

Confronting Nuclear, Biological and Chemical Terrorism

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The level of security and prosperity enjoyed by today's advanced democracies is virtually unprecedented in history. Internally, the basic political order of these states is not seriously contested. There are only a handful of external military threats, none truly global in reach. The world's many civil wars and internal conflicts are largely confined to specific regions, and their effects can be prevented from spilling over into the protected nations of the West. There are of course many serious long-term foreign-policy challenges – China's rise, Russia's decline, the stability of the Persian Gulf, energy depletion, environmental problems and widening economic inequality, for example – but the advanced democracies face few mortal vulnerabilities.

All modern societies, however, are vulnerable to massive loss of life from an attack involving a weapon of mass destruction (WMD) – nuclear, biological or chemical (NBC). This vulnerability has existed for many years: it is a function of accessible weapons, porous borders, free and open societies, and high population densities in cities. Yet while national-security leaders have generally recognised the military threat posed by NBC weapons, they have tended to downplay or disregard the possibility that these weapons might be used by a non-state or transnational actor in a campaign of mass-destruction terrorism. The threat of NBC terrorism had always had its adherents, and remains an inspiration for novelists and scriptwriters, but policy-makers have traditionally had more pressing concerns.

Something of a shift now appears under way, evident particularly in the United States since the early 1990s. Senior US officials, Congressional leaders and non-governmental experts now routinely call attention to the threat of WMD terrorism – particularly biological weapons – and rank it among the most serious challenges to US security.¹ Literally dozens of US federal, state and local government agencies have created new programmes, or augmented

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existing ones, against the threat. The media have produced countless stories on the subject, often with a sensationalist spin.

This article addresses one basic question: how serious is the threat of NBC terrorism to the national security of modern liberal democracies? More specifically, where should the responsibility for combating the threat of NBC terrorism lie within a country's national-security priorities as it allocates resources for new capabilities, organises its existing capabilities and declares its policies and threat assessments to the public? To help answer this question, I make four arguments.

First, increased concern with the possibility of NBC terrorism is justified. In many discussions of this threat, the basic distinction between national security and personal safety is often forgotten. If an individual were to rank the likely causes of death in terms of probability, it is unlikely that death from an act of NBC terrorism would be in the top 100. He or she would be more concerned with cancer and car accidents, even murder and natural disasters. However, if national leaders were to rank the single, purposeful events that could kill thousands or tens of thousands of their citizens, a terrorist NBC attack would be in the top three. The focus of this article is on the societal threat, not individual safety or well-being. Societal vulnerability to NBC terrorism is high, and no state has the civil-defence capabilities that would allow it to claim to be 'prepared' in any meaningful sense. In this sense, NBC terrorism poses one of the most serious national-security challenges of the modern era.

Second, NBC terrorism is a low-probability, high-consequence threat. Many assessments of this threat fix on either of these characteristics, resulting in polarised conclusions. The principal reason to be concerned with this threat is that even a single act of NBC terrorism could have devastating effects on the targeted society. This concern, however, must be tempered with a sober appreciation that NBC terrorism has been rare in the past, and that there are good reasons to believe that it will remain so in the future.

Third, the harm caused by even one successful act of NBC terrorism in a major city would be profound – and not only in terms of lives lost. Hundreds of thousands of people could be killed or injured in a single attack. These casualties, however, would only be the first in a series of consequences that could result from such an attack. Panic, economic damage and environmental contamination could follow in the near term. Over the longer term, the nation could be confronted with deep social-psychological questions about the standards of internal security it is willing to live with, and the costs – in terms of curtailed civil liberties or foreign commitments – it is willing to bear to maintain these standards. The conventional, low-technology terrorism of the past has exercised a social and political impact far out of proportion with the casualties it has caused. The massive, indiscriminate destruction caused by an act of NBC terrorism would have similarly disproportionate social, political, economic and strategic effects.

Fourth, the likelihood of acts of NBC terrorism in the future is low, but it is not zero, and it is rising. Future acts of NBC terrorism are by no means

inevitable. However, there is no logical reason to believe that future acts are any less likely than other forms of NBC attack, such as a ballistic-missile strike. Given the severity of the potential consequences, future acts of NBC terrorism should be regarded as likely enough to place this threat among the most serious national-security challenges faced by modern liberal democracies.

Weapons Characteristics and Accessibility

NBC weapons are largely unfamiliar devices. Few people have ever seen – much less built – one, and a comparably small number have witnessed their effects on human beings. A basic understanding of the three weapon types is important for understanding the threat of NBC terrorism, and for fashioning an appropriate strategy against it.

Nuclear Weapons

Nuclear weapons release vast amounts of energy through one of two types of nuclear reaction – fission and fusion.² Fusion weapons are far more destructive than fission weapons, but they can only be produced by technologically advanced states, at great cost. Fission weapons are less powerful than fusion weapons, but are considerably less complex. A first-generation fission weapon – like those used on Hiroshima and Nagasaki – would have an explosive yield of around 10,000 tonnes of trinitrotoluene (TNT). In comparison, the Oklahoma City bomb of April 1995 was equal to about two tonnes of TNT – about 5,000 times less powerful than a small nuclear weapon. Depending on population density, weapon yield and the severity of subsequent fires, a nuclear-fission detonation in a city could kill over 100,000 people and devastate an area extending a kilometre or more from the epicentre. Unless the weapon can be found and disabled, evacuation is the only real possibility for damage limitation prior to the detonation of a nuclear weapon.

The main technical barrier to nuclear-weapons acquisition is access to a sufficient quantity of fissile material, either plutonium or highly enriched uranium (HEU).³ If this obstacle were removed through the theft or purchase of fissile material, almost any state with a reasonable technical and industrial infrastructure could fabricate an improvised nuclear weapon. Some exceptionally capable non-state actors could also design and build a nuclear weapon, particularly if they had access to a substantial quantity of HEU metal, which allows an inefficient but simple weapon design to be used.⁴ The collapse of the Soviet Union, which has exposed large stockpiles of fissile material to an unprecedented risk of theft and diversion, has significantly heightened the risk of nuclear-weapons acquisition by non-state actors and states without an indigenous fissile-material production capability.⁵

Biological Weapons

Biological weapons disseminate pathogenic organisms or biologically produced toxins to cause illness or death in human, animal or plant populations. Whereas normal diseases begin in small pockets and spread through natural

processes of contagion, a typical biological weapon would release a large quantity of infectious organisms against a target population. The result is a massive, largely simultaneous outbreak of disease after an incubation period of a few days, depending on the agent used and the dose inhaled. Because of their ability to multiply inside the host, pathogenic micro-organisms can be lethal in minute quantities: an invisible speck of disease-causing microbes can kill or incapacitate an adult; a few kilograms of effectively disseminated concentrated agent could cause tens to hundreds of thousands of casualties. Biological-warfare agents without a system for aerosol dissemination cannot easily cause casualties on this scale, and should therefore be considered potentially dangerous contaminants, rather than WMD.

Toxin weapons disseminate poisonous substances produced by living organisms, and are therefore commonly classified as biological weapons. Like biological agents, toxins generally need to be delivered as an aerosol to be effective as anything more than a contaminant or an assassination weapon. Toxins differ from microbial biological-warfare agents, such as bacteria, in that they are non-living, like man-made chemical poisons. Gram for gram, toxins are less deadly than certain living pathogens, since the latter reproduce themselves in the victim. Toxins are not contagious, and thus cannot spread beyond the exposed population.

