual-use equipment enables the production of chemical and biological weapons. Moreover, with the breakup of the Soviet Union, the risk of a black market has emerged for various weapons of mass destruction (WMD) components, and related expertise. The motivations of terrorist groups are changing as well, as they are often inspired by millenarian and extremist ideologies, thus increasing their proclivity to use WMD, as evidenced by Aum Shinrikyo's attack on the Tokyo subway in 1995. One could add that inasmuch as U.S. armed forces are in such a strong position of superiority vis-a-vis other militaries, America's adversaries have few options other than to pursue asymmetrical strategies. For these reasons, some observers fear that the risk of WMD has heightened in recent years. Fred Schreier, a retired colonel in the Swiss Army and currently a consultant with the Geneva Centre for Democratic Control of Armed Forces, examines the challenges to the new international security environment in his book *WMD Proliferation: Reforming the Security Sector to Meet the Threat*.

The first part of the book discusses variants of WMD beginning with nuclear weapons. As Schreier points out, some states view nuclear weapons as a way in which to balance the overwhelming conventional superiority of the U.S. military. This pattern held in the past. For instance, during the Cold War NATO relied largely upon U.S. extended nuclear deterrence to offset the Warsaw Pact's perceived superiority in conventional forces. In an historical turnabout, today Russia maintains tactical nuclear weapons to balance the perceived superiority of NATO's conventional forces. Although relatively successful, the non-proliferation regime in place today is still fragile. As more countries come to acquire nuclear weapons, it follows that there is a greater likelihood of further proliferation. Furthermore, over the past several decades, there has been a steady expansion in the number of reactors, as more and more countries use nuclear technology to generate electrical power. With this expansion comes the risk that fissile material could be diverted to rogue states, or terrorist groups, and be used for a nuclear bomb, though this scenario still seems unlikely because of stringent security measures and the number of demanding hurdles that would have to be surmounted to successfully carry out a nuclear terrorist attack. More feasibly, terrorists could strike nuclear facilities and still cause considerable damage.

Unlike nuclear devices, chemical weapons would be well within the reach of individuals and small groups. If disseminated effectively, chemical weapons could produce mass casualties. Despite this potential lethality, the effective dispersal of chemical weapons is a difficult task. Striking an industrial chemical facility would be one method for amplifying the effect of a conventional attack. Conventional explosives could disperse dangerous chemicals, thus contaminating adjacent people and property.

Potentially more lethal is the use of biological weapons. The October 2001 anthrax-laced letters demonstrated the possibility that weapons could be diverted by an insider. Adding to these fears is the fact that biological weapons are difficult to detect. Nevertheless, from the perspective of terrorists, biological weapons pose a number of logistical problems. First, a pathogenic or toxin-producing organism must be acquired. Second, the microorganism or toxin must be produced in bulk. And finally, the most significant technical hurdle would be devising a system that is capable of dispersing the chosen agent in an infectious or toxic concentration as a respirable aerosol.

For small groups, or lone wolves without much wherewithal, employing a radioactive dispersal device (RDD), or dirty bomb, could be an attractive option. Nevertheless, as Schreier explains, the highly radioactive material necessary for a lethal RDD would be difficult for terrorists to acquire and handle. Nevertheless, even if crude RDD were detonated, the incident could cause panic and social disruption far out of proportion to its actual lethality.

According to Schreier, the main reason why terrorists have so seldom resorted to WMD in the past is because they were difficult to obtain and employ. As the case of Aum Shinrikyo illustrated, the effective use of WMD is still challenging. The group pursued sophisticated weaponry, including nuclear, biological, and chemical weapons, the latter of which was used in the sarin gas attack on the Tokyo subway in March 1995. Furthermore, the group's formidable resources (according to some estimates, its coffers reached an estimated \$1 billion) enabled the group to carry out serious plans for the procurement and development of such weapons. Nevertheless, with the expenditures that

were used for these ventures, far more destruction and casualties could have been inflicted using conventional explosives.

In the second part of the book, Schreier outlines his recommendations to reform the security sector. First, to counter the threat of WMD, Schreier calls for a centralized national security decision-making structure to coordinate the various aspects of crisis management. The primary purpose of this entity, analogous to the National Security Agency in the U.S., is to provide the nation's chief executive with the information and analysis necessary to make appropriate decisions. To that end, intelligence services must be transformed and strengthened as well. Intelligence products must be unbiased in order to ensure that they are accurate and reliable. As he explains, the most daunting challenge for analysts today is disentangling the relevant information that is often buried in the mountains of open source information, which now composes the majority of intelligence. In order to counter today's terrorist networks, he avers that intelligence, defense, and law enforcement agencies must also learn to forge networks to share information about potential threats.

National legislation, Schreier advises, should be updated to fulfill obligations contained in international conventions intended to counter WMD proliferation and terrorism. National security policy must be clearly articulated in order to provide a clear framework on how the government provides security to its citizens. This would guide the implementation of policy, build a domestic consensus, and enhance regional and international confidence and cooperation. On an international level, he cites the Comprehensive Test Ban Treaty as the single most important measure to revitalize nonproliferation and disarmament today. Also important in reducing the WMD threat is

the U.S. Cooperative Threat Reduction Program, which has strengthened the physical security at Russia's nuclear facilities.

The security sector should be updated to handle all major contingencies involving WMD and related issues. Greater interoperability would enhance cooperation between intergovernmental agencies and foreign allies alike. As Rupert Smith recognized in his study, *The Utility of Force: The Art of War in the Modern World*, the interstate era of warfare is being replaced by war amongst the people in which political and military developments go hand-in-hand. These conflicts involve coalitions of countries contributing to peacekeeping, disaster relief, and nation-building; thus greater cooperation is in order.

In the area of homeland security, Schreier recommends a layered, in-depth defense that protects the national infrastructure and the population with sufficient emergency and preparedness measures to guard against potential WMD threats. To improve the exchange of critical information, he calls for greater foreign, intergovernmental, and interagency collaboration. As he points out, traditionally governmental agencies have been reluctant to share information insofar as they have different missions. Law enforcement agencies, for instance, are concerned primarily with making arrests and prosecutions. By contrast, intelligence agencies collect information that produces sound judgment with respect to long-range national security objectives. In sum, Schreier favors a risk-based approach to homeland security policymaking. The complex threat environment arising from highly adaptive adversaries demands greater innovation. Also, contemporary state systems include numerous subsystems such as the economy and infrastructure, which if attacked, could have a cascading effect on other

subsystems. For these reasons, he counsels that the security sector must be revised to meet these security threats.

At times, Schreier's study is overly didactic and comes across more as a presentation than a monograph. Nevertheless, the book is well-researched and well-organized. Its primary value is that it could serve as a useful reference guide for those interested in improving the security sector.

Chapter 3: Nuclear Terrorism

Although the risk of nuclear war has greatly diminished after the Cold war, the risk of a nuclear attack could be greater than ever. Contemporary terrorist movements are often informed by apocalyptic worldviews that could make them un-deterrable to threats of retaliation. Inasmuch as terrorist groups do not occupy a fixed location, a retaliatory strike against a specific territory would be ineffectual. A nuclear first strike launched against the United States by way of intercontinental ballistic missiles would almost assuredly occasion a massive retaliatory strike against the culprit, as the attack, though swift, would not come as a complete surprise insofar as satellites would detect the launch well before the weapons reached their intended targets. By contrast, terrorists would not deliver a nuclear weapon by aircraft or missile, but by a truck or a freighter, thus the attack could come as a complete surprise.¹⁰ Moreover, the time necessary to attribute the attack to the responsible party would rule out a quick retaliatory response.

The tremendous potential damage that could be wreaked by a nuclear attack is so great that it could bring about the goals of a revolutionary group. The Bolshevik strategist Vladimir Lenin once reproached his fellow revolutionaries for their childlike assumption that the right bomb in the right place at the right time would bring about the worldwide communist revolution.¹¹ However, the enormous destructive capacity of a nuclear weapon might make such a far-flung fantasy more plausible. Under certain circumstances, the potential payoff from a nuclear attack could be so great that a terrorist group would undertake the effort. Specifically, an attack on a capital city could

¹⁰ William J. Perry, "Proliferation on the Peninsula: Five North Korean Nuclear Crises," in *Confronting the Specter of Nuclear Terrorism*. (London and New Dehli: Sage Publications, 2006), p. 67.

¹¹ Thomas P.M. Barnett, *Blueprint for Action: A Future Worth Creating*. (New York: Berkley Books, 2005), p. 282.

decapitate the central government, and by doing so, allow a terrorist organization to achieve its objectives. Even in the United States, with a massive homeland security apparatus, the country could still be at risk of state decapitation as a result of nuclear terrorism. The prospect of using nuclear terrorism to decapitate the government could be seen as an attractive alternative to extremist and terrorist groups that have virtually no hope of achieving their objectives through conventional political means. The following reviews examine the prospect of nuclear terrorism and its consequences.

Charles D. Ferguson and William C. Potter, *The Four Faces of Nuclear Terrorism*. New York and London: Routledge. 376 pp; \$39.95. ISBN: 0415952441

Originally published in *Terrorism and Political Violence*, Vol. 23 No. 3 (Summer 2011), pp. 482-485.

Although the likelihood of global thermonuclear war has decreased drastically over the past two decades, some observers fear that the threat of nuclear terrorism is now greater than ever. During the Cold War, the nuclear balance of terror was thought to follow a certain train of logic as both the U.S. and the Soviet Union pursued their foreign policy goals in a rational manner and were loath to risk nuclear annihilation in the form of mutually assured destruction. Nuclear-armed terrorist groups, though, might not follow the same rationale because of their radical worldviews which inures them to mass casualties. Moreover, inasmuch as terrorists do not occupy a national territory, classic deterrence theory would be less applicable. The potential damage stemming from nuclear terrorism could be catastrophic. A study conducted in 2004 by the RAND Corporation of a hypothetical attack on the port of Long Beach, California, estimated that a 10-kiloton nuclear device would kill 60,000 persons instantly, or soon thereafter, while exposing another 150,000 persons to harmful radioactive water and sediment. The total economic cost could exceed \$1 trillion. Considering these factors, on the eve of the Nuclear Security Summit in April 2010, U.S. President Barack Obama announced that the prospect of nuclear terrorism was the single greatest threat to U.S. national security. Charles Ferguson, currently the president of the Federation of American Scientists, and William C. Potter, the Director of the James Martin Center for Nonproliferation Studies at the Monterey Institute of International Studies, identify the possible scenarios of such attacks in their book *The Four Faces of Nuclear Terrorism*.

