Essay 5. *Weapons of mass disruption?*

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Introduction

On 11 September 2001 terrorists deliberately flew three aircraft into the World Trade Center in New York City and into the Pentagon, across the river from Washington, DC. These unprecedented terrorist attacks radically altered security perceptions in several ways. First, democracies throughout the world now perceive an increased vulnerability to aggression, particularly because the terrorists exploited the openness of these societies to plot their attacks. Second, rather than a massive strike involving sophisticated weaponry, the main threats may consist of unexpected and unpredictable attacks carried out with relatively unsophisticated means but with terrible consequences for the targeted society. Third, a national security posture that is based on passive defensive measures and mitigating the consequences of an attack may offer citizens and critical infrastructure too little protection too late.

Non-conventional weapons, in particular, are cause for extra concern in this new threat environment. They include biological, chemical, nuclear and radiological agents and their delivery systems.[1] Nuclear weapons have the greatest potential for large-scale destruction, but they may still be beyond the reach of terrorist organizations. The other categories possess the potential to cause massive destruction or casualties, but such outcomes of their use are not the most probable scenarios.[2] However, in the case of the use of radiological weapons, which involves the dissemination of radioactive particles by means of the detonation of explosives (so-called dirty bombs), remediation may require the demolition of contaminated buildings and other infrastructure. Chemical and biological (CB) agents have been used in several terrorist attacks, such as the ones with the nerve agent sarin carried out by the Japanese religious cult Aum Shinrikyo in Matsumoto and Tokyo in 1994 and 1995, and the mailing of letters contaminated with anthrax spores to leading members of the US Congress and media in the wake of the 11 September attacks.[3] The anthrax attacks demonstrated that mass casualties need not result even if terrorists use one of the potentially most lethal agents and prepare it in a sophisticated way. However, the psychological impact of a terrorist attack with CB agents is amplified because of their insidiousness, and their use may cause long-lasting disruption of social and economic activities with effects reaching far beyond the immediate area of attack.

Consequences of the use of CB materials

In contrast to the type of terrorism experienced on 11 September, the use of CB agents would not necessarily be an act of sudden violence. There would be a delay between the release of the agent and the contamination of the target and a further

[1] See also chapters 15 and 16 in this volume.

[2] Zanders, J. P. *et al.,* 'Risk assessment of terrorism with chemical and biological weapons', *SIPRI Yearbook 2000: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2000), p. 559.

[3] Zanders, J. P., Hart, J. and Kuhlau, F., 'Chemical and biological weapon developments and arms control', *SIPRI Yearbook 2002: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2002), pp. 696–703.

delay between contamination and the appearance of the symptoms of poisoning or infection. These delays could range from minutes to days to months depending on the type and quality of agent used, the proximity of the victim to the source of contamination, the received toxic or infectious 'load' and the environment in which the agent had been released (open or closed space, presence or absence of physical barriers in the path of the agent, amount of wind, degree of humidity, etc.). In most cases, CB agents act insidiously. For certain agents the victims could remain unaware of exposure until much later, when the effects would be irreversible. Characteristically, following an initial phase of few and possibly isolated casualties, the number of cases would rise to a peak and then gradually decrease in number. The time intervals are usually shorter for exposure to chemical than biological agents.

Critical resources—such as emergency, health and law enforcement agencies—could be tied up for long periods of time because of these delays. In addition to the victims, large groups of other people (e.g., co-workers, family members and those in the vicinity of the incident) could be exposed to the after-effects of the agents and required to take preventive medication. Economic activities could also be seriously impeded due to the need to identify and contain the source of contamination and possibly decontaminate the area where the attack occurred. Almost invariably, an attack utilizing CB materials would be followed by copycat attacks or hoaxes, further tying up critical resources.

Terrorist attacks with CB agents have hitherto been treated as criminal cases (despite the 'war on terrorism' rhetoric). The goal of a criminal investigation is to identify the perpetrator of the attack and to build a case for successful prosecution. As was demonstrated in the attacks using anthrax-contaminated letters, these requirements may test the limits of the current understanding of the structure of such agents and their behaviour after dissemination and physiological impact. Criminal investigations tend to be a slow process, which is at odds with the need for a swift response. The desire to avoid additional casualties and the approach to dealing with the consequences of a terrorist attack with CB agents create a fundamentally different situation from the management of the use of chemical and biological weapons (CBW) on the battlefield. For instance, the clean-up operations in the buildings that were contaminated with anthrax spores were hampered by lack of consensus about what constitutes a safe environment following decontamination. As a consequence, the Hart Senate Office Building remained closed for months; 18 months after the attacks the Brentwood Mail Processing and Distribution Center in the District of Columbia had still not reopened.

