Terrorism and Weapons of Mass Destruction

Responding to the challenge

Edited by Ian Bellany

Routledge
Taylor & Francis Group

Terrorism and Weapons of Mass Destruction

There is a widely held belief in the imminent probability of nuclear, chemical or biological weapons of mass destruction being used by terrorists against civilian targets. This edited volume critically assesses the suggestion that one safeguard against this possibility would be to strengthen existing international prohibitions against state-level acquisition of such weapons.

A glimpse of the possible potential of terrorist use of weapons of mass destruction has been seen through the actions of the Tokyo Aum group, and through the use of chlorine by insurgents in Iraq. However, the extent of the real threat posed is as yet unclear, and safeguarding against it in developing countries will not be easy. This book assembles specialists in each category of WMD in order to examine the potential of expanding the three 'classical' arms control treaties in order to combat the threat posed by smaller terrorist groups, and draws conclusions as to the strengths and weaknesses of this suggestion.

This book will be of interest to students of International Relations, Security Studies and Terrorism Studies.

Ian Bellany is Emeritus Professor of Politics at Lancaster University. He has written or co-written a total of ten books on aspects of international security.

Routledge global security studies
Series editors: Aaron Karp, Regina Karp and Terry Terriff

1 Nuclear Proliferation and International Security
Sverre Lodgaard and Morten Bremer Maerli

2 Global Insurgency and the Future of Armed Conflict
Debating fourth-generation warfare
Terry Terriff, Aaron Karp and Regina Karp

3 Terrorism and Weapons of Mass Destruction
Responding to the challenge
Edited by Ian Bellany

4 Globalization and WMD Proliferation
Edited by James A. Russell and Jim J. Wirtz

5 Power Shifts, Strategy and War
Declining states and international conflict
Dong Sun Lee

Terrorism and Weapons of Mass Destruction

Responding to the challenge

Edited by Ian Bellany

Routledge
Taylor & Francis Group
LONDON AND NEW YORK

First published 2007
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

Simultaneously published in the USA and Canada
by Routledge
270 Madison Ave, New York, NY 10016

This edition published in the Taylor & Francis e-Library, 2007.

Routledge is an imprint of the Taylor & Francis Group, an informa business

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging in Publication Data
A catalog record for this book has been requested

ISBN 0-203-93753-8 Master e-book ISBN

ISBN10: 0-415-41714-7 (hbk)
ISBN10: 0-203-93753-8 (ebk)

ISBN13: 978-0-415-41714-3 (hbk)
ISBN13: 978-0-203-93753-2 (ebk)

Contents

Contributors

Ian Bellany is Professor Emeritus of Politics at Lancaster University. He has written extensively on questions of international security and arms control and has helped pioneer formal modelling approaches on this side of the Atlantic. His most recent book is *Curbing the Spread of Nuclear Weapons* (Manchester University Press, 2005).

Daniel Feakes is a Research Fellow with the Harvard Sussex Program at SPRU – Science and Technology Policy Research, University of Sussex. He spent three years working as the Program's researcher in the OPCW. He has published widely on issues relating to chemical and biological weapons. His co-edited book (with R. Kenyon) *The Creation of the Organisation for the Prohibition of Chemical Weapons* (TMC Asser Press) came out in 2007.

Stephen M. Francis has worked in the UK nuclear industry for over 20 years. His work is primarily in the field of nuclear materials accountancy at UK nuclear installations and the development of international nuclear safeguards strategy. He spent a period as an UNSCOM weapons inspector in Iraq and acted as a consultant to the International Atomic Energy Agency. He has written extensively on international nuclear safeguards.

D. Marc Kilgour is Canadian and Professor of Mathematics at Wilfrid Laurier University and Adjunct Professor of Systems Engineering at University of Waterloo. He is also Research Director: Conflict Analysis at the Laurier Centre for Military Strategic and Disarmament Studies. He is the author of several books including, with Frank Zagare, *Perfect Deterrence* (Cambridge University Press, 2000).

Ron G. Manley is Visiting Professor at the Defence Academy, Cranfield University, UK. He was formerly Director of the Verification Division of the Organisation for the Prohibition of Chemical Weapons. His recent publications include contributions to *The Creation of the Organisation for the Prohibition of Chemical Weapons* (eds R. Kenyon and D. Feakes: TMC Asser Press, 2007) and *Global Non-proliferation and Counter-terrorism* (eds O. Bosch and P. van Ham: Brookings Institution Press, 2007).

Ian Reader is Professor of Japanese Studies at the University of Manchester. He researches on religion in Japan, and on the relationship between religion and violence. His publications include *Religious Violence in Contemporary Japan: The Case of Aum Shinrikyo* (University of Hawaii Press and Curzon Press, 2000).

Nicholas A. Sims is Reader in International Relations at the London School of Economics. He is a leading authority on biological weapons and on legal constraints on their possession and use, and has written widely in the area. His most recent book is *The Evolution of Biological Disarmament* (Oxford University Press, 2001).

Edward M. Spiers is Professor of Strategic Studies and Pro-Dean of Research (Arts Faculty) at the University of Leeds. He is a leading authority on chemical warfare and has written widely on military history and strategic studies. His most recent book is *Weapons of Mass Destruction: Prospects for Proliferation* (Macmillan, 2000).

Acknowledgements

Three sorts of acknowledgement are called for here. The first is to those people from official and non-official backgrounds who attended the conference in Lancaster in 2006 and gave so generously of their expertise and ideas, much of which has found its way into the chapters of this book.

The second is to the United States Institute of Peace. Their financial support made this work possible at what was a difficult time.[1]

Finally, to Routledge Journals for permission to reproduce text and diagrams from Ian Bellany 'Terrorism: Facts from Figures', *Defence and Peace Economics*, 18 (2), April 2007.

Note

1 The opinions, findings, and conclusions or recommendations expressed in this work are those of its authors and do not necessarily reflect the views of the USIP.

Introduction

It is difficult to find anyone who takes a close interest in such things who does not believe that a terrorist group will sooner or later use weapons of mass destruction (chemical, biological, nuclear or radiological) in pursuit of casualties on a par with those of '9/11'. So far this has not quite happened, but there are straws in the wind. In 1995 the Japanese Aum group used a few kilograms of a very sophisticated poison gas (sarin) in a very amateurish way to produce only a handful of deaths. In 2007 one of the Iraqi insurgent groups exploded a road tanker carrying ten tonnes of chlorine – a very crude gas – and again produced only a handful of deaths. In both instances, however, there were hundreds of injuries – casualties involving persons who may or may not have been exposed to sub-lethal doses of the gas. So it is possible that the actual psychological impact of the two identified uses on their intended targets may have been much greater than the simple death totals imply. But sooner or later, it is widely believed, a terrorist group will be able to match its competence in acquiring the weapon of mass destruction with competence in its employment, pushing death totals into the hundreds or thousands and creating numbers of casualties perhaps fiftyfold greater than that.

The thrust of the present volume is critically to assess the suggestion that one thing that may be done to head off such an eventuality is to enlarge the footprint of the three existing arms control treaties restricting state-level access to weapons of mass destruction, to cover sub-state actors. There are three such 'classical' arms control treaties, in order of signature: the Nuclear Non-proliferation Treaty (NPT); the Biological Weapons Convention (BWC); and the Chemical Weapons Convention (CWC). It is fair to say that contributors take a position of qualified scepticism on the footprint issue largely on the basis that, whatever the practical considerations might be, and these would seem to be clearly positive at least in the case of the NPT, the fly in the ointment is the US political position. Since the end of the Cold War the unchallenged military and economic strength of that country has tempted it away from multilateral approaches to security problems, such as classical arms control, towards unilateral action. Even if this were to prove temporary, some feel, like the lady whose honour has been impugned in public, classical arms control may not be able to recover its reputation.

This summary of course tramples on the nuances characteristic of the chapters that follow, the most important perhaps being discussions of the updating of the BWC – a problem originally quite distinct from the terrorism issue.

The book is divided into three sections. The first is general with a general chapter, and a detailed case study of Aum where the particular must stand for the general. The second deals with chemical and biological weapons together, but with the troubled process of updating the BWC never far off centre stage. And the third deals with nuclear weapons and less directly radiological weapons (e.g. 'dirty bomb'), with a focus on the question of inspection, including a formal discussion of the process of inspection which in itself shows that extending the footprint even of the NPT is not a purely mechanical matter.

In his general chapter Bellany attempts, using a variety of techniques from data analysis to the exploration of analogies, to say something about terrorist use of weapons of mass destruction ahead of any significant actual history of use. This is swimming against the tide, but the example of insightful scholarly treatment of nuclear weapons and their impact on international relations against a similar background of almost no actual use is encouraging.

Whilst the chapter is in many ways introductory, especially in the section exploring the kinds of weapons of mass destruction (WMD) probably attractive to terrorists, and their relative ease of manufacture/acquisition and use, it nonetheless reaches a number of conclusions.

First it suggests that at least as large an obstacle to terrorist use of WMD as actually obtaining the weapon in question is devising a satisfactory means of disseminating it against the target. The only exception to this rule or rather the second part of it (obtaining a nuclear weapon is difficult) is a nuclear weapon, even a badly designed nuclear weapon with a very low yield.

Second an examination of trends in international terrorist use of conventional weapons demonstrates that the new terrorism thesis as usually stated that terrorists are going in for more casualties is incorrect. The average number of casualties per lethal terrorist incident has remained remarkably steady at around five dead for almost 40 years. But what has changed over time is a growing preference for death-dealing incidents over, for instance, hijackings or bombings with warnings attached. In addition it transpires that the proportion of death-dealing incidents killing more than a certain number of people is fixed, so as the number of these incidents accumulates, the number of very lethal incidents will increase too. Moreover the sorts of terrorist groups associated with very lethal incidents tend, as far as may be imperfectly judged, to be of a religious kind. Extrapolating from particularly destructive conventional modes of attack to weapons of mass destruction is not a very large step.

Finally and more tentatively it seems possible that predicting what sorts of WMD may be attractive to the terrorist depends on a principle of least effort. A great deal of effort would normally be necessary to come up with a working nuclear weapon but very little would be involved in stealing a road tanker carrying ten tonnes of chlorine. The latter is therefore more probable than the former. Maintaining the proportionality between a high degree of effort and the

destructive potential of the WMD in question can then be a guiding principle for counterterrorism political action. Thus an extension of the remit of the Nuclear Non-proliferation Treaty to reduce the chances of simple transfer of a nuclear weapon from a pariah state to a terrorist group makes sense. Similarly the Chemical Weapons Convention and the Biological Weapons Convention by eradicating at least in principle all state stocks of weapons (but see Manley's chapter) reduces the chances of theft or transfer short-circuiting the principle of least effort.

But it is easy to underestimate the political difficulties of any formal move to extend the remits of existing arms control treaties negotiated at state level to help tackle the terrorist problem, as subsequent chapters show.

Reader raises a number of points that need serious consideration. The first relates to the interesting question whether the Aum experience taken as a whole indicates the ease or the difficulty of a terrorist group making and using WMD, and chemical and biological weapons in particular (they had some interest in nuclear weapons but this was never pushed very far). Aum was well funded and by the peculiarity of its circumstances remarkably free from the attentions of the authorities. It also attracted to its ranks well-educated followers some of whom had more or less relevant university-level training in chemistry and biology. The choice of sarin as the agent with which they eventually hoped to make a big impact seems quite logical, and some of their earlier planning on how to disseminate it (always the hardest part according to Bellany) showed thoughtfulness. On the other hand there was a tendency not to concentrate effort but to flirt with other possibilities such as botulism and even the ebola virus, to say nothing of their eccentric interest in Tesla's ideas on artificially produced earthquakes. This might have been some sort of safeguard against the sarin plans going wrong, but in view of the restricted amount of scientific expertise at their disposal looks more like a mistake. Reader moreover makes it clear that simple incompetence was never very far below the surface so that sufficient attention was not always paid to the purity of the sarin produced, for instance, and the dissemination method chosen for the attack on the Tokyo underground, perhaps done in too much of a hurry, breaks every law in the book, not least the fact that sarin evaporates at about the same rate as water, making large shallow pools infinitely more dangerous to those exposed than plastic bags with small holes punched in them.

In normal circumstances of alert authorities unafraid to act, this tendency to incompetence might have meant that Aum's plans would have been thwarted at a very early stage. The unusually permissive circumstances under which Aum operated makes it particularly hard to generalise from their experience with regard to the question posed above about the difficulties facing terrorist groups in general in acquiring and using WMD.

Reader makes the further point with regard to Aum and to certain other groups concerning a tendency to use WMD as soon as the weapons have become available. This makes sense in the context of millenarian groups who like Aum are not interested in deterrence (do not do it – or else) or compellence (do it – or else) but

more in punishing the evil doers that are seen to be pressing in around it. This corresponds roughly too with findings reported by Bellany correlating particularly severe incidents of terrorism with religious groups. A group interested in compellence for example might use limited amounts of violence to signal a capability for greater use later if its demands were not met.

But matters are not quite so straightforward. Certainly in the case of sarin, Aum's main weapon, there may be practical reasons for using it immediately, especially if the chemical is impure. Even with sarin of professional levels of purity, so to say, its keeping qualities are not always to be relied on, which is one reason why US forces during the Cold War increasingly stockpiled nerve gases not in the form of the finished article but as so-called binary chemical components which reacted to produce the gas only at the moment of actual use in war.

Whilst Al Qaeda may be a religious group and perhaps comparable with Aum both in the scale of resources available to them and in their skill at finding safe havens remote from the attention of the authorities, in other respects the fit is not good. For one thing, according to Bellany, Al Qaeda have expressed an interest in deterrence as far as WMD are concerned. And second although they are also interested in causing large casualties *tout court* – even if the numbers killed in the World Trade Center attack may have exceeded their private expectations – they have a characteristic of patience, willing to trade an interval between attacks for an effective blow when it comes. It would be more in keeping with their style in a matter such as sarin to spend time perfecting the production process so as to give the product an appreciable lifetime or in setting up parallel laboratories so as to permit multiple near simultaneous attacks to be made.

Whilst not a recommendation to read his chapter from back to front, Spiers's references are an education in themselves and it is hard to see how a better case could have been made using secondary sources for the proposition that the chances of stretching the modalities of inter-state arms control to cover the threat of terrorist access to WMD are very slight. This is a strategic, not tactical, matter in the sense that the USA has lost faith in non-proliferation regimes in favour of more unilateral and hence less diplomatic approaches to the proliferation of WMD whether at the inter-state or lower levels. He acknowledges that this may possibly be a temporary thing, and indeed most disinterested observers must remain deeply puzzled at the refusal of the Senate to ratify the comprehensive test ban treaty, but Spiers speaks of the presence of a sort of action/reaction, where the new US attitude, reaching back since before the election of G.W. Bush, has provoked a suspicion of the USA amongst its natural allies which might itself prove an obstacle to a future sea change in US attitudes.

Wittingly or not Spiers also gives a very clear account of how shakily based are most appraisals of the extent of the terrorist threat, especially with regard to WMD. There is a strong tendency to exaggeration, which must be partly due to an arguable underestimation of the same thing prior to '9/11', partly to inadequate intelligence and hence resort to 'worst case' theorising, and partly deliberate in order better to marshal a largely ignorant public opinion. For instance, even reputable New York press accounts of what was found in Afghanistan

relating to Al Qaeda work on WMD exaggerated its significance almost beyond parody. Another example coming out more clearly perhaps in Feakes is the attribution to terrorist groups of skills with regard to manipulating in particular biological weapons far beyond their reach. It is possible that slipping standards of education in the sciences may have something to do with this. It is all very reminiscent of the Cold War and periodic US attribution of immense military prowess to the Soviet Union on the slightest evidence.

The question is an important one since a large threat presumably calls for a large response and in such a context the NPT, CWC and the BWC might certainly appear old fashioned and not up to the task. But if the threat is a small one existing non-proliferation instruments may as a practical matter easily do the job, suitably tweaked in the right direction.

But like Spiers, Feakes is doubtful that either the BWC or the CWC could be effectively extended to cover terrorist threats. There is, he implies, a principled and a practical case for this point of view. The principled case is that these treaties already exist, were drawn up only with difficulty, are valuable in themselves at the still highly significant inter-state level, and tampering with them formally to extend their range downwards to subsume sub-state-level threats would risk what has already been achieved. In making this case Feakes will seem to some to romanticise rather the origins of the BWC which rather than being carefully thought out and argued over came about as a cynical concession by the then Soviet government to a domestically beleaguered US administration that had already unilaterally forsworn biological/bacteriological weapons.

The practical case is that modifying these treaties to bring terrorist access to biological weapons (BW) or chemical weapons (CW) more within their ambit would not be tolerated by the USA as it would mean conceding power to the elbow of arms control treaties that for Washington inadequately reflect the apparent new realities of power in the post-Cold War era. The strength of this allergy to arms control treaties can be measured by the above-mentioned refusal of the Senate to ratify the comprehensive test ban treaty, which was so worded as to be a very advantageous document to the USA indeed. But Feakes is careful to point out that just as arms control is a lesser form of disarmament, there is a lesser form of arms control available, called by Sims the counter-proliferation paradigm. Thus there is the Australia Group whose members control sensitive CW and BW-related exports, or the Proliferation Security Initiative where dubious transfers are actually interdicted, or the declarations of the G8 group of states, or UNSCR 1540. What all these measures have in common is the recognition they accord to the privileged military and economic position of the USA and a frank top-down quality with a few ‘givers’ of the law, led by the USA and many ‘takers’. Indeed there is a flavour of ‘export controls’ over most of these measures, which sits uneasily with a globalising world, and which helps account for the sometimes thick patina of secrecy obtaining over the functioning of some of these counter-proliferation measures. But just as the retreat from disarmament to arms control disclosed that arms control had virtues of its own it is possible that the retreat from arms control might also pay dividends. It may be one of the

ironies of a globalising world that the 'one size fits all' of comprehensive early post-war disarmament measures and some later measures of arms control is indeed old fashioned.

Sims's focus is the BWC, which he sees as a building block in an essentially disarmament-led approach to improving international security. Like Feakes he is nervous about tampering with it in order to give it allegedly more leverage over sub-state actors, but at the same time recognises its weaknesses in the form of poor institutional infrastructure and the absence of verification provisions. He is maybe rather pessimistic about how a better BWC and a better-functioning CWC might as disarmament treaties contribute to nuclear disarmament. Even Baruch in 1946 opined that there never would be a chance of nuclear disarmament unless states could be satisfied that chemical and biological weapons had been ruled out of court first.

Sims's careful account of the Sixth Review Conference of the BWC would seem at least on the surface to hint at a possible salient bargain between the EU-led group of member states and the USA. If the latter wants the BWC more explicitly to target sub-state groups it should be made to pay a price, if not in the form of a new verification protocol (too large a step, probably), at least in the direction of repairing the 'institutional deficit' that so diminishes the Convention.

To the tacit question of whether the verification provisions of the CWC could be tightened in order to bring within range the diversion of relatively small quantities of harmful chemicals likely to be of use to terrorists, Manley's answer is in the negative. Or rather such tightening would bring scant returns in exchange for the implied enormous extra burden on the legitimate chemical industries of the world and on the CWC inspectorate.

To the question of whether *any* improvements to the CWC would have the desired effect on sub-state access to chemical weapons Manley has two replies, both it is reasonable to say in the affirmative, but of different kinds. The first relates to 'national implementing legislation' where Article VII of the Convention requires states to take powers to clamp down on activities by private persons within their jurisdiction contrary to the aims of the Convention. In practice states parties have been rather slow off the mark here and an educated guess might suggest that stronger US support for the Convention would have had an accelerating effect. The second reply is of a different kind. Manley interestingly cites the lawfully held stocks of tear gas at the level of states as a temptation to terrorist groups. Stealing canisters of tear gas is unlikely to be an equally difficult task as between the different countries of the world, and tear gas let off simultaneously with a exploding tanker of chlorine, say, could have a disproportionately damaging effect on a civilian target. The argument as to whether tear gas should be lawfully held under the Convention is probably beyond reassessment. But making lawful purchase of tear gas more difficult and tighter physical control on stocks held by police forces and others would be a help.