Seizing an intact nuclear weapon either through theft, diversion, or political instability, represents the first face of nuclear terrorism. Although this would be the most direct method, it is also the least likely. States would be reluctant to convey nuclear weapons to underground groups for to be implicated in doing so would run the risk of serious retaliation from the targeted country as well as the international community. Alternatively, terrorists could attempt to purloin a weapon from a nuclear stockpile; however, absconding with a nuclear weapon would be problematical for a terrorist group because of tight security measures at installations. A sympathetic insider would be one way to short circuit some of the hurdles facing the group. Conceivably, rogue elements in a regime might be willing to assist a terrorist group to obtain a nuclear weapon. A terrorist group might also be able to acquire a nuclear weapon in the event of political turmoil when security is compromised. If a regime collapsed, state control over nuclear weapons could evaporate, thus allowing a terrorist or criminal group to obtain weapons from the nuclear arsenal. Still another scenario could involve a collapsing regime that would transfer a nuclear weapon to a terrorist group in order to exact revenge against an adversary. Without state assistance, a terrorist group could still attempt to acquire one on the black market, but the black market is not really developed. Presumably, an intact nuclear weapon would be very expensive, somewhere on the order of millions of dollars. But even if terrorists acquired an intact nuclear weapon, the group would still have to bypass or defeat various safeguards, such as permissive action links (PALs), and safing, arming, fusing, and firing (SAFF) procedures. The group would also have to transport the weapon to the designated target of the attack without interception. As far as the type of nuclear weapon most desired, terrorists would probably prefer tactical nuclear

weapons because of their greater portability. Moreover, these weapons are often forwardly-deployed making them more feasible targets for theft.

The second face of nuclear terrorism involves the Improvised Nuclear Device (IND). The most crucial step in this pathway is acquiring enough fissile material for the weapon. According to some estimates, roughly 25 kilograms of weapons-grade uranium or eight kilograms of plutonium would be necessary. Enriching uranium, or producing plutonium in a nuclear reactor, is far beyond the scope of any terrorist organization. However, amid the growing concern over global warming and energy shortages, nuclear power is seen as an increasingly attractive and cleaner alternative to burning fossil fuels to generate electrical power. It remains to be seen if the March 2011 simultaneous reactor containment failures in Japan will affect this trend. One possible consequence of this trend if it continues, though, is the potential for the diversion of fissile material into the custody of a rogue state or terrorist group. Highly-enriched uranium (HEU) and plutonium stockpiles are plentiful and exist in both civilian and military sectors. But, even assuming that fissile material could be acquired, the terrorist group would still need the technical expertise to complete the required steps to build a nuclear device. Although the hurdles to nuclear terrorism are formidable, the authors point out that it would not be necessary for terrorists to meet the same quality standards of states when fabricating nuclear devices. Most experts believe that constructing a gun-assembly weapon would pose no significant technological barriers. In fact, according to a *New York Times* report, a 100-pound mass of weapons-grade uranium dropped on a second 100-pound mass, from a height of about six feet, could produce a blast of five to ten kilotons. Constructing an IND from plutonium, though, would be much more challenging insofar as it would

require the more sophisticated implosion-style design. If an implosion device does not detonate precisely as intended, then there would probably be a fizzle rather than a mushroom. Terrorists could settle on less enriched uranium (ninety percent is considered weapons grade by contemporary standards, but an atomic device could be crafted with lower grade HEU, such as the “Little Boy” bomb that was detonated over Hiroshima, which used about 60 kg of 80 percent enriched uranium). Conceivably, a gun-assembly device could be fabricated with plutonium, but the detonation would amount to a fizzle yield no greater than 10 to 20 tons of TNT. Nevertheless, the yield would still be much greater than one from a conventional explosive.

Attacks against nuclear facilities constitute the third face of nuclear terrorism. Nuclear power facilities are hardened, but nevertheless, they remain fixed targets and are thus vulnerable to sabotage. As the incident at Chernobyl in 1986 and Japan in 2011 illustrated, the effects of an attack or sabotage could be potentially devastating. Presently, there are 441 commercial nuclear power plants world-wide of which 104 are in the U.S. at 65 plants sites in 31 states. Potential targets also include research reactors located on university campuses where security is less rigorous. Many research nuclear reactors are located on urban university campuses that terrorists might be able to gain access. A variety of methods could be used to attack a site, including airplanes, truck bombs, commando attacks, insider collusion, and waterborne attacks. Although power plants are designed to withstand earthquakes, tornadoes, and other natural disasters within postulated limits, experts do not agree as to whether a nuclear power plant could withstand a direct hit by a commercial jet without releasing dangerous radioactive material. Alternatively, terrorists could disrupt the flow of coolant water which could

cause the reactor to overheat and meltdown. At reprocessing sites, a major explosion could aerosolize a significant quantity of high-level liquid waste and spew radioactivity over a wide area. The damage wreaked on the earth quake-stricken reactors in March 2011 demonstrated the potential vulnerability of nuclear power plants. Conceivably, this disaster could have a demonstration effect on terrorists who might opt for nuclear sabotage as a more viable option in lieu of the more challenging proposition of constructing an IND.

Finally, a radioactive dispersal device, or so-called “dirty bomb,” is the fourth face of nuclear terrorism. In essence, a dirty bomb consists of radioactive material conjoined with conventional explosives, which when detonated, disperses harmful radiation, thus possibly rendering an area uninhabitable for a considerable length of time. For small groups, or lone wolves intent on inflicting nuclear terrorism, employing a dirty bomb, would be the most feasible option. Radioactive materials are used in a variety of commercial applications in industrial economies and are thus widely accessible. Many sites containing high-risk radioactive materials remain vulnerable to theft. As the authors point out, the controls over nuclear and radioactive material remain fragmentary and uncertain in some of the countries where terrorist groups operate. Although not as deadly as a nuclear detonation, a dirty bomb’s primary threat would be economic and societal disruption. Cleaning up the radiation after an attack would entail laborious cleansing of surfaces and potentially removing some materials that cannot be fully decontaminated.

As the authors explain, in order to carry out a nuclear attack, the terrorist group must have certain attributes. Presumably, only those terrorist groups with the most extreme objectives would contemplate such an attack. A strong central authority would

be necessary to coordinate the numerous operatives involved in the acquisition and delivery of the weapon. A group would also need a network of competent and dedicated operatives around the world capable of arranging the transport of the weapon across national borders without detection. Finally, the group would most likely need substantial funding to procure the materials necessary with which to build a bomb, unless a weapon was conveyed to the group by a state or some criminal entity.

The authors identify those countries that pose the most serious threat of contributing to nuclear terrorism. Russia comes up at the top of the list because of the large amount of fissile material that was produced—roughly 600 metric tons of weapons-usable plutonium and HEU outside of nuclear weapons—which is enough for 20,000 nuclear warheads. As Joseph Cirincione of the Ploughshares Fund once opined, would-be nuclear terrorists are not unlike Willie Sutton, who once explained that he robbed banks because “that’s where the money is.” Caring less about a state’s geopolitical orientation, terrorists will go where the nuclear material is. As was the case during the early 1990s, in Russia, and some of the former Soviet republics, the security at numerous nuclear sites was often less than adequate. In fact, the Russian government was not even aware of the location and amount of much fissile material due to poor accounting practices. Despite these fears, there are no documented cases of nuclear weapons being stolen from Russian nuclear arsenals, though there have been confirmed cases of diversion and illicit trafficking of small amounts of nuclear-weapon materials. Pakistan also presents a danger. Though the supply of fissile material in Pakistan is relatively small—approximately one metric ton—chronic political instability casts a dark shadow

over the country's nuclear program. North Korea possesses a small arsenal, but the regime's erratic behavior and previous sponsorship of terrorism raise fears as well.

In order to mitigate the threat of nuclear terrorism, the authors counsel that priority must be given to securing global supplies of HEU and plutonium. To that end, the U.S. government should work with the governments in Pakistan, Kazakhstan, and Uzbekistan where radical Islamist groups are active and pose a threat to the security of nuclear materials. Security should be upgraded at sites in Russia insofar as so much nuclear material resides there. Measures such as the Nunn-Lugar sponsored Cooperative Threat Reduction Program should be expanded to prevent fissile material from getting in the wrong hands. In order to minimize the effects of nuclear terrorism, the authors call for a program of consequence management to include training first responders, developing decontamination technologies, and post-attacks therapies. Finally, security at nuclear power and research facilities should be improved to prevent sabotage.

This is a well-informed study that carefully dissects the scenarios of nuclear terrorism along with an analysis of the technological and logistical hurdles necessary to carry out such an attack. As such, it will be of interest to specialists in the fields of terrorism and nuclear proliferation.

Brian Michael Jenkins. *Will Terrorists Go Nuclear?* Prometheus Books, 2008. \$26.98 paper. ISBN: 978-1-59102-656-3

Originally published in *Terrorism and Political Violence*, Vol. 21. No. 4 (Fall 2009), pp. 647-649.

The most worrisome aspect of modern terrorism is the prospect of a radical group obtaining a nuclear weapon. But just how plausible is this scenario? Brian Michael Jenkins, a longtime analyst at the RAND Corporation, thoroughly examines this issue. Although the probability of this eventuality is still quite low, it is so consequential as to merit its consideration. Nevertheless, despite the alarming prospect of nuclear terrorism, the obstacles to obtaining such capabilities are formidable.