Aerosols of toxins and pathogenic micro-organisms in low concentrations are generally odourless, tasteless and invisible. Unless the agent-dissemination device (such as an aerosol sprayer) is noticed and identified, it is possible that a terrorist biological-weapon attack could go undetected until the infected population begins to show symptoms of disease or poisoning. Once a surreptitious biological attack is identified, it may be too late to limit its geographic extent or control its medical consequences. In addition, dispersal devices could have disappeared, perpetrators could be nowhere near the scene, and responsibility could be difficult to attribute. This combination of factors makes biological weapons especially suitable for terrorist use. Also, depending on the type of agent used and the nature of the disease outbreak, a surreptitious biological attack on a civilian population could initially be mistaken for a natural epidemic. Detection time will, therefore, depend on the nature of the attack and the quality of the public health system.

Biological weapons are regarded with opprobrium by the international community. Despite the minimal technical obstacles to their acquisition, their use has been rare. The US officially ended its offensive biological-weapons programme in 1969, and they are formally banned by the 1972 Biological Weapons Convention, an agreement ratified by 140 nations but lacking verification provisions. However, it is now known that both the Soviet Union and Iraq had large-scale illegal biological-weapons programmes, the former continued for some time (possibly to this day) by Russia. The US government and outside experts further suspect another eight countries – China, Egypt, Israel, Iran, Libya, North Korea, Taiwan and Syria – of possessing some form of offensive biological-weapons programme.⁶

Many states and moderately sophisticated non-state actors could construct improvised but effective biological weapons, as information on the necessary science and technology is openly available. Culturing the required micro-organisms, or growing and purifying toxins, is inexpensive and could be accomplished by someone with university-level training in biology and sound laboratory technique. Acquiring the seed stocks for pathogenic micro-organisms is also not particularly difficult, but the easiest acquisition option – placing an order with a biological supply service – has been made somewhat harder by improved national and international regulation. The most significant technical challenge in fabricating a biological weapon is effectively disseminating bulk biological agent as a respirable aerosol. The most efficient aerosolisation systems, which could reliably produce high casualties over wide areas, would require considerable technological sophistication, and remain beyond the reach of most states and most conceivable non-state actors. However, less efficient aerosolisation techniques are available, and could be mastered by many states and some highly capable non-state actors. The effects of biological attacks could vary greatly, but a single biological weapon could kill or incapacitate thousands of people even with an inefficient delivery system, especially if directed against large indoor populations.

Chemical Weapons

Chemical weapons are extremely lethal man-made poisons that can be disseminated as gases, liquids or aerosols. There are four basic types of chemical weapons: choking agents, such as chlorine and phosgene, which damage lung tissue; blood gases, such as hydrogen cyanide, which block the transport or use of oxygen; vesicants, such as mustard gas, which cause burns and tissue damage to the skin, inside the lungs and to tissues throughout the body; and nerve agents, such as *tabun*, *sarin* and VX, which kill by disabling crucial enzymes in the nervous system. Chemical-warfare agents are highly toxic, but must be delivered in large doses to affect large open areas. For open-air targets, the required amount of even highly toxic agents, such as *sarin*, rapidly reaches hundreds to thousands of kilograms per square kilometre, depending on weather conditions. This is true even if the agent is efficiently dispersed. A simple outdoor attack, involving no more planning and execution than a large truck-bomb, is thus likely to kill at most several hundred people even at high population densities. An attack on a crowded indoor area might kill several thousand people. Some chemical-warfare agents are persistent, and could render large areas uninhabitable for extended periods of time.

Chemical weapons have been used or stockpiled by many militaries for most of this century, beginning with their first large-scale use in the First World War. Immense quantities of chemical weapons were produced by the US and the Soviet Union during the Second World War and Cold War; these stockpiles are now being destroyed.⁷ Most other major states with chemical-weapons arsenals have also pledged to destroy these stocks under the Chemical

Weapons Convention (CWC), but several states have either boycotted the Convention or are suspected of harbouring clandestine chemical-warfare programmes. No non-state actor is known to possess chemical weapons, although the Japanese cult Aum Shinrikyo manufactured significant quantities of the nerve gas *sarin* in 1994–95.

Chemical weapons suitable for mass-casualty attacks can be acquired by virtually all states and by non-state actors with moderate technical skills. Certain deadly chemical-warfare agents can be manufactured in a kitchen or basement in quantities sufficient for mass-casualty attacks. Production procedures for some agents are simple, are accurately described in publicly available sources and require only common laboratory glassware, good ventilation and commercially available precursor chemicals. Greater expertise and some specialised equipment are required to fabricate the most toxic chemical-warfare agents, but the acquisition of quantities sufficient for mass-casualty attacks would still be within the reach of some technically capable non-state actors. The use of a highly toxic chemical agent as a WMD is not especially difficult in principle.

Consequences of a Terrorist NBC Attack

The defining element of a terrorist NBC attack is that the weapon is delivered in a manner that cannot be readily distinguished from the normal background of traffic and activity. A wide variety of terrorist NBC delivery methods are available, ranging from the simple to the sophisticated. Any potential aggressors competent enough to acquire a WMD in the first place would be able to deliver it covertly against high-value targets in open societies with a high chance of success.

The consequences of a major NBC attack would come in waves, played out over a period of months or years. The first impact would be immediate physical damage, but terrorist NBC attacks would also have broad repercussions for the economy, for the nation's strategic position in world affairs and perhaps even for its ability to sustain itself as a strong democracy. These effects could be compounded by an organised campaign of multiple attacks, or if a range of different weapon types – including conventional weapons – were used in conjunction. At least seven general consequences are likely.

- *Massive casualties.* The first and most obvious effect of an NBC attack would be its destruction of human life. The March 1995 Tokyo subway attack killed 12 and injured about 5,000. If Aum Shinrikyo had been more proficient in its delivery of the nerve gas, fatalities would have climbed into the thousands. Biological-weapons effects are even more variable, but fatalities in the low tens of thousands are feasible even with unsophisticated weapons, while a more advanced biological weapon could kill or injure hundreds of thousands of people. A single nuclear weapon could easily kill over 100,000 people if detonated in a densely populated urban area. Only wars and plagues have produced casualties on such a scale in the past.

