Terrorism and the Weapons of Mass Destruction Threat to the United States

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Within the national security establishment there is a pervasive belief that the United States faces imminent attack from a terrorist network in possession of weapons of mass destruction (WMD). The question is not if, the question is when. Whether the attack will be chemical, biological, radiological, or nuclear none can say, but few doubt that time is running out. This article challenges this view and suggests that the homeland may face less risk than Americans are led to believe. Why? All forms of WMD are hard to acquire and even harder to successfully deploy. This is particularly true of chemical and biological weapons, which are highly susceptible to environmental factors, making them an undesirable weapon. The greatest danger facing the United States comes from the potential detonation of a nuclear device in a major American city, but this threat has the lowest probability of happening because of the inherent difficulty of acquiring or building a nuclear bomb. In addition to the difficulties terrorists face in building and deploying WMD, we must also consider the political objectives such an attack against the American homeland would achieve. They are, in fact, few and would only serve to increase American resolve rather than force a change in US foreign policy. Since acts of terror are designed to achieve a specific political objective, even a seemingly irrational terrorist will be reluctant to use WMD against the most power military in the world

Introduction

For most Americans the attacks of September 11, 2001 shattered the perception that terrorism is reserved for distant lands where Americans seldom visit. Instead, the shocking images of the World Trade Center towers collapsing into a giant heap of ash and rubble and the tearful families frantically searching for loved ones shook the nation to its core. While terrorism was not unheard of, it had not touched many Americans in a personal way. When the scenes of trapped people hurling themselves from the roof-top of sky scrapers engulfed in flames were broadcast on television every person watching the events unfold was deeply moved. What no previous terror attacks could do, 9/11 did almost instantly.

Understanding terrorism is more difficult than it may initially appear because something as simple as an accepted definition remains hotly debated. To scholars, policy makers, diplomats, and terrorists, terrorism is understood in very different ways. The White House, Congress, Departments of Defense, State, Justice, and Homeland Security each define terrorism differently. At the United Nations no single definition of terrorism can be agreed upon. Since this article examines the threat nuclear, radiological, chemical, and biological weapons pose to the United States and its allies, this debate is purposefully avoided, but it is necessary to

establish a framework for the discussion of potential threats posed by weapons of mass destruction (WMD).

The article suggests terrorism has four basic characteristics. First, it employs violence or the threat violence. Second, acts of terror are designed to create a psychological state of fear in the target population. Third, terrorism is a tactic of the weak designed to achieve a political objective. Fourth, non-combatants are specifically targeted (Kegley, 2002 and Combs, 2004). With these characteristics in mind, an examination of the prospective use of weapons of mass destruction (WMD) becomes less complicated.

Purpose

As mentioned in the previous paragraph, this article examines threat WMD pose to the United States and its allies. More specifically, it seeks to accomplish three objectives. First, it examines the capabilities and limitations of nuclear/radiological, chemical and biological weapons. This is done by synthesizing the available scientific and popular literature. Second, real and hypothetical ("most likely") cases of WMD use are examined in an effort to understand what form a potential attack may take. Each attack is placed within the context of the scientific literature to determine the likely destruction it may cause. Using past WMD attacks and declassified government scenarios to evaluate potential threats is imprecise, but provides a useful tool for developing an improved understanding of the strengths and weaknesses of weapons of mass destruction. Third, conclusions are then drawn which suggests that probability of a WMD attack against the United States or its allies may be overstated. If such an attack were to occur, probable destruction would be less severe than is often thought.

The article's primary contribution lay in its findings. Contrary to the work of Graham Allison and others whom suggest that it is not a matter of if, but a matter of when; this article makes the case that terrorists are rational actors seeking to achieve political objectives. Each potential method of attack is evaluated for its ability to assist in achieving those political objectives. Given the limitations of WMD, which terrorist are aware of, it is argued that they are less attractive option than is often suggested.

Methodology

The structured case study method developed by Alexander George serves as the basis of the methodological design employed in this article (George and Smoke, 1974: George and Bennett, 2005). Three questions are asked of each form of WMD:

1. What are the strengths and weaknesses of (nuclear/radiological, chemical, or biological) weapons?

2. What is/are the likely scenario(s) in which (nuclear/radiological, chemical, or biological) weapons will be used?
3. Is the use of (nuclear/radiological, chemical, or biological) weapons likely or is the probable risk overstated?

While there is a substantial literature on the strengths and weaknesses of WMD and the probable impact of a WMD attack, much of the literature remains classified. This article relies on open source material and declassified government scenarios for analysis.

Weapons of Mass Destruction: Past and Present

Advances in weaponry during the 20th century are often considered an important element in the rise of modern terrorism. Without automatic weapons, high explosives, and WMD, it is often thought that terrorists would lack the tools to carryout devastating attacks on civilian populations. This attitude illustrates a basic misunderstanding of terrorism and its more than two millennia history. One need look no further than the Old Testament kingdom of Judah where, more than 2,000 years ago, Mattathias the Hasmonean struck terror into the hearts of the Seleucid Dynasty's Judean supporters by assassinating fellow Jews who worshipped the Hellenic gods as the Seleucids commanded. Throughout the Revolt of the Maccabees (165-63 B.C.), which was sparked by Mattathias' acts of terror, the Jewish rebels utilized a combination of terrorism and guerrilla warfare to frustrate and defeat the Seleucids for over a century (Goodspeed, 1959).