Both answers rather contradict the position Spiers shows was widely taken in the USA after the Aum outrages in Tokyo where it was claimed than an 'in force' CWC would have made no difference.

Francis's chapter should be read in particularly close conjunction with those of Kilgour and Bellany. It is chiefly noteworthy for two things. First it deals with the whole business of safeguards as applied to nuclear materials via the International Atomic Energy Agency (IAEA) in extraordinary and rare detail and, like Manley's, with the voice of experience.

Second and most importantly it indicates how far the IAEA has already gone in extending its remit from the state level to offer services – such as the Physical Protection Advisory Service – highly relevant to the task of keeping nuclear materials out of the hands of terrorists. This is a classic instance of an inter-state treaty aimed at restricting the spread of nuclear weapons at state level extending its footprint to provide some assurance to states that terrorist groups will not find it a simple matter to divert nuclear materials from civil nuclear facilities.

The first thing to be said about this is that it runs against the tendency rather implicit in earlier chapters dealing with chemical and biological weapons that such a footprint extension may be difficult. In turn we must ask why. It is first of all possible that the catch-all phrase 'weapons of mass destruction' is misleading here, as it can be elsewhere, in that nuclear weapons (and associated materials) may be *sui generis*. Even with research reactors included there are relatively few actual nuclear sites, globally, and such sites as there are, are at least semi-detached from the commercial economy and often under state control.

Another reason may be that the structure of the NPT within which the IAEA safeguards division works is very different from that of the Chemical Weapons Convention or the Biological Weapons Convention in that participation of the major powers in the safeguards system is voluntary. So no great principle seems to be at stake when as Francis points out IAEA advice on the security of nuclear materials is taken by smaller states but regarded as intrusive by the larger powers. A third reason may simply be time. It could be argued that a failure to reach beyond states to keep warlike chemical or biological materials out of non-state hands is the least of the failures of the CWC and the BWC. The latter has no verification system at all, and the former's system cannot be said to be running smoothly even at the inter-state level. On the other hand the IAEA safeguards system has a long record of gradual reform to meet new challenges as they arise, without actually needing to repair its extant procedures. As Francis points out such nuclear proliferation as has occurred during the watch of the IAEA has occurred outside the then remit of the Agency and reform in the shape of extending the remit has become the norm.

There is one blot on the landscape for which Francis provides evidence without taking matters further. It is the question of funding. Up to now the taking on of new tasks by the IAEA seems to have been paid for not by fresh funding but through economies made in the exercise of existing tasks. An expansion of safeguards to monitor the safe keeping and safe transit of civil nuclear materials on a large scale, even if only with the direct involvement of smaller states would plainly add to costs. At worst this might demand new expenditure and force the major powers as major funders into a decision whether wholeheartedly to back the venture. Even if it were decided to meet costs

through economies there would be a risk that this would slow down the process below the pace of events.

Kilgour starts with the important insight that rational choice theorising about problems of international security has always enjoyed a reflexive relationship with the outstanding problems of the day, with the problems themselves stimulating theoretical innovation. Thus, in keeping with Sims, Spiers and Feakes in their different ways and with different degrees of emphasis, Kilgour gives novel grounds for thinking that the smaller quantitative challenge terrorist interest in weapons of mass destruction poses to existing arms control structures cannot be automatically coped with by a corresponding quantitative as opposed to qualitative adjustment to these structures.

Taking probable terrorist interest in nuclear waste for nefarious purposes as his example, although the analysis as he says could be extended to the chemical industry and in particular terrorist interest in dual use or in precursor chemicals, the contest or 'game' is now qualitatively different from what it was in the case of the Nuclear Non-proliferation Treaty for instance. Under classical arms control the actor with an interest in cheating on the arms control agreement was the same actor with whom the agreement had been reached and the source of the threat being controlled. In the terrorist case, for Kilgour, quite correctly, the terrorist is not an actor at all. One side is still an inspectorate – Kilgour's Agency – free from any bias and hence probably comprising international or at least transnational civil servants. The other side is also taken to be *politically* disinterested and in Kilgour's main example is the operator of a nuclear installation with nuclear waste on the premises. The inspectorate wants to ensure that the operator of the facility runs a tight ship in the sense that the nuclear waste is physically safeguarded to such standards as may have been agreed, perhaps by international convention. The operator of the facility is himself now the 'enemy' in that he will normally in a competitive economic environment have an incentive to cut costs by paring to the bone and perhaps beyond his anti-terrorist safeguard procedures. He is being asked to provide a public good of benefit to society as a whole but at the same time being asked to pay the costs himself.

The above notwithstanding, in a pretty faithful echo of the classical arms control situation, there is an added complication in that facility operators based in countries with a poor public safety culture ought in an ideal world to be inspected more often or more thoroughly than in countries where the reverse applies. But the practical difficulties of directing inspection resources to where they are most needed seem insurmountable: India, for instance, would never accept that its nuclear installations should be inspected more frequently than those of Canada, say.

Given that this obvious way of economising on the activities of the inspectorate – which increase not only institutional costs but also burden innocent operators of the facilities in question – is unavailable, economies have to be found elsewhere. And the natural way to do this is for an inspectorate to make a sample stand for the whole, with the chance of being inspected (and having a

violation detected if it has occurred), along with the consequent costs (perhaps a plant shutdown) great enough to deter the violation in the first place.

Perhaps surprisingly, Kilgour finds that the optimum procedure for the inspectorate in such a situation has not been adequately studied and his own modelling of the situation reaches only limited conclusions. Plainly one cannot have both minimum costs (falling on the Agency and the innocent plant operator) and maximum assurance of compliance at the same time. Costs he finds are the bugbear. Two routes out which he does not explore suggest themselves, one from classical arms control and one not. The former consists in extending the brief of unmanned sensing equipment installed by the IAEA at certain nuclear facilities to monitor unauthorised diversion of plutonium to cover in addition the ongoing adequacy of physical safeguards applied to nuclear waste. The latter uses economics to fight economics, and may be pushing at an open door at least in those countries where new nuclear installations are being planned or built to help meet CO_2 emissions targets. Releasing nuclear power from a requirement to compete with other fuels on a level commercial playing field would help reduce the significance of plant operators having to bear inspection costs. Countries with large existing nuclear sectors in being or in the planning stage, that Kilgour identifies, are in no instance ideologically hostile to such 'market interference' (he even suggests indirectly that such countries might even include the USA, were nuclear energy to experience a revival there). Of course, this 'solution' is peculiar to the nuclear question and not applicable to the respective chemical or biotechnology sectors.

So to the proposition that what takes care of the large can take care of the small – that classical arms control aimed at curbing state-level interest in weapons of mass destruction ought to be able to cope with the smaller threats posed by terrorist groups – the answer would seem to be the Scottish verdict of 'not proven'. The proposition seems in fact to have a declining plausibility as one moves from nuclear through chemical to biological arms control. At the same time there is no disagreement that terrorist interest in weapons of mass destruction is real and the first really successful terrorist use of a WMD will move the argument on from pre-emption to prevention with priorities determined by the class of weapon actually used. If a prediction were to be insisted on, the prediction of the present volume is that it will be a chemical weapon of some kind, which passes the test of economy of effort in acquisition, and which with careful design and choice of target can skirt around most of the obstacles to effective dissemination.

Part I
General

1 Material dangers

Ian Bellany

Following the advice of P.M.S. Blackett (in his case concerning large-scale nuclear war), the absence of any actual large-scale terrorist use of weapons of mass destruction means that in order to make any progress in understanding the topic some sort of theoretical approach is necessary (weapons of mass destruction are taken to mean nuclear, radiological, chemical or biological weapons). That is to say the complexities of the world as it is have temporarily to be substituted by simple models that attempt to replicate the essentials of the real world situation (Blackett 1961). As such, the simplifications inherent in the models do not mean that the models are no good for drawing conclusions, but that there is a limit to the weight of interpretation that can be put on the models. Indeed, as a simple example, the comparative rarity with which weapons of mass destruction have been employed in any setting means gaps in information and disagreement between sources regarding even their warlike properties. The models in question are quantitative and qualitative, with only the former bearing much relation to the 'operations research' sort of theoretical models Blackett had in mind. The limitations of the qualitative models will normally be self-evident, those of the quantitative models are spelled out in the context of discussion.

Definitions

But we begin by asking what terrorism is. Blackett is probably right when he also says that clear-cut definitions have little place in the beginnings of a scientific subject, and if the question of terrorists and their access to WMD qualifies as a scientific subject then it is sensible not to become too vexed about precise definitions. But this is a large 'if'. Vagueness about what constitutes terrorism matters politically a great deal. And some sort of working definition is surely needed so that model building can begin, provided some flexibility in application can be accepted. Terrorism, seen here, is a method of employing organised armed force with unusually little regard for humanitarian considerations to achieve, normally, political cum religious cum warlike ends, and which relies for its effectiveness on creating a pressing fearfulness in the minds of target persons for their lives or the lives of those close to them, or their property. It will normally be more effective when directed at civilians

who unlike the military have no special training or ready means of defence (poorly trained military on the other hand might easily become subject to terror attack). As a method of fighting wars declared and undeclared, open or covert, and as an extension of politics it is part of the military repertoire of most, possibly all, states and of both sides in internal war situations, and comprises virtually the entire repertoire of the terrorist, sub-state groups that are the topic of this piece.

Second, for practical reasons that will become clear when we come to build arguments on the foundations of data, we can at least provisionally distinguish between two types of terrorism as practised by sub-state groups, domestic terrorism and international terrorism. According to the US State Department, one source of data on terrorist activity, terrorism means premeditated, politically motivated violence perpetrated against non-combatant targets by sub-national groups or clandestine agents, usually intended to influence an audience. And the term international terrorism means terrorism involving citizens or the territory of more than one country. According to the definition of another data source, the US consortium of the RAND Corporation and the Memorial Institute for the Prevention of Terrorism (RAND/MIPT), domestic terrorism is defined as incidents perpetrated by local nationals against a purely domestic target. International terrorism means incidents in which terrorists go abroad to strike their targets, select domestic targets associated with a foreign state, or create an international incident by attacking airline passengers, personnel or equipment. In fact, slightly disconcertingly, RAND/MIPT in practice seem to treat as international all acts of terrorism that do not fall within their definition of domestic.

These definitions are spelled out simply because they are convenient for the statistical section of this chapter. For instance, there is a not unreasonable argument to the effect that all terrorism is international to a greater or lesser extent, or is becoming so (Falkenrath 2001: 164), and indeed this argument tacitly lay behind some of the US Congressional criticism of the 2003 State Department data and its analysis. The outrages of 11 September 2001 in the United States seem to have been perpetrated chiefly by nationals of one state (Saudi Arabia) organised by a group based in another (Afghanistan). Nearer the other, domestic, extreme, Irish terrorist attempts to expel Britain from Northern Ireland have been organised, and directed at targets, mainly within Northern Ireland itself, which is a part of the United Kingdom. But some IRA (or PIRA) attacks took place in Germany against British military targets there, and groups of US citizens played an important part in keeping the terrorists in funds. And it is certainly true that terrorists whose target state is X might deliberately extend their attacks to X-related targets in Y, where defences and other countermeasures, say, may be weaker. Of course, more subjectively, governments facing a difficult domestic environment arising from terrorist attacks might seek political easement by emphasising the international nature of the problem they were facing.

But it would be a mistake to abandon statistical enquiry on such grounds any more than data-based studies of war allow themselves to be stymied by the

long-mooted argument that all wars are to a greater or lesser extent international, and civil wars do not therefore exist. The distinction (domestic/international, civil/international) is a useful one even if it cannot always be made in a hard and fast manner, and here we are relying on the judgement of those coding the RAND/MIPT data, whilst at the same time recognising the difficulty as another possible source of error in the interpretation of the data.

At the inter-state level, which is not our main concern here but which we are not quite free to ignore, there is a spectrum of terror-related activity. At one extreme, virtually captive terrorist groupings perhaps based overseas can be used as biddable tools to project the military power of states when targeting foreign enemies. This may be because the state sponsor in question is too weak along other more standard dimensions of military capability or because the sponsor values the deniability and limitable liability inherent in this type of force projection. One example was US intervention in Nicaragua in the 1980s via its sponsorship of the Contras whose guerrilla methods certainly included acts of terrorism. At the other extreme of state involvement, Britain for instance by early 1942 was employing direct terrorism in the form of area strategic bombing against Germany, internally reasoning uneasily that a terrorised, i.e. increasingly frightened and intimidated civilian population, would withdraw their political support from the regime.[1] Much the same was true – in spite of official denials – of the US air campaign against mainland Japan. After the notorious British-led bombing raid on the German city of Dresden in February 1945, a city virtually bereft of normal military targets, US Secretary of State for War Henry Stimson publicly claimed that it had never been US policy to inflict 'terror bombing' on civilians and that US efforts were confined to military targets. But the US Army Air Force director of intelligence General McDonald on making enquiries at Stimson's behest found that the USA had been 'drawn in' to a policy (in McDonald's words) of 'homicide and destruction' (Parker 1997: 170), exemplified presumably by the March 1945 B-29 attack on Tokyo using incendiary bombs which killed 80,000 persons indiscriminately. Terrorism is therefore a method of fighting, directly employed even by states but normally with some reluctance, often behind a screen of denial, and frequently with a bad conscience at its anti-humanitarian qualities. It is a method of war-fighting comparable in this sense to the employment of weapons of mass destruction against places where there are large civilian population concentrations – the dropping of the atom bombs on Hiroshima and Nagasaki were in a sense an extension of the Tokyo raid by other means. And everyone has heard of the 'balance of terror' during the Cold War. It is not a method of war-fighting (except perhaps when poorly trained or poorly motivated armies are the target) likely to be openly resorted to until other methods have been found deficient. Partly of course this may be a matter of utility – whilst the atom bombing of Japan 'worked', as did the more recent 'shock and awe'[2] combined land and air attacks on the feebler units of the Iraqi army in 2003 by the US-led coalition, it is not in the least clear that the area strategic bombing of Germany had the desired effect on

German morale. Partly it is a matter of legitimacy. Electorates and parliaments where they are a factor, and the publics of friendly states likewise, may withhold support from this type of warfare (in particular when practised against civilians) on moral, humanitarian grounds.

Terrorists, on the other hand, or terrorist groups, of an autonomous or near autonomous kind, which are the subject of this enquiry, resort to terrorism without, it would seem, a bad conscience and without always having tried other warlike methods first. This is not to insist that terrorists are interested always in killing or maiming as many civilians as possible. Terrorists might deliberately limit the damage they do in proportion to their fear of the longer-term consequences of a failure on their part to do so. Excessive destruction might forfeit such sympathy as may exist for their cause and/or stir their target governments to unusually vigorous countermeasures. Where this is the case, terrorists might demonstrate their strength comparatively safely by targeting military as opposed to civilian targets, although the military targets whether personnel or installations will normally be attacked when off-guard or stood down in some way. It would seem to follow that terrorists conducting such 'limited' campaigns would have little interest in weapons of mass destruction. Up to a point this may be true, indeed the employment of such weapons might be seen as signalling that the terrorists had crossed the Rubicon and now ceased to care about what damage they did. On the other hand, possessing such weapons would allow even groups cautious about killing to carry out impressive demonstration attacks, say after having issued a warning. It would also allow them, especially after a convincing demonstration that they *could* possess such weapons, to issue hoax warnings of attack. And demonstration attacks would allow strategically minded terrorists to follow a policy of compellence, threatening implicitly or explicitly to follow up a demonstration attack with something more substantial unless the target showed signs of meeting the terrorists' demands. Incidentally there is no evidence of any trend over time of a coarsening attitude of terrorists to their choice of target. Statistical evidence relating to international terrorism (RAND/MIPT definition) over the period 1968 to 2006, shows the proportion of serious (death-dealing) incidents involving attacks on military targets has remained fairly steady at about 12 per cent of the total.

The stated opposition on the part of many leading states to terrorism is usually couched in high-minded language exactly comparable to that used by Stimson and McDonald in 1945 when referring scathingly to area strategic bombing. But underneath there is surely the more complex reason that terrorists and especially autonomous and free-standing terrorist groups represent in the long run a challenge in principle to the monopoly enjoyed by states over organised violence, both as between states and within them. It is arguably a feature of democratic societies when engaging in war, even a 'war on terrorism', often to line up behind a popular, not necessarily mendacious of course, version of the reasons why for public consumption rather than the sort of underlying reason normally discernible to historians.

Terrorists and weapons of mass destruction

But we turn now to a superficially puzzling phenomenon. Terrorist groups have as a matter of record, as we shall see, scarcely resorted at all in practice to weapons of mass destruction (WMD – shorthand for non-conventional weapons, i.e. nuclear, chemical, biological or radiological). In spite of this, apprehension that terrorist attacks employing WMD may be just around the corner is, by 2007, extremely high. A survey of articles in *The Times* (London) newspaper between 1985 and 2007 containing at least one mention of terror and any of each of the main weapons of mass destruction (nuclear, chemical and biological) shows a steady but unspectacular rise from the mid-1980s to the late 1990s from about one article a month to two articles. From 2001 onwards there is a precipitous rise to over one article a day, with some tailing off since then to about one every two days on average (*The Times* 2007).

The apprehension certainly has a non-objective basis. It is easy to see how governments anxious to brace their populations for the rigours entailed in 'a war on terrorism' through defensive or offensive measures will be prone to exaggerate (or at least take a 'worst case' position on) the terroristic threat posed in order to buy public acquiescence in what may be inconvenient countermeasures. They will also in propaganda terms sometimes be anxious to paint the enemy in as lurid colours as possible to lend justification to their anti-terrorist campaigns. In addition the US government, certainly, after the terrorist outrages of 2001,

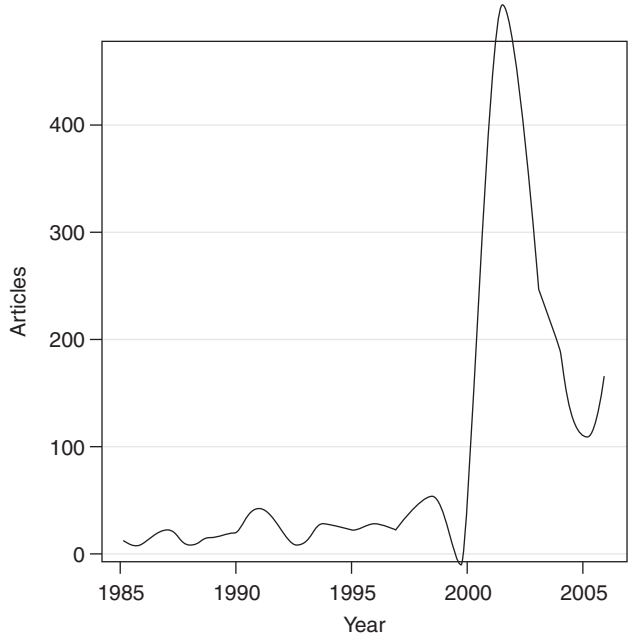

Figure 1.1 Number of articles in any one year in *The Times* (London) mentioning terror and a mass destruction weapon.

came to believe that historically there had been an underestimation of the terrorist threat and has reacted as if determined not to repeat that particular error with the natural consequence that some overestimation is bound to creep in. It will not be alone in this tendency. Some British intelligence authorities (the Joint Terrorism Analysis Centre) were surprised (strategically, not just tactically) by the 7 July 2005 attacks on London public transport (Wilkinson 2005: 45), suggesting that some overestimation (arguably) of threat would soon creep into official British pronouncements.