- *Contamination.* An NBC attack could contaminate a large area. Depending on the type of weapon used, the area immediately affected by the attack could be rendered uninhabitable for extended periods of time, requiring a costly and perhaps dangerous clean-up operation. A nuclear weapon would also send radioactive waste into the atmosphere, affecting people downwind for years to come. NBC contamination could raise the disease rates and reduce the quality of life for a much larger population than that which suffered the immediate effects of the weapon.
- *Panic.* An NBC attack against a civilian population would, in all likelihood, trigger a panic incommensurate with the real effects of the weapons. After the World Trade Center bombing in February 1993, many more people reported to hospitals claiming ill effects than were injured in the incident. In a chemical or biological attack, hospitals are likely to be overwhelmed by people fearing contamination or infection. A nuclear attack – or even a limited radiological incident – is likely to stimulate uncontrolled movement away from the affected area, given the public's deep-seated fear of all things radioactive.
- *Degraded response capabilities.* The government personnel needed to conduct an effective operational response to a real NBC threat may themselves be unable to carry out their responsibilities, compounding the effects of an attack. Active-duty military personnel will generally have the training and discipline to conduct operations in a hazardous environment. But without appropriate equipment and training, emergency-response personnel such as police officers, fire-fighters and paramedics may be among the first casualties of an NBC incident. Those who arrive at the scene later might decide that the risks to themselves are too high. Congested roads and airspace will also complicate whatever operational response the government can mount.
- *Economic damage.* An NBC attack could cause major economic damage to the affected area. A large attack or series of attacks could affect the national economy, perhaps even precipitating a recession. Likely effects include death of and injury to workers, the destruction of physical plant and the contamination of workplaces. An attack could also trigger a run on international financial markets, especially if the target has economic significance. The loss of plant and productivity from even a single, moderately damaging NBC attack could amount to millions or billions of dollars.
- *Loss of strategic position.* An NBC attack or campaign of attacks could do great damage to the strategic position of the target state. The US, for example, could be deterred from entering a regional crisis in which its national interests were threatened. Key institutions and political leaders might be attacked directly, or military forces and force-projection capabilities might be damaged, in an effort to prevent an effective military response. An international military coalition might collapse, or an essential ally might request the withdrawal of

foreign forces from its territory, under threat of NBC attack. The precise nature of these strategic effects is impossible to predict, but they could seriously complicate efforts to deal with a foreign adversary or crisis.

- *Social-psychological damage and political change.* Actual mass-casualty attacks, and the prospect of their continuance, could have a profound psychological effect on the target population, and an equally profound impact on the nation's politics and law. Public terror in the aftermath of an NBC incident would likely be at least as intense as the abstract Cold War fear of nuclear war. Powerful, conflicting forces – including paranoia, xenophobia, isolationism and vengeful fury – would struggle for control of foreign policy. Domestically, the inability to prevent terrorist NBC attacks, or to respond to them effectively, could cause the population to lose confidence in its government, and initiate a chain of political and legal reactions leading to a shift in the relationship between citizen and state. A society that comes to fear massively destructive terrorist attacks is likely to demand action from its government. The response would probably involve curtailing the civil liberties that form the basis of democratic society.

The Likelihood of NBC Terrorism in the Future

Only one non-state actor has successfully acquired and used a WMD: the Japanese cult Aum Shinrikyo. In June 1994, it carried out a nerve-gas attack in Matsumoto, Japan, killing four people and injuring 150, but which went unnoticed by Western intelligence. Its second attack in the Tokyo subway killed 12 and injured over 5,000.

If threat assessment were a simple extrapolation of past trends, analysts would probably conclude that modern societies have little to fear from terrorist NBC aggression. But threat assessment must also consider the changing capabilities, motives and strategic options of potential adversaries, as well as the scope and character of their own vulnerabilities. The capacity to conduct terrorist NBC attacks is growing among states and non-state actors alike. It also appears that the motivation to conduct attacks of this kind is increasing.

A specific threat of NBC terrorism arises when a group emerges that falls into three categories simultaneously: capable of NBC weapons acquisition and use; interested in causing mass casualties; and wanting to use NBC weapons for this end. The threat of NBC terrorism is growing more serious because the number of non-state actors that are simultaneously NBC-capable and interested in causing mass casualties is growing. At a minimum, these two trends suggest that conventional non-state violence is likely to become more deadly; at the other extreme, however, these two trends suggest that an increasing number of violent non-state actors are moving into position for more frequent and more effective forays into the largely uncharted territory of NBC terrorism.

NBC Terrorism is Historically Rare, and Likely to Remain So

A review of the history of non-state actor involvement with WMD yields several empirical conclusions. First, with the important exception of Aum Shinrikyo, no non-state actor has conducted, or attempted to conduct, an

effective, widespread attack with a functional NBC weapon. There is little evidence that any established terrorist organisation is or has been interested in acquiring, much less using, WMD. There are virtually no reports, much less solid evidence, linking established terrorist groups – the Irish Republican Army (IRA), *Hizbollah*, Jewish extremists, the Italian Red Brigade, the many different Latin American terrorist and revolutionary groups, the Japanese United Red Army, or various Turkish, Armenian or Palestinian terrorist organisations – to any serious interest in WMD. A possible exception is West Germany's Red Army Faction, which may have tried to produce botulinum toxin in Paris in the early 1980s, but it is not certain that the Faction had a clear delivery concept in mind, much less the determination to use it.⁸

Dozens of cases have been documented in which a non-state actor is known to have used, or attempted to use, lethal chemicals or harmful biological agents in indiscriminate poisonings. And there have been countless more individual assassinations and assassination attempts involving poisons. These incidents should not, however, be confused with an attack involving biological or chemical WMD, which require effective means for wide-area airborne dissemination and generally far more lethal agents. Murdering a few people with poison is a relatively simple matter, but there are logistical limits to the number of people who can be killed through product tampering.⁹

Similarly, many cases have been reported – including several in the mid-1990s – in which ostensibly hostile non-state actors have been caught in possession of lethal chemicals, dangerous biological agents or radioactive material. In April 1993, for example, Canadian border police confiscated 130g of ricin from Thomas Lewis Lavy, an Arkansas resident with reported links to survivalist groups, as he tried to enter Canada from Alaska. After a two-year investigation by the Federal Bureau of Investigation (FBI), Lavy was arrested and charged under the 1989 US Biological Weapons Anti-Terrorism Act with possession of a biological toxin with intent to kill. He was never tried because he hanged himself in his cell shortly after arraignment. In August 1994, Douglas Allen Baker and Leroy Charles Wheeler – both associated with the Minnesota Patriots Council, a right-wing militia group – were arrested for possession of ricin and planning to murder law-enforcement personnel. Their planned delivery technique was to smear the toxin on the doorknobs of their intended victims' homes.¹⁰ In 1995, Larry Wayne Harris, an individual with some scientific training and right-wing affiliations, was arrested for mail fraud after ordering three vials of freeze-dried bubonic plague bacteria from American Type Culture Collection. These are not the only cases in which non-state actors have acquired some quantity of biological-warfare agents, but they are representative of the larger stock of cases. Although these cases indicate a worrying fascination with chemical and biological agents among some disaffected Americans, all have lacked evidence of serious intent or technical capacity to use the agent as an effective WMD.

There are at least four reasons why capable non-state actors have not conducted more mass-destruction attacks with NBC weapons. First and most important, inflicting massive human casualties generally does not serve the

objectives of terrorist groups and other hostile non-state actors. The fundamental purpose of acquiring WMD is to kill large numbers of people. Yet terrorist attacks that seek to cause mass casualties are, in fact, quite rare (see Table 1).