What is at Stake?

As technology has advanced over time, the development and use of chemical and biological weapons has advanced as well. Where poisons blended by local alchemists were the standard for more than 2,000 years, the range of chemical agents developed in the 20th century greatly expanded the ability of nations or terrorists to wage chemical warfare on a new and larger scale.

Where the use of biological weapons was once restricted, in the middle ages, to catapulting plague infested corpses over castle walls, scientists have developed new and devastating strains of biological organisms. No longer is biological warfare restricted to passing out smallpox infested blankets to an unsuspecting enemy.

Harnessing the power of the atom may be the most significant accomplishment of the 20th century, although it is with this achievement that the most powerful weapons in the world are created. Much like with chemical and biological weapons, nuclear weapons technology has advanced and spread. In the era of the Global War on Terror (GWOT) the spread of chemical, biological, and nuclear weapons is of

serious concern to the United States and other industrialized countries that may be the target of their use.

Current Perspectives on the use of WMD

The view that terrorists will strike the United States with weapons of mass destruction dominates the current literature (Laqueur, 1996: Falkenrath, 1998: Betts, 2003: Allison, 2005). For those that believe terrorists will employ WMD to attack the United States, this perspective holds that terrorists evaluate risk and reward in terms of ideology and religion, rather than in term of preserving geographic territory as is common for states (Whiteneck, 2005: 187). This leads terrorists to accept risks that would be deemed unacceptable to a nation-state. Thus, terrorists are seen as more likely to use WMD than a nation-state. The desire to err on the side of caution is understandable given the potential devastation of a well planned attack. Not all analysts, however, view a WMD attack as inevitable. Some take a more moderate approach, suggesting that a WMD attack, while likely, can be deterred by preventing terrorists from acquiring these weapons (Whiteneck, 2005 and Auerswald, 2006). A minority of scholars hold that the WMD threat may be overstated (Parachini, 2003). This view suggests that the technological and logistic difficulties posed by WMD acquisition, development, and deployment can be prohibitive. What makes each of these perspectives difficult to empirically verify is the uncertainty that dominates the study of terrorism and illicit weapons acquisition and development.

Nuclear/Radiological Weapons

What are the strengths and weaknesses of nuclear/radiological weapons?
Graham Allison, Director of Harvard University's Belfer Center for Science and International Affairs, paints an alarming picture of the nuclear threat facing the United States and its allies (Allison, 2005). For adversaries of the United States, acquiring nuclear weapons is becoming a top priority as they are seen as a way to protect against American intervention or invasion, or a decisive strike against a regional adversary. Iran, North Korea, al Qaeda, and Hezbollah are but a few examples of state and non-state actors actively pursuing offensive nuclear weapons. Some countries, such as India and Pakistan, are not concerned with any threat the United States may pose, but that of a rival state with which they share a border, each other. For some states, it is this threat that drives the development of nuclear weapons.

In the wake of the 9/11 attacks and President Bush's designation of Iraq, Iran, and North Korea as members of the "Axis of Evil," Iran and North Korea were quick to violate international agreements restricting their nuclear programs to the peaceful production of energy. Both countries claim their actions are a response to increased fears that, without nuclear weapons, they will find themselves in a serious conflict with the United States they cannot win. Additionally, al Qaeda and other terror networks are known to be actively seeking one or more functioning nuclear devices

and the radiological material needed for a dirty bomb, which can be used against a number of targets such as the United States, Israel, and Saudi Arabia (Powell, 2005). Each of these developments is of serious concern to the International Atomic Energy Agency (IAEA), the United States, and the world.

Before continuing, it is important to point out that nuclear weapons are a tactical asset. They do not constitute a strategy, but are part of a broader strategy which may include diplomacy, international law, and nuclear deterrence. All weapons of mass destruction share this characteristic because they are tools used to achieve an objective that may be part of a broader military or political strategy. The detonation of a nuclear device or dirty bomb in New York, Washington, D.C., or Tel Aviv is but one of many ways a terror network or hostile state, for example, may decisively strike the United States or Israel. To date, the United States is alone in using nuclear weapons when it dropped a 15-20 kiloton bomb on Hiroshima August 6, 1945 and a second bomb on Nagasaki three days later.

As the Global War on Terror (GWOT) remains the focus of security policy in the decade to come, the use of nuclear weapons is likely to come at the hands of non-state actors such as al Qaeda or other terror networks who, lacking geographic restraints and feeling the increased pressure of international counter-terror efforts, can move undetected in and out of states that are the target of their animus. States such as Iran and North Korea are less likely to use nuclear weapons in an offensive capacity because the United States has the ability and will to respond decisively. A nation-state offers a ready target for retaliation, which cannot be said of an amorphous terror network.

What is/are the likely scenario(s) in which nuclear/radiological weapons will be used?Scenario I. In an effort to illustrate the effects of a nuclear attack against the United States, four possible scenarios are examined (McKenzie, 2000: 20). In the first scenario, a nuclear device is smuggled into the port of New York in a cargo container by an al Qaeda cell operating in northern New Jersey. A one-megaton bomb is then detonated as it sits inside a van on a busy Manhattan street. The affects are devastating. Everything within a one-quarter mile radius is instantly vaporized. All buildings within 4.5 miles are destroyed or heavily damaged. There is moderate damage to buildings and homes up to 7.4 miles from the blast's epicenter (WGBH, 2004). Depending on wind conditions, fallout will cause serious internal injuries to humans and animals up to 160 miles from the site of the blast with the severity of injuries increasing as the blast site is approached. As many as one million New Yorkers would perish as the city becomes uninhabitable for a decade or more. Should the same weapon be detonated while in a helicopter or small plane flying over Manhattan, even greater destruction and loss of life would result.