More objectively, but not entirely free from presentational and propagandist considerations, evidence-based assessments by intelligence agencies warn of terrorist interest in WMD. A reasonably detailed public warning comes from the then CIA Director Tenet in his statement before the US Senate Committee on Intelligence in February 2004 (Tenet 2004). He reported that Bin Laden (leader of the Al Qaeda terrorist group and presumed responsible for the attacks on the USA on 11 September 2001) considered the acquisition of weapons of mass destruction by his followers as a religious obligation (see below). Tenet also said that the Al Qaeda group continued to pursue its strategic goal of obtaining a nuclear capability, adding for good measure that two dozen other terrorist groups were pursuing chemical, biological, radiological and nuclear materials.

Also in 2004, a British survey of intelligence (reaching and analysed by British agencies and collated by the Joint Intelligence Committee – JIC) relating to WMD and pariah states (preponderantly Iraq), but including terrorist groups, is considerably more detailed (Review of Intelligence on Weapons of Mass Destruction 2004). Prior to 1995 British intelligence believed that terrorist groups 'would not be able to acquire … a nuclear weapon; radiological attacks are possible but unlikely. Attacks involving chemical or biological (CB) agents are also unlikely, though use of toxic chemical substances remains a possibility'. Reassessment began in 1995 with the Aum Shinrikyo nerve gas (sarin) attack on the Tokyo underground in March of that year. The Lyons G7 summit in June 1995 specifically included in its communiqué a warning that special attention should be paid to the threat of use of nuclear, biological and chemical materials for terrorist purposes. By the end of the 1990s British intelligence had become more worried, partly because the rise of suicide bombing as a terrorist tactic had demonstrated that the dangers employment of a WMD might present to terrorist users themselves had become at least in some circumstances less of a deterrent, partly because of the demonstration effect of Aum Shinrikyo that, first, such attacks were possible and that, second, there existed at least one terrorist group (Aum Shinrikyo) happy to produce potentially large civilian casualties, and partly because it was now judged that one specific group, that run by Bin Laden, had by the end of the 1990s acquired at least modest quantities of CB materials. Even so British intelligence judged in early 2001 that Bin Laden was the only terrorist seriously interested in weapons grade (see below) nuclear materials or radiological material.

After the atrocities of 11 September 2001, for which British intelligence assumed Bin Laden to be responsible, the JIC, without apparently considering the possibility that the attack on the World Trade Center had created far more

casualties than the terrorists themselves had bargained for, took this attack as evidence (or further evidence) that some terrorists were thinking in terms of weight of casualties as an end in itself. A British government dossier ('Responsibility for the Terrorist Atrocities in the United States, 11 September 2001') publicly described how Bin Laden had sought to obtain nuclear and chemical materials for use as weapons of terror since the early 1990s, and quoted him as saying in 1998 that 'acquiring such weapons [chemical and nuclear] for the defence of Muslims was a religious duty'. He is said to have added however, in November 2001, that if the USA used chemical or nuclear weapons against 'them' (it is unclear whether the 'them' refers to Muslims as a whole or Al Qaeda), then they may retort with chemical and nuclear weapons and that 'they' had these weapons as a deterrent (Responsibility for the Terrorist Atrocities in the United States 2001).

The US-led invasion of Afghanistan, where Bin Laden had been given sanctuary by the Taliban government since 1996, showed that his attempts to acquire WMD from scratch at least had not got far. The most substantial and tangible progress related to biological weapons, with the discovery of a laboratory in Kandahar. Actual activity on the chemical front as uncovered by the invading forces was risibly insubstantial (training courses on how to make and use poisons). And Bin Laden's own claim to be setting up a nuclear laboratory in Afghanistan seems to have been at the least premature. Nothing found in Afghanistan contradicted the earlier appraisals of the JIC, but there was something anticlimactical about what was found, pointing perhaps to the tendency of the appraisals to conflate reports dealing with actual capabilities and those to do with intentions. However, later reports by British intelligence in 2002 and 2003 described the activities of a number of Bin Laden's associates in the Kurdish Autonomous Zone of Iraq after fleeing from Afghanistan as including the production of 'various poisons'. Published information is ambiguous as to whether this amounted to anything more than laboratory-scale attempts to make chemical or biological agents, but there seem to have been actual buildings, which were bombed in the 2003 war, even if British intelligence for one saw no connection between these activities and the Saddam regime in Baghdad.

Since 2004, official intelligence pronouncements on terrorists' ambitions with respect to weapons of mass destruction have lost some of their stridency, just as *The Times* reports on the same topic have tailed away somewhat. The most detailed recent public intelligence assessment comes from General Maples, director of the US Defense Intelligence Agency (DIA), in January 2007, in his testimony to the US Senate Intelligence Committee (Maples 2007). Whilst maintaining the long-term general official trans-Atlantic intelligence position that 'some terrorist groups see employing chemical, biological, or radiological materials as low-cost, high-impact options for achieving their goals', Maples is also more specific. The DIA believes that 'if terrorists were to use unconventional materials in an attack … they likely would use low-level biochemical agents such as ricin, botulinum toxin or toxic industrial chemicals such as cyanide'. Even more specifically, the DIA judges that 'Al Qaeda and

other terrorist groups have the capability and intent to develop and employ a radiological dispersal device'.

Are there other ways of understanding the apprehension about terrorist use of WMD and how far it may be justified over and beyond the warnings issued by governments whose agenda in such matters may not always be clear?

Of course widely disseminated and detailed warnings about certain threats to security can be expected to be self-fulfilling up to a point, when individuals and organisations with a grudge or grievance are as a result alerted to the existence of certain technical possibilities and practical vulnerabilities that they had hitherto known little or nothing about. Naturally, previous publicised action by unrelated terrorist groups can itself have the same effect. Commentators may then see it as their duty not so much to ensure that their writings are not widely read, but to be as unspecific as possible about certain technical and organisational details. Of course commentators themselves need to be aware of this self-denying ordinance and alert to the possibility that an apparent lack of comment in the literature on possible terrorist use of crude forms of chemical weapon, say, may be deliberate (but see below).

In addition, the above reference to strategic bombing in the Second World War, leading up to the atomic bombing of Japan is a reminder that certain classes of weapon may be more suitable for terror use than others. Armies were quick to learn that dispersal would reduce the effectiveness of atom bombs directed at them; protective suits and air-tight vehicles together with tactics involving high mobility gave them extensive protection from chemical weapons; and traditional forms of biological weapons, at least, have become increasingly unsuited to the modern battlefield, partly due to protective measures but more so to tactics involving high mobility and high tempos of fighting, whilst biological agents (together with, for that matter, radiological weapons) remain very slow acting. But none of this applies to civilian concentrations or second-rate armies – the traditional targets of direct terror attacks by states. That these same weapons (bar radiological) have all been subject to international controls seeking to limit or ban their possession or use by states testifies to their doubtfully legitimate status.[3] So terroristic groups which by definition specialise in terror attacks might reasonably be thought to have an interest in weapons whose chief merit lies in their capacity to cause terror. In fact out of the admittedly small number of international and domestic terrorist incidents that employed chemical or biological agent, none were used against military targets.

Proliferation and homology[4]

How far might the logic of the proliferation of WMD at the inter-state level apply to sub-state groups? This section is based on the proposition that autonomous or near autonomous terrorist groups stand to pariah states in a position intermediate between the analogous and the homologous. Or to put things slightly differently, if everything is like something else, the suggestion is being made that terrorist groups or some of them are like pariah states.

International state-level interest in acquiring weapons of mass destruction is unevenly distributed. But it is not distributed at random. To a good first approximation interest is concentrated first in the great powers or those states most firmly established within the international system and it is concentrated secondly at the opposite end of the spectrum amongst states which are the least well established – here called pariah states. The former, great power group are central to what might loosely be called international society. The latter are peripheral to it. The former enjoy extensive global diplomatic links; the latter's are comparatively few and tenuous with the possible exception of each other. The former normally see votes at the UN go in their favour: the latter tend to see the opposite. Pariah states, in short, are lacking in international legitimacy in that their policies internal or external normally meet with substantial international opposition. Between the two extremes lies the broad mass of international society, which is comparatively uninterested in weapons of mass destruction.

A curve drawn with an ordinate of interest in weapons of mass destruction and an abscissa of increasing international legitimacy of the state, would be shaped in the form of wide U. A similar U-shaped curve would apply to the relationship between international legitimacy and an interest or track record in sponsoring terrorism. Large well-established powers do it (the USA at least to a degree in Nicaragua and Afghanistan during the Cold War) as do pariah states. The difference here is that established states sponsoring terrorism are likely to have a restraining effect on their protégés using WMD, whereas a similar guarantee cannot be expected from pariah states. As pariah states become more interested in WMD for themselves, and as far as nuclear weapons are concerned there is evidence that this is the case (Iraq, Libya, North Korea), there is an increased danger that they might disseminate agents and weapons downwards to those groups they sponsor.

This is of course a generalisation and does not fit every case. There is also a difficulty to be faced in the definition of what constitutes a pariah state, and this is made no easier by the fact that states can gain or lose pariah status. One candidate for definition is that a pariah state is almost wholly lacking in Nye's 'soft power' (Nye 2004). South Africa was a pariah state prior to the abandonment of apartheid. Independent Rhodesia was a pariah state until the coming of the Mugabe government during which it has become one again. Israel is a pariah, as is North Korea since the ending of the Cold War, exchanging places rather on the pariah list with South Korea. Libya is a pariah but is currently looking for rehabilitation and working its passage interestingly through having itself publicly purified of all interest in WMD for itself. Iraq became a pariah after the first Gulf War (1990/91); Iran has been oscillating towards and away from pariah status since the 1979 revolution. Taiwan and Pakistan are probably pariahs. The former meets most of the criteria; the latter has reinforced its credentials in this matter through its nuclear dealings with Libya, North Korea and Iran.

So as we have seen there is a rough relationship of a non-linear kind between the legitimacy of certain state actors and their degree of actual or presumed interest in weapons of mass destruction. Unless it should be thought that

this may be true for nuclear but not other WMD, a 2002 listing by the Monterey Institute of International Studies of states with a greater than normal interest in chemical and biological weapons shows a very similar pattern (Monterey Institute 2002). Pariah states again feature prominently as at least having a probable interest in offensive use of at a minimum chemical weapons – these include all the pariah states mentioned above, except South Korea. The chief difference with nuclear weapons is that only two of the big powers – China and Russia – appear on this listing as opposed to the nuclear weapon listing, and the reason for the difference is the existence in cases of chemical and biological weapons of international arrangements (of unequal potency) banning all possession.

High and low legitimacy both appear to mean an interest in weapons of mass destruction. If the low legitimacy actors – the pariahs – were extrapolated to include actors that enjoyed even less legitimacy, that is to say militarily active sub-state groups, it is natural to credit them too with such an interest. Importantly, the fact that the low legitimacy cluster is almost wholly comprised of actors who would find it difficult to acquire a capability in weapons of mass destruction in quite the normal way, illustrates that there are other routes. Most remarkably there is the attested Israeli theft of a natural uranium shipment in the Mediterranean and more doubtfully an irregular shipment of highly enriched uranium from the USA;[5] the transfers of uranium enrichment centrifuge technology from Pakistan or from Pakistani nationals to North Korea, Libya and Iran; the sub rosa transfers, in this case rather incomplete, of centrifuge (uranium enrichment) technology and details of design from German sub-contractors to URENCO (an EU consortium for enriching uranium as reactor fuel) to Iraq. One partial difference between pariah states and terrorist groups is that acquisition of WMD by transfer will need to be more complete and ready for use – terrorist groups being further down the chain of being and capability than pariah states. This implies at least 25 kilograms of highly enriched uranium, or a complete working device or for a radiological device a quantity of radioactive material (e.g. spent reactor fuel or more probably some suitable radioactive constituent thereof) in easily dispersible form.

So extrapolation or to go further the suggested homology is a kind of justification for suspecting that terrorist groups may wish to acquire weapons of mass destruction. Can it tell us any more? Perhaps there is something we can say about the method of acquisition as it pertains to nuclear materials. Pariah states have resorted to theft (Israel, Iraq and Pakistan if suborning and espionage are included here) but more frequently to overt or semi-overt transfers as between each other. So by extension non-state groups might be expected to do the same, with pariah states themselves the most likely source of transfers, but theft could as easily be directed towards first world sources. As for chemical and biological materials, pariah states tend, as far as can be seen, towards greater self-sufficiency. The Monterey study at least as far as BW are concerned credits pariah states with developing an interest in such weapons at least at the research level. The same conclusions may then tentatively be drawn for sub-state groups. In addition the example of pariah states may contain another moral. Pariah states

do not normally take the shortest and easiest route towards acquiring weapons of mass destruction. The fact of these weapons is not enough, often, what is also desired is some kind of prestige for domestic and non-domestic reasons. The most direct route to a nuclear weapon for instance is a crude method of uranium enrichment, using perhaps electromagnetic techniques (the so-called calutron or EMIS of the Manhattan Project), using as feed if possible slightly enriched uranium (the usual fuel for reactors) rather than the natural variety. The highly enriched uranium can them be made into a 'gun' type nuclear device of the sort the USA used on Hiroshima in 1945 without any prior testing. The obvious method of delivery is an aircraft of the sort widely traded internationally. But in practice only one pariah state – apartheid South Africa – chose this 'efficient' route and, even there, uranium enrichment was entrusted to a rather elaborate and unconventional method proudly developed, if not invented, by the South Africans themselves. Iraq prior to 1991 indeed sought to enrich uranium by the method of the calutron, but planned to use it in a nuclear bomb based on the relatively complex symmetrical compression technique (to achieve critical mass conditions) and to deliver the weapon using missiles, which are very intolerant of excessive payload weight. Not only that, efficiency was sacrificed even in enrichment when resources that might have gone into the calutron were diverted to the development of the much more demanding centrifuge methods of enrichment. The example of pariah states then suggests not only that terrorist groups will take an interest in WMD, but also that they will not be insensitive to prestige aspects. This means for instance an interest in nuclear explosive devices as opposed to radiological devices (dirty bombs); nerve gases as opposed to mustard or phosgene; and perhaps biological or toxin (non-living chemicals produced by living organisms) agents other than anthrax.

Another reason to anticipate interest in WMD by terrorists is the phenomenon of displacement. One factor behind the interest of pariah states in weapons of mass destruction is displacement. Largely cut off by their pariah status from more traditional means of defence and offence, such as supportive allies or access to conventional weapons of the most up to date kinds through an international arms trade dominated by the big powers, WMD become an obvious alternative. Similarly, one not unexpected consequence of the increase in deadly incidents of terrorism over the past decade has been for some targets to take steps to improve their defences against such attacks. Where this has been done efficiently, well-organised terrorist groups have shifted the focus of attack to targets and places that are less well protected. Thus instead of targeting a British government building in London, a British embassy overseas becomes preferred. When these too receive protection, attention can shift to foreign hotels popular with British tourists, and so forth. And according to Enders and Sandler, 'the installation of metal detectors at airports cut down on skyjackings but was associated with an increase in other kinds of hostage-taking events' (Enders and Sandler 2002: 162). But displacement can be vertical as well as horizontal. Since 2001, passenger aircraft have become even more difficult to hijack, but some terrorist groups have become interested in using ground to air missiles in the

vicinity of airports. The ultimate vertical displacement would come with terrorist groups frustrated by the protective measures taken against conventional attacks resorting to weapons of mass destruction after which there would presumably be a new cycle of action and reaction.

So the argument from homology if valid is very powerful. First it suggests that sub-state terrorist groups have a natural interest in weapons of mass destruction. Second it suggests that this interest covers all three main classes of WMD. Third it suggests that theft and transfer will be the favoured mechanism for the acquisition of nuclear weapons or related material. Fourth it suggests that transfers might easily involve pariah states, whereas theft could take a wider purview. Fifth it suggests that C and BW weapons are likely to be acquired more independently. Sixth it suggests that the shortest route to acquiring WMD capability will not always be taken because of the adverse impact on prestige and image of second-ratedness projected.

Demand

But the search for an objective appreciation of the risk can be taken further by looking more closely at the historical data. It is true that data on terrorist attacks have to be approached and handled very carefully (see statistical section below). But in the period between 1 January 1968 and 11 December 2006, out of 10,000 (in round figures) incidents of international terrorism recorded by RAND/MIPT only one such incident involved the apparent use of a biological agent (RAND/MIPT 2007). This was an unspecified white powder sent to an employee of the US consulate in Sao Paulo, Brazil, in September 2003, causing injury rather than death. Over the same time period there was a total of 30 incidents involving a chemical agent, with almost exactly half of these (16) occurring in the first half of the period in question. No reports of nuclear or radiological weapons being employed were registered at any point in the 38 years covered by the data. On the other hand, the picture is complicated by data concerned with *domestic* terrorist incidents. Over the shorter period covered by these data (1998–2006) 14 instances were recorded as involving biological agents, and 19 involving chemical agents (it is probably a statistical freak that the chemical incidents are concentrated in the second half of the period in question, and the biological incidents in the first half). The 33 incidents involving chemical or biological agents domestically in eight years (as against only 30 incidents in 38 years in the international context) may indicate a greater willingness for terrorist groups operating in a domestic context to resort to such methods. But these domestic incidents collectively killed only 11 persons, a long way from ‘mass destruction’. In fact the instigators of most incidents did not even attempt mass casualties. There is no record, in the period of 38 years covered by international data and the eight years of domestic data, of chemical or biological weapons (or any WMD) being used against military targets by terrorist groups.

In spite of these appearances, however, more detailed statistical analysis can tell us more about likely terrorist interest in WMD. Naturally the approach is

indirect and takes the form of asking some questions. Is terrorism (appropriately defined) on the increase? What is the evidence for the emergence of the so-called 'new terrorism', identified from the late 1990s on as possessing among its characteristics a partiality for particularly violent methods? And the point of the questions is to determine what the factual record may have to say – directly or indirectly – about terrorist interest in weapons of mass destruction.

Data[6]

There are in fact at least three major publicly available sets of data relating to terrorist incidents and their immediate consequences. Acts of terror directly committed by states (e.g. essentially indiscriminate air attacks on civilian targets) lie outside their purview, but acts by sub-state groups sponsored by states, even those wholly so, do not. In addition to the data presented by the RAND/MIPT consortium (RAND/MIPT 2007) there are as we have seen those provided by the US State Department (State Department 2006). A set is also provided by the US-based Inter-university Consortium for Political and Social Research (ICPSR), given the acronym of ITERATE (International Terrorism Attributes of Terrorist Events) (ITERATE 2006). The State Department's data set is assembled from embassy and CIA reports, whereas the other two rely on press and broadcast media coverage. The RAND/MIPT set has the longest, most easily accessible unbroken run of data relating to international terrorism over time, starting in 1968 and going up to the present day (its data on domestic terrorism, by contrast, go back only to 1998). The preference of all statisticians for large samples rather than small essentially dictates concentration here on the RAND/MIPT international terrorism data set. The State Department database, issued annually under the title 'Patterns of Global Terrorism', reaches synoptically only as far back as 1977 and is published quite retrospectively. In fact it seems likely that the 2003 data set may be the last to be published for some time, at least.[7] The ITERATE set does not appear to lend itself to easy public access to data appropriate to recent years at all.

The different sets of data are not strictly compatible partly for definitional reasons. As we have seen the State Department definition (of terrorism) is: 'premeditated, politically motivated violence perpetrated against *noncombatant* targets by sub-national groups or clandestine agents, usually intended to influence an audience' (emphasis added). But RAND/MIPT (see above) do not distinguish between civilian and non-civilian targets. ITERATE focuses on transnational terrorism, which seems essentially to be the same as international terrorism. It is defined as what occurs when a terrorist incident in one country involves victims, targets or institutions of at least one other country (Enders and Sandler 2002).