Table 1 Twentieth-Century Terrorist Attacks Incurring 100-Plus Casualties

Year	Event	Location	Deaths
1995	Bombing of federal building	Oklahoma City, OK	168
1993	Bombings (10 bombs in under 3 hours)	Bombay	235
1989	Bombing of Colombian Avianca aircraft	Bogota	107
1989	Bombing of French UTA airliner	Niger	171
1988	Bombing of Pan Am Flight 103	Lockerbie, Scotland	278
1987	Car bomb in bus station	Sri Lanka	113
1987	Bombing of South Korean airliner	Thai–Burmese border	117
1985	Bombing of Air India passenger airliner	Irish Sea	328
1983	Bombing of US Marine barracks	Lebanon	241
1979	Arson attack on cinema	Abadan, Iran	477
1946	Nakam poisoning of German POWs	Nuremberg, Germany	100s (?)
1925	Bombing of cathedral	Sofia, Bulgaria	160

Note: This table includes only conventional terrorist attacks. It does not include large-scale massacres carried out by militaries or guerrilla groups using guns, machetes or other small arms; or acts by guerrilla groups animated by a particular ethnic hatred or extreme ideology, such as the Bosnian Serbs, Algerian Islamic radicals, Rwandan militias and the Vietcong.

Undoubtedly, other terrorist attempts to inflict mass casualties have been made – the World Trade Center bombing and Aum Shinrikyo are examples – but the available data strongly suggest that there has been a general aversion to mass casualties among most violent non-state actors. This aversion has not resulted from a technical incapacity or lack of opportunity to kill large numbers of people; instead, terrorist organisations have made conscious decisions to kill fewer people than they could. The reasons for this general aversion have been that mass casualties undermine political support; they raise the risk of unfettered government reprisal; and they do not make easier the terrorists' efforts to achieve their aims through violence.

The second reason for the rarity of NBC terrorism is that mass destruction, to the extent it is desired, is possible without WMD. The overwhelming majority of organised violence undertaken by terrorist groups has involved only conventional weapons – chemical explosives, guns and knives. Chemical explosives – ranging from the simplest, such as ammonium nitrate mixed with fuel oil, to the most advanced military high explosives, such as C4 and Semtex – can be used to kill up to several hundred people.

Third, the acquisition and use of NBC weapons would entail additional risks and challenges to a terrorist group beyond those associated with conventional weapons. Holding other factors constant, a rational attacker will employ the

simplest, least costly, and most reliable means of attack available to it. There are of course costs, risks and challenges associated with acquiring conventional weapons as well, but these are less severe than those associated with WMD. With respect to acquisition, NBC weapons are clearly more technologically challenging than conventional weapons, and also generally more expensive. Moreover, work on WMD inevitably involves a heightened hazard to health. Attempts to acquire NBC weapons raise the risk that the group would be found out and crushed by the authorities, especially if individuals with special expertise must be recruited for the NBC-acquisition effort. With respect to the actual use of the device, NBC weapons again present risks and challenges beyond those of their conventional counterparts. Terrorists in particular prefer predictable and reliable forms of attack. The immediate and long-term effects of an NBC weapon will generally be less predictable than a conventional one. NBC weapons may also have a harmful physical or psychological effect on the human operatives charged with handling or delivering them.

The final and most controversial explanation for lack of interest in NBC weapons among groups capable of acquiring and using them is that group leaders and members may hold moral objections.¹¹ This may seem counter-intuitive, given the willingness of most terrorist groups and many states to kill innocent people in order to achieve their political goals. NBC weapons, however, have a special stigma. This norm against NBC use probably is strongest in the case of biological weapons. While it will never be possible to separate the causal impact of self-interest (including group preservation) from that of morality on decisions not to launch NBC weapons attacks, the idea should not be ignored.

Explaining the capability constraints on groups 'interested' in mass-casualty terrorism is more difficult than explaining the lack of interest of NBC 'capable' groups. It is virtually impossible to untangle technical inability from genuine lack of motive. Nonetheless, the known cases suggest that most non-state actors with an interest in NBC weapons or materials would have trouble acquiring or using them successfully. Two reasons appear to explain this. The first is that the psychological make-up of an individual or group that wishes to cause human casualties on a massive scale is often incompatible with the technical and organisational requirements for acquiring and using NBC weapons. This argument applies most obviously to deranged individuals who are motivated to kill not by a clear, rational purpose, but by mental illness. A second possible explanation applies only to state-sponsored terrorist groups. In the unlikely event that such a group decided to obtain or use WMD, it is likely that the state sponsor would actively oppose its efforts because of the extreme risks involved.

Many of the factors described above that have discouraged NBC terrorism in the past will continue to obtain. However, some of these factors are operating with diminishing force. In particular, it is certain that more and more non-state actors will become capable of NBC acquisition and use. Moreover, a growing body of evidence suggests that increasing numbers of terrorist groups are motivated to cause mass casualties.

Latent NBC Potential of Non-State Actors is Rising

Non-state actors in all modern societies are becoming more capable of mastering the challenges associated with NBC attack. This gradual increase is a by-product of economic, educational and technological progress. It also results from the fact that, in most modern societies, the ability of the state to monitor and counter illegal or threatening activities is being outpaced by the increasing efficiency, complexity, technological sophistication and geographic span of the activities – legal and illegal – of non-state actors.

- *The impact of economic, educational and technological progress.* The technological and scientific challenges associated with covert NBC acquisition and use are significant, but they are no more difficult than they were 40–50 years ago. Meanwhile, non-state actors are growing steadily more capable, and thus better able to surmount the technical hurdles to NBC acquisition and use. Since the fundamental cause is social progress, this expansion of latent non-state actor NBC potential is inexorable, and is not reversible by governments.

How and why is the underlying capacity of non-state actors to master the technical challenges of NBC acquisition and use increasing? The first reason is that the basic science behind these weapons is being learned by more people, better than ever before. In the US alone, the number of people receiving degrees in science and engineering fields more than doubled between 1966 and 1994.¹² Education data on other countries suggest similar trends. An even more important gauge of the ability of non-state actors to build and use WMD, however, is the increasing level of knowledge available in school science courses, as well as the sophistication of laboratory and analytical tools – from computers to laboratory-scale fermentation equipment – that are now available. The new physics that the Manhattan Project scientists had to discover to make nuclear weapons possible is now standard textbook fare for young physicists and engineers.

Nowhere is this phenomenon more pronounced than in biology. The advance of the biological sciences is creating a situation in which a sophisticated programme can produce advanced biological weapons with heightened resistance to prophylaxis or treatment, increased virulence, controllable incubation periods and agent longevity, and conceivably even a selectivity that targets groups of people according to their genetic make-up.¹³ The biotechnology revolution is also increasing the number of people with the knowledge to use such agents. Similarly, the biotechnology industry's growth has made available a wide range of tools and supplies – such as efficient fermenters for producing large amounts of bacteria in small facilities, and increasingly sophisticated tools for measuring aerosols – that would ease a basic biological weapons procurement effort.

Finally, apart from rising education levels and growing familiarity with relevant technologies, the latent NBC potential of non-state actors is increasing because the ability to acquire information is growing. The internet contains a vast amount of information relevant to planning and executing complex violent

acts – including information on specific targets, detailed accounts of previous incidents and tactics, and basic technical information for making NBC weapons. The basic technical descriptions of NBC weapons that are available on the internet generally do not amount to the detailed, step-by-step instructions that might allow a novice to fabricate an improvised NBC weapon from scratch. Even so, today's terrorists, if they can conduct even a modest computer search for information, are able to start substantially higher on the terrorist learning curve compared to their predecessors of even a decade ago.