Terrorism with toxic materials

Terrorism can also be effected with impure military-type agents (e.g., Aum Shinrikyo's sarin attacks) or toxic industrial and commercial chemicals. If used for such purposes, several high-risk industrial chemicals—including ammonia, chlorine, hydrogen chloride, phosgene and sulphur dioxide—would escape as gases and have relatively high toxicity when inhaled. Important elements in calculating risk include whether a potential CB agent can be produced, stored and transported in large volumes. Chemical production and storage sites are often located near housing areas, and the potential for sabotage of these industrial facilities is a major concern. Past accidents in the chemical industry point to the potential seriousness of such an event. The worst industrial accident yet to occur took place on the night of 2–3 December 1984

when the Union Carbide pesticide plant in Bhopal, India, released approximately 40 tonnes of methyl isocyanate into the atmosphere.[4] The vapour spread 8 kilometres downwind over a city of 900 000 inhabitants. An estimated 2000 people were killed immediately and 1500 more died in subsequent months. In addition, 100 000–300 000 people were injured. Over a decade later, an estimated 50 000 people remained partially or totally disabled. The disaster, which was the result of a combination of legal, technological, organizational and human errors, also caused significant damage to crops and livestock—some 7000 animals perished. Half of the population fled Bhopal in a haphazard and uncontrolled evacuation.[5]

Not all such incidents would exact a toll on the scale of Bhopal. However, psychological trauma, economic repercussions and loss of confidence in the political authorities could result from a terrorist strike against a site where toxic chemicals are manufactured, stored or used. On 10 July 1976, following an explosion at the ICMESA chemical plant in Meda, Italy, a small town about 20 km north of Milan, the contents of a reactor containing primarily 2,4,5-trichlorophenol as well as 250 grams of the extremely toxic industrial by-product TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin) were discharged into the atmosphere.[6] The cloud contaminated a densely populated area of about 6 x 1 km, and the neighbouring town of Seveso was most affected. The disaster had a particularly traumatic effect on the local population, not least because of inadequate information and faulty communication strategies. Within days people began to develop skin rashes (burns) because of exposure to 2,4,5-trichlorophenol; four days after the explosion livestock poisoned by the dioxin started dying. The people living closest to the factory were evacuated and vegetables, fruits and livestock in the contaminated area had to be destroyed. There were almost 200 cases of chloracne (an eruption on the skin following exposure to chlorine or its compounds), and the accident has had undetermined long-term health and environmental consequences. Some 70 000 animals had to be destroyed, and a lengthy operation was required to remove the dioxin-contaminated soil in the stricken area.[7]

Depending on its goals, terrorism with industrial toxicants can also take place on a much smaller scale. In July 2001, 153 workers, who had been laid off from the chemical firm Cellatex in the northern French town of Givet, poured some 5000 litres of sulphuric acid into a tributary of the Meuse River in order to force the French Government to agree to their demands regarding severance pay and unem-

[4] Methyl isocyanate (MIC) is an intermediate in the production of the agricultural pesticides carbaryl and aldicarb. MIC is produced by reacting phosgene with monomethylamine. Kalra, R., Henderson, G. V. and Raines, G. A., 'Contagion effects in the chemical industry following the Bhopal disaster', *Journal of Financial and Strategic Decisions*, vol. 8, no. 2 (summer 1995), p. 2.

[5] Patel, T., 'Bhopal disaster in India and trade aspects', *TED Case Studies*, vol. 5, no. 1 (Jan. 1996), URL <http://www.american.edu/projects/mandala/TED/bhopal.htm>; Shrivastava, P., 'Long-term recovery from the Bhopal crisis', ed. J. K. Mitchell,, *The Long Road to Recovery: Community Responses to Industrial Disaster* (United Nations University Press: Tokyo, 1996), available at URL <http://www.unu.edu/unupress/unupbooks/uu21le/uu21le00.htm#Contents>; and US Chemical Safety and Hazard Investigation Board, 'Bhopal disaster spurs US industry, legislative action', URL <http://www.chemsafety.gov/lib/bhopal01.htm>.