But in spite of differences in definition and in the way the data are collected, the three sets all nonetheless tell essentially the same story. For instance, over the 27 years between 1977 and 2003 where direct comparison is possible for incidents of international terrorism reported by the State Department and the

RAND/MIPT consortium, the two sets of data (Figure 1.2) track one another reasonably closely or, more formally speaking, they are positively correlated statistically with a less than 1 per cent probability that the correlation observed arises by chance ($p<0.01$: where the p figure is greater than 10 per cent the result is held to have no statistical significance). Some confirmation that the ITERATE data set is also essentially in line with RAND/MIPT is given below.

For reasons then both of its unparalleled online accessibility and unbroken length of data run, the bulk of the statistical analysis in this chapter is based on the RAND/MIPT data set for international terrorism. This focus on international terrorism is as already stressed chiefly because of the extent of the data available, with over 10,000 incidents recorded over the period 1968–2006. But it is also the case that data on international terrorism are inherently likely to be more reliable than data on domestic terrorism, since governments who are targets of the latter will often have the wish and the means to censor reports. If it is the case that the distinction between international and domestic terrorism is a sustainable one, nothing further needs to be said here on the matter, except that our findings are to do with international terrorism and that alone. If on the other hand the distinction between the two categories of terrorism is held to be artificial (as L.F. Richardson judged the distinction between civil and international war), the findings relating to international terrorism can be thought of as findings relating to a sizeable sample (about 10,000 cases or 10 per cent) of the whole.

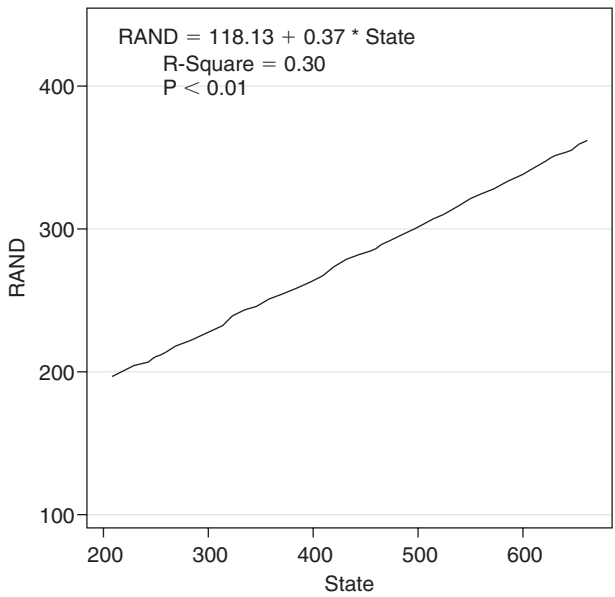

Figure 1.2 Correspondence between US State Department and RAND/MIPT data for annual numbers of international terrorist incidents between 1977 and 2003 inclusive.

Findings

Four versions of the original questions are used to interrogate the data: the direct relevance of each to questions concerning WMD varies. Has there been an increase in the raw number of international terrorist incidents over time? Second, have individual acts of international terrorism become more violent over time? Third, has the frequency (annual number) of lethal international terrorist incidents (a lethal incident is defined as leading to at least one death) itself increased over time? And fourth, what patterns other than time dependence (or independence) may be discerned in the data?

The first conclusion to be drawn is that for the 38 years between 1968 and 2005 inclusive there is no statistically valid correlation between the raw number of international terrorist incidents in a year and the passage of time (in other words, there is a more than 10 per cent chance that the correlation, the apparent small upward trend shown on the graph as a straight line, is accidental). So over this period the number of international terrorist incidents in any one year was essentially random, with no real trend either way (Figure 1.3). This result seems to be supported by Enders and Sandler, using the ITERATE data set for the years 1970 to 1996, who refer to their uncovering of 'virtually no evidence of an upward trend in transnational terrorism' (Enders and Sandler 1999: 145–67).

Mindful of the possibility that international terrorism data may have been skewed since 2003 as a result of the US-led invasion of Iraq (most probably in an upwards direction), the analysis was repeated with 2002 as the stopping

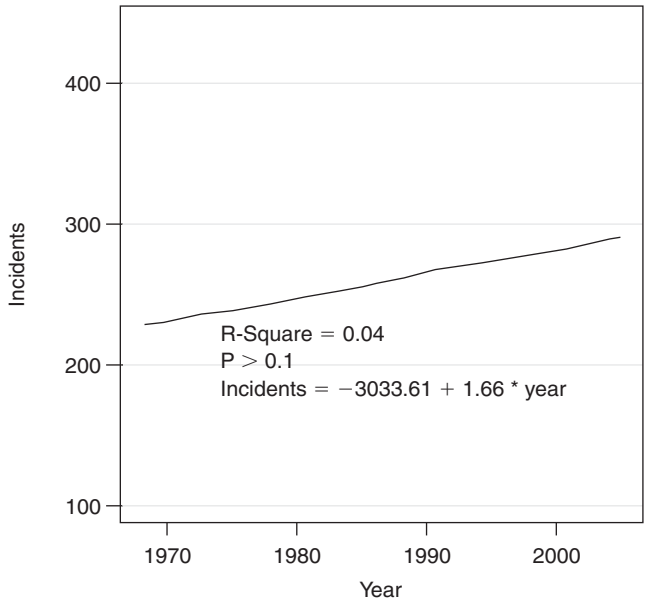

Figure 1.3 Annual figures for total recorded (RAND/MIPT) international terrorist incidents plotted against time, 1968 to 2005 inclusive.

point. The apparent small upward trend remains, but as before lacks all statistical validation and the only safe conclusion is to say there is no trend at all.

Lethal acts

We also ask whether individual acts of international terrorism are becoming more violent (measured by number of deaths caused per incident on average) over time. If this was shown to be so, it might for instance be seen as evidence that terrorist groups will soon downgrade conventional methods in favour of weapons of mass destruction in the search for ever greater casualties. Or putting things slightly differently, it might be seen as evidence for the emergence of 'new terrorism' whose definitions usually include as a distinctive feature greater lethality of individual terrorist acts. Or it might be seen as a consequence of a sort of action–reaction response as terrorist groups responded to increasingly severe anti-terrorist measures on the part of governments.

To test for this, the raw data of RAND/MIPT showing numbers of international terrorist incidents in each of the 38 years covered are first deliberately filtered to include only lethal incidents. We define a lethal incident as one leading to at least one death, and only about one-quarter of all incidents recorded fall into this category (about 2,500). The chief reason for filtering is to provide us with the raw material that concerns lethal incidents alone, but it also carries the bonus of helping to avoid error. Incidents involving deaths are simply more likely to be recorded and reported by the press and broadcasting organisations than those that do not, so the danger of failing to include unreported incidents in the data is reduced. One has merely to compare the reporting in the UK of deaths in Iraq since the 2003 invasion caused by 'insurgents' and the reporting of kidnappings by the same. Moreover, concentrating on deaths rather than casualties per se avoids the additional error arising from the variability over time and place as to what constitutes an 'injury' as a result of terrorist action and, to a degree, differences between time and place over the care of the injured. For instance, taking incidents of *domestic* terrorism between 1998 and mid-2006, in round terms the global ratio of injured to dead was two whereas for North America and Western Europe (taken together) the ratio was almost 4.5 (RAND/MIPT 2007).

So, with the focus now on lethal incidents of international terrorism, we first find (Figure 1.4) that there is no statistical evidence for the proposition that individual lethal acts of international terrorism are any more death-dealing today than 38 years ago. In other words there is no trend upwards or downwards in the average severity of individual death-dealing international terrorist incidents in any one year. Again the analysis was repeated for the slightly shorter run of data to exclude any Iraq war-induced phenomena. And again the original null result was repeated.

But these null results are in a sense misleading. Further statistical analysis (Figure 1.5) shows that the annual number of lethal international terrorist incidents *has* undergone a definite increase over time, with the five worst years for actual deadly incidents occurring in the most recent seven complete years of

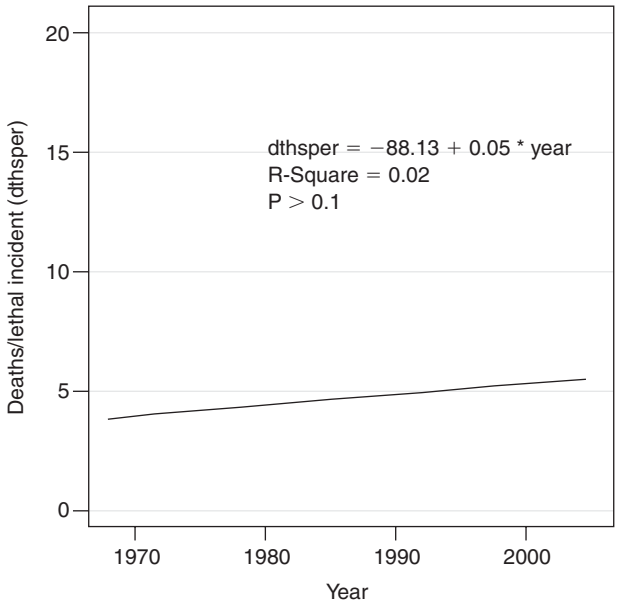

Figure 1.4 Annual average deaths per lethal international terrorist incident plotted against time.

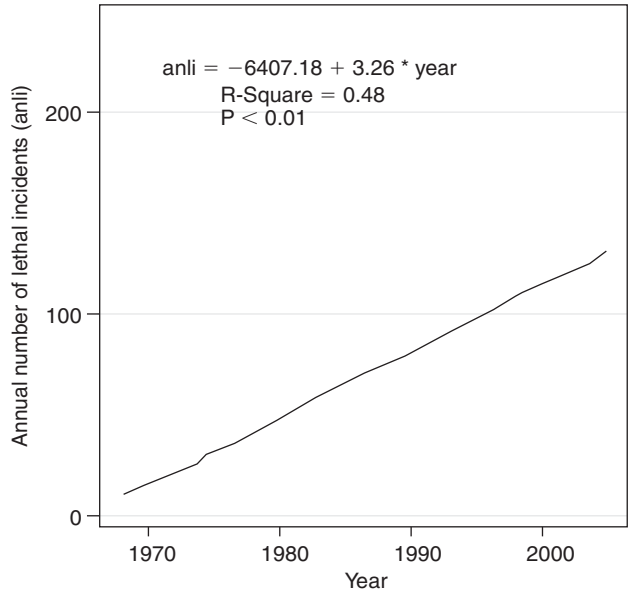

Figure 1.5 Annual number of lethal incidents of international terrorism, plotted against time.

data (i.e. between 1999 and end 2005). And not surprisingly, the total annual number of deaths due to international terrorism also shows (Figure 1.6) on average a year on year increase. Repeating the analysis but with Iraq left out of the picture does not change things significantly, with the annual number of lethal international terrorist incidents rising as before. The three worst years for deadly international terrorist incidents now occur between 1998 and 2002, and the finding of a steady increase in the annual number of deaths due to international terrorism is unaltered.

The mutual consistency of the statistical findings should be apparent. To summarise so far, there is no discernible trend upwards or downwards in the annual number of international terrorist incidents in the period 1968 to 2005 (inclusive). But the annual number of lethal international terrorist incidents has risen over the same period, so the proportion of incidents that are lethal has on average also risen. Even if the average lethality of a lethal incident has not increased in this period and remains fairly close to a long-term average of about five dead per lethal incident, it nonetheless follows that the total number of deaths in any one year due to international terrorism will also have risen and this is too is borne out by the statistics.

What the statistical analysis so far has disproved is the claim that individual lethal acts of international terrorism have become more violent. They have not, but they have become more frequent. If there is a 'new terrorism' it means not a greater readiness to kill more people at one blow than ever before, but a

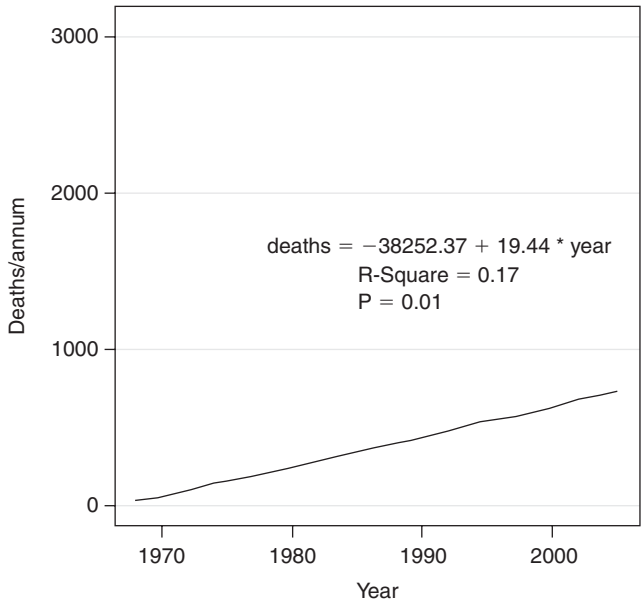

Figure 1.6 Annual totals of deaths due to international terrorism, plotted against time.

progressive tendency to prefer a lethal act of terrorism over a non-lethal act (e.g. explosions in built-up areas detonated without warnings, rather than with). But this enquiry needs to be taken further.

Power law

Before attempting some final conclusions, we need to perform one more calculation relevant to the important question concerning trends in the destructiveness of terrorist acts and the related question regarding possible terrorist interest in weapons of mass destruction in a supposed search for ever more lethal terrorist 'events'.

There is of course a considerable variation in the severity of lethal international incidents, just as there is variation in the severity of individual wars. The RAND/MIPT data allow the approximate classification of historical incidents sorted by severity (numbers killed) and by frequency. Thus very severe international terrorist incidents with more than 300 dead are rare whereas low severity incidents with dead between one and five are comparatively common.

It is very instructive to explore these data further. Visual inspection of the bottom (totals) row of Table 1.1, which charts the cumulative number of lethal incidents against their severity, suggests strongly that there is an inverse connection between the two, with perhaps incidents that are twice as severe being roughly only half as common, or frequent. If this were in fact the case then formally we could write frequency (f) as $f=K/s$ or $f=Ks^{-1}$, where s is severity and K a constant term. But in fact closer, more formal analysis indicates that the bias towards less severe incidents is considerably stronger than this.

Formal analysis in fact shows that the data in Table 1.1 match very closely a 'power-law' relationship of the kind identified by L.F. Richardson (1948: 244) in his pioneering study of the relationship between the frequency of wars and their severity as measured by deaths caused (Richardson, as we have seen, deliberately drew no distinction between international and civil wars seeing them all as 'fatal quarrels'). Recalling the formulation in the previous paragraph, Richardson found the linkage between the frequency of wars and their severity to be of the form $f=Ks^{-\alpha}$, with α a new constant bigger than one with a value to be determined from the data. In fact, Richardson found that for the wars studied by him, α had a value of about 1.6. That is, for every doubling in the severity (death toll) of a war, the corresponding frequency does more than reduce by half – it reduces by about a factor of three. More recent war studies with more recent and perhaps more accurate data to hand, and concentrating exclusively on international wars find α to have a value closer to 1.4 (Cederman 2003).

If we hypothesise that a similar relationship might hold between frequency and severity of lethal international terrorist incidents, we can test this in three stages. Partly because of the way the RAND/MIPT data are presented, it is useful first of all to transform the Richardson-type relationship between frequency and severity to a cumulative form, which allows us to interpret the proportion of incidents above a certain level of severity. So, by definition, 100 per cent of lethal

Table 1.1 Spread of severity (deaths) of lethal incidents of international terrorism on annual basis

Deaths range	*1 to 5*	*6 to 15*	*16 to 30*	*31 to 100*	*101 to 300*	*>300*
1968	10	1	0	0	0	0
1969	6	1	0	0	0	0
1970	18	2	1	1	0	0
1971	14	1	2	0	0	0
1972	19	4	2	1	0	0
1973	24	2	0	1	0	0
1974	21	2	1	2	0	0
1975	26	2	0	0	0	0
1976	60	2	1	3	0	0
1977	39	1	0	1	0	0
1978	43	1	0	1	0	0
1979	55	5	0	0	1	0
1980	53	5	0	2	0	0
1981	48	2	1	3	0	0
1982	53	5	0	1	0	0
1983	43	5	2	4	1	0
1984	61	6	1	1	0	0
1985	90	13	4	2	0	1
1986	64	5	3	2	0	0
1987	59	3	2	1	1	0
1988	72	8	3	1	1	0
1989	61	4	2	1	1	0
1990	59	4	0	0	0	0
1991	58	9	0	0	0	0
1992	48	11	1	0	0	0
1993	72	12	0	0	0	1
1994	81	11	3	21	0	0
1995	68	6	3	1	0	0
1996	49	4	7	1	1	0
1997	28	1	1	0	0	0
1998	27	6	3	0	1	0
1999	13	26	0	0	0	0
2000	8	8	1	2	0	0
2001	43	22	1	2	1	1
2002	83	9	6	1	2	0
2003	67	0	11	1	0	0
2004	145	0	3	0	1	0
2005	120	12	2	2	0	0
Totals	1,908	221	67	59	11	3

Source: RAND/MIPT (2007).

international incidents were of a severity with at least one person killed, and as it happens only 0.13 per cent of incidents were of a severity greater than 300 dead, out of a total of 2,233 lethal incidents listed. If a Richardson-type relationship holds, then the fraction f of incidents with a severity greater then s becomes proportional to $s^{-(\alpha-1)}$. Second, a plot of logarithm to base ten of f (log f) against log s

using the Table 1.1 data should, if the mooted relationship is correct, produce a straight line graph, with a negative slope of magnitude ($\alpha - 1$). Third, elementary statistical tests can be used to give a value for the slope of the graph, from which a value for α follows immediately, and to give a figure for how well the power law fits the actual data (Figure 1.7).

In fact the fit to the power law is extremely close, with 99 per cent of the variation in the data accounted for by the power law, and gives a value for α of 2.2 (compare Richardson's α for his wars of 1.6). The figure of 2.2 is not very different from the result – 2.5 – for terrorism recently obtained by Clauset *et al.* (2006).

As customary, confidence in this result will be proportionate to how well sources of error are compensated for. There is a particular difficulty here with the reliability of the RAND/MIPT data, in that there is a gap of 500 in the total number of lethal international terrorist incidents recorded in the time period and the smaller number to which the database compilers are able to assign a figure for the number of dead. In other words it is sometimes clear that a lethal incident has occurred but (in these 500 cases) it is impossible reliably to establish the number of dead even roughly. One way of allowing for this is to assign all of the 500 cases to the category one to five killed on the grounds that the more lethal the incident the greater the chance that details of numbers killed would have become known. Another is to assume that the 500 cases are distributed in the

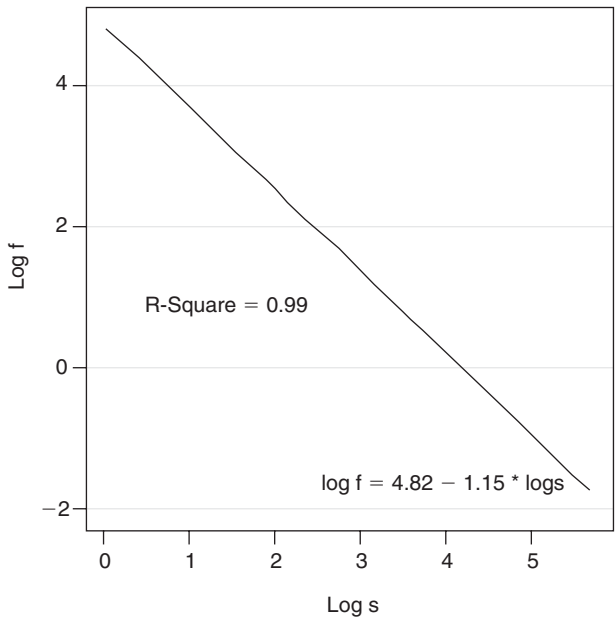

Figure 1.7 Plot (logarithmic) of the fraction (f) of lethal international terrorist incidents leading to a greater number of deaths than given severity (death tolls).

same way as the known cases. The former approach produces the same value for α as before – 2.2. The latter gives 2.1.