First, neither nuclear weapons nor nuclear technology has proliferated to the degree that some observers once feared. Although nuclear weapons have been around for over sixty years, the so-called nuclear club stands at only eight members—U.S., Russia, China, United Kingdom, France, India, Pakistan, and Israel (whose government has never confirmed its arsenal). Although North Korea may have such ambitions, the device it detonated in 2006 had a yield of about a half-kiloton, which by modern weapons standards, was effectively a dud. Likewise, the Iranian program to enrich weapons-grade uranium appears years away from completion. Acquiring highly enriched uranium with which to build a bomb would also be challenging in that states would be reluctant to convey such material to underground groups. Uranium enrichment is a very complex process far beyond the capacity of terrorist groups operating in a clandestine environment. If states that aspire to obtain nuclear capability face such difficulties, it would follow that it would be even more challenging for terrorist groups with far fewer resources and without a secure geographic area in which to undertake such a project.

Furthermore, even if a rogue regime were to develop nuclear weapons, it would be loathed to convey them to terrorist groups over which it could not exercise tight control. To be implicated in supplying nuclear weapons to terrorist groups, would run the risk of serious retaliation from the targeted countries as well as the international community.

Nor would it be easy to acquire a nuclear bomb on a black market. Despite concerns over “loose nukes,” nuclear facilities are usually well protected. What is more, nuclear weapons usually include safe measures to prevent their unauthorized use. In 1997, the Russian General Aleksandr Lebed alleged that over sixty “suitcase” bombs were missing from the Russian military arsenal. Supposedly, Soviet scientists created a nuclear bomb that weighed around sixty pounds. Smuggling such weapons would effectively render an SDI-style defense nugatory. Echoing Lebed’s claim, a Russian defector, Stanislav Lunev, asserted that dozens of these weapons were forward-deployed in the U.S. during the Cold War. However, U.S. officials generally remain unconvinced of this story inasmuch as they were never mentioned in any Soviet war plans. Furthermore, nuclear weapons require considerable maintenance and cannot be mothballed in an attic. Finally, there is no evidence that either the Chechen rebels or al Qaeda has acquired such weapons despite stories to the contrary.

The empirical evidence does not support the supposition that acquiring nuclear weapons is an easy task. For example, despite al Qaeda’s efforts that span over a decade, there is no credible evidence that the organization has succeeded. Instead, the group has occasionally fallen victim to nuclear scams in which operatives have purchased useless material at high monetary costs. Likewise, the Chechen rebels who would seem to be the most advantageously situated to acquire nuclear weapons because of their connections to

organized crime and experience in the Russian military, appear to have been unsuccessful as well.

Still another factor inhibiting nuclear ambitions centers on motives, as terrorists operate under self-imposed constraints. As Jenkins opined back in 1975, “Terrorism is theater, terrorists want a lot of people watching, not a lot of people dead.” Wanton murder could tarnish a group’s image, alienate constituents and the international community, and provoke a ferocious response from the targeted community or government. Moreover, it would be problematic for a government to negotiate with a nuclear-armed terrorist group. In negotiations, how could a government verify disarmament on the part of the terrorist group? And if a terrorist group did disarm, what incentive would the government have to honor the settlement? Thus as part of a national strategy, possession of nuclear weapons can serve as a useful deterrent; however, as an instrument of coercion, they would be far less effective.

If terrorists groups could not obtain a nuclear bomb, they might opt instead for nuclear sabotage. Although experts do not agree as to whether a nuclear power plant would withstand a direct hit by a commercial jet without releasing dangerous radioactive material, the prospect is serious enough to warrant trepidation. Still another option for terrorist groups would be to construct a so-called dirty bomb—radioactive material conjoined with conventional explosives, which when detonated, would disperse harmful radiation thus possibly rendering an area uninhabitable for a length of time. In 1995, a team of Chechen rebels planted such a device in Ismailovsky Park in Moscow, but alerted authorities to its location. Although the device contained only a small amount of

radioactive material, it nevertheless raised the worrisome prospect of a poor man's nuclear terrorism and thus provoked fear out of proportion to its actual lethality.

Despite the difficulties in obtaining nuclear weapons, there are still reasons to worry. As Jenkins points out, over the past two decades, groups that hold radical eschatological worldviews are increasingly represented in contemporary terrorism. Previously, terrorists were in the main motivated by secular ideologies and were more pragmatic in their demands. Conversely, contemporary terrorists are often motivated by racial and ethnic hatreds and religious fanaticism and thus are less constrained in attacking their enemies whom they vilify in absolutist terms. Those groups that seek to “cleanse” the world of infidels or racial and ethnic enemies would find nuclear weapons an effective vehicle to affect their political, social, and religious goals. In fact, the Aum Shinrikyo cult led by Shoko Asahara used some of its considerable resources in an effort to develop a nuclear weapon, but discovered that the obstacles were too high and thus settled on sarin gas, which it released in the Tokyo subway in 1995. In a similar vein, William Pierce's classic, *The Turner Diaries*—a popular novel in the extreme right subculture—concludes when the protagonist carrying out a kamikaze mission in which he flies a dust cropper plane loaded with a nuclear bomb into the Pentagon. Conceivably, a small nuclear weapon detonated in a crucial location—e.g., near the U.S. Capitol during the President's State of the Union Address—could effectively decapitate the government. But still, even a group informed by radical eschatology may still be reluctant to use a WMD for which there is a comparatively low probability of success insofar as failure would diminish their reputation, perceptions of prowess as warriors, and could be interpreted as a sign that God did not favor them in their struggle. Even radical groups

must calibrate their violence, as evidenced by Dr. Ayman al-Zawahiri's admonitions to Abu Musab al-Zarqawi to relent in his campaign of violence against the Shia in Iraq. Yet, even without acquiring nuclear weapons, it is still possible for terrorist groups to wreak nuclear terror. In fact, Jenkins characterizes al Qaeda as the first nuclear terrorist organization. By instilling a sense of nuclear anxiety through bin Laden's pronouncements on the suitability of acquiring nuclear weapons, al Qaeda has managed to induce nuclear terror in the United States.

Although terrorists may someday detonate a nuclear bomb, it is almost certain that it would be a low-yield device. The destruction from such an attack would be tragic, but as Jenkins points out, would not precipitate a societal collapse and the country would survive. Furthermore, such an attack would assuredly provoke a ferocious response from the U.S. In order to avoid such a scenario, Jenkins counsels government to maintain the taboo against the offensive use of nuclear weapons, reduce the size of existing arsenals, ensure the protection of those that remain, and dissuade other countries from acquiring nuclear weapons. Highly enriched uranium should be removed from research reactors because of inadequate security. Jenkins calls for calm, counseling that the fear and anxiety generated from nuclear terror could threaten civil liberties and democracy. This is a well-informed study that will be comprehensible to students, terrorism analysts, and the general public.

Michael Levi, *On Nuclear Terrorism*. Cambridge, Massachusetts and London: Harvard University Press, 2007. \$17.95. ISBN: 978-0674032385

Originally published in *Terrorism and Political Violence*, Vol. 22 No. 4 (Fall 2010), pp. 669-671.

On the eve of the Nuclear Security Summit in April 2010, U.S. President Barack Obama announced that the prospect of nuclear terrorism is “the single biggest threat to U.S. security, both short-term, medium-term and long-term.” Although still beyond the capabilities of the overwhelming majority of terrorist groups, the potential consequences of such an attack are so severe as to merit serious consideration. Michael Levi, a senior fellow at the Council on Foreign Relations in New York, explores the hurdles involved in the implementation of nuclear terrorism and various countermeasures that authorities can apply to thwart such an eventuality.

From the perspective of the terrorist group, the easiest and most direct method for staging a nuclear attack would be to obtain a nuclear weapon from a state sponsor or acquire one on the black market. Though it is highly unlikely that a state would convey a nuclear weapon to a terrorist group, it is conceivable if a regime felt particularly threatened. In such a scenario, a collapsing regime could transfer a nuclear weapon to a terrorist group in order to exact revenge against an adversary. Although state leaders would be reluctant to relinquish nuclear expertise and materials to a non-state entity, insiders may do otherwise, as evidenced by the case of the notorious Pakistani proliferator Dr. A.Q. Khan. Moreover, if a regime collapsed, state control over nuclear weapons could evaporate, thus allowing a terrorist or criminal group to obtain weapons from the arsenal.

Without state assistance, a terrorist group could still attempt to steal a weapon or acquire one on the black market; however, sophisticated security measures would be difficult to surmount. For example, permissive action links are designed to prevent the unauthorized execution of nuclear weapons. Despite the alarmism over loose nukes, there is no well-developed market for non-state actors to acquire illicit nuclear materials. In fact, in the past, al Qaeda fell victim to scams in its quest to procure a bomb. Moreover, the financial requirements for such a transaction would be very high, as states have spent millions and billions of dollars to obtain their arsenals. Transferring such sums of money could raise red flags and thus present opportunities for authorities to uncover the plot. What's more, in illicit markets involving covert transactions, there is no dependable way to resolve disputes. Furthermore, when pursuing such transactions, terrorist groups would be vulnerable to sting operations.

If a terrorist group could not acquire a workable nuclear weapon, the most challenging hurdle would be to obtain the enriched uranium or plutonium used in the pit of the bomb. At a minimum, it is estimated that roughly one hundred kilograms of pure weapons-grade uranium would be necessary to build a viable nuclear weapon. Such an amount would be difficult to procure from one source or in one transaction. Collective efforts, such as the Cooperative Threat Reduction program, the G-8 Partnership against the Spread of Weapons of Mass Destruction, and the Nuclear Suppliers Group, have done much to secure nuclear weapons and fissile materials. As a result, nuclear facilities in the former Soviet Union have received substantial security upgrades and nuclear materials are now better accounted for than they were in the immediate aftermath of the dissolution of the Soviet Union. Nevertheless, problems remain. For instance, the number of nuclear

reactors is projected to double by the end of the century. Although most will be used for civil purposes, the threat of diversion remains.