[6] TCDD is also a breakdown product of Agent Orange—a 50/50 mixture of two herbicides: 2,4,-D (2,4, dichlorophenoxyacetic acid) and 2,4,5-T (2,4,5 trichlorophenoxyacetic acid). Agent Orange was a widely used defoliant in the Viet Nam War in the 1960s. TCDD has been implicated as the causative agent of various symptoms suffered by US veterans and by Vietnamese people who were exposed to the defoliant.

[7] Hay, A., *The Chemical Scythe: Lessons of 2,4,5-T and Dioxin* (Plenum Press: New York, 1982), pp. 197–227; and De Marchi, B., Funtowicz, S. and Ravetz, J., 'Seveso: a paradoxical classic disaster', ed. Mitchell (note 5).

ployment benefits. The workers threatened to discharge another 51 000 litres into the river. Firefighters were quickly able to control the spread of the acid before it flowed into Belgium and were aided by the fact that the strikers had added a colourant to the toxicant. The French Government partially agreed to the demands (the strikers had threatened to blow up the factory, which also stored carbon disulphide and soda), which led to discussion of whether a government should give in to terrorist threats to carry out attacks.[8]

Small-scale attacks with commercially available poisons, as in the case of food tampering or acid attacks against individuals or property, are often associated with single-issue groups (such as extremist environmentalists or animal rights activists), disgruntled employees or members of radical groups. High-grade chemical agents have been used in assassinations.[9]

Terrorist attacks with biological agents

In 1984 the Rajneesh cult used a common agent, salmonella, to incapacitate a large number of people in order to prevent them from participating in a local election in Oregon. There are few other known attempts of using disease to attain terrorist goals. With the exception of the anthrax-contaminated letters sent to members of the US Congress and media in 2001 none of them appears to have been primarily directed against humans. During the Mau Mau uprising in Kenya in 1952 toxin from the African milk bush was used to kill cattle. In addition, in several cases Palestinian organizations have contaminated Israeli fruit exports with CB agents. Other incidents are believed to have been committed by criminals. Since 1998 the US Justice Department and the Federal Bureau of Investigation have recorded a significant increase in the number of 'events' (including hoaxes and threats) involving non-conventional agents, many of which were biological in nature.

The increasing appreciation of the obstacles faced by terrorists seeking a biological means to create mass casualties has prompted analysts to investigate new forms of terrorism with disease-causing agents. Other factors that have influenced the change of focus include the observation that 'traditional' terrorist organizations have shifted their efforts from killing people to attacking economic targets; awareness of the damage done by recent serious outbreaks of epidemics among farm animals—foot and mouth disease (FMD), bovine spongiform encephalopathy (BSE or 'mad cow disease'), various forms of swine fever, and so on—and their economic impact; and the information that, until recently, some countries may have conducted offensive anti-agricultural biological weapon programmes.

The purpose of anti-agricultural warfare is to undermine and destroy the economic progress and stability of an adversary. The possible consequences of terrorism with biological agents against agricultural targets are difficult to gauge. The debate on this subject is still in the initial phase and, as in the case of earlier catastrophic casualty scenarios for terrorism involving CBW, analysts tend to focus on the limits of what is technically feasible and on detailing all possible vulnerabilities in democratic and industrialized societies. Two points feature prominently in such

[8] Mathiot, C, 'Les employés de Cellatex déversent leur détresse' [The employees of Cellatex spill their distress], *Libération* (Internet edn), 18 July 2000, URL <http://www.liberation.fr/quotidien/semaine/20000718/18mara.html>; and Cué, E., 'Ecoterrorism as negotiating tactic', *Christian Science Monitor* (Internet edn), 21 July 2000, URL <http://www.csmonitor.com/durable/2000/0721p8s1.htm>.

[9] Zanders *et al.* (note 2), pp. 543–45.

assessments: the importance to a country's gross domestic product of agriculture and other economic activities that are dependent on agricultural production (e.g., transport and distribution); and the economic impact of outbreaks of highly infectious diseases. The latter includes the loss of or damage to livestock and crops, the cost of efforts to contain outbreaks and the effect on international commerce of trade restrictions imposed because of health concerns. These costs may, in turn, contribute to the destabilization of the social and political structures of a society. Developing countries whose economies depend largely on a single food crop or type of livestock and countries with a weak institutional or social fabric may be particularly vulnerable.