- *Non-state efficiency and flexibility is outpacing that of the state.* A complex, illegal activity like clandestine NBC weapons acquisition has several different constituent parts, any of which may be vulnerable to law-enforcement surveillance. A team of like-minded, appropriately skilled individuals must be assembled; places must be found for them to work; they must be able to communicate with one another, possibly over great distances; information, materials and equipment must be gathered, perhaps from abroad; and a dangerous weapon must be assembled and delivered without error. This is a challenging list of tasks, and would entail risks of detection in any state able to provide for its internal security. The rapid development of increasingly pervasive communications and transport systems makes several of these tasks easier, however, while the growth of legitimate uses of such systems makes criminal use harder to spot.

Whereas non-state actors once had access to little more than analogue phone lines and the postal system, today they can communicate by facsimile, cellular or satellite telephone, teleconference, alpha-numeric pagers, e-mail, computer modem and computer bulletin boards. They can quickly transport weapons and supplies via numerous shipping services. Telecommunications traffic has increased dramatically in both volume and variety over the last decades, easily outpacing the state's ability to track it all.¹⁴ The communications systems available to non-state actors can also be more secure than ever. Strong encryption systems were once exclusive to governments, but virtually unbreakable encryption software is now readily available on the global market, and easily downloaded from the internet.¹⁵ The benefits to legitimate users are considerable, but the implications of this trend on the ability of law enforcement to cope are profound. According to FBI Director Louis Freeh:

Law enforcement is in unanimous agreement that the widespread use of robust unbreakable encryption ultimately will devastate our ability to fight crime and prevent terrorism. Unbreakable encryption will allow drug lords, spies, terrorists and even violent gangs to communicate about their crimes and their conspiracies with impunity. We will lose one of the few remaining vulnerabilities for the worst criminals and terrorists upon which law enforcement depends to successfully investigate and prevent the worst crimes.¹⁶

Before the information age, state agencies technologically dominated their non-state challengers, in areas ranging from eavesdropping equipment to

advanced surveillance cameras. Law enforcement and intelligence-gathering continue to benefit from improving technology, but cannot increase their effectiveness at detecting hidden illegal activities at the same rate as individuals because of the constraints of law, manpower, financial resources and technology. As one study put it, 'power is migrating to actors who are skilled at developing networks, and at operating in a world of networks'.¹⁷ In this competition between a centralised process – the state seeking the needle of criminal activity in the haystack of an increasingly complex society – and decentralised criminal processes – where effectiveness is limited by human competence, resources and technology – the state is clearly at a disadvantage.

Terrorists' Propensity Towards Mass-Casualty Violence Appears to be Rising

This is a relatively new development, and it remains poorly understood. The classic conceptual model of a terrorist group – with limited political aims, a strategy of controlled violence for achieving them, and an interest in self-preservation – appears to be breaking down. New groups are emerging with hazier objectives, shorter life-spans and a more direct interest in violence for its own sake, often for religious or political reasons. The ascendance of Western culture and US power in the post-Cold War international system is making the US and its allies increasingly attractive targets for terrorism. In short, terrorism is changing in a way that points towards an expanding range of groups that are simultaneously NBC-capable and interested in inflicting human casualties at levels well beyond the norms of previous decades.

What evidence supports this claim of rising lethality? According to the US State Department, 'while the incidence of international terrorism has dropped sharply in the last decade, the overall threat of terrorism remains very serious. The death toll from acts of international terrorism rose from 163 in 1995 to 311 in 1996, as the trend continued toward more ruthless attacks on mass civilian targets and the use of more powerful bombs'.¹⁸ The 1995 FBI report on terrorism noted that 'large-scale attacks designed to inflict mass casualties appear to be a new terrorist method in the United States'.¹⁹ Based on the most detailed database of terrorism incidents in the public domain – the RAND–St Andrews Chronology of International Terrorist Incidents – Bruce Hoffman similarly concluded that 'while terrorists were becoming less active, they were also becoming more lethal'.²⁰ As Table 1 shows, most of the mass-casualty terrorist attacks in history have occurred since 1979.

Four trends, often tightly interrelated, suggest that the past disincentives to mass-casualty attacks will have diminishing force in the future. First, violence and terrorism motivated by religion are becoming more common and more lethal. Religious terrorism has undergone a renaissance in the last two decades, as the number of known terrorist groups believed to be motivated primarily by religious causes has grown.²¹ Many of the reasons why secular terrorists have tended to refrain from causing mass casualties apply with limited force or not at all to terrorists motivated by religious beliefs.²² Most secular terrorists have

been politically motivated, and have sought either to extract specific concessions from a state, or to foment or block social and political change – purposes not often served by causing mass casualties. Religious violence follows a different logic. For religious terrorists, violence can become a sacramental act, dictated and legitimised by theology. The primary purpose of violent acts is not to extract particular concessions, but to fulfil a spiritual requirement.²³ Loss of popular support is of little concern to the religious terrorist, since the act is done for God, or God's clerical proxy, not public opinion.²⁴ Group cohesion is threatened less by practical matters – such as disagreements over the tactically and morally appropriate level of violence – than by the possibility of appearing unfaithful to the belief system that binds the group together. Harsh counter-measures by secular authorities are expected, but the deterrent effects of this prospect are relatively modest for religious terrorists: in their own minds, zealots are already locked in a life-and-death struggle with their opponents, and heightened oppression serves mainly to reinforce the teachings of fanatical spiritual leaders. For all these reasons, as religiously inspired terrorism becomes more prevalent, terrorism in general will become more lethal.

Second, local opposition to foreign influence and military presence appears to be intensifying in the moderate, pro-Western sheikdoms of the Persian Gulf, resulting in increasingly frequent and damaging anti-military terrorist attacks. Religious and political motives for terrorism clearly reinforce one another in the Middle East, especially the Persian Gulf, and they do so in a way that suggests that this is the region where the risks of mass-casualty terrorism against US and other Western targets are growing most rapidly. This risk has become visible as a result of two major bombings in Saudi Arabia: the first at the offices of the US Program Manager for Security Assistance with the Saudi Arabia National Guard in Riyadh on 13 November 1995, killing seven and wounding 40; and the second at the Khobar Towers housing complex for US Air Force personnel in Dhahran on 25 June 1996, killing 19 Americans and injuring more than 500.²⁵ Exactly who was responsible for the two bombings remains a mystery, but the rationale behind the attacks is clear. Certain strands of Islam, particularly some elements of radical Shi'ism, are profoundly hostile to what they perceive as the dominance of Muslim lands by foreign powers, especially the US. Radicalised by a long colonial history, the Arab–Israeli conflict and the 1991 Gulf War, many Muslims see the US regional presence and influence as fundamentally incompatible with Islamic faith, primarily because the US abets secular governance and transmits a Western culture some Muslims consider depraved. In the Gulf region, this religious hostility is magnified by the *realpolitik* of Iran and Iraq, whose aspirations towards regional hegemony are blocked by the forward US presence, and by the anti-Americanism of many ordinary Arabs and Muslims, some of whom hold Washington responsible for their poverty and political powerlessness. Because of this combination of religious, geopolitical and social factors, the risk of mass-casualty terrorist attacks against Western interests in the Persian Gulf appears to be rising, jeopardising the political foundations on which the US presence in the region rests.