After the terrorist group obtained weapons grade fissile material, there would still be several other difficult steps that would remain. For instance, the group would have to construct the bomb. Even if a terrorist group could extract the fissile material from a nuclear warhead, Levi notes that modern nuclear weapons designs are more complex than earlier designs and use less nuclear material which would not be an adequate amount for a more crudely fabricated terrorist nuclear bomb. Would-be nuclear terrorists would probably have to settle on the less-sophisticated gun-type design nuclear device as opposed to the more challenging implosion device. This would rule out plutonium as usable material insofar as it can only really be used effectively in the latter design. In order to ensure that their weapon would work, terrorists would more than likely want to test their weapon design which would run the risk of exposing their plot unless they did so in the conditions of a sanctuary or extreme isolation. The terrorist group would also have to have the support of the local population so that informers would not expose their plot. Finally, the group must be able to deliver the weapon to the intended target, which could be challenging considering heightened border patrol security measures, including gamma ray detectors. Alternatively, attempting to smuggle nuclear materials across borders that avoid official points of entry would conceivably be even more difficult as evidenced by the greater number of border seizures for drugs through this method. At each phase, the plot is vulnerable to failure.

Although potentially devastating, as Levi makes clear, the obstacles to overcome to carry out a nuclear terrorist attack are formidable. In fact, the logic underlying the adage

that a defense against terrorism must succeed every time, while terrorists must succeed only once, Levi contends, is reversed for nuclear terrorism. If a terrorist plot is to succeed, each stage of the plot must be carried out, otherwise it will fail. Conversely, the defense must succeed only once. The chances of failure accumulate at each stage of the terrorist plot. Because of the complexity behind the prospect of nuclear terrorism, each stage in the plot is critical and dependent on a high level of expertise and means. Therefore, a successful defense will take advantage of terrorist proclivities for bad luck.

To that end, Levi calls for a layered defense that includes an integrated system in which each part of the defense complements and reinforces others thus reducing the likelihood of nuclear terrorism to almost zero. Specifically, he counsels that controls over nuclear weapons and materials should be improved to prevent their proliferation. In order to dissuade the use of nuclear weapons, defense and response measures can be implemented to deal with the consequences of nuclear terrorism and incidents thus demonstrating that the state would still be viable in the face of such an eventuality. Through a strategic intelligence assessment of the nuclear terrorist threat, authorities will be better able to thwart such a plot. An effective defensive system, as envisaged by Levi, would bring together various government agencies to combat nuclear terrorism. Finally, a system to audit defensive efforts that reflected a range of possible threats, rather than overemphasizing worst case scenarios, would be used to test the defense system as a whole.

This is a well-informed study of an important national security issue. Levi frequently draws upon his background in mathematics and physics which makes the book

appear to be aimed at a specialist audience. Despite this orientation, it will still be useful to a broad range of students of terrorism and nuclear proliferation.

Jeffrey T. Richelson, *Defusing Armageddon: Inside NEST, America's Secret Nuclear Bomb Squad*. W.W. Norton & Company, 2009. \$27.95. ISBN: 978-0-393—06515-2

Originally published in *Terrorism and Political Violence*, Vol. 24 No. 5 (2012), pp. 862-865.

In a world in which dual use technologies travel across national borders with increasing frequency, the threat of nuclear terrorism looms large. Reflecting this concern, the Obama administration's 2010 *Nuclear Posture Review* identifies nuclear proliferation and nuclear terrorism as the two most serious threats to American national security. Likewise, the preceding administration of George W. Bush also gave high priority to preventing nuclear terrorism and proliferation, as he justified the 2003 invasion of Iraq in large part on preventing the prospect of a rogue state conveying a weapon of mass destruction (WMD) to a terrorist group. To meet the challenges posed by nuclear or radiological accidents and incidents, the Nuclear Emergency Support Team—a group composed of scientists, technicians, and engineers—is ready to respond anywhere in the world. In *Defusing Armageddon: Inside NEST, America's Secret Nuclear Bomb Squad*, Jeffrey T. Richelson, a senior fellow with the National Security Archive, explores the history of this obscure, but important, agency which operates under the U.S. Department of Energy's National Nuclear Security Administration.

Inasmuch as nuclear weapons have such destructive potential, their stewardship must be closely safeguarded. Despite safety protocols, on several occasions during the cold war, nuclear weapons in the U.S. arsenal have been lost in transit. Richelson documents several of the more significant “Broken Arrow” accidents. For instance, on February 4, 1958, a B-47 bomber carrying a thermonuclear weapon collided with another Air Force plane during an exercise. Forced to make an emergency landing, the pilot decided to

jettison the bomb in the Atlantic Ocean near Tybee Island, Georgia, before landing safely at Hunter Air Force Base outside of Savannah. After a nine-week search, the Air Force declared the bomb to be irretrievably lost.

In 1970 a new security challenge emerged in the form of nuclear extortion. In the first incident recorded that year, the city of Orlando, Florida, received threatening letters that a hydrogen bomb would be detonated if the author's demand for one million dollars was not met. It later transpired the culprit was a fourteen-year-old high school student. More threats would follow. In fact, Richelson lists 103 cases of nuclear extortion from 1970 to 1993. A threat against the city of Boston was ultimately the impetus for the creation of the Nuclear Emergency Search Team NEST in 1974. (In 2002, the name of NEST was changed to the Nuclear Emergency Support Team. The acronym remained the same.) Its main site was at the Remote Sensing Laboratory located at Nellis Air Force Base near Las Vegas, Nevada. Initially, the existence of the agency was classified, but in 1977, during a closed session of the House Armed Services Committee, panel members were apprised of NEST's mission, which included responding to nuclear incidents and assisting in recovery operations involving nuclear materials.

As the cold war intensified, the U.S. government often prevailed upon NEST to evaluate the plausibility of nuclear threats. Some defense analysts warned that the Soviets might use surreptitious methods to launch a nuclear attack against America. Likewise, after China detonated its first nuclear device in 1964, some analysts suggested that China might launch a clandestine attack against America insofar as the former did not yet have the capability of attacking the latter with intercontinental ballistic missiles (ICBMs). Conceivably, an adversary might consider a clandestine nuclear attack—which

could be erroneously attributed to another country—as a way in which to embroil the United States with a third power. In 1946 at a closed Senate hearing, J. Robert Oppenheimer, the scientific director of the Manhattan Project was asked if three or four men could smuggle an atomic bomb into New York and blow up the whole city. He replied “Of course it could be done...” When asked what instrument could be used to detect such a weapon he responded “A screwdriver.” A few years later, a top-secret study was produced—the “Screwdriver Report”—which explained how to neutralize enemy efforts to smuggle nuclear weapons or radioactive material into the United States. As Richelson notes, this report led to the discrete placement of radiation detectors at airport and ship terminals during the 1950s.

As Richelson explains, by the early 1970s, the prospect of nuclear terrorism attained greater salience after several high-profile events, most notably, the Black September attack at the Summer Olympic Games held in Munich. In the aftermath of the sarin gas attack on the Tokyo subway system on March 20, 1995, some observers feared that the Aum Shinrikyo cult portended a new type of terrorist group that would indiscriminately employ WMD. Compounding these fears, in 1997, the Russian General, Alexander Lebed, alleged that eighty-four nuclear “suitcase” bombs were missing from the Russian military arsenal. For its part, the Russian government officially denied the loss of any backpack nuclear weapons. Moreover, U.S. officials generally remain unconvinced of Lebed’s story, which he later recanted. Nevertheless, as several U.S. intelligence agencies have determined, some terrorist groups are committed to acquiring WMD and using them against the United States. In August 2001, representatives of al Qaeda, including Osama bin Laden and Dr. Ayman al-Zawahiri, met with Sultan Bashiruddin

Mahmood and Chaudhry Abdul Majeed, two retired senior engineers at the Pakistan Atomic Energy Commission during which they discussed the prospect of building a nuclear bomb and other WMD.

According to Richelson, an unnamed source within NEST explained that the agency considered the detonation of a dirty bomb to be a “more sensitive” issue insofar as it was more likely to occur than the threat of a stolen or improvised nuclear device. A radiological dispersion device, or “dirty bomb,” consists of radioactive material conjoined with conventional explosives, which when detonated, would disperse harmful radiation, possibly rendering an area uninhabitable for a considerable length of time.

Well-equipped, NEST has the ability to travel across the globe if necessary to search for, disable, and contain the effects of nuclear devices and dirty bombs. As Richelson explains, the first line of defense against nuclear terrorism is the Material Protection Control, and Accounting (MPC&A) Activity which assists Russia, Pakistan, and other nations in improving their ability to maintain proper control of their inventories of nuclear weapons and materials. Presently, the largest stockpiles of plutonium and weapons-usable uranium reside in Russia. To shore up defenses, the Nunn-Lugar sponsored Cooperative Threat Reduction Initiative and the Global Threat Reduction Program seek to prevent fissile material from getting in the wrong hands. Pakistan also presents a danger. Though the supply of fissile material in Pakistan is relatively small, chronic political instability casts a dark shadow over the country’s nuclear program. The second line of defense, which was initiated around 2005—the Megaports Initiative—led to the installation of radiation detectors at foreign border crossings, airports, and port areas. In January 2002, the Bush administration instructed NEST to begin periodic

searches for dirty bombs in Washington, D.C. and other large American cities. NEST personnel patrol in unmarked moving vans equipped with sophisticated gamma and neutron detectors that are sensitive to the emission of radiation. NEST agents also patrol on foot with detectors concealed in briefcases and backpacks. They are often deployed for major events such as the Super Bowl.