Interestingly, this scenario is one the Departments of Energy, Homeland Security, and Defense ran before and after 9/11 as they sought to determine the

destructive power of a nuclear detonation (Davis, 2002 and Ferguson, 2005). As Graham Allison remarks in his recent work, "In my own considered judgment, on the current path, a nuclear terrorist attack on America in the decade ahead is more likely than not," (Allison, 2005: Ch 15).

American nuclear policy has long maintained that a nuclear attack against the United States will result in a counter-strike (Rumsfeld, 2002). The difficulty in this scenario is determining responsibility. In the aftermath of an attack, an effort must be made to determine how the bomb entered the country, the bomb's place of origination, the source of the fissile material, and the bomb's designer and sponsor. This is no easy task, particularly when terror networks are adept at operating covertly (Falkenrath, 1999). If the culprit can be determined, the United States must determine whether it will respond with its own nuclear weapons against a terrorist network operating within a country that may or may not have provided assistance in the attack.

Scenario II. In a second scenario, the United States is in the opening phase of a Middle East invasion when a short-range ballistic missile carrying a low-yield nuclear warhead strikes the center of the American advance. Given the probable density of American forces, 5,000-10,000 casualties are taken instantly and the invasion is halted as troops are forced to withdraw from a contaminated battlefield. Military intelligence was taken by surprise in the first attack making it difficult for the president and battlefield commanders to determine whether a second strike is likely. Since the first strike was on foreign soil retaliation with nuclear weapons is difficult for the president to justify. The failure to predict the first strike also leaves open the question of the adversary's long-range strike capability, which could place regional allies and their civilian populations in danger of a nuclear strike should the United States determine that the advance should continue (Hughes, 2003: 28-32).

Such a scenario appears increasingly likely as Iran continues to violate international agreements in the development of its nuclear program while also continuing to support Hizbollah and its aggressive stance toward Israel, as the conflict between the two in July and August of 2006 exemplifies (UNSC, 2006). Iran's Revolutionary Guards (IRGC) remains an active participant in international terrorism with it activity focused on eliminating opponents of the regime in Tehran (Council on Foreign Relations, 2007 and Priest, 2006). The IRGC was linked to the terrorist bombing of the Khobar Towers (1996) which killed 19 Americans (Timmerman, 2006: 183-189). Neither overt nor covert use of nuclear weapons against the United States or Israel appears likely, but the escalating rhetoric of Iran's President, Mahmoud Ahmadinejad, and his calls for the destruction of Israel are of grave concern to American and Israeli leaders (Yoong, 2006). Iran's active support of Iraqi insurgents and recent revelations that insurgents planned on carrying out attacks in the United States suggests that American troops may find themselves in a conflict with a nuclear Iran in the near future (Shanker and Weisman, 2004 and

ABC, 2007). This gives the scenario described above greater credence, although the probability of such an attack remains low.

Scenario III. The third scenario envisions the United States Air Force Space Command detecting an object launched from the Middle East, North Korea, or China and heading for the United States. While the object is in the upper atmosphere somewhere over Kansas it explodes. Commercial aircraft filled with passengers lose electronic control and navigation with some aircraft failing to safely land, the North American power grid is severely damaged, and computer circuitry is damaged or destroyed in homes, businesses, and government offices by the electromagnetic pulse (EMP) generated in the blast. If the explosion occurs in the Van Allen belt, the electrons released will positively charge the belt and knock commercial and military satellites out of service (Webb, 1995). While there are few casualties from the explosion and no city is left in ruins, billions of dollars in damage and a degraded military capability are, however, the result as the American economy and the nation's military suffer a severe blow. Once again, the president must decide how to respond. Without Los Angeles, New York, or Washington, D.C., in ruins, the president is left with a difficult decision in selecting a response.

Few states currently possess the necessary intercontinental ballistic missile technology to launch an attack like the one described (Friedman, 1997). North Korea is, however, continuing to improve its Tae Po Dong class ballistic missiles. The willingness of the cash-strapped North Koreans to sell advanced weapons technology to American adversaries (Iran) increases the threat an EMP attack poses to the United States as the number of states with ballistic missile technology increases in the years to come (Kerr, 2007). Iran's rapidly improving Shahab class ballistic missiles and its successful enrichment of uranium, announced in April 2006, may soon add one more state to the number of countries capable of launching an EMP attack against the United States or Europe. This scenario is, however, the least likely of the scenarios discussed. Technology requirements are substantial as an attacker would need advanced intercontinental ballistic missile technology and nuclear weapons. Neither is possessed by more than a handful of states and even fewer possess both. States such as China and North Korea whose arsenals include intercontinental ballistic missiles capable of reaching the continental United States are unlikely to seek open conflict because of the devastating consequences of such a conflict (Center for Nonproliferation Studies, 2006). An EMP attack, while possible, remains unlikely.