Second, as before, we need to allow for the possibility that data have been distorted by the invasion of Iraq in 2003. Thus the analysis is repeated but with a stopping point at 2002. This produces a value for α of 2.1.

We can conclude that on the basis of data analysis, the probability that a lethal incident of international terrorism will lead to a greater number than in deaths seems pretty well fixed. Out of say 10,000 such incidents we may expect 15 to result in 300 or more killed. If as we have shown the actual number of lethal international terrorist incidents is increasing year on year, and this trend continues, the expected absolute number of incidents with large numbers killed must itself increase and this is a warning to expect more large incidents of the '9/11' variety. It also explains the difference between the common sense or 'gut feeling' that terrorism has become more violent with the finding that the average lethal incident is no more violent today than ever it was.

It is natural and, as it turns out, helpful to seek some sort of explanation for the existence of a power law. Whilst it would probably be premature to dismiss the possibility that it is simply a subtle statistical effect, it is also possible that there is no particular linking mechanism between different cases of the power law. Thus at about the same time as Richardson published his power law relating to wars, Zipf published a power law relating the use of words in written English (Pierce 1962: 238–47). The (for example) fiftieth most common word in English occurs in any reasonably lengthy piece of writing only about one-fiftieth as frequently as the most common word ('the'). Zipf explained this – a finding in the field of linguistics that $\alpha = 1$, in our terminology – by a principle of least effort. Using Zipf's explanation in the context of terrorist acts of violence, the probability of a terrorist act will decrease with an increase in the difficulty of organising the act, and acts of a very lethal kind are more difficult to arrange than acts aimed at killing only a few (at a given level of technology and technique). This would relate frequency of acts inversely to their lethality. Perhaps we can go further with this admittedly crude sort of analysis and suggest that the probability of preparations for a terrorist act not being detected by the authorities would also vary inversely as the size of the planned act. Therefore the frequency of realised acts of terrorism should perhaps vary as the inverse square of their size (roughly proportional to deaths caused) – close to the relationship found.[8]

Conclusions

The power law, or rather the interpretation of it given here, has simple suggestions to make concerning terrorist recourse to weapons of mass destruction. The failure of terrorists to use such weapons on any sizeable scale so far may be linked to the difficulty of doing so, both in the obtaining of the device and in the concealment of the planning stages from the authorities. But as the difficulty of using conventional weapons to achieve large-scale casualties increases as the authorities become more on their guard, there may be a point where for a

comparable death toll (and there is no evidence of a slackening in the search for higher death tolls), a weapon of mass destruction becomes the easier route. Added to which, amongst the possible weapons of mass destruction, the kind that is easiest to obtain without alerting the authorities would seem to recommend itself ahead of alternatives. More speculatively, but stemming directly from the trends in terrorism data, the growing preference of terrorists for acts that are death dealing over other kinds (such as kidnappings, bomb threats with warnings, etc.) could be motivated at least in some part by a hunger for the publicity that killings almost guarantee. But if killings almost guarantee publicity, killings done with unconventional weapons (WMD) will be even more bankable as a gainer of media attention.

Finally, the RAND/MIPT database can be interrogated, admittedly rather imprecisely, on the question of possible differences between the kinds of terrorist groups in terms of their enthusiasm for acts leading to large numbers of casualties. Omitting the year 2001, between 1968 and end 2000 there were 4,727 incidents involving identifiable terrorist groups, with an average fatality rate per incident of 1.3 (obviously, not all of these incidents were of a lethal kind). Taking the RAND/MIPT classification of terrorist groups (e.g. 'nationalist', 'anarchist' etc.) on trust, over the same period there were 523 incidents for which 'religious' groups were responsible, with a fatality rate of 3.7. This was the highest rate for any category of terrorist group. Over the more recent five year period between 2002 and 2006, religious groups produced a fatality rate of 6.2 – again the highest rate – against an average figure for identified groups of 4.5. Whilst these data are somewhat insecure (it is impossible usefully to allow both for the possible distortions caused by the outrages of 2001 and the US-led invasion of Iraq in 2003), they suggest that religious groups may be more interested in mass killings than other sorts of terrorist organisations. It is a short step from here to conclude that they may also be more interested in WMD.

Supply

If terrorists are truly developing an interest in weapons of mass destruction what, aside from the technical argument above, determines their weapon of choice? The way chosen to approach this question is to assume that terrorists are rational in that they optimise or aim to optimise the reaching of a particular end by careful selection of means. Their ends as such do not enter into consideration except in one respect. Where ends are apocalyptic and derived from a world view that accords ideology an unusually large prescriptive role, the persons in question may be incapable of rational behaviour. Or rather a propensity towards rational behaviour with its necessary questioning of authority and search for evidence normally sits uneasily with strong ideological or religious convictions of a 'fundamentalist' kind with a corpus of teaching. The tactical effects, so to say, of irrational behaviour of any kind may be unpredictable but the strategic effect will be unfavourable to the terrorist.

What WMD all have in common is an unusually great disproportion between

the raw quantity or bulk (volume or weight) of the weapon in question and the number of deaths it could, ideally (from the perspective of a user interested in maximising casualties or destruction) inflict. The classic illustration of this is the contrast between the yield of a *single* standard modern thermonuclear weapon (a few megatons of TNT equivalent) and weighing less than a tonne, and the total TNT equivalent of all the bombs dropped on Germany during the Second World War (a few megatons of TNT equivalent, or a million or more conventional bombs). But with the one exception of a nuclear weapon, as will be seen, the actual practical death-dealing effects of WMD are a strong function of the method adopted for the delivery of the weapon (in the case of nuclear weapons there is also a functional relationship, but it is much weaker). As J.B.S. Haldane (the Blackett of the inter-war era and the then national authority on such matters) pointed out during the anxious pre-Second World War debates in Britain about gas attacks from the air on civilians:

> [it is perfectly true that] ten tons of gas would render the atmosphere poisonous over an area of several square miles if it were rightly distributed; but it is also true that one ton of bullets would destroy the whole British Army if it were rightly aimed.[9]

Chemical and biological weapons

The admittedly very restricted history of terrorist use of WMD seems to bear this out. Unlocking the undoubted death-dealing *potential* of a few grams of anthrax or a few kilograms of nerve gas (gas is a slight misnomer since nerve gases usually present themselves as liquids, but the usage is standard) is the difficult part, not necessarily the acquisition of the agent itself. Easy routes to acquisition of the agent include transfer from a sympathetic state source, purchase or theft where the agent is commercially obtainable or traded, laboratory-scale production of agents with the lowest threshold of difficulty in that class of agent (e.g. tabun as opposed to sarin nerve gas, or ricin as opposed to botulinum toxin). The hard part is first in preparing the agent for effective dissemination over a target area, and in the case of anthrax (and ideally with nerve gas too) this means rendering it in a form suitable for aerosol dissemination (sprayed as a fine mist, which will suspend the agent in the atmosphere), and in the case of nerve gas paying attention to purity considerations that may affect storage life as well as potency. Second comes the central difficulty of actually distributing the agent in question uniformly over the populated target area, an area we can take for illustrative purposes as being one square kilometre.

How might a terrorist group ideally proceed? First it needs to procure about 0.25 tonnes of pure sarin. Aerosol dispersion is the ideal method, and near to the ground. In a built-up area, where concentrations of population are most naturally to be found, this could be done on a pavement by pavement basis at a height of two metres, say. A vertically mounted sham exhaust pipe on a heavy vehicle might do. But this would have to be done quickly to minimise the risk of

detection and a large number of vehicles would probably be necessary to cover a square kilometre in the limited time available. Curiously, here the terrorist has a technical advantage over the formal military user of such agents. First he can choose his timing to suit local meteorological conditions. Second he can secure tactical surprise. Third he is unlikely to miss his target. And last he has the opportunity (execution is another matter) for very efficient dissemination, reaching towards the Haldane ideal.

Suppose an attack of this kind using sarin nerve gas was made on the City of London (i.e. the London financial centre) during a rush hour on a still winter's day. The minimum persistency of sarin in normal weather is about 15 minutes but cold weather could extend this to hours. The fatal dose of sarin when inhaled (fatal on average to 50 per cent of those exposed) is 70 milligrams minutes per cubic metre. In other words breathing air contaminated with sarin to the extent of 70 milligrams per cubic metre for 1 minute would be fatal in 50 per cent of the cases. Breathing air contaminated only to seven milligrams per cubic metre for ten minutes would have the same effect. Pure sarin has no taste or smell. The week-day population of the City is extremely large at about 100,000 per square kilometre (a more typical city population density might be 10,000 or fewer per square kilometre). If half of those in the City of London were exposed to the sarin for about ten minutes between their trains and their offices (or vice versa), to kill a further half of those – say 25,000 persons all told – in round figures 250 kilograms of sarin would need to be sprayed (*Military Balance* 1988: 245–6). If only ten kilograms of sarin were available then we should see about 1,000 dead.

In spite of some factors favouring the terrorist, mentioned above, the organisational complexity of the idealised dissemination technique involved in an attack of this kind leaves many opportunities for things to go wrong, both in the preparatory phase and the execution phase. In reality far less risky methods of dissemination are likely to be sought.

In fact just this method of dissemination was seriously considered and tried out by Aum Shinrikyo, who found the practical aspects too difficult. The actual attack on the Tokyo underground in March 1995 by Aum, using impure sarin, and relying on unforced evaporation in semi-enclosed and thickly, but very transiently, populated spaces (underground stations) to disseminate it, killed only 12 persons, employing about ten kilograms of agent to do it. The difference between effective preparation and dissemination of the agent and the Aum approach is two orders of magnitude or the difference between the deaths of an extended family and that of a village. Only the latter begins to qualify as 'mass destruction'.

The City of London sarin illustration might be thought of as setting an upper limit to efficiency and some short cuts might be taken with comparatively little cost to the terrorist in terms of casualties inflicted. Tabun, as already mentioned, is a simpler nerve gas to make than sarin and might be easier to produce without too many impurities. It is not the latest nerve gas by any means and sarin (when pure) is twice as lethal as tabun. A more haphazard but more easily executed means of dissemination might rely on the explosive bursting of a container. Sarin in the City of London situation could again, it is claimed, produce about 25,000

dead if the container held a tonne of the pure agent (Report of the Secretary-General 1969: 34) (almost certainly at the upper limit of the capacity of theft or transfer or laboratory-scale production), but the Aum group in 1995 appear to have had enough unused raw material to produce at least ten tonnes of sarin (Council on Foreign Relations 2007). It is hard to believe that even with optimum selection of situation and weather conditions a bursting container would have as much as 25 per cent of the efficiency of the aerosol method. Further down the scale, on the same assumptions, a tonne of mustard gas in an exploding container could produce nearer 1,000 dead. Mustard is even easier to make than tabun, but again tonne quantities would be at the upper limit of what laboratory-scale work would probably be capable of. Lower down the scale still, perhaps 500 dead could be the result of exploding a container filled with a tonne of phosgene or chlorine. On the other hand a tanker with ten tonnes of chlorine was blown up in Baghdad in February 2007 and produced only nine dead, with 148 injured. Whilst the high ratio of injured to dead is typical where gas is used, the death toll is very low and is presumably due to the crudeness of the dispersal method used (*New York Times* 2007). Phosgene, although a chemical agent that retained a place in the Soviet military arsenal during the Cold War (apart from nerve gases, the USA retained only mustard), is also a fairly widely used industrial chemical, which opens up the possibility of direct theft by terrorists rather than manufacture. Chlorine, used in warfare in the First World War, is even more widely used as an industrial chemical, and as a poison gas is more immediately acting than phosgene. The only classical (pre-nerve gas) agent to approach nerve agents in speed of effect, provided the dose is sufficiently high is the 'blood agent' category, including hydrogen cyanide thought to have been employed by the Iraqi government against Iraqi-Kurdish cum Iranian opponents in Halabjah in March 1988. Its specific lethality, tonne for tonne, may be no more than that of phosgene, whose annual production for industrial applications is about the same (up to about 100,000 tonnes per annum in industrialised countries), or chlorine, but the suddenness of its effects might be psychologically valuable to the user.

By this point in the discussion it will have become evident that a number of mutually contending considerations will inevitably come into play during terrorists' calculations. One has already been alluded to and is that of impressiveness. A terrorist group with sarin at its disposal presents a more intimidating face than one that has managed to steal a road tanker of chlorine or phosgene. Another is marrying effective dissemination of nerve gas – even small quantities – with the avoidance of detection before and during the event and the physical protection of the person or persons doing the job for long enough at least to see the job through. In addition there is a point at which the qualitative difficulty of obtaining a sophisticated agent by manufacture is outweighed by the requirement for less than industrial quantities. Chlorine is very easy indeed to produce on a laboratory scale but making it by the tonne is a different matter and difficult to do so in secrecy. Another is the point at which it becomes easier, casualty for casualty, to employ conventional explosives than something as unfamiliar and esoteric as gas. A tonne of phosgene detonated in a parked lorry in a sidestreet of the City

of London might produce fewer casualties than a tonne of high explosives detonated against the walls of a densely occupied building. This does not rule out terrorist interest in classical agents but suggests that more sophisticated gases might have more appeal.

The same coverage – a square kilometre – would be lethally saturated by a very small amount of anthrax spores, again efficiently disseminated. Instead of 200 kilograms of sarin less than one kilogram of anthrax could have the same effect. Where 70 milligram minutes/cubic metre is the lethal concentration of sarin, anthrax is lethal at 0.1 milligram minutes/cubic metre (US Congress 1993: 53). Perhaps the actual quantity of anthrax needed would be ten or so times greater than this in order to allow for losses of activity during the process of aerosolisation. Another difference between the two methods is that sarin efficiently disseminated would produce the sorts of casualties envisaged with reasonable certainty. Anthrax might produce considerably fewer were weather conditions to become adverse, especially since the living organism once released will inevitably lose virulence to an extent partly dependent on the weather, or more if there was less than anticipated loss of activity and winds carried lethal concentrations of the agent beyond the one square kilometre zone (a strength of anthrax from the terrorists' point of view is that its decay rate is smaller than that of a number of other possible biological agents, especially if the release is during darkness) (Stuart and Wilkening 2005: 2738). Yet another difference is that a sarin attack would have immediate and visible effect on those affected, whereas even a successful anthrax attack might not produce actual effects on those exposed for days. One advantage of anthrax over nerve gas from the terrorists' viewpoint relates to the persons in charge of disseminating the agent. They are themselves not going to be affected by the agent before they have finished the job, which gives opportunities for martyrdom if desired or more practically prophylaxis by vaccination and treatment afterwards by antibiotics. At the same time the organisational difficulties of planning and executing an aerosol attack on a built-up area would be just as great as in the sarin illustration.

Toxins are poisonous chemicals produced by living organisms (some however can be synthesised in professionally equipped laboratories). Botulinum toxin is lethal at 0.02 milligram minutes/cubic metre and is usually said to be the most deadly poison known and is five times more lethal weight for weight than anthrax. One gram (the weight of one cigarette) of botulinum 'rightly distributed' could kill one million persons. In fact the notorious polonium isotope 210, when rightly distributed and ingested by target persons is more lethal than botulinum, with a gram (about 3,000 curies of radioactivity) capable of inducing fatal radiation sickness in at least ten million persons.[10] Ricin is a toxin produced by plants and 1,000 times less lethal than botulinum, putting it on roughly a par with nerve gases. Small-scale manufacture (few grams) of ricin of doubtful purity is not difficult, and terrorist groups have also been thought capable of manufacturing small amounts of botulinum (Rote Armee Fraktion, Aum) (Biological Gateway 2007), but again the real difficulty lies in effective dissemination. Botulinum is commercially produced in most industrial states for the manufacture of 'Botox', very

dilute solutions of the toxin used for medical and cosmetic procedures. Theft or transnational transfer of botulinum that presumably appears in the manufacturing process in a less dilute form than the final Botox product would seem a possibility. Likewise ricin is a by-product of castor oil production and waste product rising to hundreds of thousands of tonnes (containing 1 or 2 per cent of ricin) are involved, again suggesting the possibility of theft or transfer.

Radiological weapons

Radiological weapons (RW)[11] or 'dirty bombs' resemble biological weapons in three ways. They have never seen anything like extensive use in war, they are normally slow and insidious in acting, and they are intrinsically difficult (without appropriate detection equipment) to detect in the environment. However RW, like anthrax, have been seriously considered for employment in war. The US authorities before they were certain that the actual Second World War atomic bomb programme (Manhattan Project) would be successful, investigated the possibility of denying territory to the enemy by contaminating it with radioactive waste from nuclear reactors already involved in the production of plutonium. They also considered using strontium-90, a particularly dangerous isotope produced in reactor waste, to contaminate enemy water and food supplies. Strontium-90 is a copious emitter of weakly penetrating (outside the body) beta rays, but which are extremely dangerous – carcinogenic – when the parent element is ingested or inhaled. Later, in the early Cold War period, aerosol dispersion of radioactive metals in presumably water soluble formulation was considered but rejected apparently on cost-effectiveness grounds. Finally, during the Korean War official consideration seems to have been given to contaminating enemy territory with caesium-137, another dangerous metal isotope found in reactor waste and like strontium-90 dangerous when ingested but also dangerous outside the body, as a net source of penetrating gamma rays (Advisory Committee on Human Radiaton Experiments 2007). The basic connection between strontium-90 and caesium-137 is that their half-lives are both about 30 years, which is short enough for them to be radioactively dangerous and long enough for them to be put to practical (in this case military) use. However the dangers they pose to human targets are inherently slow and insidious. It could take several years for cancers to show as a result of low exposure to these and other similar radioactive sources (e.g. cobalt-60, which has wide medical and industrial applications and like caesium-137 does not have to be ingested to present a danger to those exposed to it). The fact that the adverse effects of human exposure to such radioactive sources would normally show up as illness years in the future, if at all, might not be a drawback from the terrorists' point of view, given the widespread (and exaggerated, because of an inability to comprehend risk) fear in many Western publics of radioactivity. The psychological impact of such weapons could be enough.

Terrorist access to radioactive cobalt, strontium or caesium would necessarily involve theft or purchase from commercial suppliers or transfer from some politically sympathetic source. Partly because strontium and caesium are to be found

naturally in nuclear waste in large quantities they have been readily taken up into industrial and medical applications. Cobalt-60 is however specifically manufactured as a gamma ray source with wide industrial applications and has a half-life of just over five years. Manufacture by terrorists of any of these isotopes – laboratory scale or other – is simply not an option. It will be a question of theft, purchase or transfer. But again, effective dissemination is the problem, but this is eased by the long delay between exposure and illness, normally. Persons may persuade themselves they have been exposed when they have not, or have not been significantly exposed. Medical tests for exposure are possible but demanding of professional medical resources. Some real dissemination will be necessary.

Radioactive contamination bears some similarity to that due to a very persistent chemical agent, except that its damaging effects on human health may be delayed by years. If an attack heavy enough to produce a clearly measurable statistical increase in the incidence of bone cancers in subsequent years was deemed enough for terrorist purposes (and this would be a lower threshold, probably), and of course this prognosis was medically ratified, and dissemination could reach the Haldane ideal, a remarkably small amount of raw material would be enough. One gram of strontium-90 (about 100 curies of radioactivity) equally shared and ingested between one to ten million persons would be enough (a similar criterion of effect explains the vast area of Central and Western Europe adversely affected to a slight but measurable extent by the Chernobyl reactor fire). More dramatic – but very difficult to organise (at least as hard has spraying central London with sarin) – and with more immediately acting effects on persons exposed could be obtained by contaminating surfaces with a gamma ray emitter. If caesium-137 was available in sufficient amounts, about 200 kilograms evenly spread over one square kilometre to which persons were exposed for an hour would have immediately noticeable ill effects. Shorter exposure times and the protection afforded by buildings would very considerably reduce the effect. More haphazard but easier methods of dissemination of either radioactive strontium or caesium in a heavily populated area, such as a fire, would create much less harm, but the psychological effects might be considerable.