Despite these efforts, as Richelson points out, weaknesses in the security system remain. Inasmuch as the nuclear sector has been drastically scaled back since the end of the cold war, a dearth of experienced and qualified technicians are available to evaluate the credibility of nuclear threats. Furthermore, in the event of a crisis involving multiple locations, NEST could face a shortage of vehicles and equipment to carry out its mission.

Richelson's study is well-informed and provides the reader with an insider's view of the persons and issues involved in NEST. It will be of particular interest to students of nuclear surety and nuclear terrorism.

Chapter 4: Looking Ahead

Despite the destructive potential, nuclear terrorism remains a low probability event. Serious efforts to mitigate the threat have been undertaken in recent years. Furthermore, the death of Osama bin Laden on May 2, 2011, dealt a serious blow to his terrorist network. Nevertheless, al Qaeda continues to operate although its effectiveness has been severely degraded from an international counterinsurgency effort led by the United States. Not long after bin Laden's death, his chief lieutenant, Dr. Ayman al-Zawahiri assumed leadership and has sought to mobilize Muslims around the world to join his global jihad.

Perhaps more worrisome than al Qaeda are the nuclear aspirations of Iran. Since the revolution in 1979, Iran has been one of the world's foremost state sponsors of international terrorism. The Islamic Revolutionary Guard Corps (IRGC), the primary organ for the sponsorship of terrorism, originally formed the nucleus of the Shiite militant group Hezbollah founded in Lebanon in 1982.¹² What is perhaps most significant about Hezbollah from the perspective of the United States is that prior to the 9/11 attacks, the organization was responsible for more terrorist fatalities against American citizens than any other terrorist group, both foreign and domestic.¹³ The most spectacular and lethal act of terrorism by Hezbollah was the October 23, 1983 suicide truck bombing of a U.S. Marine Corps barracks in Lebanon, which killed 241 U.S. servicemen. Iran is also believed to have sponsored the Saudi Hezbollah organization that attacked the Khobar

¹² Alireza Jafarzadeh, *The Iran Threat: President Ahmadinejad and the Coming Nuclear Crisis*. (New York: Palgrave, 2007), p. 205.

¹³ Paul R. Pillar, *Terrorism and U.S. Foreign Policy*. (Washington, D.C.: Brookings Institution Press, 2001), p.134.

Towers complex near Dhahran, on June 25, 1996, which killed nineteen U.S. airmen.¹⁴ On occasion, Hezbollah has attacked Israeli and Jewish targets outside of the Middle East. In 1993, a truck bomb detonated near the Israeli embassy in Buenos Aires, Argentina, killed twenty-nine people and wounded over 200 others. This attack was followed by a second bombing on July 18, 1994, which killed 86 people and wounded several hundred more and destroyed the AIMA (Argentine Israelite Mutual Association) building in Buenos Aires, where several Argentine Jewish organizations were located.¹⁵ More recently, Iran continued to support Hezbollah during its confrontation with Israel in the summer of 2006.¹⁶

Nevertheless, Iran's past behavior suggests that it is reluctant to provide WMD to a terrorist group. Moreover, 9/11 and the subsequent U.S. military operations in the Middle East, seemed to have a limiting effect on Iran's sponsorship of international terrorism.¹⁷ Still, some observers do not look at the prospect of a nuclear-armed Iran with equanimity. At the very least, some fear that a nuclear-armed Iran would be more prone to adventurism in the Middle East.¹⁸ The Israeli government considers such a

¹⁴ Kenneth R. Timmerman, *Countdown to Crisis: The Coming Nuclear Showdown with Iran*. (New York: Crown Forum, 2005), pp. 183-196.

¹⁵ Samuel Katz, *Relentless Pursuit: The DSS and the Manhunt for the al-Qaeda Terrorists*. (New York: Forge, 2002), p. 235.

¹⁶ Tensions between Iran and Israel increased as a result of fighting in Lebanon. In the summer of 2006, Iranian Defense Minister Mohammad Mostafa Najjar announced that Iran's Supreme Leader Ayatollah Ali Khamenei instructed the Iranian military to concentrate on asymmetric options. According to one report, 250 Iranian Army ballistic missile experts and as many as 1,000 Revolutionary Guards were involved in preparing the operation. Babak Ganji, *Iran & Israel: Asymmetric Warfare and Regional Strategy*. (Defence Academy of the United Kingdom, October 2006), pp. 2-14.

¹⁷ Daniel Byman, "Iran, Terrorism, and Weapons of Mass Destruction," *Studies in Conflict & Terrorism*, Vol 31, (2008), p. 179.

¹⁸ Gregory F. Giles, "Deterring a Nuclear-Armed Iran from Adventurism and Nuclear Use," in Barry Schneider and Patrick Ellis (eds), *Tailored Deterrence: Influencing States and Groups of Concern*. (Maxwell Air Force Base, AL: USAF Counterproliferation Center, 2011), p. 121.

proposition an existential threat to national survival insofar as Israel is a very small country that might not survive a nuclear first strike. As the noted defense intellectual Anthony Cordesman once noted, some states in the Middle East are “one-bomb states” in the sense that a nuclear strike effectively delivered against their capital or on a few major cities could shatter the economic and political stability of their countries, perhaps leading to the downfall of the state itself.¹⁹

Finally, the pronouncements of some Iranian clerics suggest a millennial orientation that could lead to catastrophe. For instance, former Iranian President Rafsanjani once raised the prospect of national suicide as part of an effort to destroy Israel, musing that the nuclear annihilation of Iran as a result of a retaliatory attack by Israel would be an acceptable price to pay to destroy half of the world’s Jewish population. In such a conflagration, he reasoned, only a small portion of the world’s Muslims would perish.²⁰ President Mahmoud Ahmadinejad has also done little to allay Israel’s fears. Not long after assuming the Iranian presidency, he gained international notoriety when he proclaimed that Israel should be “wiped off the map” at a conference titled “The World Without Zionism” in October 2005.²¹ No isolated incident, Ahmadinejad’s comments

¹⁹ Anthony H. Cordesman, *Iran and Iraq: Threat From the Northern Gulf*. (Boulder, CO: Westview Press, 1994), pp. 111, 274 in Barry R. Schneider, *Future War and Counterproliferation: U.S. Military Responses to NBC Proliferation Threats*. (Westport, CT: Praeger, 1999), p. 202.

²⁰ Ledeen, *The War Against the Terror Masters*, p. 282.

²¹ There is some dispute over the translations of Ahmadinejad’s comments. Juan Cole, a professor of Middle East and South Asian History at the University of Michigan, pointed out that the idiom “wiped of the map” does not exist in Persian. According to Cole, Ahmadinejad’s statement could be more accurately translated to mean that the “occupation regime over Jerusalem must be erased from the page of time.” See Juan Cole’s website at <http://www.juancole.com/>. Seeking to clarify his position, in an interview with *Time* magazine, Ahmadinejad distinguished between Jews and Zionists, commenting that while he opposed the latter, he believed that the former were entitled to their own state. Scott Macleod, “We Do Not Need Attacks,” *Time*, September 17, 2006, <http://www.time.com/time/magazine/article/0,9171,1535777-1,00.html>.

suggested a combative streak in his character. In an effort to solidify Iran's great power status, he has sought to build a nuclear arsenal. Israel is particularly concerned that a nuclear-armed Iran could supply Hezbollah with nuclear weapons and the means to deliver them.²²

The following reviews offer contrasting views on the contemporary nuclear landscape. John Mueller argues that nuclear weapons have not had the significant impact on history that we often assume. In the future, he predicts that their influence will wane. Less optimistic is Ron Rosenbaum who fears that a concatenation of events could spiral out of control and lead to a global nuclear war.

²² Ze'ev Schiff, "Israel's War With Iran," *Foreign Affairs*, v. 85 no. 6 (2006), pp. 23-31.

John Mueller, *Atomic Obsession: Nuclear Alarmism from Hiroshima to Al Qaeda*. (London: Oxford University Press, 2009), 336 pp. \$27.95.

Originally published in *The Journal of International Security Affairs*, No. 20 (Summer 2011), pp. 141-144.

Despite substantial reductions in both the U.S. and Russian nuclear arsenals, the Federation of American Scientists estimates that over 20,000 nuclear warheads still remain around the world. Moreover, in recent years, the nuclear aspirations of North Korea and Iran have stoked fears among their neighbors and may set off one or more waves of new regional proliferation. And in April 2010, on the eve of the Nuclear Security Summit in Washington, DC, President Obama announced that the prospect of nuclear terrorism had emerged as the greatest national security threat to the United States. Yet, argues John Mueller in his book *Atomic Obsession*, our fears of the bomb are overwrought.

Mueller concedes that, if used, nuclear weapons would be devastating. Nevertheless, he points out that their main effect is suddenness. After all, destruction can also be wreaked by conventional weapons—as evidenced by the bombing raids on Tokyo, Hamburg, and Dresden during World War II. Indeed, argues Mueller, nuclear weapons have had only a modest influence on history, and may not even have been determinative in bringing an end to World War II as commonly claimed since, by August of 1945, the defeat of Japan was already a foregone conclusion.

Be that as it may, the image of the atomic bomb as the world's most destructive weapon was seared into the public consciousness at the end of the war. As Mueller explains, in the immediate aftermath of World War II, both the Americans and the Japanese had an incentive to inflate the significance of the atomic attacks on Hiroshima

and Nagasaki. For the U.S., as the world's sole possessor of nuclear weapons, the attacks underscored American prestige and influence in the region. For Japan, the bomb offered a convenient explanation that assuaged the country's wounded pride—Japanese defeat could be said to have come about not as a result of leadership mistakes or a lack of martial valor, but rather because of an unexpected advance in science.