Scenario IV. The final scenario poses the greatest threat because it requires little more than radioactive material and a conventional bomb. In the near future, al Qaeda is successful in stealing: medical gauges containing cesium, cobalt from a food irradiation facility, or uranium from a research lab at a major American university. Although the radioactive material cannot be used in a nuclear weapon, it can be used in a dirty bomb which consists of conventional explosives laced with radioactive

material. If the small amount of cesium, cobalt, or uranium is detonated with a bomb containing ten pounds of TNT in the financial district of Manhattan or near the Capital building in Washington, D.C., the immediate devastation would be limited, but as the radioactive cloud created by the conventional blast settles it is likely that a radius of five blocks or more would be contaminated and require a lengthy period for decontamination. This process would disrupt economic activity on Wall Street or daily operations at the White House, Capital, Supreme Court, and other government offices in the area. While few people would die in such a blast, the fear, insecurity, loss of productive activity, and decontamination costs would enable al Qaeda to achieve the financial and psychological effect that is sought (Kelly, 2002). By striking at the heart of American commerce or the seat of government al Qaeda could illustrate the inherent insecurity of life in the United States. Such a message could have a devastating effect on the psyche of many Americans.

Is the use of nuclear/radiological weapons likely or is the probable risk overstated? Each of the four scenarios presented above offers a disturbing view of the future and what may be, as Graham Allison suggests, inevitable. For rivals such as India and Pakistan, who both possess nuclear weapons, their use would lead to devastating consequences for the two states. In rivalries where one adversary has nuclear weapons and the other does not, a nuclear strike is untenable in an international system that would condemn such an act. Non-state actors like al Qaeda are, however, restrained in their use of nuclear weapons for very different reasons.

First, terror networks lack the weapons grade uranium or plutonium necessary to assemble a workable nuclear device. While the design of a nuclear bomb, such as the one dropped on Hiroshima, is simple and the plans are available on the internet, obtaining highly enriched uranium-235 or plutonium-239 in a subcritical or supercritical state is exceedingly difficult (Carson, 2006). Developing the facilities necessary to enrich uranium-238 using a gas centrifuge is expensive and difficult (FAS, 2004). An effort by al Qaeda scientists to undertake uranium enrichment is unlikely to occur without a host nation discovering the activity. Thus, terror networks seeking to develop nuclear weapons are likely to attempt to acquire a working nuclear device or weapons grade material that is easily integrated into a working bomb.

Former Senator Sam Nunn, Co-Chairman and Chief Executive Officer of the Nuclear Threat Initiative, and the Bush administration are particularly concerned about the threat nuclear terrorism poses to the United States (Nunn, 2003). As al Qaeda and other terror networks increase their independence from state sponsorship, the ease with which a nuclear strike can be carried out in anonymity increases. Deterring a nuclear attack by a terror network depends on the success of the United States, Russia, and other countries possessing nuclear weapons or civilian nuclear power programs denying terrorists access to fissile material.

Second, the Nuclear Non-Proliferation Treaty (NPT), which went into effect in 1996, is the international community's primary tool in stemming the proliferation of nuclear weapons technology. Key provisions of the treaty require that signatories grant the International Atomic Energy Agency (IAEA) oversight authority of nuclear programs, limit research to peaceful purposes and avoid the proliferation of nuclear weapons material and technology (FAS, 2006). In addition to the NPT, the United States has provided the Former Soviet Union with financial and technical assistance in disabling and destroying its nuclear weapons and material. In 2002 the Department of Energy created the Fissile Materials Disposition program to provide greater assistance to Russia as it continues to dispose of nuclear material which, if it fell into the wrong hands, could be used in a nuclear weapon (Department of Energy, 2002).

If, however, the past is any indicator of the future, the proliferation of nuclear weapons technology is likely to continue. Despite the best efforts of the United States, Russia and the United Nations, countries and non-state actors are likely to continue in their pursuit of the ultimate weapon. International treaties and bilateral agreements may slow proliferation, but a state determined to acquire nuclear weapons is likely to do so. The security of the United States and its allies may depend upon preventing al Qaeda, Hamas, Hizbollah, and other terror networks from acquiring nuclear weapons and material, should they choose to seek them.

Chemical Weapons

What are the strengths and weaknesses of chemical weapons? In August of 2002 CNN correspondent Nic Robertson journeyed to a remote region of Afghanistan where he purchased 64 video tapes that turned out to be a treasure-trove of *al Qaeda* training material, interviews, and, most importantly, a chronicle of the terror network's ongoing development of nerve gas, which the tapes show being tested on dogs (Robertson, 2006). The discovery of an advanced chemical weapons capacity caught many terrorism analysts off guard. Few thought al Qaeda possessed such an advanced capability. The discovery did, however, serve to underscore the threat chemical weapons continue to pose. In the triangle of destruction formed by WMD, the least effective yet easiest to produce are chemical weapons.

While biological and chemical agents share a number of characteristics, they also vary significantly in fundamental ways that make chemical agents generally less lethal. Chemical and biological weapons serve much the same strategic purpose: to act as a deterrent, delay an invasion or strike terror into a civilian population. Chemical weapons are not, however, equal to biological or nuclear weapons in their destructive capacity. For the novice, chemical and biological weapons are often thought of interchangeably. Both rely on microscopic killers that are invisible to the naked eye and both cause their victims to die a painful and prolonged death. Associating the two weapons too closely is a mistake because they differ greatly in

their composition, lethality, and production. The best place to begin is with an examination of two cases in which chemical weapons were deployed in combat and one case in which an apocalyptic terrorist organization attacked civilians.