Third, right-wing terrorism appears to be growing both more prevalent and more lethal. In England, Germany, France, Israel and Russia, and several other former Soviet states, this has been manifested in racially motivated attacks on foreign residents.²⁶ Right-wing violence is chauvinistic and hateful. Opponents are seen not just as politically or ideologically mistaken, but as inferior, usually for reasons of race, religion or sexual orientation.²⁷ Far-right groups are by no means uniformly dangerous or effective. A handful have well-developed organisations, considerable resources and an active membership, but others are little more than a single extremist with a photocopier and a mailing list. In both organisation and ideology, the radical right is exceptionally fluid and eclectic – groups form and disband frequently, and individuals move from group to group often and with ease. There is rising concern among US law-enforcement officials that right-wing American extremists may seek to carry out mass-casualty attacks in the future, and may use exotic weapons in doing so. This US concern stems both from the precedent set by the Oklahoma City bombing and from the handful of incidents in the 1990s involving right-wing individuals caught in possession of biological-warfare agents.

Fourth, it now appears that more and more non-state violence is committed by *ad hoc* collections of like-minded individuals who come together for specific purposes, sometimes to commit a single attack. While these terrorists probably have a lower capacity to carry out mass-casualty attacks, the motivational restraints on their ability to do so are also likely to be lower. Unlike traditional terrorist organisations, ‘amateur’ terrorist groups have no political organisation to worry about, and form only to commit a limited number of violent acts. Amateur groups, especially those pursuing a goal they believe is ordained by God, or motivated by a political ideology that is more a justification for violence than a political blueprint, are likely to be less averse to causing mass casualties since they have a lower stake in group preservation.²⁸

How Governments Should Respond

Arguing that the threat of NBC terrorism should be treated as a first-order national-security challenge raises questions about what can, and should, be done about it. To protect all potential targets all the time is impossible, and should not be attempted. But a purely passive, reactive posture is equally unsatisfactory. The governments of the world’s leading democracies should instead institute a package of measures to make NBC terrorist threats less likely to emerge, and should create operational capabilities that give them a reasonable chance of detecting, defeating and minimising the consequences of terrorist NBC threats. These measures should be viewed as a prudent investment in the long-term security of their citizens and national interests, not as an emergency campaign.

No two countries will respond identically to the threat of NBC terrorism, as the deficiencies in their policies, governmental organisation and operational capabilities vary.²⁹ Nonetheless, five key prescriptive concepts should guide the policy responses of any government.

First, concerned policy-makers and legislators should not over-react – and in particular, should take no action that might compromise personal liberties and freedoms. The threat of NBC terrorism straddles the traditional domains of law enforcement and national security, and any discussion of how to respond to the terrorist NBC threat will almost inevitably raise questions about the relationship between the state and its citizens.³⁰ Many of the measures that could be taken to combat terrorist threats would increase the power of the state at the expense of the freedom and privacy of individuals or groups. An unprepared society's vulnerability to NBC terrorism can be significantly reduced through policy changes, improved government organisation and focused investments in new operational capabilities without undermining essential civil liberties. The threat of NBC terrorism is a serious challenge, but it is not so imminent that governments should pre-emptively begin to change the societies that they have been charged to protect.³¹

Second, before starting new programmes and initiatives, the government should have a comprehensive national strategy for addressing the problem, and should instigate a system for effective inter-agency coordination and long-range planning. This is a particularly marked deficiency in the US, which has an abundance of disparate policies and operational capabilities directed against the NBC terrorism threat – some quite formidable, others wholly inadequate. Although the Clinton administration has expressed concern over the threat of high-technology terrorism, it has not established a coherent national 'blueprint' for long-term capability building, and most new initiatives have been driven either by activist legislators or individual federal agencies.³²

Third, intelligence is the first and most important line of defence. Specific conspiracies are relatively easy to defeat if the authorities discover their existence with adequate lead time and in sufficient detail to investigate and take action. Most intelligence services already look at the issue of NBC weapons proliferation, but specific enhancements are needed in their ability to acquire early warning of emerging NBC threats, especially by watching for the most likely signatures of small-scale, improvised NBC acquisition programmes, abroad and at home; to improve the use of public-health capabilities – particularly epidemiological surveillance – to detect medical evidence of NBC weapons programmes and biological-weapons attacks; to identify those responsible for NBC attacks after the incident has occurred; and to cooperate internationally against shared transnational threats. In the US, shortcomings in these areas are symptomatic both of the difficulty the US intelligence community has had in adapting to post-Cold War security challenges, and of its failure to make use of state-of-the-art information-processing technology. Since the Soviet threat disappeared, the shortcomings of US intelligence have been commented upon and studied at length, but the pace of reform is slow.

Fourth, the single best possible insurance policy against the risk of nuclear terrorism is to ensure that all stockpiles of fissile (especially HEU) and nuclear weapons themselves are properly accounted for and guarded. Nuclear terrorism is not a serious threat when all stockpiles of direct-use fissile material

are held under secure conditions. However, the degradation of the Soviet nuclear custodial system has heightened the risk by rendering vast quantities of fissile material more accessible than at any time in history. The US government has been active in attempting to address this issue, but its European and Asian allies have largely ignored it, making only minuscule investments in the training and assistance programmes needed in Russia. The problem is so large that it will require sustained international effort for many years.

Finally, national governments should improve their operational capacity to detect and reduce the consequences of chemical- and biological-weapons attacks at home and, for states with external security commitments, abroad. This should be done not by establishing new stand-alone assets, but by strategically augmenting certain existing capabilities, most of which are independently valuable and worthy targets for further investment.³³ In preparing for biological terrorism, the most important area is the public-health sector, which already has systems in place to detect, contain and treat natural disease outbreaks.³⁴ Most biological weapons do not cause immediate ill effects, and the symptoms of many biological-warfare diseases initially resemble a cough or influenza, so acts of biological terrorism may be detected first by existing epidemiological-surveillance systems. Since the effective medical treatment of most biological-warfare diseases depends on early detection, states should invest in improving the speed and accuracy with which their epidemiological-surveillance systems can detect unseen biological-weapon attacks. Likewise, most states will have to enhance their emergency medical systems so that they are capable of mounting an effective, no-notice medical response in a major biological-weapons incident – an exceptionally demanding contingency that would require stockpiles of key medicines and vaccines, trained personnel to deliver them and a high-readiness mobilisation system.

Unlike biological weapons, chemical-warfare agents generally have prompt, noticeable effects on humans, and the chemical incident is likely to occur over a matter of hours rather than days. For this reason, the most important operational capability for mitigating the effects of a chemical terrorist act is the 'first-responder' community – the local police force, fire departments, hazardous-material specialists, emergency medical personnel and public-health and disaster-relief officials. In a no-notice chemical-weapon attack, there will be no time to bring in far-flung specialists to manage the incident, so this task will fall to municipal and state officials, the vast majority of whom have no special knowledge, training or equipment for dealing with WMD. Not all potential emergency staff in a large country can have a deep understanding of how to respond to this threat, but it is possible to create a layered system of preparedness, which would start with broad-based awareness training, specialised training and equipment for local specialists (for example, HAZMAT – hazardous-materials – teams, bomb squads, police special weapons and tactics teams and emergency-management officials), and specialised medical units for large-scale chemical or biological attacks at the regional level. These response capabilities should be regularly tested and examined through full-field

exercises against realistic, challenging WMD simulations, with the participation of relevant agencies at all levels of government administration.