More recently, despite initial fears of widespread proliferation in the nuclear age, relatively few countries have actually acquired the bomb. For Mueller, there are several reasons why countries eschew nuclear weapons. First, he sees limited military value in possession of such a capability. To be sure, the effects of nuclear weapons are devastating, but the world-wide opprobrium against their use and the risk of massive retaliation render them marginal as an effective instrument of warfare absent the most existential threat. Moreover, the declining incidence of state-to-state warfare suggests their continued marginalization as an instrument of statecraft. Thus, argues Mueller, there is very little strategic advantage for those countries that possess nuclear arsenals.

Second, developing nuclear weapons is an extremely wasteful proposition—which explains why so many capable countries have decided to forego their acquisition. The economic cost of nuclear weapons is enormous: for the U.S. during the Cold War, the estimated cost of developing an offensive nuclear capability was between 5.5 and 10 trillion dollars. What's more, the development of nuclear arsenals leads to a tremendous diversion of scientists, engineers, and technicians who could devote their talents elsewhere to more productive endeavors.

Finally, in contemporary international affairs, Mueller sees little status accruing to nuclear aspirants. He cites the example of Italy, which boasted in 1987 that it had

surpassed Britain in its gross domestic product. Absent in Britain's reply was any reference to its military superiority or its possession of nuclear weapons. Acquiring the bomb, meanwhile, can have severe consequence for the aspirant, as the country could find itself diplomatically isolated. Sanctions could be imposed and neighbors may seek to counterbalance nuclear proliferation by strengthening regional alliances arrayed against the aspirant country. For instance, nuclear weapons have not helped North Korea, which remains isolated, backwards, and poor. Likewise, Iran, despite the talk of a "Shia Revival," remains a pariah nation in the minds of much of the world community. Even Muammar Qaddafi finally realized that nuclear weapons were not worth the hassle. By foreswearing their development, he was able to reintegrate Libya into the global community of which it had been shut out due to his previous support for international terrorism.

Not surprisingly, Mueller is scathing in his criticism of U.S. counterproliferation policies. He concedes that nuclear weapons are destructive, but in counterintuitive ways insofar as non-proliferation and counterproliferation policies can entail substantial human costs. Most notable is the case of Iraq. Saddam Hussein's alleged pursuit of WMD, including nuclear weapons, was ultimately the justification for the 2003 U.S.-led invasion, which resulted in a protracted conflict and human suffering. The sanctions regime that followed the first Gulf War resulted in much privation, as medical supplies were prevented from entering the country. In fact, the sanctions and the war resulted in more human destruction than the bombings of Hiroshima and Nagasaki combined. Likewise, Mueller warns that saber-rattling on the Korean Peninsula could also be potentially catastrophic, insofar as another Korean War could result in the deaths of as

many as 1,000,000 people (including 80,000 to 100,000 U.S. servicemen), according to a Pentagon estimate.

The proliferation fixation, according to Mueller, also stymies the development of nuclear power as a valuable and efficient energy source. Amid the growing concern about global warming, increasingly, nuclear power is seen as an attractive and cleaner alternative to burning fossil fuels to generate electrical power. In fact, in the United States, about 20 percent of all electricity is generated by nuclear power plants. The number of nuclear reactors worldwide is projected to double by the end of the century.

One possible consequence of this trend, though, is the potential for the diversion of fissile material into the custody of a rogue state or terrorist group. However, Mueller finds this scenario highly unlikely, and argues that the hyperbole surrounding such a proposition is counterproductive. As he points out, a nuclear device fabricated by a terrorist group would probably have a comparatively low yield. And the hurdles that a terrorist group would have to overcome to build or acquire a nuclear bomb are formidable (from safety devices and procedures to the need for highly competent technicians, unflinching loyalty and discipline). Using a multiplicative rule of probability for twenty steps necessary to carry out a nuclear attack, Mueller calculates that the probability of such an eventuality to be one in over three billion. The bombastic rhetoric surrounding nuclear terrorism, Mueller argues, only encourages terrorist groups to explore that option.

And even if a single nuclear device were detonated, it would not portend the demise of an entire city, much less the economy of a country, the government, or a civilization. Rather, Mueller believes that America would be resilient, citing the example of Japan during World War II, which sustained an intense nation-wide conventional

bombing along with two nuclear attacks, yet whose civil society and government survived. Conceding that a nuclear attack could devastate a locale, Mueller still dismisses the notion that it would extinguish the rest of the country. As he puts it: “Do farmers in Iowa cease plowing because an atomic bomb went off in an Eastern city? Do manufacturers close down their assembly lines? Do all churches, businesses, governmental structures, community groups simply evaporate?”

Arguably, though, this analysis is somewhat facile and gives short shrift to the possibility of strategic nuclear terrorism. For instance, a nuclear device planted in a certain place (near the Capitol Building in Washington, D.C.) at a certain time (the President’s State of the Union Address) could conceivably decapitate the U.S. government. Although there is a plan of presidential succession, it might not be carried out smoothly. Moreover, in such a scenario, if power was contested by different officials, would the rest of the country recognize their authority? And without a functioning government, would the state governments, which depend so much on the federal government, really be viable for very long? In time of crisis, Americans have come to assume that the federal government will take the lead. If the federal leadership were decapitated, it might not be that easy to put Humpty Dumpty together again.

More significantly, Mueller seems to ignore the importance of vigilance. The reason nuclear terrorism remains a highly unlikely proposition is because it is taken so seriously. As a consequence, it is exceedingly difficult for terrorists to succeed at each stage of the plot because various measures have been implemented to thwart such an occurrence. And though it is highly unlikely that a state would convey a nuclear weapon to a terrorist group, it is conceivable that if a regime felt particularly threatened it might

do so. In such a scenario, a collapsing regime could transfer a nuclear weapon to a terrorist group in order to exact revenge against an adversary.

Moreover, if a regime collapsed, state control over nuclear weapons could evaporate, thus allowing a terrorist or criminal group to obtain weapons from the nuclear arsenal. As was the case during the early 1990s, in some of the former Soviet republics, the security at some of the nuclear sites was often less than adequate. In fact, the Russian government was not even aware of the location and amount of much fissile material due to poor accounting practices.

Although Mueller's study might be tendentious, it is well-researched and certain to provoke discussion on serious topics surrounding nuclear issues. At the very least, it provides a compelling counterpoint to the conventional wisdom on nuclear terrorism.

Ron Rosenbaum, *How the End Begins: The Road to a Nuclear World War III*. Simon & Schuster, 2011. 305 pages, \$28.

Originally published in *The Nonproliferation Review*, Vol. 19 No. 1 (March 2012), pp. 143-147.

Ron Rosenbaum, a widely published journalist and author, explores the new nuclear landscape in *How the End Begins: The Road to a Nuclear World War III*. In his book, Rosenbaum warns that the predictable yet potentially catastrophic bipolar nuclear era, which was premised on a balance of terror, has degenerated into a chaotic state of nuclear multipolarity in which even a small regional nuclear conflict could escalate into a global conflagration.

Viewed in retrospect, deterrence appears to have worked during the Cold War, insofar as a nuclear exchange between the two superpowers never materialized. As historians excavate the history of that period, however, a number of close calls have been revealed. The most obvious was the 1962 Cuban Missile Crisis, during which the US and Soviet navies faced off and the prospect of nuclear war was perilously real. During the crisis, a Soviet submarine aimed a nuclear-tipped torpedo at a US blockade vessel and nearly fired, but the order was countermanded by a Russian submarine fleet commander who happened to be on board. Another crisis was averted in the fall of 1983 during the Operation Able Archer NATO war game in Europe. Soviet officials feared that the exercise, which simulated the release of nuclear weapons by senior US and NATO political and military leaders, might have been a ruse for a preemptive nuclear attack on the Warsaw Pact states. Soviet Colonel Valery E. Yarynich, a veteran of the Strategic Rocket Forces, was able to convince the Soviet leadership that NATO would not launch a surprise attack, thus quelling the crisis.

Rosenbaum fears that the stage is now being set for a redux of the Cuban Missile Crisis, as a concatenation of events could lead to a nuclear conflagration involving the United States, Russia, and regional nuclear weapon states. *How the End Begins* opens with a recounting of the 2007 Israeli raid on a Syrian nuclear reactor that—if it had become operational—would have produced weapon-grade plutonium as a byproduct. For Rosenbaum, this incident could presage a nuclear cascade. Should Israel preemptively strike Iranian nuclear facilities, other nuclear powers could be drawn into the conflict. Both Russia and the United States use satellites to monitor such trouble spots; there is the possibility that Russia could provide Iran with intelligence of an imminent Israeli strike. During the 1973 Yom Kippur War, when Israel’s military threatened to crush Egypt’s Third Army—the last barrier to Cairo—the Soviet leadership conveyed an indirect nuclear warning to Israel. Were Russia to do likewise in the lead-up to an Israeli strike against Iran, Israel would instantly relay the threat to the United States, a close ally with which it maintains a special relationship. Implicitly, the US nuclear umbrella extends to Israel, as evidenced by presidential candidate Senator Hillary Clinton’s remark during the 2008 campaign that in the event of an Iranian nuclear attack on Israel, the United States would obliterate Iran with nuclear weapons. Another wild card in the region is Pakistan, a country marked by chronic political instability that possesses a nuclear arsenal whose security is questionable. What is more, Pakistan’s military and Inter-Services Intelligence have been implicated in supporting regional terrorism and given Osama bin Laden’s long residence at a safe house in Abbottabad, Pakistan, near prominent military installations—may even have provided support to the al Qaeda leader. Pakistan, with its much-vaunted “Islamic bomb,” could also be drawn into a regional nuclear war, insofar as it might feel

compelled to assist any Islamic country attacked by Israel. As a result, Rosenbaum writes, a regional conflict could escalate into a nuclear standoff among several nuclear powers.

Today, much of the tension between the two major nuclear powers centers on the contentious US ballistic missile defense (BMD) program. President Ronald Reagan's "Star Wars" speech, delivered on March 23, 1983, placed BMD front and center on the political agenda. Reagan billed the program as a defensive shield that would render ballistic missiles impotent and obsolete; critics, however, argued that the system was really intended to augment a first-strike offensive strategy, since such a defense would allow for an offensive first strike with less fear of successful retaliation.