What is/are the likely scenario(s) in which chemical weapons will be used?

Scenario I On April 22, 1915, entrenched German forces near the Belgian village of Ypres released chlorine gas into a west wind, which covered the Allied line in the choking agent. More than 160 tons of gas was released from 6,000 artillery shells killing approximately 5,000 men in what was the first use of chemical weapons in modern warfare. Throughout the course of World War I (1914-1918) more than 113,000 tons of chemical agents were weaponized and deployed by both sides, resulting in approximately 92,000 of the 1.3 million combat deaths during the war (SIPRI, 2001). Despite German efforts to break the war's stalemate by introducing more lethal chemical agents, such as the blister agent Mustard and the nerve agent Soman, chemical weapons failed to turn the war in favor of either side. For American and British soldiers the probability of surviving a gas attack was much greater than that of surviving a frontal assault on German lines. With World War I lasting for more than four years, both sides sought to break the stalemate by employing chemical agents to turn the tide of war. The strategy failed miserably and the telling failure of chemical weapons lay in the casualty figures. Out of more than 1 million casualties caused by chemical attacks, approximately 92,000 men died (SIPRI, 2001). With a kill ratio of less than 10 percent, chemical weapons failed to turn the war and proved far less lethal than conventional weapons.

Scenario II. A second instance in which chemical weapons were used on the battlefield occurred three quarters of a century later when Iraq began deploying Mustard agent to halt the Iranian "human wave" attacks during the Iran-Iraq War (1980-1988). Between August 1983 and February 1986, approximately 16,000 unprotected Iranian soldiers were killed in Mustard attacks. When Iraq weaponized the nerve agent Tabun in 1984, more than 10,000 ill-equipped Iranian soldiers perished when Tabun-filled bombs were dropped on their positions. By the war's end fewer than 30,000 Iranian soldiers had, however, perished in chemical attacks (Pike, 1998). When it is considered that Iran suffered between 500,000 and 950,000 casualties, the number of soldiers killed in chemical attacks is quite small. As in World War I, introduction of chemical weapons on the battlefield failed to change the course of the war.

Scenario III. The final case is not drawn from the battlefield, but from a scenario that greatly concerns the United States and other countries fighting the Global War on Terrorism. After its founding in 1988, the apocalyptic cult Aum Shinrikyo began a long term attempt to develop a biological and chemical weapons capacity. Scientist-members of Aum ordered precursor chemicals and biological agents, which were then used in the cult's development programs. After years of setbacks and failure, cult scientists were finally successful in making a small quantity of Sarin, a deadly nerve agent. When members of Aum dispersed the deadly

nerve agent in a crowded Tokyo subway during rush hour on March 10, 1995, 12 people died and 1,000 suffered minor injuries, with few suffering long term complications (Center for Nonproliferation Studies, 2001).

Sarin, one of the deadliest nerve agents in the world, was dispersed in an enclosed space where unprotected civilians were tightly packed and completely unaware of the danger, yet the surprise attack killed only twelve people. Had a single gunman entered the same subway station and begun firing wildly into the crowd, far more deaths would have been the result. After investing large sums of money into almost a decade of chemical weapons research and development, Aum failed to topple the Japanese government and install the cult's founder, Shoko Asahara, as King of Japan.

Is the use of chemical weapons likely or is the probable risk overstated? The terrorist attack on the Tokyo subway left many analysts with a set of important lessons. First, it is difficult for a terrorist group to successfully develop a biological or chemical weapons program. This is made more difficult when the terror network is forced to operate covertly. Recent nonproliferation efforts have made the acquisition of precursor chemicals more difficult, adding to the already complex technical tasks that took a team of highly trained Aum scientists almost a decade to achieve modest results.

Second, while it may be possible to attack an adversary with chemical weapons on the open battlefield and cause significant casualties among unprotected troops, the prospect of a terrorist organization dispersing a large quantity of a chemical agent in an urban area is highly unlikely (McKenzie, 2000: 81-83). In order to cause serious casualties in a densely populated metropolitan area, the aerial delivery of a chemical agent, whether aerosol or powder, would require numerous low level flights over the target area (Utgoff, 1991). To kill approximately 125,000 civilians in a city such as New York, it would take more than 14,000 thousand pounds of VX under ideal weather conditions. When it is considered that a large capacity crop duster holds up to 400 pounds of a chemical, it would require a terrorist make 35 flights over a target area to disperse enough VX to cause the desired casualties. Such an attack is, however, highly unlikely. Improved awareness among first responders, particularly those in cities where terrorists are most likely to strike, has increased dramatically since 9/11 making it highly unlikely that a terror cell could carry out an attack of the magnitude required above before police, fire, and disaster response teams could terminate an attack in progress and begin recovery efforts.

Third, a high casualty count is unlikely the primary result of a chemical attack against a civilian population. Widespread anxiety, fear, and a sense of helplessness would be the most devastating outcome from a chemical attack. The psychological affects of an al Qaeda sponsored chemical weapons attack against civilians in the United States, Israel, or Europe would work to sow a sense of insecurity, as the

terrorist attacks in Madrid (2004) illustrate, which led to the subsequent election of anti-war Premier of Spain and the withdrawal of Spanish troops from Iraq (BBC News, 2008 and Bailey, 2004).