Nuclear reactors

Still within the category of an RW, but an excellent illustration of the key role played by dissemination, would come with a terrorist attack on a nuclear reactor. Most nuclear reactors, from the terrorist perspective, are in the wrong place – i.e. very rarely in the centre of towns (small research reactors might be an exception). An attack on a large power reactor designed to breach its containment provisions will vary in difficulty somewhat with the reactor design. Most modern reactors of the PWR type have heavy containment shells. The British Magnox reactors have no containment shell, but are nonetheless of massive construction. The Soviet Chernobyl reactor had no containment shell and this contributed to the severity of the accident in 1986. A total of ten million curies of radioactivity were released, including 2.5 million curies of caesium-137 and about one-tenth of that amount of

strontium-90. Most of the released curie-count of radioactivity fell out quite quickly in the form of short-lived radioactive iodine in a zone within about a 20 kilometres radius of the reactor. This area was densely enough populated for thousands to be affected by the iodine, which showed up in the form of normally treatable thyroid cancers (iodine taken up by the body naturally concentrates in the thyroid) in the subsequent decades. The rest was spread to detectable levels over thousands of kilometres, and deposited somewhat unpredictably in certain 'hot spots', where radioactive strontium and caesium became the main problem. That is to say, far from the immediate vicinity of the reactor, enough people received radioactive doses for thousands of additional deaths to be caused over the longer term even if this might not have a statistically clearly measurable effect on normal, relatively high, cancer rates. The dramatic immediate death-dealing effect of the reactor was confined to its vicinity and chiefly to personnel engaged in tackling the fire.

A terrorist attack on a major nuclear facility could have even greater damaging effects than the Chernobyl fire, since some facilities will also have radioactive materials stored outside the reactor but on the premises. Theoretically these stored nuclear waste materials could be a target for theft, but ready-made sources of strontium-90 and radioactive caesium already circulating within an economy seem a better prospect for terrorists. But stored nuclear waste either on a reactor site or at some reprocessing facility would multiply radioactive fallout in the event of an engineered explosion or fire.

Even so the predictability from the terrorists' viewpoint of an attack on a nuclear facility is not high and the considerable investment represented for instance by a hijacked passenger aircraft flown into a building at Sellafield, the British reprocessing centre, might not pay off. The 20,000 curies released from an accidental fire at the same site in 1957 had marginal public impact. However, the quantities of caesium-137 externally stored at Sellafield are very great indeed, at over 200 million curies or two tonnes (Ferguson and Potter 2004: 230), even if releasing all of this into the atmosphere would be a far from simple matter and indeed how much was released would depend largely on luck. On the one hand a respect for the vulnerability of commercial nuclear facilities to deliberate attack in warlike situations is reflected in the India–Pakistan agreement of 1985 not to target each other's nuclear premises in the event of war. On the other the very indirectness of this approach to irradiating maliciously the public introduces uncertainties. The deliberate air attack by allied forces in 1991 on Iraq's operating research (five megawatt) reactor – potentially much more devastating than flying a passenger aircraft into it – led to no radioactive release at all (not that this was necessarily the chief intention), since the collapsing structure seems to have entombed rather than released radioactivity. Sometimes the uncertainty is inherent in the situation. A remarkably small leak of radioactivity at the US Three Mile Island reactor in 1979, amounting to ten curies, generated huge public alarm. But as we have seen the 20,000 curies accidentally released as a result of a fire in a reactor in the north of England (Windscale) in 1957 had no public impact at all, although the remoteness of the Windscale (military) site from most centres of population played a part.

Research reactors, among which Iraq's five megawatt reactor could be

counted (30 kilometres south of Baghdad) and which are generally more often to be found in built-up areas than nuclear power stations, have certainly been run down in Britain over the years (there was a land-based working model of a submarine propulsion reactor – Jason – at the Royal Naval College in thickly populated Greenwich, London, until it was decommissioned in 1999). The absence of elaborate containment structures and the difficulties even of simple police protection, relative to power reactors, help make them more vulnerable to terrorist attack. There are (2007) only four research reactors running in Britain. Three are Ministry of Defence facilities: one near the sparsely populated Dounreay on the north coast of Scotland (Vulcan), another at Aldermaston, near Oxford (Viper) and a third at Derby (Neptune), in the Midlands. A fourth reactor is run by Imperial College, London University (Consort) at Ascot, near Windsor (40 km west of, but meteorologically upwind of, London).

Research reactors whose power output is usually in the low megawatt region at most, tend to contain a much smaller reservoir of radioactive waste product than power reactors and an explosion, deliberate or otherwise, and/or fire at Aldermaston, Ascot or Derby could release radioactivity within populated areas but only on a comparatively small scale. Outside the 20 kilometre zone effects would probably be negligible, whereas inside the effects would be very much nearer Three Mile Island than Chernobyl. Of the three, the reactor at Ascot is probably the least well protected from terrorist attack, since the others are Ministry of Defence establishments.

Research reactors can offer themselves as a terrorist target in a different way in as much as they are normally fuelled by uranium enriched in the isotope uranium-235 to a level where the fuel becomes officially classified as 'highly enriched' – HEU.[12] The Consort reactor at Ascot has fuel enriched to 80 per cent in uranium-235. However, unless research reactors are in the megawatt range, the amount of HEU in the reactor core will be less than a bare critical mass. None of the British reactors are in the megawatt range. Depending on circumstances even reactors without a critical mass of HEU in the core may still be attractive targets for theft if spare fuel for the reactor were also to be stored on or near the premises. Theft of this fuel makes a very convenient starting point for terrorists looking to make a nuclear weapons.

Such reactors might be seen as even more vulnerable in other parts of the world. Of pariah states, only Libya and North Korea have research reactors in the megawatt range.

Actual marine propulsion reactors often bear some resemblance to research reactors, in that they are of compact design and often employ HEU as fuel. Where they do, the quantities of fuel within the core will usually be well in excess of a bare critical mass of uranium.

Rule of thumb

With chemical weapons, biological weapons, toxins and RW we have an emerging rule of thumb. Terrorist acquisition of the agent concerned is not always

very difficult, whether we are speaking of manufacture, black market purchase, theft or international transfer. The difficult part is effective delivery on a target. An intelligent rational terrorist group would seek to circumvent this by having the target 'come to the agent'.

There are two or three obvious ways to do this depending on the choice of agent available. One way is to choose as target a crowded enclosed space and to expose it to the release of a volatile (i.e. rapidly self-disseminating into the atmosphere) powerful chemical agent with no smell. The containers of the agent could be put in place well ahead of time and equipped with timers or remote control devices. The second way is to contaminate food or water supplies serving a particular locality. Contamination could be chemical, biological or radiological. Or third there could be a conventional assault of some kind on a research reactor situated in a well-populated area with a view to arson, say.

The rule of thumb is reasonably well borne out by practical operational experience, however limited. In 1984 the Rajneesh Cult in Oregon successfully contaminated food using *Salmonella enterica*. We have already discussed the Aum attack on the Tokyo underground using sarin. And in late 2001 there was a postal distribution on a small scale of anthrax spores in dry powder form in the USA. Each instance seeks to avoid or substitute for the central problem of dissemination.

Using the rule of thumb as a predictor, then, of what future terrorist use of WMD might look like, we get the following. First, chemical attack would involve a comparatively highly volatile agent in an enclosed space.

The high volatility requirement narrows the agent down to hydrogen cyanide or phosgene (odourless when pure but with a delayed action by comparison) or to the less volatile sarin nerve gas. To take a large enclosed space such as the Royal Albert Hall in London, the volume is 90,000 cubic metres and it holds about 6,000 persons when full. To fill that volume with hydrogen cyanide or phosgene at lethal concentrations would require about 100 kilograms of agent. To fill the same volume with sarin would require only one kilogram. The final effect would depend greatly on the sophistication of the method used to introduce the agent, since special steps would perhaps be necessary to speed up normal evaporation where sarin is concerned, but even 10 per cent effectiveness might count as a success.

Second, the contamination of water supplies would seem to be an effective way in principle of disseminating poisonous agents to potentially massive effect. Of course public water supplies are subject to rigorous standards of purification in all advanced industrial countries, and there could be uncertainty how well biological agents or toxins would survive these processes and of course the necessary dilution stages. So terrorist interest would tend to focus on local water storage reservoirs down stream, so to say, from the main purification plants, which could reduce the impact unless a number of sites were targeted simultaneously. We have already seen how a remarkably small quantity of strontium-90 in water-soluble form could be used in this way to create at least the impression of great danger. A similar situation could arise with botulinum toxin. A

five million litre town reservoir could be contaminated to dangerous levels by only five kilograms of botulinum toxin (it is less dangerous when ingested than when breathed in). The more easily manufactured ricin would not submit itself to the same approach because about five tonnes would be needed to have a comparable effect.

Third, among purely biological agents, typhoid fever (*Salmonella typhi*) lends itself to water-borne dissemination at least as well as botulinum. One kilogram of agent would do the work of five kilograms of botulinum. In 1972, in the USA a domestic extremist terrorist group, 'The Order of the Rising Sun', were found to have cultures of *S. typhi* that they apparently intended to use to contaminate the water supplies of cities, including Chicago and St Louis.

The second stage of the rule of thumb is to suggest that for rational terrorist groups, the choice of agent whether chemical, biological, toxin or radiological may be determined not primarily by its weight for weight lethality but by its convenience for easy and effective dissemination against civilian targets. Much existing discussion of agents in these four categories takes its cue from historical military requirements where properties may be looked for in an agent such as persistence so as to deny territory or a penetrability that could compromise protective clothing worn by the military or a nicety of effect that could sidestep precautionary measures such as advance inoculation or the protection afforded by self-administerable antidotes. From the perspective of the intelligent terrorist an agent capable of more or less auto-dissemination would seem to have high priority, even if a wish on the part of the terrorist to intimidate would also suggest the choice of an agent playing on the psychological vulnerabilities of publics. Thus a nerve agent in an enclosed space would be more psychologically oppressive than hydrogen cyanide or phosgene in the same situation. And a water-carried radioactive agent such as a salt of strontium-90 more oppressive than *Salmonella typhi*, even if the *S. typhi* was weight for weight more injurious.

Nuclear exception proving the rule

The rule of thumb concerning WMD that we have sought to establish, that from the terrorist's perspective obtaining the agent is not very difficult, dissemination being the hard part, has to be reversed in the nuclear case. Obtaining the agent is normally quite difficult but dissemination takes care of itself. Additionally, the imprecision of previous sections concerning other WMDs, their manufacture and their effects, gives way to greater certainty where nuclear bombs are concerned. This is not because of greater actual experience in their use, especially, but because of greater and more consistent great power interest in their use.[13]

There are only two feasible 'agents', plutonium-239 or uranium-235. The bare critical mass of a sphere of the respective metals in pure form (and metallurgically most suitable form in the case of plutonium) is eight and 25 kilograms (see Francis, this volume). In the case of uranium, almost any method of rapidly assembling the 25 kilograms from say two hemispheres of 12.5 kilograms each would produce a considerable nuclear explosion. The much more practicable

assembly of a critical mass from two cylindrically symmetrical sub-critical masses would require significantly more uranium. But plutonium is much more problematic to work with altogether. Less is needed but assembling the critical mass from sub-critical components is much harder because of a strong risk of a half-cocked chain reaction being set off before the final mass was properly assembled, resulting in a much feebler explosion than otherwise would be expected. What is unclear from the published literature is by how much a plutonium bomb let off by firing together two hemispheres of four kilograms each would fall short of the yield obtainable from a properly designed bomb (about 15 kilotons TNT equivalent). It is clear that the falling off would be very considerable in view of the effort expended by the original designers of bombs to find another way (ultimately settling on the technically demanding symmetrical implosive compression of a sub-critical sphere) of creating a critical mass of plutonium out of sub-critical components. But one kiloton of TNT equivalent instead of 15 kilotons would not necessarily inconvenience a terrorist (see below).

In discussions of terrorist manufacture of a nuclear bomb, it is logical to confine discussion to the 25 kilogram uranium device and the eight kilogram plutonium device and it is important not to be diverted by considerations of how advanced industrial nuclear powers have themselves been able to build bombs from perhaps half the amounts stated or less. In order to do this, considerable ingenuity in the design of bombs is required chiefly so as to reflect neutrons back into the mass concerned – the neutrons would otherwise escape faster than they were created in an ordinary even only slightly sub-critical mass. The effort here was justified at least in the beginning by an awareness of the difficulty and expense of obtaining plutonium-239 and uranium-235 in multi-kilogram quantities, even for advanced industrial powers.

Uranium-235 is found in nature to the extent of 0.7 per cent of all natural uranium. Plutonium-239 is found only in spent reactor fuel in roughly similar proportions weight for weight, depending on factors such as reactor design. Laboratory-scale extraction of kilogram quantities of either element is totally out of the question for terrorist groups. The enrichment of uranium (in the uranium-235 isotope) is a highly specialised industrial process. The extraction of plutonium from spent reactor fuel relies on relatively simple chemistry but the radioactivity of the spent fuel and the quantities requiring to be processed again argue for specialised industrial techniques. Laboratory-scale extraction of symbolic but very small quantities of virtually 100 per cent uranium-235 would be possible, albeit laboriously, using a commercially available mass spectrometer and commercially available quantities of natural uranium (few grams). This would be of no practical use, but might appeal to terrorist groups wishing to create alarm by suggesting they possessed more HEU than they actually had, by mailing a few (harmless) milligrams to a newspaper office, say. Larger, kilogram quantities of HEU, like plutonium-239, would be available to the terrorist only through theft or transfer.

Assuming that the obstacles to theft or transfer of weapon quantities of

plutonium-239 or HEU were about the same, the rational terrorist would chose HEU, even allowing for the fact that the quantities needed for a critical mass could be three times greater than that of plutonium. This is for two reasons. HEU is easier to work with than plutonium-239, since the latter as well as being metallurgically complex, is a chemical poison on top of everything else, and second because the design of a nuclear bomb based on HEU can be far simpler than is the case with plutonium-239, where as we have seen a critical mass is much more prone to premature, and inefficient, detonation unless special precautions are taken in the design of the bomb. The recent history of pariah states lends some support to this supposition, in that South Africa (pre-Mandela), Pakistan, Iraq, Libya and Iran have all shown or allegedly shown more interest in HEU-based bombs than those based on plutonium (North Korea is the partial exception).

From the terrorist's perspective a nuclear bomb is undeniably impressive, and from a more practical viewpoint has a fail-safe quality not so easily found elsewhere. The difference between what ten kilograms of sarin could do if properly prepared and disseminated and what in practice was achieved by Aum amounted to two orders of magnitude in terms of fatalities. But a nuclear bomb intended to produce a yield of 15 kilotons, placed at ground level in a city-centre setting, would do a psychologically and physically impressive amount of damage even if it produced only one kiloton of yield as a result of some problem in design or with the purity of the fissile material. For instance, the reach of the blast wave, in an unrestricted, open setting, of an intensity sufficient to topple normal buildings in the case of a one *megaton* bomb is four kilometres. The reach from a one kiloton bomb is not one-thousandth but one-tenth as much, at about 400 metres. The corresponding area affected in the latter case would be about 0.5 square kilometres. By the same metric, a 15 kiloton bomb would topple buildings over an area of about three square kilometres.

Furthermore, it is a curiosity of low yield nuclear explosions that the reach of harmful nuclear radiation immediately emitted by the fissioning core of the bomb is greater than that of the air blast (this was the foundation of the so-called neutron bomb aired during the Cold War). A one kiloton bomb emits radiation to deadly intensity to persons (again in the open) out to 0.8 kilometres or covering an area of about two square kilometres.

In a built-up area the reach of devastation from a nuclear bomb detonated at ground level would be less than this, since buildings outside the immediate vicinity of the explosion would tend to shield each other and their occupants to some extent, but there could be some channelling and possible reinforcement of blast effects down spaces between buildings, additional damage caused by flying debris and of course a strong likelihood of fire. The primary neutron and gamma ray radiation deadly out to 0.8 kilometres in the open will be reduced by the protection provided by buildings to about 0.25 kilometres or an area of about 0.2 square kilometres. But the secondary, delayed, radiation effects of the bomb from the fallout of radioactive elements (somewhat like nuclear waste, except that nuclear waste disseminated to do harm remains dangerous for longer than fallout) made by the nuclear reaction will be funnelled upwards by buildings and

tend to be disseminated over wider areas than would be the case with a bomb in the open (Office of Technology Assessment 1980: 45–6). This would spread the fear of dangerous radioactive contamination if not the objective risk itself (fallout spread over a wider area because it had been sent higher up into the atmosphere in the first place will first of all be spread out more thinly on return to ground level and second will have spent more time in the atmosphere, decaying to less harmful levels). The objective risk would nonetheless be real. If the immediately deadly zone is about 0.5 square kilometres, fallout dispersed by wind of 25 kilometres/hour will extend this downwind to one square kilometre from which more or less immediate evacuation (within 24 hours at most) would be necessary in order to avoid radiation-induced death (Office of Technology Assessment 1980: 24–5).

Immediate deaths from a one kiloton bomb in the City of London setting envisaged above would approach those resulting from the perfect Haldane ideal dissemination of 200 kilograms of sarin and probably exceed it. The physical damage would also be very impressive. And of course immediate damage from a 15 kiloton bomb would be scaled up by about a factor of six.

Prognosis

What is to be done? Where should the priorities lie in seeking to head off or stymie terrorist interest in WMD? One answer of course is a concerted attack on the underlying causes of terrorism (assuming they can be identified). A more immediate response is to deal with supply rather than demand, through identifying first what classes of WMD are most likely to appeal to terrorist groups and then erecting obstacles to their acquiring them. As we have sought to demonstrate, to a good first approximation, the most attractive WMD to the terrorist will belong to the class typified by ease of dissemination against the target, which is taken to be a population of civilians.

At the head of this class is the nuclear weapon, by which is meant everything from a complete modern working model down to a critical mass worth either of highly enriched uranium or plutonium-239. Even the very imperfect assembly of either of the latter into a unitary critical mass would be more than adequate from the terrorist's point of view.

More under the radiological weapon heading, a research reactor operating within 20 kilometres or so of populated areas is also near the head of this class, as a target for arson. Of course it is less to be relied on, since much would depend often on local meteorological conditions (a careful terrorist would be aware of this), and even less predictably on how the targeted population reacted to a comparatively small release of radioactivity in their midst (the refusal of Londoners to be panicked in 2006 at the news that a quantity of polonium-210 had found its way to various parts of the city may be a straw in the wind here). Also in the same class are those weapons that are easily disseminable, but only under certain rather strict and artificial conditions. Thus whenever a large group of persons are congregated in a relatively small space such as a concert hall, a

chemical or biological weapon possessing a more or less natural volatility (tendency to evaporate) and at the same time a compactness sufficient to allow it to be smuggled into the small space and to remain there undetected also meets the test. In fact only a modern chemical agent fits the bill, and for instance sarin would be preferred over tabun by virtue both of its superior volatility and lethality, whereas hydrogen cyanide would have its bulkiness tell against it. Lower still in the class are those chemical, biological or radiological weapons which can piggyback on pre-existing innocent mechanisms of dissemination. The contamination of water supplies or insertion into the food chain removes the dissemination problem at the cost of narrowing the population target, normally, and introducing uncertainties concerning the survivability of biological agents and integrity of chemical agents between the time of release and the anticipated time of effect. Possibly a toxin would be preferred to a living agent and botulinum to ricin, given its greater lethality gram for gram. A radiological weapon in the form of a soluble salt of say strontium-90 dissolved into a water supply would have greater certainty of effect.[14]

The ease of dissemination or Haldane test steers those wishing to control supply both towards completed nuclear bombs and unassembled multi-kilogram quantities of uranium-235 and plutonium-239. The test also tends to steer control of chemical weapons towards more modern types and in the case of biological weapons away from anthrax and other agents difficult to disseminate, towards toxins. Apart from the de-emphasis on classical biological weapons this is not very different as a prospectus for control from that applicable to inter-state relations. However the field of view is slightly larger in respect of radiological weapons. In short, the best established inter-state control regime – the NPT – will require the most modification, and the least well-established, the Biological Weapons Convention, which is still encased in political scaffolding, the least. This signals more hope for progress than if things had been the other way about. In some ways the extension of the remit envisaged for the NPT is slight (but see Kilgour in this volume) – constructional integrity of reactors, siting of research reactors, storage of reactor waste. But in other respects, especially controls on the movement of specific radioactive isotopes, devolution of authority to national governments may work where industrial states are involved, but elsewhere in the world more direct involvement will be necessary.