Analyses of known military programmes have shown that attacking livestock and crops with biological agents is considered to be less technically demanding than attacking humans. Several potential anti-crop or anti-livestock agents are non-zoonotic (i.e., cannot be transmitted to humans from animals) and therefore pose a limited risk or none at all to the perpetrators. Moreover, the technical obstacles to weaponization (i.e., preparation to deliver as a weapon) are limited, and many dissemination devices are commercially available. In addition, security is low at many potential sites for agent release, such as pastures and fields, livestock auction houses and the chain of distribution from producer to consumer of seeds, fertilizers, pesticides and fodder. The agricultural sector in general is less protected than other industrial or economic entities. In addition, obtaining strains of non-zoonotic pathogens is relatively easy because fewer controls monitor micro-organisms that only infect plants or livestock, and they are easier to cultivate than human pathogens. Finally, because terrorism with biological agents against agricultural targets primarily seeks to disrupt economic activities, moral barriers to such actions may be low and the potential loss of support for the group may be limited. Taken together, these factors may encourage terrorist organizations or individuals to use biological agents for terrorism.

Dissemination technology

The upper limits of the damage caused by a terrorist act with chemical or biological agents can be estimated. However, the question remains whether the level of technology would constrain a terrorist entity from dispersing the agent available to it or whether it instead would select a dissemination technology that would produce the level of damage or disruption corresponding to its goals. The array of options is extremely wide. Terrorists could consider a complex method such as the use of crop dusters or unmanned aerial vehicles to spray agents over large areas. Commercial spray equipment, however, may be unsuited for the optimal dissemination of CB agents.[10] On the other hand, the dissemination technology could be as simple as pouring a pathogen on to food in restaurants, puncturing plastics bags filled with a nerve agent, releasing a toxicant from storage tanks into a river, throwing a caustic agent at a victim or tampering with food products by injecting foreign material into them. These examples illustrate the constraints that technology imposes on what can be achieved. However, if a terrorist were to resort to a highly infectious non-zoonotic pathogen such as FMD, simple dissemination devices would be adequate to cause major economic harm or disruption. (In order to achieve similar results with plant pathogens a more sophisticated device would be needed because such pathogens are highly dependent on environmental conditions.)

[10] Zanders, Hart and Kuhlau (note 3), pp. 702–703.

In search of balanced policies

The attacks of 11 September and the anthrax-contaminated letters sent following them increased the Western world's sense of vulnerability to indiscriminate mass-casualty terrorism. Despite the difference in scale, both events demonstrated the potential for widespread social and economic disruption. The past focus of many experts on terrorism involving CBW emphasized the potential to cause large numbers of casualties. The probability of that occurring remains low because of the technological challenges involved in the development, manufacture and dissemination of CB agents, and the demands these challenges place on the organizational structure of the terrorist entity. However, in addition to causing human casualties, acts of terrorism can be intended to sabotage or disrupt the economy. A wide variety of industrial chemicals (ranging from highly poisonous substances to oil) could easily be employed by single-issue groups, criminals and loosely structured organizations. Such chemicals could be released into the environment with little prior preparation (e.g., by damaging storage tanks) for purposes of economic sabotage or blackmail by threatening environmental destruction. Similarly, biological agents could be used to cause large-scale economic disruption because they can be employed to infect livestock or destroy crops. Owing to the time needed for an animal or plant disease to develop, such an attack would inevitably extend over a prolonged period of time. The demand for containment, remediation and compensation would involve both local and national authorities. The economic damage would not be limited to the destruction of livestock or crops but would also affect other enterprises that depend on agricultural activities and international trade. Communities that depend on monocultures for their livelihood are particularly at risk.

The range of possibilities is extensive, and it is obvious that no government can be prepared to deal with all contingencies. The issues involved for governance are of a complexity comparable with the cold war challenge of protecting civilians against the aftermath of nuclear war—with the difference that the consequences of terrorist attacks would have to be dealt with in a 'peacetime' environment. The measures to be taken in order to prevent acts of terrorism, protect people and infrastructure, and deal with the consequences of a terrorist attack must be designed and executed in such a way that they cause the least disruption to economic and social activities. Such measures must also avoid compromising the fundamental organizing principles of a society.