As the examples above show, developing and deploying chemical weapons for use on the battlefield or against civilians has proven less successful than the use of conventional weapons. The one advantage chemical weapons may possess is the psychological effect their use generates, an effect which is largely based on the prolonged and horrific death such weapons cause. When regimes seeking to develop chemical weapons compare the costs of developing an advanced capacity to the already existing detection and denial systems of the United States and other advanced countries, the attraction of chemical weapons is substantially diminished.

If the effectiveness of chemical weapons is included in the equation and compared to the destructive capacity of conventional weapons, chemical warfare becomes an expensive and ineffective counter to the offensive military capabilities of the United States, Israel, and other advanced states. Chemical agents are, however, less volatile and less susceptible to degradation than biological agents, which make them a better battlefield weapon. Their limited effectiveness does require significantly greater quantities of an agent to achieve the desired affect (Cordesman, 1999: 81-83). For example, it would take 3,809 pounds of Sarin to produce a 50 percent casualty rate among unprotected infantry in a typical formation spread over 0.8 miles (Cordesman, 1999: 82). This assumes ideal weather conditions and a target force that is completely unprepared for such an attack.

They are also proving less than ideal for use by terrorists, but remain a threat against which civil and military leaders must prepare (Croddy, 2002). The United States was quick to learn from its experience with chemical weapons in World War I and developed civilian and military counter-chemical warfare capabilities, which it continues to maintain. Responsibility for responding to a chemical attack is dispersed among first responders (local fire and police), state emergency management agencies, the National Guard, Federal Emergency Management Agency (FEMA), Department of Homeland Security (DHS), and the military. In the event of an attack against civilian or military targets, the appropriate response would be taken and contaminated areas would be safely decontaminated.

Emergency management officials in large metropolitan areas receive significantly greater training in hazardous material response than do their rural counterparts, leaving them more prepared for a chemical attack then at any previous time. It should be noted that training and preparation for disaster response of all varieties is arguably at an all time high among state and local governments both large and small. In the wake of 9/11, funding under the Nunn-Luger-Domenici Domestic Preparedness Program has increased dramatically, enabling first responders to improve the equipment and training needed in the event of a terrorist attack that might include nuclear, radiological, chemical, or biological weapons (Fort

Lauderdale City Commission, 2002). Hospitals are also receiving funding to improve identification of symptoms related to chemical agents and the proper care of patients in the event of a chemical attack with mass casualties. Thus, if al Qaeda were to detonate an explosive devise in Manhattan which spread a fine particulate of VX, city, state, and federal officials would be able to respond by isolating the contaminated area, warning the public of the hazard, and begin decontaminating the area while treating casualties.

International concern over the use of chemical weapons is certainly not a recent phenomenon. On the contrary, the first international prohibition of chemical weapons came in 1675 when the German states and France signed a bilateral agreement prohibiting the use of poisoned bullets. Not until 1874 was chemical warfare addressed again when the Brussels Convention on the Law and Customs of War prohibited the use of all poison weapons (Organization for the Prohibition of Chemical Weapons, 2008). Two decades later, the Hague Conference of 1899 led to an agreement that prohibited the use of projectile weapons filled with poison gas. World War I, however, saw the use of more than 100,000 tons of chemical agents and the death of 92,000 men from chemical attacks. The horrific deaths that resulted from blister and nerve agent attacks were responsible for the passage of the Geneva Protocol for the Prohibition of the Use of Asphyxiating, Poisonous, or other Gases and Bacteriological Methods of Warfare (1925). Another 75 years would pass before the international community again addressed chemical weapons.

Currently, the Chemical Weapons Convention (CWC), which went into effect in 1997, is the international community's effort to prohibit the use of chemical weapons and control the proliferation of precursor chemicals used to create them. With the ratification of the Chemical Weapons Convention came the creation of the Organization for the Prohibition of Chemical Weapons (OPCW), which is responsible for monitoring the chemical industries of member countries (Forsberg, 1999). By the time the Chemical Weapons Convention was ratified the United States and two dozen advanced countries were already monitoring the purchase of dual use chemicals and working to prohibit the production of chemical weapons under the auspices of the Australia Group, which was formed in 1984 (Australia Group, 2008).

Despite the efforts of the United States, Russia, and other countries seeking to limit the proliferation of chemical weapons, a number of states and non-state actors are actively pursuing chemical weapons programs (Center for Nonproliferation Studies, 2002). One major concern of the United States is the large number of under-employed scientists in the Former Soviet Union whose knowledge and skills have been sought by countries and terror groups alike. The rapid economic decline that occurred in the immediate aftermath of the Soviet Union's collapse left more than 10,000 scientists with significant knowledge of biological, chemical, and nuclear weapons production living in or near poverty. Efforts to limit the dissemination of information needs improvement and it is unknown if Russia's scientists have shared

their knowledge of WMD production with those who seek to harm the United States (Parachini, 2005).

If recent trends in the dissemination of knowledge and technology are an indicator of the future, it is likely that chemical weapons proliferation will continue. The failure of chemical agents to prove decisive in past conflicts has, however, led countries currently pursuing WMD programs to focus their efforts on developing biological and nuclear weapons. While this may offer faint hope for nonproliferation, it will not be enough to discourage a determined proliferator. Among nations that currently possess a WMD capacity, chemical weapons are the most prolific. This is largely because of the relative ease of producing simple chemical agents such as Mustard, Chlorine, and Soman and the ease of delivering them to the battlefield. Production of the most lethal chemical agents is more difficult. Developing delivery systems that disperse chemical agents in a fine aerosol is also proving difficult, making their use far less desirable. For nonproliferation efforts, the difficulty of overcoming technological barriers may be the best hope.