The military should be tightly integrated into any such national-preparedness plan, since the armed forces will generally contain most of a state's technical and operational capacity to counter specific NBC threats, including most of its capacity to operate in a chemically or biologically contaminated environment; to decontaminate casualties, equipment and facilities; and to treat large numbers of chemical- and biological-warfare victims. The capabilities needed to manage the consequence of domestic NBC-weapons attacks overlap substantially with those needed to fulfil the more traditional mission of protecting military forces on the battlefield and in rear areas against chemical and biological attacks. As the US and its allies work to enhance their armed forces' overall capacity to fight against NBC-armed regional adversaries, they should ensure that they also improve their society's capacity to cope with domestic NBC attacks.

Conclusion

WMD terrorism is a serious, often underestimated but not apocalyptic threat to the national security of advanced democracies. Liberal, urbanised nations are vulnerable to terrorist attack with NBC weapons, and the probability of such an attack is higher than commonly assumed – and growing. This situation merits broad programmes of action both to reduce national vulnerability and to make the emergence of future threats less likely. Such efforts would essentially be a hedge against a low-probability, high-consequence event – an act of prudence, not unlike an insurance policy on one's home. Many of the steps required, however, do not resemble traditional national-security programmes, and will encounter financial, institutional and conceptual obstacles.

These obstacles would disappear after a major domestic NBC attack. In the atmosphere of national emergency that would follow a successful NBC attack, or even a credible threat of NBC use, the political will and funding necessary to implement a vigorous response to the terrorist NBC threat would become considerably easier to generate, but there would also be a real risk of political overreaction. Unwise and wasteful measures – both offensive and defensive – might be taken reflexively, with costs measured not only in money, but in liberties, lives and strategic position. After a mass-destruction attack, the national leaders who were disinterested in hedging against an uncertain threat might find themselves accountable for the nation's failed preventive efforts and low level of preparedness. The excuses given for not having done more beforehand will ring hollow. The best action policy-makers can take to avoid having to make these excuses is to focus on the threat before it reaches emergency proportions, and to begin implementing a balanced programme of preventive and preparedness measures.

Notes

¹ Several studies have drawn attention to different aspects of the problem. They include Brad Roberts (ed.), *Terrorism with Chemical and Biological Weapons: Calibrating Risks and Responses* (Alexandria, VA: Chemical and Biological Arms Control Institute, 1997); Jonathan Tucker, 'Chemical/Biological Terrorism: Coping with a New Threat', *Politics and the Life Sciences*, vol. 15, no. 2, September 1996, pp. 167–83; and Defense Science Board, *Report of the 1997 DSB Summer Study on DoD Responses to Transnational Threats*, vol. 1 (Washington DC: Office of the Under-secretary of Defense for Acquisition and Technology, December 1997). For possible insight into the argument of a classified US study of the subject, see Joseph S. Nye, Jr. and R. James Woolsey, 'Defend Against the Stealth Enemy', *Los Angeles Times*, 1 June 1997, p. 4.

² Radiological weapons disperse radioactive substances but do not produce a nuclear yield. The simplest radiological weapon would consist of a conventional explosive surrounded by a quantity of any radioactive material. In its immediate physical effects, a radiological weapon is unlikely to produce mass casualties. In most cases, large quantities of highly radioactive material would be needed to produce strong effects over even a moderate area, and obtaining and working with large amounts of such materials would be challenging because of the high radiation levels involved. A radiological attack might, however, trigger panic out of proportion with its destructiveness.

³ For more on the technical issues associated with nuclear weapons acquisition, see US Congress, Office of Technology Assessment (OTA), *Nuclear Proliferation and Safeguards* (New York: Praeger, 1977), pp. 139–44; Robert Serber, *The Los Alamos Primer* (Berkeley, CA: University of California Press,

1992); and J. Carson Mark, Theodore Taylor, Eugene Eyster, William Maraman and Jacob Wechsler, 'Can Terrorists Build Nuclear Weapons?', in Paul Leventhal and Yonah Alexander (eds), *Preventing Nuclear Terrorism: The Report and Papers of the International Task Force on Prevention of Nuclear Terrorism* (Lexington, MA: Lexington Books, 1987), pp. 59–60.

⁴ The term 'non-state actors' includes traditional, familiar terrorist organisations; paramilitary guerrilla groups fighting for control of territory; cults and other religious organisations; militias or other geographically fixed paramilitary groups; organised-crime syndicates; mercenary groups; breakaway units of a state's military, intelligence or security services; corrupt multinational corporations; and lone individuals.

⁵ See Graham T. Allison, Owen R. Coté, Jr., Richard A. Falkenrath and Steven E. Miller, *Avoiding Nuclear Anarchy: Containing the Threat of Loose Russian Nuclear Weapons and Fissile Material* (Cambridge, MA: Massachusetts Institute of Technology Press, 1996).

⁶ US Congress, OTA, *Proliferation of Weapons of Mass Destruction: Assessing the Risks* (Washington DC: US Government Printing Office, August 1993), p. 83.

⁷ The US stockpiled some 30,000 tonnes of chemical agent, which it is now incinerating at eight sites in the US and on Johnston Atoll in the Pacific Ocean. Russia has declared a chemical-weapons stockpile of 40,000t, but some estimates of its true size range as high as 200,000t. Russia has pledged to destroy the chemical-weapons stockpile it inherited from the Soviet Union, but this programme has been delayed by financial difficulties.

⁸ See 'W. German Terrorists Said to Test Bacteria', *International Herald Tribune*, 8–9 November 1980, p. 2.

⁹ Apart from the Nazi gas chambers, the most lethal chemical poisoning ever appears to be the arsenic poisoning of several thousand captive German SS soldiers outside Nuremberg in April 1946 by the Jewish reprisal organisation 'Nakam'. Members of the group infiltrated the bakery that supplied bread to the camp, spreading an arsenic-based poison on the loaves before they were delivered. Despite being forced to flee before they had finished, the group is estimated to have killed hundreds of prisoners and sickened thousands. See Michael Bar-Zohar, *The Avengers*, translated by Len Ortzen (London: Arthur Barker, 1968), pp. 43–58.

¹⁰ The pair had 0.7g of ricin in their possession. In February 1995, they were convicted under the US Biological Weapons Antiterrorism Act of 1989.

¹¹ See Brian Jenkins, 'Understanding the Link between Motives and Methods', in Roberts (ed.), *Terrorism with Chemical and Biological Weapons*, p. 46. Bruce Hoffman argues that this observation applies mainly to 'secular political' terrorists, not 'religious political' ones. See Hoffman, 'The Contrasting Ethical Foundations of Terrorism in the 1980s', *Terrorism and Political Violence*, vol. 1, no. 3, July 1989, p. 363.

¹² National Science Foundation, *Science and Engineering Degrees: 1966–94* (Arlington, VA: National Science Foundation, 1996), Table 1, p. 35.