Notes

1 Thus the UK Chief of the Air Staff Sir Charles Portal writing in early 1942:

> Ref the new bombing directive: I suppose it is clear that the aiming points are to be built-up areas, not, for instance, the dockyards or aircraft factories . . . . This has to be made quite clear if it is not already understood.
>
> (Webster and Frankland 1961: 324)

2 A technique known in the Pentagon as ‘shock and terror’ prior to 2001.

3 Historically, international attempts to control radiological weapons have been made within the Conference on Disarmament but progress has been hampered partly by problems of definition.

4 In biology, similarities between apparently dissimilar species arising from a possibly remote common evolutionary ancestor.
5 In 1965 the USAEC discovered a discrepancy in the enriched uranium balance in a uranium enrichment cum fuel fabrication plant at Apollo, Pennsylvania. The gap was about 100 kilograms. Suspicions that this had been diverted to Israel by the owners of the plant remained just that – suspicions. The USAEC were unable to find any evidence either way (Walker 2001: 109).
6 This section leans very heavily on Bellany (2007).
7 Since 2004 the statutary requirement on the State Department to supply annual data to Congress has been met via a new body called the National Counterterrorism Center, with its 'Country Reports on Terrorism'. But the data are now all from 'open sources'.
8 A much more ambitious explanation is due to Johnson *et al.* (2007). This relates the lethality of an incident directly to the size of the terrorist group responsible. He further derives the distribution of the size of the group by considering that a given group has a certain probability of growing even larger and also a probability of splitting.
9 Quoted (from a presentation Haldane gave to the RUSI) in Clark (1968: 128). It must be presumed, although this cannot be completely certain since he was an unusually well-informed and well-connected individual, that Haldane knew nothing about nerve gas, which had seen some secret pre-war development in Germany, and would have been referring to an agent such as mustard, which is only about one-tenth as poisonous. The British Army in 1937 was about 200,000 strong. In 1944 a British Joint Planning Staff report speaks of a possible gas attack on German cities employing 16 tons of phosgene to a square mile, or just over six tonnes to a square kilometre.
10 Polonium is a radioactive metal chemically similar to bismuth. It was first isolated from radium, and discarded radium used for medical purposes can be chemically processed to extract the polonium-210 isotope, which is the longest lived of the Po isotopes, with a half-life of 138 days. Alternatively it can be produced to order in a nuclear reactor, as was the case in the post-war British atomic bomb programme, where Po 210 was needed on more or less a continual basis (because of its short half-life) to form a triggering mechanism for the early British weapons. Its harmfulness to health arises from three factors. First it is intensely radioactive because of its short half-life, and a gram of it emits alpha particles at a rate of about 1,000 million million per second; second, inside the body alpha particles are the most damaging form of radiation possible; and third, once ingested the polonium stays in the body for several weeks. Alpha particle energy released in one second from one gram Po 210 amounts to about 100 joules, or over 50 days, 430 million joules. A fatal dose of alpha radiation over the whole body is about 30 joules. Therefore 1 gram Po 210 rightly distributed could kill about ten million. The true figure may be somewhat different in that no account has been taken here of the different failure rates of key organs of the body and whole body exposure has been assumed.
11 RW in some usages subsumes two different classifications of radiological weapon. One is the radiological dispersion device (RDD), which is designed to disseminate radioactive material over a wide area and which could include the so-called 'dirty bomb', but could be no more than an aerosol spray carrying strontium-90 in solution. The other is the radiation emission device (RED) that emanates radiation locally. Thus a cobalt-60 source of gamma rays with a hole in its lead container would qualify. See Ferguson and Potter (2004: 259).
12 The IAEA uses this designation for fuel with an enrichment of over 20 per cent uranium-235. It is difficult to see terrorists being able to incorporate 20 per cent HEU into a crude nuclear weapon. The critical bare mass of uranium required at this degree of enrichment is 800 kilograms as opposed to 50 kilograms when enrichment is 90 per cent. But the IAEA designation is presumably meant to indicate that 20 per cent

enriched uranium could rather easily and quickly be further enriched by delinquent states to 80 per cent or 90 per cent given the facilities.

13 See for instance, US Congress (1993).

14 The public health safety level for beta emitters in drinking water would just be breached by a concentration of 1 gram of strontium-90 to every ten million tonnes of water, assuming of course, it was uniformly dissolved.

References

Advisory Committee on Human Radiation Experiments (2007) Online, available at: gwu.edu/~nsarchiv/radiation/dir/mstreet/commeet/meet4/brief4.gfr/tab_o/br4o5.txt (accessed 2007).

Bellany, Ian (2007) 'Terrorism: Facts from Figures', *Defence and Peace Economics*, 18, 2, 18, April.

Biological Gateway (2007) Online, available at: cbwinfo.com/Biological/Toxins/Botox.html (accessed 2007).

Blackett, P.M.S. (1961) 'Critique of some Contemporary Defence Thinking', *Encounter*, March.

Cederman, Lars-Erik (2003) 'Modeling the Size of Wars: From Billiard Balls to Sandpiles', *American Political Science Review*, 97, 1, February.

Clark, Ronald (1968) *J.B.S.: The Life and Work of J.B.S. Haldane* London: Hodder and Stoughton.

Clauset, Aaron, Maxwell Young and Kristian Skrede Gleditsch (2006) 'Scale Invariance in the Severity of Terrorism', e-print,arXiv:physics/0606007 v1, 1 June. Online, available at: citebase.org/cgi-bin/fulltext?format=application/pdf&identifier=oai:arXiv.org:physics/0606007 (accessed 2007).

Council on Foreign Relations (2007) Online, available at: cfr.org/publication/9238/ (accessed 2007).

Enders, Walter and Todd Sandler (1999) 'Transnational Terrorism in the Post-Cold War Era', *International Studies Quarterly*, 43.

Enders, Walter and Todd Sandler (2002) 'Patterns of Transnational Terrorism, 1970–1999: Alternative Time-Series Estimates', *International Studies Quarterly*, 46.

Falkenrath, Richard (2001) 'Analytical Models and Policy Prescription: Understanding Recent Innovation in US Counterterrorism', *Studies in Conflict and Terrorism*, 24, May.

Ferguson, Charles D. and William C. Potter (eds) (2004) *The Four Faces of Nuclear Terrorism* Monterey, CA: Center for Nonproliferation Studies.

ITERATE (2006) Online, available at: sscnet.ucla.edu/issr/da/index/techinfo/I79471.HTM (accessed 2006).

Johnson, Neil, F., Mike Spagat, Jorge A. Restrepo, Oscar Becerra, Juan Camilo Bohórquez, Nicolas Suárez, Elvira Maria Restrepo and Roberto Zarama (2007) Online, available at: lanl.gov/ftp/physics/papers/0605/0605035.pdf (accessed 2007).

Maples, Lieutenant General Michael D. (2007) 'Current and Projected National Security Threats to the United States', US Army, Director, Defense Intelligence Agency. Statement for the Record, Senate Select Committee on Intelligence, 11 January. Online, available at: intelligence.senate.gov/070111/maples.pdf (accessed 2007).

Military Balance 1988–89 (1988) London: IISS.

Monterey Institute (2002) Online, available at: cns.miis.edu/research/cbw/possess.htm (accessed 2007).

New York Times (2007) 21 February.

Nye, Joseph Jr (2004) *Soft Power* New York: PublicAffairs.
Office of Technology Assessment (1980) *The Effects Of Nuclear War* London: Croom Helm.
Parker, R.A.C. (1997) *The Second World War: A Short History* Oxford: Oxford University Press.
Pierce, J.R. (1962) *Symbols, Signals and Noise* London: Hutchinson.
RAND/MIPT, Knowledge Database (2007) Online, available at: beta.tkb.dfi-intl.com:8080/TKB/Home.jsp (accessed 2007).
Report of the Secretary-General (1969) *Chemical and Bacteriological (Biological) Weapons and the Effects of their Possible Use* New York: United Nations.
Responsibility for the Terrorist Atrocities in the United States, 11 September 2001 – an updated account (2001) No date given but probably November 2001. Online, available at: pm.gov.uk/output/Page3682.asp (accessed 2007).
Review of Intelligence on Weapons of Mass Destruction (2004) HC 898, London: The Stationery Office (colloquially known as the Butler Report).
Richardson, Lewis F. (1948) 'Variation in the frequency of fatal quarrels with magnitude', *American Statistical Association*, 43.
State Department (2006) Patterns of Global Terrorism data can be found online, available at: state.gov/s/ct/rls/pgtrpt/ (accessed 2006).
Stuart, Amy L. and Dean A. Wilkening (2005) 'Degradation of Biological Weapons Agents in the Environment: Implications for Terrorism Response', *Environmental Science and Technology*, 39.
Tenet, George (2004) 'The Worldwide Threat 2004: Challenges in a Changing Global Context', 24 February. Online, available at: cia.gov/cia/public_affairs/speeches/2004/dci_speech_02142004.html (accessed 2007).
The Times on-line archive (2007) Online, available at: newsint-archive.co.uk/pages/free.asp (accessed 2007).
US Congress, Office of Technology Assessment (1993) *Proliferation of Weapons of Mass Destruction: Assessing the Risks*, OTA-ISC-559 Washington DC: US Government Printing Office.
Walker, J. Samuel (2001) 'Regulating against Nuclear Terrorism: the Domestic Safeguards Issue, 1970–79', *Technology and Culture*, 42, January.
Webster, Charles and Noble Frankland (1961) *The Strategic Air Offensive Against Germany 1939–1945* London: HM Stationery Office, Vol. 1.
Wilkinson, Paul (2005) 'International Terrorism: the Changing Threat and the EU's Response', Chaillot Paper 84, Institute for Security Studies, October. Online, available at: iss-eu.org (accessed 2007).

2 Manufacturing the means of apocalypse

Aum Shinrikyo and the acquisition of weapons of mass destruction[1]

Ian Reader

A frequently recounted story about the Japanese new religious movement Aum Shinrikyo tells of how villagers at Kamikuishiki (the village area around Aum's main commune in Yamanashi prefecture, north-west of Tokyo) saw a group of Aum members wearing laboratory coats and masks, rushing out of a building (known as Satyam 7, the term Satyam being derived from Sanskrit, the classical language of Hindu and Buddhist texts, from which Aum drew inspiration) that was later discovered to be where Aum had constructed a clandestine laboratory for the manufacture of chemical weapons. Those fleeing had been working in the laboratory when an experiment went badly wrong (a not uncommon event in Aum, where numerous of their attempts to make sarin and other chemical or biological agents, failed), and were frantically escaping the noxious vapours of a toxic gas they were trying to make. Subsequently, too, further indications of failed experiments that threatened severe harm to their perpetrators (including the near-death of one devotee, Niimi Tomomitsu, who became exposed to sarin, collapsed and was only rescued by a rapid injection of an antidote) and to their environment (e.g. vegetation around the commune was destroyed due to toxic leaks, a fact that alerted the authorities to probable indiscretions going on within Aum's facilities) came to light.

These incidents are crucial to any understanding of Aum's acquisition of weapons of mass destruction (WMD). They indicate that there was a remarkable degree of incompetence in Aum's attempts to arm itself; experiments went wrong and their supposedly 'brilliant' scientists were forced to flee the results of their mistakes, or save with antidotes, fellow devotees whom they had inadvertently managed to poison. As will be outlined later, too, the processes of acquiring and making WMD were characterised in many ways by chaos and a lack of technological brilliance. Yet this, in itself, helps illustrate a critical theme that I will focus on in the first part of this chapter, which is that, despite the evident dangers that Aum's activists faced in this context, they continued to risk their lives and to indulge huge amounts of effort and resources into the programme – a fact that says much about the mindset of the participants and the levels of dedication and conviction (or fantasy) that they held. Indeed, it was this mindset, one that was framed in paranoia and focused on apocalyptic imagery, that proved central and that enabled Aum's practitioners to engage in the dangerous

process of acquiring, making and using WMD and that provided the essential devotional, theological and practical framework within which Aum operated. After outlining the mindset and framework within which Aum operated, I will next turn to the personnel and the mechanics of acquisition, discussing further how this was characterised not so much by methodical competence and meticulous planning, as by an at times haphazard and even chaotic approach, in which the WMD themselves were also afforded almost reverential status – a factor that was important in stimulating Aum to use the WMD it made. In outlining some aspects of Aum's actual process of WMD acquisition, manufacture, and use, I will also consider the question of its intentions – whether the WMD were solely meant for offence or whether any concepts of deterrence played a part as well.

Having outlined the above, I will discuss briefly another element that was crucial to Aum's acquisition of WMD: the lack of intervention by law authorities in Japan. The Aum Affair was played out in the public domain. The incidents reported above, the fleeing and the escape of noxious substances that alerted people nearby that something strange was going on in Aum's commune and at buildings it owned, were seen by members of the public, and brought to the attention of the authorities. The local residents and local authorities at Kamikuishiki in Yamanashi prefecture, where Aum's main commune was, were strongly opposed to the presence of Aum's commune and the behaviour of its members, who flouted various local by-laws and behaved aggressively to locals, and they sought any means available to discredit the movement, including ensuring that such incidents were brought to the attention of the media and Japanese law enforcement authorities. Other incidents (including some overseas forays that raised questions about Aum's intentions) were also well known in Japan, yet even after evidence appeared suggesting that Aum might be responsible for the case of sarin poisoning that killed seven people in the town of Matsumoto in June 1994, the authorities seemed reluctant to intervene, until the Tokyo attack of March 1995. This failure was itself a crucial element in the whole process of WMD acquisition – a factor that, as I shall discuss, is unlikely to be present in any future cases.

Catastrophic millennialism and the 'right to kill'

In seeking to understand how groups such as Aum Shinrikyo that have engaged in religious-inspired terrorism, have gone about acquiring the weapons that they have used to foment terror, it is first critical to understand why they have done so. Understanding the 'why' of the process of acquisition is itself a (if not the) key issue in the process of how movements such as Aum have been able to gain possession of weapons, construct laboratories and manufacture biological and chemical weapons. Space does not permit an extended analysis of Aum's thought, structure and the development of its views of the world during its turbulent history between 1984 (when it was first established) and the 1995 subway attack (Reader 2000; Shimazono 1997), but here I append a short account.

Aum Shinrikyo was a relatively small (by Japanese standards) new religion with perhaps 10,000 members in Japan, of whom approximately 110 formed a 'hard core' of monastic-style world renouncers who lived in Aum's communes. Founded in 1984 as *Aum Shinsen no Kai* (Aum Hermits' Society) by Asahara Shōkō (real name Matsumoto Chizuo, born 1955, now under sentence of death), a partially blind charismatic figure who was considered to be enlightened and was regarded as the 'supreme spiritual master' of the universe by Aum devotees, it became Aum Shinrikyo ('Aum Supreme Truth') in 1986. The word Aum comes from the Sanskrit term that encapsulates the powers of the universe, simultaneously incorporating destruction, preservation and creation. In classical Hindu terms, the notion of destruction relates to destroying the negative influences of the world, and indicates a significant factor about Aum: its focus on destruction as a means of cleansing the world. Aum was (I use the term in the past because it has, since the late 1990s, renamed itself and renounced many of its earlier tenets) a 'catastrophic millennialist' movement that regarded the material world and the society in which people lived, as corrupt, decadent and harmful to spiritual progress – the sole aim of all humans. Catastrophic millennialism refers to the notion/belief that the current age is coming to an end, that it needs to be changed and replaced by a new, spiritually rather than materially based age and civilisation – but that such a world transformation will only occur as a result of cataclysms (e.g. nuclear or cosmic war, and/or environmental collapse) that will destroy the existing realm and allow for the emergence of a new spiritual civilisation. Often, groups with such visions see the catastrophe as being a 'cosmic war' of good and evil, in which the forces of good (the group itself) sees itself as being engaged in a symbolic spiritual war with the forces of evil, which represent materialism and worldly power (hence, in Aum's vision, these forces included the Japanese and US governments). Often, such 'evil forces' are seen as being part of a 'conspiracy' against 'good'; and, sometimes, the symbolic cosmic war of good against evil may – as in the case of Aum – be transformed into a real war.[2]

Aum criticised the ethos of materialistic society and its members sought spiritual enlightenment in ascetic practices, yoga and meditation, but it was initially optimistic in that it believed a world spiritual transformation (and hence evasion of catastrophes) could be achieved peacefully, becoming a destructive movement that eventually believed that the world was so evil that a final war was essential and that to paraphrase the title of Robert Jay Lifton's book (Lifton 1999), the world had to be destroyed if it were to be saved. This emphasis on purifying the world through destruction was closely connected to Aum's emergent spiritual elitism; as it became more focused on the notion of a real cosmic war of good against evil, it became increasingly convinced that all who were not with it, were opponents of the truth who did not deserve to live, and it saw its practitioners as super-elite spiritual figures who had the right to kill those who were spiritually impoverished and mired in materialism. Practitioners in Aum engaged, under the guidance of their leader and guru Asahara, in severe and arduous ascetic and meditation practices as a way of eradicating their negative

karma and attaining spiritual liberation. Aum's view of the world was basically negative; it referred often in its literature and in Asahara's sermons to the everyday world and to society at large as a 'den of evil' (*akugō no sōkotsu*)[3] and in terms reminiscent of Buddhism (in which terms such as *shaba* 'this decadent world/world full of decay and corruption', indicate a basic belief that this realm is one grounded in suffering).

For devotees, liberation was both individual and collective. On an individual level members focused on attaining liberation from the bonds that tied them to the corrupt material world, by practising asceticism, meditation and following the guru's teachings that, they believed, would lead them to higher spiritual realms after this one. Asahara – drawing on standard Buddhist doctrines – taught devotees that everyone was subject to a cycle of rebirth, and that there were ten realms of existence ranging from the highest realm of absolute enlightenment down to the lowest hells, into which those who did not behave appropriately would fall at death. In this process, the body was a karmic impediment tied to the corruptions of this world and to its excesses and temptations; hence much Aum practice revolved around purifying and subjugating the body in various ways (including fasting and cold water ablutions). One might note – crucial to the Aum affair – that Aum's practices were extreme and, as such, attracted relatively few people, but those who devoted themselves to such practices were, of necessity, extremely ardent and zealous. Because of this individual focus on spiritual practice – and because of Aum's adherence to Buddhist notions that regarded the exterior world as shallow compared to the internal world of reality in which liberation could be attained – there was a distinct sense of superiority that grew inside Aum, whose practitioners regarded themselves as a spiritual elite.

Aum's devotees believed ardently that the world was in a state of chaos and was being dragged, through the accumulation of negative karma, towards destruction; from the mid-1980s onwards Asahara prophesied that some form of apocalyptic scenario would occur and that the only thing that could save the world was a spiritual transformation. While, initially, this transformation was seen as being peaceful, with Aum practitioners leading a spiritual mission to change the world through a combination of their own exalted spiritual virtue and by converting enough people to their path to create an aura of positive energy that would negate the bad karma of materialism, Aum quickly became convinced that more aggressive means of transformation were necessary.