The debate on policy responses to terrorism involving CB agents has mostly revolved around pre-emption and management of the consequences of such an attack. The undifferentiated application of the label 'weapon of mass destruction' to any type of chemical or biological agent and the implicit focus on the outcome of the use of such agents conjure up images of mass casualties. In this view, terrorism involving CB agents is a matter of if, not when. The enormity of the prospect of such a catastrophic event and its aftermath nourishes misguided assumptions about state sponsorship of terrorists. It leads to a belief that massive national resources must be mobilized to address the threat and its consequences, as if the country were in a state of war. In contrast to these dark visions, all known terrorist attacks involving CB agents have produced relatively few casualties and fewer fatalities.

Since it is impossible to identify the targets before an attack, terrorism involving CB agents strikes at society as a whole. The perpetrators may be domestic or foreign, and they can select from a wide range of agents and means of delivery, many of which are easily obtainable in industrialized and scientifically advanced

societies. Given the uncertainties and the wide range of plausible scenarios, it is appropriate to identify generic and cost-effective countermeasures, which can also contribute towards improving the health and safety standards of a society. Such measures include investment in the health infrastructure so that there is a good regional distribution of emergency wards and a spare capacity of hospital beds. It may be sound policy to establish a number of specialized laboratories in hospitals throughout the country for quick identification of toxicants and rare pathogens so that first responders and other emergency personnel can quickly be given information about the nature of the contamination or infection. Annual refresher and training courses for doctors and other medical staff can be used to familiarize them with unusual diseases in order to improve their ability to make rapid and accurate diagnoses. Compatible means of communication for the various emergency services and adequate field detection and diagnostic equipment for civil emergency units are also needed, as are sufficient supplies of medication and equipment. Recurring realistic exercises must be conducted in order to test and improve procedures and equipment.

Legal and political instruments that are developed and implemented before an act of terrorism involving CB agents occurs constitute a second group of generic, cost-effective measures. Anti-terrorism provisions in national criminal law should be based on the general purpose criterion (GPC) in Article I of the 1972 Biological and Toxin Weapons Convention (BTWC) and Article II of the 1993 Chemical Weapons Convention (CWC). The GPC basically prohibits the manipulation or possession of pathogens, toxins and poisonous substances for purposes that are not explicitly permitted by either convention. The GPC could be incorporated into the parts of national legislation which make the prohibitions in the international conventions applicable to natural and legal persons on the territory or under the jurisdiction of a state party or it could become part of criminal law. This would enable law enforcement authorities to apprehend terrorists or criminals before they have committed a criminal act on the grounds that the possession of CB agents or equipment cannot be justified under the BTWC and the CWC. (Despite the lack of an equivalent treaty, the principle of the GPC could be applied to radiological weapons, too.) Ideally, states will coordinate their legislation with each other—especially in the framework of political, economic or regional security arrangements—so that terrorists cannot exploit the legal weaknesses of one country in order to prepare attacks against targets in another country. Through international cooperation under the BTWC and the CWC, programmes can be set up to assist parties to the conventions in drafting adequate national legislation.

It is also important for civilian authorities to realize that the military standards for CB decontamination differ fundamentally from those required in a civilian setting. Military standards for decontamination are governed by operational necessity on the battlefield, and under certain circumstances military commanders have to accept CB casualties. There is no such tolerance for casualties in civil society. However, if the civilian standards are set at unnecessarily low levels or, worse, no commonly accepted levels have been adopted, the normalization of activities after a terrorist attack would be considerably delayed and cause more social disruption and economic loss than the attack itself.

In summary, while it is necessary for policy makers to sufficiently prioritize the threat posed by terrorism involving CB agents, it is equally important not to excessively dramatize the threat and, especially, the consequences of hypothetical events. Governments and public authorities can take wide-ranging preventive meas-

ures against terrorism involving CB agents without resorting to mass mobilization of national resources as if the country were waging total war (e.g., the mass vaccinations in the USA against smallpox and anthrax[11]). Such measures are generic and cost-effective. Moreover, they are not 'dead investments': society will benefit from the improvements to the health and emergency infrastructure and procedures, which can also be utilized in the event of natural disasters or major industrial accidents (although certain aspects will necessarily be specific to terrorism involving CB agents). However, it is important for governments and public authorities to realize that countermeasures and preventive measures must be taken before a terrorist incident involving CB agents occurs and that such preparations take several years before they achieve maximum effectiveness. Governments and parliaments have a responsibility to act now in order to be prepared to meet the potential threat.

[11] See also chapter 16 in this volume.