Research on missile defense slowed after the end of the Cold War, but the George W. Bush administration accelerated it. In December 2001, Bush withdrew the United States from the US-Russian 1972 Anti-Ballistic Missile Treaty in order to deploy a rudimentary missile defense system in Alaska and California. New research and funding for the program began, and in April 2007 the Bush administration announced that the United States planned to install interceptor rockets in Poland for the stated purpose of striking down missiles targeted at Europe by Iran. Later that same year, Russian president Vladimir Putin—unconvinced that US intentions were purely defensive—authorized the resumption of long-range strategic bomber flights, which had not been conducted since the Cold War. This new policy raised the prospect of dogfights between fighter jets and nuclear-capable bombers, Rosenbaum ominously points out. The Obama administration later scuttled plans for siting interceptors in Poland planning instead to install them in Romania.

Rosenbaum is also worried by doctrinal changes to US nuclear policy, such as the 2001 Nuclear Posture Review, which he felt broke the taboo against normalizing nuclear weapons use. Rather than regard nuclear weapons as instruments to prevent—or respond to—the use of nuclear weapons by others, the 2001 posture supported treating them more like conventional weapons (albeit more destructive) to be deployed and used in a variety of battlefield situations. In a controversial plan, the George W. Bush administration considered developing low-yield nuclear weapons that could be brought to bear on a variety of targets; nuclear earth penetrators (“bunker-buster” bombs) could be used to destroy well-fortified targets burrowed deeply underground or in caves. This was problematic to Rosenbaum and other observers because of the cultural and political taboo that places nuclear weapons in a different military, political, and even metaphysical category of weapons.

During the Cold War, proliferation had been mainly vertical, in the sense that the nuclear powers added more and more weapons to their stockpiles. Today, as Rosenbaum notes, that pattern has been reversed, with the major nuclear powers drastically reducing their arsenals. More countries are aspiring to acquire nuclear weapons, and the diffusion of nuclear technology enables this pattern. Most worrisome for Rosenbaum is the Middle East, a region beset with a myriad of religious and sectarian conflicts. Rosenbaum sees Iran as the most likely potential nuclear flashpoint. The prospect of a nuclear-armed Iran is especially troubling in Israel, but Arab nations in the region also fear the ascent of the largely Shiite and Persian country. The pronouncements of some Iranian clerics and leaders have intensified Israel’s fears. For example, former Iranian president Akbar Hashemi Rafsanjani once raised the prospect of national suicide as part of an effort to

destroy Israel, musing that the nuclear annihilation of Iran as a result of a retaliatory attack by Israel would be an acceptable price to pay to destroy half of the world's Jewish population. In such a conflagration, he reasoned, only a small portion of the world's Muslims would perish. Israel's small size renders it extremely vulnerable. As the noted defense analyst Anthony Cordesman once speculated, a nuclear attack of just one or two bombs could effectively destroy it.

Israel, which has a policy of "nuclear opacity," has never officially acknowledged that it has a nuclear arsenal, though it is an open secret that it does. According to some observers, Israel's nuclear deterrent extends beyond its Middle East rivals. As the journalist Seymour Hersh explained, the "Samson option" implies that in the event of an existential defeat, Israel's five Dolphin-class submarines (ironically made in Germany) could wreak vengeance by attacking not only immediate belligerents, but also others (e.g., Moscow and other European capitals) on the basis of their historical anti-Semitism. Rosenbaum fears that Israel, seeking to avert a second Holocaust, may actually precipitate such a calamity by launching a preemptive strike that could ultimately be genocidal for the Jewish state.

Rosenbaum's most interesting chapter deals with the legacy of the Holocaust on Middle East politics and how it informs Israel's aggressive counterproliferation posture, as demonstrated by its 1981 attack on Iraq's Osirak nuclear reactor and 2007 attack on Syria's reactor at al Kibar. Rosenbaum, a Jew who wrote about the origins of the Holocaust in his book *Explaining Hitler: The Search for the Origins of His Evil*, makes no pretense of dispassion on this subject. He warns that the shrillness of Islamist rhetoric could presage a second Holocaust, noting in particular Iranian president Mahmoud

Ahmadinejad's oft-cited remark that Israel should be "wiped off the map." (Rosenbaum unfortunately seems to have missed reports that Ahmadinejad never actually uttered that phrase; however, this detail has little impact on Rosenbaum's larger point.) Rosenbaum argues that the first Holocaust, which added a sense of urgency to the Zionist project, may have actually set the stage for a second Holocaust, insofar as Jews from around the world are now concentrated in the tiny Middle Eastern nation of Israel, where they are easy targets for a nuclear attack. As Rosenbaum points out, Jewish scientists, fearful of the prospect of a nuclear-armed Nazi Germany, were at the forefront of the development of the atomic bomb. President Franklin D. Roosevelt authorized the Manhattan Project after receiving a letter from Albert Einstein and Leo Szilard warning that German scientists were working on developing an atomic bomb; J. Robert Oppenheimer directed the scientific research for the Manhattan Project. Investigations after the war revealed that the German project had been a half-hearted effort; the exigencies of war had precluded such a hypothetical weapon when resources were needed elsewhere. Thus Rosenbaum observes the irony that the atomic bomb, which was in large measure a creation of Jewish scientists—many of whom were refugees from Hitler's new order in Europe—could one day "serve to finish off Hitler's Final Solution if detonated in Israel."

What Rosenbaum calls "The Question"—how many people would perish in a global nuclear conflict?—has long motivated his study of nuclear weapons. Considering fallout and other ancillary effects such as a famine and nuclear winter, he estimates that as many as 1 billion people could die in a nuclear conflagration.

Despite this, Rosenbaum finds reasons for optimism. As governments come to accept inspection and verification regimes, arms control becomes more feasible. There are indications that both the US and Russian governments are seriously committed to complying with Article VI of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), which stipulates that all NPT signatories (nuclear weapon and non-nuclear weapon states alike) work toward the total elimination of nuclear weapons. Although “nuclear zero” might sound far-fetched, prominent statesmen have endorsed it, including Ronald Reagan and Mikhail Gorbachev, who first expressed the aspiration for a nuclear-free world at a summit in Reykjavík, Iceland, in October 1986. In more recent years, George Shultz, William Perry, Sam Nunn, and Henry Kissinger echoed this goal in their now-famous 2007 *Wall Street Journal* op-ed, “A World Free of Nuclear Weapons.” President Barack Obama has even made nuclear elimination a holy grail of his foreign policy agenda; on April 8, 2010, he and Russian president Dmitry Medvedev signed the New Strategic Arms Reduction Treaty (New START). Both the US and Russian governments ratified the treaty within a year. Under the terms of New START, the United States and Russia agreed to dramatically reduce their deployed arsenals to 1,550 nuclear warheads each. According to the Federation of American Scientists, as of 2011, the total nuclear inventories for the United States and Russia were respectively 8,500 and 11,000—a substantial reduction from the peak levels of roughly 32,000 and 45,000 nuclear warheads held by Washington and Moscow, respectively, during the Cold War.

Rosenbaum concedes that there are perils on the road to global zero. For instance, as the United States reduces its arsenal, the credibility of its extended deterrence guarantee to allies could be diminished. Some allies may be inclined to develop their own

nuclear weapons if they come to believe that the US guarantee is not reliable. Still, Rosenbaum sees the current disarmament trend as a welcome development.

Nevertheless, as Rosenbaum observes, Obama is up against an entrenched nuclear establishment that has its own self-preservationist agenda. He cites the case of General Kevin P. Chilton, head of US Strategic Command, who at a conference in 2009 made light work out of Obama's goal of achieving nuclear zero. In a speech, Chilton exhorted his commanders to "wage deterrence," counseled his audience that nuclear weapons would be around for the foreseeable future, and urged his colleagues to make the most out of nuclear weapons without getting rid of them.

In order to mitigate the risks of nuclear catastrophe, Rosenbaum believes that measures such as the Cooperative Threat Reduction Program sponsored by senators Sam Nunn and Richard Lugar should be expanded to prevent fissile material from getting into the wrong hands. He also supports the Comprehensive Nuclear-Test-Ban Treaty, which sends a powerful message that the United States is committed to nonproliferation. Perhaps even more important than disarmament, according to Rosenbaum, is de-alerting nuclear weapons. By taking nuclear weapons off high alert, the chance of an inadvertent launch due to a false positive is greatly reduced. Concomitant with these efforts, regional conflicts must be defused in order to remove the underlying conditions that give rise to nuclear proliferation.

At times, the scenarios that Rosenbaum depicts in his book come across as overwrought and alarmist, though that can be expected when dealing with such a potentially destructive topic. Nevertheless, *How the End Begins: The Road to a Nuclear World War III* is a well-informed study that probes the most pressing issues of the

contemporary nuclear landscape and will be of great interest to students of counterproliferation.

Conclusion

Over the past several years, serious efforts have been made to stem the tide of proliferation. In recent years, there has been much progress to contain vertical proliferation. For instance, the United States and Russia have entered into a number of treaties. Most recently, the New START Treaty was ratified in early 2011. According to the provisions of the treaty, both countries will each reduce their deployed nuclear arsenals to 1,550 warheads. Still, the number of inactive stockpiled nuclear warheads will remain in the high thousands. Moreover, the treaty does not cover non-strategic nuclear weapons nor does it preclude nuclear modernization and the anti-ballistic missile issue is left unresolved.

Previously, proliferation was mainly vertical in the sense that the nuclear powers added more and more weapons to their stockpiles. But today, the pattern has been reversed. The major nuclear powers have drastically reduced their arsenals, but more and more countries aspire to acquire nuclear weapons. The diffusion of nuclear technology enables this pattern. There have been efforts to stem the tide of horizontal proliferation.