¹³ See Erhard Geissler, 'Implications of Genetic Engineering for Chemical and Biological Warfare', in Stockholm International Peace Research Institute (SIPRI), *World Armaments and Disarmament: SIPRI Yearbook 1984* (London: Taylor & Francis, 1984), pp. 421–51; Malcolm Dando, "'Discriminating" Bio-Weapons Could Target Ethnic Groups', *Jane's International Defense Review*, March 1997, pp. 77–78; and US Department of Defense, *Advances in Biotechnology and*

Genetic Engineering: Implications for the Development of New Biological Warfare Agents (Washington DC: US Department of Defense, June 1996), available at www.acq.osd.mil/cp/biotech96.htm.

¹⁴ Likewise, with respect to physical traffic, 'huge increases in the volume of goods and people crossing borders and competitive pressures to speed the flow of trade by easing inspections and reducing paperwork make it easier to hide contraband'. See Jessica T. Matthews, 'Power Shift', *Foreign Affairs*, vol. 76, no. 1, January–February 1997, pp. 50–66.

¹⁵ See National Research Council, *Cryptography's Role in Securing the Information Society* (Washington DC: National Research Council, 1996).

¹⁶ Louis J. Freeh, 'The Impact of Encryption on Public Safety', statement before the Permanent Select Committee on Intelligence, US House of Representatives, Washington DC, 9 September 1997, available at www.fbi.gov/congress.

¹⁷ John Arquilla and David Ronfeldt, *The Advent of Netwar* (Santa Monica, CA: RAND, 1996), pp. 15–16, 43, 81–82.

¹⁸ US Department of State, *Patterns of Global Terrorism 1996* (Washington DC: US Department of State, April 1997), p. 1, available at www.state.gov/www/global/terrorism. The overall drop in the incidence of terrorism noted by the State Department results from the post-Cold War decline in left-wing, ideologically motivated terrorism and a marked drop in state-sponsored international terrorism.

¹⁹ US Department of Justice, Federal Bureau of Investigation, *Terror in the United States 1995* (Washington DC: FBI, 1996), available at www.fbi.gov.

²⁰ Bruce Hoffman, 'Terrorism and WMD: Some Preliminary Hypotheses', *Nonproliferation Review*, vol. 4, no. 3, Spring–Summer 1997, p. 47.

²¹ In 1968, none of the 11 identified

international terrorist groups was religiously motivated; in 1980, two of 64 were; in 1992, 11 of approximately 50. Data from the RAND–St Andrews University Chronology of International Terrorist Incidents, Centre for the Study of Terrorism, St Andrews University, Scotland.

²² See Bruce Hoffman, *'Holy Terror': The Implications of Terrorism Motivated by a Religious Imperative* (Santa Monica, CA: RAND, 1993) pp. 11–14.

²³ This thesis is developed and applied to Sikh religious violence in Mark Juergensmeyer, 'The Logic of Religious Violence', in David Rapoport (ed.), *Inside Terrorist Organizations* (New York: Columbia University Press, 1988), pp. 185–90.

²⁴ See Hoffman, 'Terrorism and WMD', pp. 48–49; Hoffman, 'The Contrasting Ethical Foundations', pp. 361–77; and Jenkins, 'Understanding the Link between Motives and Methods', p. 48.

²⁵ On the Khobar bombing, see US Department of State, Bureau of Diplomatic Security, *Significant Incidents of Political Violence against Americans 1996* (Washington DC: US Department of State, July 1997); US Congress, *Bomb Attack in Saudi Arabia*, Hearings before the Committee on Armed Services, US Senate (Washington DC: US GPO, 1997); and US Congress, *Terrorist Attack against United States Military Forces in Dhahran, Saudi Arabia*, hearings before the Committee on National Security, US House of Representatives (Washington DC: US GPO, 1997).

²⁶ See Stan Taylor, 'The Radical Right in Britain', in Peter H. Merkl and Leonard Weinberg (eds), *Encounters with the Contemporary Radical Right* (Boulder, CO: Westview Press, 1993), pp. 165–84; Ekkart Zimmermann and Thomas Saalfeld, 'The Three Waves of West German Right-Wing Extremism', in *ibid.*, pp. 50–74; William Safran, 'The National Front in France: From Lunatic Fringe to

Limited Respectability', in *ibid.*, pp. 19–49; Ehud Sprinzak, 'The Israeli Radical Right: History, Culture, and Politics', in *ibid.*, pp. 132–61; Vladislav Krasnov, 'Pamiat: Russian Right-Wing Radicalism', in *ibid.*, pp. 111–31; and Paul Wilkinson, 'Violence and Terror and the Extreme Right', *Terrorism and Political Violence*, vol. 7, no. 4, Winter 1995, pp. 82–93.

²⁷ See *ibid.*, p. 83; and Ehud Sprinzak, 'Right Wing Terrorism in a Comparative Perspective: The Case of Split Delegitimization', *ibid.*, vol. 7, no. 1, Spring 1995, pp. 17–43.

²⁸ See Martha Crenshaw, 'An Organizational Approach to the Analysis of Political Terrorism', *Orbis*, vol. 29, no. 3, Autumn 1985, pp. 473–87.

²⁹ For a detailed set of recommendations directed at the US government, see Richard A. Falkenrath, Robert D. Newman and Bradley Thayer, *America's Achilles' Heel: Nuclear, Biological and Chemical Terrorism and Covert Attack* (Cambridge, MA: Massachusetts Institute of Technology Press), pp. 261–336.

³⁰ For an excellent study of these issues, see Philip B. Heymann, *Terrorism and America: A Commonsense Strategy for a Democratic Society* (Cambridge, MA: Massachusetts Institute of Technology Press, 1998).

³¹ As a corollary to this, states should also not begin to retreat pre-emptively from their international commitments, even if these are sometimes the source of heightened terrorist risk, as some analysts, such as Richard K. Betts, have suggested. See Betts, 'The New Threat of Mass Destruction', *Foreign Affairs*, vol. 77, no. 1, January–February 1998, pp. 26–41.

³² On the US concern, see President Bill Clinton's 'Commencement Address', the US Naval Academy, Annapolis, MD, 22 May 1998. The text of this speech is available at www.pub.whitehouse.gov/

uri-res/I2R?urn:pdi://oma.eop.gov.us/1998/5/26/18.text.1.

³³ For an excellent analysis of initial US efforts in this area, see Jonathan B. Tucker, 'National Health and Medical Services Response to Incidents of Chemical and Biological Terrorism', *Journal of the American Medical Association*, vol. 278, no. 5, August 1997, pp. 362–68.

³⁴ Many national and international epidemiological-surveillance systems were allowed to decline in the 1980s, a period of misplaced optimism in the ability to manage infectious-disease threats. In the 1990s, these systems have struggled to cope with the emergence of

new infectious diseases (such as Ebola, AIDS, Lyme disease, Legionnaires' disease and the hanta virus), the massive resurgence of familiar diseases (such as cholera, malaria, yellow fever, diphtheria and tuberculosis), and increasing bacterial resistance to antibiotics. See National Science and Technology Council, Committee on International Science, Engineering, and Technology (CISSET), Working Group on Emerging and Re-emerging Infectious Diseases, *Global Microbial Threats in the 1990s* (Washington DC: The White House, 1996), available at www.whitehouse.gov/WH/EOP/OSTP/CISSET/html/ciset.html.