Biological Weapons

What are the strengths and weaknesses of biological weapons? When American Special Operations Forces (SOF) raided a number of al Qaeda compounds during Operation Enduring Freedom's (OEF) ground campaign in October and November of 2001, they discovered what turned out to be the chilling evidence of a biological weapons program that was rapidly moving toward the successful development of a lethal biological agent the United States government has yet to publicly disclose (CBS News, 2006). With the discovery of an al Qaeda biological weapons program, intelligence officials began to understand the threat these deadly agents pose to the United States and its allies (Kadlec and Larsen, 1995). For more than a dozen countries and a handful of terrorist groups, the lure of waging biological warfare is too strong to resist. These weapons are inexpensive to produce and require a lower level of technical expertise and advanced equipment to create than do nuclear weapons, yet they serve much the same deterrent effect (Tierno, 2001). In spite of the 1972 Biological Weapons Convention (BWC), a number of signatory states have chosen to actively pursue secret weapons programs that they believe will provide a strategic advantage. For nations that find themselves increasingly at odds with the United States, possessing biological weapons is viewed as an effective deterrent to possible American intervention or invasion. Al Qaeda and other terrorist networks, however, seek to use biological weapons against unsuspecting civilian populations in the United States and elsewhere (USA Today, 2003).

After briefly examining the danger biological weapons pose the question remains, what are they and how are they different from chemical weapons? A biological weapon is comprised of two basic components. The key component is the biological agent, which is a given quantity of a naturally occurring micro-organism

(bacteria, fungi, or virus) or toxin that can cause death or disease if internalized by the target. Once a biological agent is weaponized it must then be delivered to the target. Thus, the delivery system serves as the second component. A delivery system may be something as complex as an intercontinental ballistic missile or something as simple as a terrorist spreading a biological agent at a buffet restaurant. In these two respects, biological weapons are very similar to chemical weapons. Where they differ, however, is in the level of danger they pose.

Biological weapons offer some significant advantages to a proliferator. First, the seed stock used to grow lethal biological agents can be found in nature or, with some restrictions, acquired for legitimate use and then diverted to illicit weapons development. Since all seed stock used in biological weapons production have a legitimate commercial or medical use, it is difficult for BWC member countries to ensure that seed stock ordered by commercial firms or research institutions is not used in violation of international agreement (Subcommittee on National Security, 1999). Second, production of biological agents requires much less infrastructure than the production of chemical or nuclear weapons. Third, an individual handling a biological agent does not require the protective clothing needed when working with or transporting a chemical agent. With the proper vaccination, a deadly biological agent can be handled without the fear of infection. This makes it easier to discreetly transport a lethal biological agent, which could offer a distinct advantage to a terrorist attempting to bring a deadly agent into the United States. Fourth, a much smaller quantity of a biological agent is needed to cause heavy casualties. For example, 10 grams of Anthrax are as deadly as one ton of Sarin. Where it was extremely difficult for a terrorist organization to successfully launch a large scale chemical attack because of the vast quantities of a chemical agent necessary, the same is not true of a biological attack. Fifth, biological weapons offer their user greater lethality and transmission through secondary infection, which makes it more difficult to isolate infected individuals and increases the number of casualties. Given the benefits listed above, it should come as no surprise that biological weapons are a greater threat than their chemical counterpart.

There is also a down side to the development and deployment of biological weapons. Tactically, biological agents are difficult to weaponize because they are highly volatile, degrade quickly, and are susceptible to heat and light. This makes it very difficult to use biological agents in missiles and projectiles where heat and lengthy storage periods work to degrade the agent. The same difficulties arise when considering their use against civil targets. Biological agents are difficult to widely disperse and are quickly degraded by the elements. Since they are most effectively dispersed as a 1-10 micron aerosol, efficient delivery is extremely difficult (GlobalSecurity.org, 2008). The weaknesses of biological weapons have rarely deterred their use as the history of biological warfare illustrates.

Biological warfare has played a significant role in the history of conflict for more than two thousand years. The earliest recorded use of biological weapons dates back to the fifth century B.C. when Scythian archers dipped their arrow tips in feces and putrefying corpses. In the middle ages, besieging Mongols attempted to cripple the Black Sea city of Kaffa by catapulting the corpses of plague victims into the city. During the French and Indian War (1754-1760) British troops attempted to eradicate Indian allies of the French by spreading smallpox among them (Croddy, 2002). The 20th century was no exception when it came to the use of biological weapons. Despite the 1925 Geneva Protocol which banned the use of biological and chemical weapons, Japan dropped plague infested fleas over parts of China during its conquest of that country (1934-1945), which ultimately led to the deaths of 20,000-200,000 Chinese. Although never confirmed, it is also believed that the Red Army used tularemia to assist in breaking the Nazi siege of Stalingrad.