Despite the relative success of the Non-Proliferation Treaty and other arms control measures, the non-proliferation regime in place today is still fragile. The number of nuclear weapon states now stands at nine, but if the Islamic Republic of Iran were to acquire an arsenal, it could precipitate a wave of proliferation in the Middle East. It follows that as more countries possess nuclear weapons, the likelihood is greater that there will be proliferation. After the fall of the Soviet Union, the nuclear sector in that country was drastically scaled back. Previously, the scientists and technicians, who worked on the nuclear program, were treated well in the Soviet system. But after the

collapse in late 1991, many of these personnel lost their jobs or were underpaid. Some observers feared that they might try to sell their expertise to so-called rogue states or terrorist groups. Furthermore, the security at some of these nuclear sites, especially during the early 1990s, was woefully inadequate. Conceivably, that could lead to smuggling of nuclear materials onto the black market. Today, many countries have porous borders through which bombs and nuclear material could conceivably be smuggled. The prospect of unaccounted fissile material deserves to be taken seriously, as the International Atomic Energy Agency (IAEA) identified 1,562 confirmed incidents of nuclear smuggling.²³ Under the aegis of Project Sapphire, the U.S. and Russian governments worked together to secure and transport fissile material from Kazakhstan to the U.S.²⁴

There is also the prospect that a nuclear-armed country could convey a weapon to another state endeavoring to acquire a bomb. For instance, North Korea was implicated in providing missile technology to Pakistan supposedly in exchange for centrifuge technology from Pakistan. Finally, over the past several decades there has been a steady expansion in the number of nuclear reactors. Despite its liabilities, with concerns over global warming, nuclear power could be a much cleaner alternative to burning fossil fuels to generate electrical power. But, nuclear reactors can produce plutonium which could be used for the pit of a nuclear weapon.

²³ Kenneth R. Timmerman, *Preachers of Hate: Islam and the War on America*. (New York: Crown Forum, 2003), p. 121.

²⁴ Richard Rhodes, *The Twilight of the Bombs: Recent Challenges, New Dangers, and the Prospects for a World Without Nuclear Weapons*. (New York: Alfred A. Knopf, 2010), pp. 141-155.

With this nuclear expansion, some fear that there could be an increase in fissile material that could get into the hands of rogue states or terrorist groups and be used for a nuclear bomb. Although the probability of nuclear terrorism is still quite low, the potential damage could be so catastrophic that it merits attention. Certain requirements are necessary in order to build a credible deterrent. First, there must be the capability to inflict an unacceptable level of damage on the would-be attacker. If the adversary calculates that the consequences of retaliation are too great, then they'll be deterred from attacking. In order to be credible, a state must demonstrate that it has the political will to retaliate. Also important is the ability to identify and locate the attacker. Arguably, this is harder to do today than it was in the past insofar as contemporary terrorists usually operate independently of any state. Nations should ask, against whom should they retaliate if attacked? During the Cold War, in the event of a nuclear strike, it was assumed that the Soviet Union would be the likely culprit. However, contemporary terrorism is murkier, thus making it more difficult to identify and locate attackers. Inasmuch as terrorists usually have no return address or fixed assets, classic deterrence theory would be less applicable.²⁵ Finally, in order for deterrence to be effective, there is the assumption that one's adversaries are rational. They will calculate the costs of attacking and will be dissuaded if they determine that those costs are too high. That logic held during the Cold War, but some observers fear that it has broken down with respect to contemporary terrorism. Today, terrorists are often informed by religious and

²⁵ Allison, *Nuclear Terrorism*, p. 130 and Thomas C. Reed and Danny B. Stillman, *The Nuclear Express: A Political History of the Bomb and Its Proliferation*. (Minneapolis, MN: Zenith Press, 2009), p. 314; Joseph Cirincione, *Bomb Scare: The History and Future of Nuclear Weapons*. (New York: Columbia University Press, 2008), p. 89.

extremist ideologies. It's difficult to deter suicide terrorists, for example, with the threat of death. After all, that's an integral part of their mission.

Steps must be taken to reduce the likelihood of nuclear terrorism. One of the first lines of defense against nuclear terrorism is the Material Protection Control, and Accounting (MPC&A) Activity which assists Russia, Pakistan, and other nations in improving their ability to maintain proper control of their inventories of nuclear weapons and materials.²⁶ Presently, the largest stockpiles of plutonium and weapons-usable uranium reside in Russia.²⁷ A confluence of factors, including economic dislocation, an explosion of crime, and endemic corruption, has created incentives for the theft of nuclear material in Russia.²⁸ To shore up defenses, measures such as the Nunn-Lugar sponsored Cooperative Threat Reduction Initiative and the Global Threat Reduction Program should be expanded to prevent fissile material from getting in the wrong hands.²⁹ Despite fears of diversion, there are no documented cases of nuclear weapons being stolen from Russian nuclear arsenals, though there have been confirmed cases of illicit trafficking of small amounts of nuclear materials. Pakistan also presents a danger. Though the supply of fissile material in Pakistan is relatively small—approximately one metric ton—chronic political instability casts a dark shadow over the country's nuclear

²⁶ Richelson, *Defusing Armageddon*, p. 220.

²⁷ Roughly 180 tons of weapons-usable plutonium and 1,100 tons of HEU have been produced in Russia. Pluta and Zimmerman, "Nuclear Terrorism: A Disheartening Dissent," p. 56.

²⁸ Pluta and Zimmerman, "Nuclear Terrorism: A Disheartening Dissent," p. 58.

²⁹ Charles D. Ferguson, "Preventing Catastrophic Nuclear Terrorism," *CSN* No. 11, March 2006, pp. 25-27.

program. The United States should assist nuclear-armed regimes to guard against the theft of fissile material in the event of political instability and state failure.³⁰

In order to prevent nuclear material from entering the country, sensitive detectors could be employed at key areas such as tollbooths, certain roadways, and airports. By 2005, the Department of Homeland Security had installed more than 470 radiation portal monitors at sites throughout the United States.³¹ Under the Megaports Initiative, radiation detectors have been installed at foreign border crossings, airports, and port areas.³² As Michael Levi explained, an integrated system in which each part of the defense complements and reinforces others will form a layered defense that could reduce the likelihood of nuclear terrorism to almost zero.³³

In order for deterrence to be effective, attribution of the nuclear attack is necessary. Nuclear forensics programs could be strengthened so that potential state sponsors would be reluctant to convey nuclear devices or nuclear materials for fear that they could be traced back to their origins. Nuclear forensics is a sophisticated science that endeavors to identify the “isotope signature” or “fingerprints” of trace metals and fissile material and by doing so, trace the precise source of the nuclear bomb.³⁴ A comprehensive database could be established that would keep records of various nuclear material samples and the facilities at which they were created, though, this measure

³⁰ Castillo, “Deterring Nuclear Terrorism,” p. 431.

³¹ Richelson, *Defusing Armageddon*, p. 221.

³² Richelson, *Defusing Armageddon*, p. 220.

³³ Levi, *On Nuclear Terrorism*, pp. 4-14

³⁴ Rob Rosenbaum, *How the End Begins: The Road to a Nuclear World War III*. (New York and London: Simon & Shuster, 2011), p. 64.

would be politically challenging insofar as some governments would be reluctant to release such proprietary information.³⁵

A comprehensive plan of consequence management could serve as a form of deterrence by denial insofar as would-be nuclear terrorists would calculate that their attack would not achieve their desired strategic intentions. A robust civil defense program could enhance governmental and societal resilience, and by doing so, introduce doubt about the operational success of an attack into the leader of the terrorist group.³⁶ Essentially, resilience is the capability of a society to “bounce back” after a crisis. The system is able to continue operating despite failures in some of its parts.³⁷ To that end, a task force impaneled by the White House Homeland Security Council developed the “Planning Guidance for Response to Nuclear Detonation.”³⁸ The Department of Homeland Security is the principal federal coordinator for domestic nuclear incidents and has the responsibility of consolidating the numerous deferral emergency plans into a single, integrated, and coordinated National Response Plan.³⁹ Both the Department of Defense and the Department of Energy have roles to play as well. The military provides Initial Response Forces (IRF) to deal with nuclear emergencies. Working with civilian incident response commanders (e.g., police, fire, and medical), the IRF commanders

³⁵ Michael Miller, “Nuclear Attribution as Deterrence,” in Barry Schneider and Patrick Ellis (eds), *Tailored Deterrence: Influencing States and Groups of Concern*. (Maxwell Air Force Base, AL: USAF Counterproliferation Center, 2011), p. 421-460.

³⁶ Lewis A. Dunn, “Influencing Terrorist Acquisition and Use of Weapons of Mass Destruction: Exploring a Possible Strategy,” in Barry Schneider and Patrick Ellis (eds), *Tailored Deterrence: Influencing States and Groups of Concern*. (Maxwell Air Force Base, AL: USAF Counterproliferation Center, 2011), p. 261.

³⁷ Patrick Ellis, “A Nation’s Resilience as a Deterrent Factor,” in Barry Schneider and Patrick Ellis (eds), *Tailored Deterrence: Influencing States and Groups of Concern*. (Maxwell Air Force Base, AL: USAF Counterproliferation Center, 2011), p. 121.

³⁸ Sternberg, “Nuclear blast victims would have to wait,” *USATODAY*, April 14, 2010.

³⁹ Mercer, “Federal Response to a Domestic Nuclear Attack,” p. 6.

establish a National Defense Area around the accident site.⁴⁰ Taken together, these measures would greatly reduce the likelihood of nuclear terrorism and mitigate its consequences if it should ever occur.

⁴⁰ The Department of Energy sends a Senior Energy Official to work closely with the IRF commander. The Department of Defense authority and guidance on domestic nuclear terrorism is the DOD Directive 3150.8, “DOD Response to Improvised Nuclear Device Incidents, which assigned the various DOD elements their responsibilities during such an incident. DOD Response to Improvised Nuclear Device Incidents, January 20, 2010.