The success of the Soviet Union's first use of biological weapons led them to develop the most advanced biological weapons program on earth. Despite being signatories to the 1925 Geneva Protocol and the 1972 Biological Weapons Convention, the Soviet Union, under the control of Biopreparat, carried out extensive biological weapons research and development (Davis, 2008). Soviet scientists focused on developing strains of pathogens that were resistant to known antibiotics. Doing so would increase the lethality of a biological weapons attack (Alibeck, 1999). With President Nixon's declaration that the United States would not pursue a biological weapons program, the United States fell dramatically behind the Soviet Union in its understanding of biological agents.

Because a number of Middle East countries, including Egypt and Syria, were allied with the Soviet Union during the Cold War, biological weapons technology was often transferred to these nations. This and a continued pursuit of biological weapons assists in explaining why Syria, for example, possesses one of the most advanced biological weapons programs in the world today. When terror-supporting states with advanced biological weapons programs are coupled with thousands of unemployed and impoverished biological weapons scientists from the Former Soviet Union, the danger currently facing by the United States and its allies is evident (Cordesman, 1999).

Terror networks are proving to be very interested in the purchase and development of biological weapons. Many of the same scientists willing to work for Iran, Iraq, and North Korea after the Soviet Union's collapse may have been willing to sell biological agents to al Qaeda and other terror networks (Tenet, 2000). Whether such transactions have actually occurred is not known, but a definite threat exists.

If history is any indicator, biological weapons will be used again. According to Anthony H. Cordesman, biological weapons will likely be used to target "infantry concentrations, air bases, ships, ports, staging areas, command centers, munitions

depots, cities, key oil and electrical facilities, and desalinization plants." Cordesman also notes that biological weapons are "potentially far more effective against military and civil area targets than chemical weapons," (Cordesman, 1999: 81). When used against military units biological weapons rarely cause large numbers of casualties. They do, however, force troops to don protective gear, which degrades offensive combat capabilities and slows an advance. A biological attack against American forces could, at best, hope to temporarily stall the mission (McKenzie, 2000: 81-85).

What is/are the likely scenario(s) in which biological weapons will be used? ***Scenario I.*** During the anthrax attacks that occurred in the United States (2001), the U.S. Capital was closed and vacated for more than a week and the House and Senate office buildings for even longer after a single anthrax-laden letter was sent to Senator Tom Daschle (D-SD) (Fox News, 2001 and CNN, 2001). In addition to the cleanup effort, which cost millions of dollars, Senators, Representatives and their staffs were given a 60-day treatment of Cyprofloxacin. From the anthrax laden letters sent to: Senator Daschle, a Florida based tabloid, and elsewhere there were five deaths. Most important, however, was the: fear and disruption these attacks created, economic costs of cleanup, and development of detection programs.

While there are other scenarios that are reasonable to envision, there is a lack of empirical data that can be employed to determine a probable outcome. There is also a lack of reliable evidence for additional real biological attacks. Thus, this section ends with the discussion of a single scenario.

Is the use of biological weapons likely or is the probable risk overstated? As the low casualty count from the 2001 anthrax attacks indicates, biological weapons have not, as yet, proven to be an effective mass casualty weapon against any target. This may offer the United States its greatest advantage in combating future threats. For al Qaeda and other terror networks, biological weapons are clearly viewed as the most viable WMD option (Coughlin, 2006). Since they are relatively simple and inexpensive to produce and, once dispersed, can be spread from person to person, biological weapons are preferred to less effective chemical weapons and difficult to acquire nuclear weapons. The fact that many biological agents are highly contagious also increases the "fear factor," which is highly valued by those who would resort to bio-terrorism (Tucker, 2000).

Thus, as the United States and its allies continue to wage the Global War on Terror, Americans should expect terrorists to adapt to the challenges they face. If conventional weapons fail to prove effective, biological weapons are a logical choice.

Conclusion

As the preceding pages suggest carrying out a terrorist attack on American soil may prove more difficult than anticipated. Technological difficulties along with human factors such as: lack of commitment, fear of failure or capture, the deterrent effect of anti-terror measures, fear of an American response, and Clausewitz's fog of war (uncertainty in war) are all working to thwart a WMD attack in the United States. Failed terror attacks are more than embarrassing to those who rely on terrorism. Where the successful terror attack can score a dramatic political victory for a terrorist network, failure can lead to a loss of credibility among the public and within the organizations own membership. Thus, as the prospects of failure increase, the less likely an attack becomes.

Weapons of mass destruction have the potential to provide the psychological impact terrorists seek, but the high risk of failure makes them a less than desirable tool in the terror arsenal. This may change in the coming years, but, at present, chemical, biological, radiological, and nuclear weapons are proving technologically difficult with a high level of risk to success.

It should never be forgotten that terrorists, in this case, Islamic fundamentalists, are not the crazy fanatics many Americans believe them to be. Instead, they are rational individuals who carefully plan their acts of terror to achieve political objectives. As Bruce Hoffman notes, "International terrorism disdains any concept of delimited areas of combat or demarcated battlefields, much less respect for neutral territory," (Hoffman, 2006: 28). Where states seek to fight wars that are largely conventional, because it is in military might that they possess a distinct advantage, the terrorist is fully aware of his limited capacity to wage a conventional conflict. Thus, terrorism is the tactic of the weak, not the lunatic. The sooner the American public comes to understand the nature of the threat America faces, the sooner victory may be achieved in the Global War on Terror. It is also useful to point out that the next terrorist attack on the United States, should there be one, is likely to take the form of a conventional attack. As the previous pages have demonstrated, WMD are no magic bullet.

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