This transformation in Aum's world view occurred during the late 1980s, when it ran into external opposition and experienced internal problems (including the death of a member during ascetic practice) and when it became clear that its mission to 'save the world' by converting large numbers of people, was failing. It was in this period that it became aggressive, confronting opponents (notably parents of young people who had dropped out of society to join its communes, along with rural neighbours of its communes) and violent, initially using coercive means to make members perform austerities and to purify them spiritually. Such coercion led to the accidental death of a member and

subsequently, in 1989, to murder, when senior figures in the movement killed a dissident follower who threatened to 'blow the whistle' on the movement's guru and leader Asahara Shōkō after the aforementioned (concealed) death of a follower. In Aum's terms, this killing was done to stop the dissident, Taguchi Shūji, from destroying the 'truth', an act that would condemn him to endless aeons in the nether realms after death because of the bad karma he would have accrued otherwise. Thus, in theological terms, the movement's leaders regarded the killing as a means of 'saving' Taguchi from greater evil; it was through such events that its theological stance, in which killing was justified if it 'saved' others from accruing negative karma that would make them spend endless lifetimes in lower realms of existence after this life, developed and became an overriding dynamic in the movement.

This involvement with violence occurred as Asahara began to lose hope that he could achieve world transformation by peaceful means; the failure of people to listen to his message became seen as a manifestation of just how sinful the world was, and convinced him and other devotees that transformation was not possible without some cataclysmic happenings that would actually destroy contemporary civilisation and open the way to a new spiritual world. In this context, the image of a final, inevitable, war of good and evil began to grow more and more prominent in Aum's thinking, and with it came the growing obsession with WMD as the means with which to engage in that war.

As the feeling that the wider world had failed to listen to Aum's messages grew, Asahara also became increasingly convinced that those who trod the path of righteousness (i.e. himself and his disciples) had the right to punish those who failed to listen and whose indifference was therefore a causal factor in the coming apocalypse. He began to refer to his disciples as 'sacred warriors' and 'true victors' (*shinri shōsha*), fusing the images of militarism and spiritual prowess together, telling them they were a sacred army fighting for the truth and against evil. As such, too, they had the right, as enlightened beings, to intervene in the lives of others in order to transform them, to punish them and if need be, to kill them because of their bad karma. The growing emphasis on a coming final Armageddon was, according to people who were devotees of Aum in the early to mid-1990s, very real indeed (Takahashi 1996: 160). They lived in a world in which a cosmic war was going to happen, in which they, as representatives of truth and good, would confront the forces of materialism and evil (personified by the USA and by the Japanese state) and in which the bulk of humanity would necessarily die in order that the movement's sacred mission of creating a new spiritual paradise could be realised.

Aum's involvement with actual killing began with Taguchi in 1989, while its first foray into WMD occurred a year later in April 1990, with a failed attempt to release botulism spores in Tokyo. This act came about because, in a final desperate attempt to get Aum's message across the wider populace, Asahara had formed a political party – the *Shinritō* ('party of truth') – to run for office in the February 1990 elections. This was an utter disaster; all 25 Aum candidates failed to be elected, while Aum's campaign was widely mocked in the mass media.

The election debacle caused Asahara to abandon any hopes that humanity could be made to listen to the 'truth' by peaceful means, and convinced him that it needed to be punished instead. It was in reaction to the election failure and in order to mete out 'punishment' to the unworthy, that he asked the emergent and influential group headed by Murai to make biological weapons, and to the April 1990 attempt to use them.

Thus, Aum developed a mindset, based around zealous disciples who engaged in severe ascetic practices, regarded themselves as sacred warriors and had come to believe they were fighting a real war to defeat evil, who engaged readily with the means of destruction and seemed not to shirk even from committing acts of murder. This point is perhaps best illustrated by the case of Nakagawa Tomomasa a 29-year-old doctor and recent recruit to Aum, who was asked in November 1989 by Asahara to take part in what Asahara described as a 'salvation mission' (*kyūsai katsudō*). This 'mission' involved killing an 'enemy of the truth' (*shinri no teki*) – the lawyer Sakamoto Tsutsumi, whose campaign against Aum, which involved mobilising the families of young people who had joined Aum and issuing lawsuits against the movement, was damaging Aum. Rather than feeling shocked at being asked to commit murder, Nakagawa felt, as he later testified, proud and elated; his selection for this mission was a testimony to his ardent faith and ascetic prowess. Aum placed huge emphasis on asceticism as a key to attaining spiritual transcendence, and by asking Nakagawa to perform this mission Asahara was clearly affirming his attainment in this area. It showed that he was a *shinri shōsha* (a 'true victor' or 'sacred warrior for the truth') a term widely used in Aum to denote those who had attained such high levels of spiritual advancement that they were able to transcend the limitations of this world and go beyond the karmic bonds of conventional morality (Reader 2000: 150, 151).

In Aum's theological framework such sacred warriors were vehicles of 'absolute truth' who were able to save others by intervening in their current lives to prevent them from committing more sins, and hence accruing more negative karma, in this world; since such negative karma would prevent them from attaining a better rebirth, it was the duty, in Aum's view, of the spiritually elite, to take appropriate steps – including terminating the lives of sinners – both to punish them for their sins and to enable them to evade the negative karma that would take them into the lowest hells at death. By being empowered to terminate the life of Sakamoto, Nakagawa was thus confirmed as a member of the spiritual elite while, by carrying out the act without remorse or fear, he showed that he had mastered the Buddhist skill of non-attachment (*seimutonjaku*): the ability to view all things with equanimity and to have transcended the emotions so that one was able to carry out deeds without emotional upheaval. As such he had overcome the normative dualities of this world and 'resolved' the traditional Buddhist dilemma between samsara and nirvana, or the material and the transcendental.

Other practitioners involved in Aum's various crimes – from attacks on enemies, to the manufacture and use of chemical weapons between 1988 and

1995 – have spoken in similar terms to Nakagawa about how their engagement in violence was an expression of their position as advanced religious practitioners engaged in a 'salvation mission'. Nakagawa's story with its emphasis on concepts of 'truth', spiritual elitism, righteousness, mission and the meting out of punishments on the spiritually impure, is indicative of the attitudes that prevailed in Aum. It illustrates the point that, if one is to understand the processes of the acquisition of WMD in religious movements, one needs also to understand the ways in which those who engage in such activities think about themselves, their relationships to others whom they may end up killing, and about their religious faith in general. Nakagawa clearly considered himself able to kill for his faith, and to be able to punish those who did not share it; as such he manifests a zealotry that itself became a driving force in the acquisition and use of WMD.

Recruitment and the establishment of WMD programmes

The internal dynamic and rhetoric within Aum, which made devotees into 'sacred warriors' and 'true victors' (*shinri shōsha*) and affirmed that they were bodhisattvas (i.e. enlightened beings working to save people in this world), and portrayed their leader as the absolute guru and only supremely enlightened being in the world, in effect also ensured that the devotees were (in their own minds) transformed into superhuman beings capable of accomplishing anything in their mission to save the world – and, indeed, permitted to do anything in this pursuit. This sense of self-belief or arrogance coupled with a sense of grandeur, and, in Asahara's case, fuelled by megalomania (Reader 2000: 10) pervaded Aum's practices, with all of its activities, from the acquisition of raw materials to the construction of laboratories and the attempts to make WMD, being done by Aum members without assistance from externally recruited specialists.

It has been commonplace in much of the commentary on Aum produced by the mass media and others, to portray the movement as fiendishly brilliant and active in recruiting brilliant scientists; indeed, this is a recurrent myth that, despite having been challenged quite early on in the affair, seems still to be repeated. The reality is rather different. Those who ran Aum's programme of WMD manufacture were not so much brilliant scientists recruited for the purpose, as bright young men who were already Aum devotees who had some scientific or technological knowledge. The two people who oversaw and were closely involved with all of Aum's experiments with and manufacture of both biological weapons were Tsuchiya Masami, an MA graduate in organic chemistry, and Endō Seiichi, who had been a graduate student of virology at Kyoto University, both of whom had joined Aum in the 1980s, well before it turned to WMD. They were part of a group that rose in prominence in Aum around 1990, when the movement became enveloped in what elsewhere I have described as a realm of 'science-fantasy' (Reader 2000: 236) that coloured and conditioned all its subsequent activities. Others in this group included Murai Hideo, a graduate from Osaka University who had worked as a science researcher for the industrial

firm Kobe Steel, who oversaw all Aum's science and technology-related activities, and Hayakawa Kiyohide, who was largely[4] responsible for Aum's programme of weapons and materials acquisition. It was after their rise (displacing, it would appear, a small group of powerful young women who had spearheaded Aum's emphasis on asceticism and who were also closely involved in inaugurating into the movement the notion of using physical violence as a means of coercing followers into performing ascetic devotions) that Aum became involved with attempts to make and use WMD. The first instance of this occurred in early April 1990, and it was this group that was central to all subsequent attempts to make weapons. Conversely, there seems to have been little external recruitment, at least to the programme of working in the laboratories. If those who joined Aum had some particular skill (for example, Takahashi Hidetoshi, who had been a member, left and returned in 1994, was a graduate student of astronomy, and he was set to work in Aum's Science and Technology section as a result), they would usually be asked to take up work using such skills, but there is scant evidence of any focused recruitment of specialists who could be used in Aum's weapons manufacture programme. Even the widely circulated claims that members of the police and *Jieitai* (Japan's Self-Defence Force) were heavily recruited, appear to be wide of the mark. The US Senate's subcommittee that held an investigation into Aum in autumn 1995, as part of its remit to study the global proliferation of WMD, claimed that some 100 *Jieitai* members were involved with Aum, and that several of these military professionals had assisted Inoue Yoshihiro (a senior figure in Aum, who oversaw its internal security networks and was regarded as one of the main 'enforcers' of Asahara's dictates) in a variety of violent acts (US Congress 1995). Certainly Inoue did make an attempt to get some muscle from the *Jieitai*, and those who joined were responsible for assisting him in a number of criminal acts, including a break-in at the Hiroshima factory of Mitsubishi Heavy Industries on 28 December 1994, when Inoue tried to steal technical documents relating to tanks and other weapons. However, there were very few *Jieitai* members in Aum, and nowhere near the 100 claimed by the US Senate subcommittee. In 1995, when the police raided Aum after the subway attack, they seized Aum's membership lists and found that just seven current or former *Jieitai* personnel were members of Aum (Nishimura and Miyaguchi 2003: 64).

Overall, Aum's activities were driven by devotees who came into the movement not because they had been recruited for their scientific or other skills, but because they had been drawn to Asahara's teachings, become devotees and then began to apply the skills they had acquired in the outside world in the service of Aum. Such people were responsible for numerous Aum activities, from its establishment of companies, to the legal handling of land purchases, to its uses (and abuses) of the legal system to thwart Aum's enemies, to the establishment and running of a medical clinic in Tokyo, which combined spiritual healing with herbal and other medicines. Aum certainly had many highly qualified and talented devotees. Aoyama Yoshinobu, a devotee who served as its main legal expert, graduated from Kyoto University and was the youngest ever person to

pass the bar examinations and qualify as a lawyer in Japan, while Hayashi Ikuo, who ran Aum's clinic, was a qualified doctor and heart specialist who had worked in the USA and been second-in-charge of a major hospital in Japan before converting to Aum.

The presence of highly intelligent and qualified people, most of whom had been through the most elite institutions in Japan (and hence were convinced of their own elite status and ability to do things), coupled with the rhetoric that affirmed their advanced spiritual status, meant they had the confidence and will to engage in activities intended to advance Aum's sacred mission – and also, possibly because they were conditioned to think of themselves as 'elite', to think they could handle any activity. Certainly, they had enough confidence in themselves to think that they could make WMD and master futuristic notions such as the development of a seismic weapon – as well as the mindset to use them. More than scientific skill, what they brought to their activities was a religious fervour and a dedication to a cause that transcended any sense of reward in fiscal terms, and rendered (in their minds) invalid the idea that one needed to have a cohort of highly qualified specialists in order to attempt what they sought to do. At times, it is clear, they blundered as a result. For example, the first attempt at making a biological weapons attack involved spraying botulism from a van in central Tokyo. It failed to work, apparently because the spores as made became detoxified on contact with air – something Aum's scientists were unaware of. Many of the attempts at making chemical and biological agents also went wrong or failed to produce any effective results. Similar failures in delivery systems and the like also point to a lack of technological know-how at the highest levels. Prior to the infamous sarin subway attack of March 1995, Aum had made other attempts to unleash chemical and biological weapons but every device they created that was intended to deliver the gas or germs had failed to work. Consequently, the subway attack (which used only 30 per cent pure sarin because Endō had been unable to get it any purer), was carried out using plastic bags of liquid sarin carried between newspapers and then punctured by pointed umbrellas.

The scientific and technological problems Aum faced were compounded by the fact that their laboratories, put together secretly and hidden from public gaze in buildings on Aum's commune in rural Japan, some two hours' drive from Tokyo, appear, according to Takahashi Hidetoshi, now an ex-devotee who worked in the laboratories in 1994, to have been less than clean, crawling with cockroaches and other pests (despite its attempts to kill vast numbers of humans, Aum adhered to its Buddhist roots in refusing to kill insects), badly organised and chaotic, with toxic materials strewn around and little attempt to impose order. Moreover, Takahashi reports that plans to make various forms of WMD or to experiment with or research new modes of destructive weaponry, would be taken up with enthusiasm within the secretive elite[5] and supported by Asahara, massive resources would be thrown into such new projects (while existing ones would be hastily dropped), only for the new project to be abandoned on a whim when another, newer and more exciting – and, as will be noted below, probably more 'fantastic' – scheme was taken up. The waste of reserves, the chaos and lack of

cleanliness upset Takahashi (who had some experience of scientific environments because of his background as a graduate student in astronomy), who suggested to Murai that the laboratory be organised and cleaned, and a more systematised way of running and deciding on projects be developed. Murai, however, dismissed such suggestions, arguing that Aum was besieged by 'spies' and any attempt to organise the movement would play into their hands, and into those of the authorities who were bent on destroying Aum (Takahasi 1996: 110–16). It is interesting, too, that those who ran the laboratories paid more attention to their belief that one should not harm insects and the like, than to efficient scientific management practices that would normally operate in laboratory situations.

WMD manufacture and acquisition: process and chaos

The above combination of ability (fuelled by self-confidence in their 'superiority') and blundering incompetence also characterised Aum's search for weapons and its attempts to arm itself. On one level, these were carried out rather well, given that their purpose had to be concealed from the authorities. Aum legally created a network of companies, including trading companies, both in Japan and elsewhere, in the USA, Russia and Taiwan, through which equipment and materials were purchased, and through which money was generated to help finance its activities. The network was extensive, and included an import/export agency in Taiwan, a company in Russia called Aum Protect (ostensibly a security firm, but which acted as a front for many of its operations, had connections to the Russian army and was a conduit through which arms and equipment were procured and shipped to Japan), and computer, food and other companies in Japan. Aum's computer company Mahaposhya (the name comes from Sanskrit and is a further indication of Aum's Buddhist connections) was especially successful in vending cheap but reliable computers through retail outlets in Tokyo and elsewhere (a Japanese academic colleague confessed to the author in summer 1995 that he had bought an 'Aum' computer from the company, that it was incredibly cheap and worked well but that he was worried that, with all the arrests and the closure of so many Aum-related concerns, he might be unable to get it serviced in future). Mahaposhya was a conduit also for funds generated in Japan, which were sent to the Taiwanese company and to Russia, and through which materials were purchased. Indeed, when the raids occurred on Aum centres in March 1995, and stockpiles of chemicals and other materials were uncovered, Aum claimed that they had been acquired legitimately (as indeed they had, in that they had been purchased through legitimate channels) as part of its computer business, and for purposes such as making computer components. Mahaposhya, like other Aum ventures, was successful also because those who worked in it were devotees, who worked long hours for nothing apart from subsistence; because, too, many devotees were of the computer generation, they were adept at a variety of computer-related commercial activities, from designing programs to web design to the manufacture of computers – all of which enabled Aum to gather funds with which to engage in the pursuit of WMD.

Aum also acquired control of an engineering company, Okamura Tekko, based in Ishikawa prefecture, which made hydraulic cylinders, in September 1992. Exact details of the acquisition are unclear; but it appears that its head became a member of Aum in 1992 and that the acquisition came through him. This firm, because of its engineering profile, was used to purchase a variety of technical equipment for Aum's laboratories. In 1993, it moved its facilities lock, stock and barrel, to Kamikuishiki, the rural area where Aum's main commune was, after which the factory and its equipment were used for making, or attempting to make, automatic pistols and AK-74 rifles. Aum had acquired one AK-74 rifle in Russia, which is believed to have been smuggled into Japan, probably by Hayakawa, and it tried to replicate this rifle on Okamura Tekko's lathes. In all, the plan was to make 1,000 such rifles, although this was never successfully implemented. Indeed, it is believed that Inoue Yoshihiro (a senior Aum figure who was deeply involved in the process of weapons manufacture and the carrying out of punishments and killings) had the arms that had been made jettisoned shortly after the 22 March 1995 raids.

Aum made, or tried to make, large numbers of chemical and biological agents at its facilities. When the police raided its commune at Kamikuishiki in March 1995 they found that Aum had secret laboratories, along with 500 drums of phosphorus trichloride (a precursor to nerve gas production), vast amounts of reagents and solvents, as well as glycerine and cyanide, and some 160 barrels of peptone (which can be used for cultivating biological spores). Among the substances or biological weapons that Aum either made or tried to make were various nerve gases, including sarin and VX gas both of which Aum used on members of the public. VX was used on two people who had made complaints against Aum, Hamaguchi Tadahiro, who had helped some Aum devotees escape from the movement, in Osaka on 12 December 1994 (he died ten days later) and Nagaoka Hiroyuki (the father of an Aum member, who had brought complaints against Aum) who was attacked and left in a coma in January 1995. Other agents included anthrax and botulism spores (both of which it attempted to use, but with no effects), cyanide (which was used, unsuccessfully, in an attempt to release a cloud of poisonous vapours in Shinjuku station in May 1995), as well as various drugs (including amphetamines, LSD and mescalin) that were used either in trade to generate funds for its WMD programme, or in initiation rituals, using LSD and mescalin in these contexts because of their supposed 'mind expanding' potential.

Aum's initial attempts centred on biological weapons; the defeat in the February 1990 election precipitated Aum's turn to a consideration of mass murder and punishment of the populace, and to attempts to make botulism toxin. Later, in 1992 and 1993, Aum also attempted to make anthrax. On the second occasion, during June–July 1993 an accident occurred, at Aum's Kameido *dojo* (training hall) in Tokyo, in which noxious-smelling gas escaped from a chimney. Members of the public complained, only to be rebuffed rather brutally by Aum members at the hall, after which the police were called in. They, too, were refused entry by Aum members, who claimed that the police visit

represented a breach of the constitutional protection of religious groups. (There have been suggestions, unconfirmed, that the emission of gases at this time may not have been accidental, but was perhaps a test to see if the anthrax spores as manufactured were capable of causing harm to the public; if that is the case, then the experiment failed, for no one reported any illness as a result. The incident is a good example of Aum's brazenness and (probably) incompetence.)

Aum had repeated failures in its attempts to make and use biological weapons effectively, and turned instead to chemical means. Sarin nerve gas – which became the the most central part of Aum's WMD programme – was selected after Tsuchiya had read about it, decided he could make it and and brought it to Asahara's attention in March 1993. Asahara appears to have been intrigued by the prospect and ordered Tsuchiya to go ahead. In November 1993 he succeeded making 20 grams of sarin, which was almost immediately used, on 18 December 1993, in a failed attempt to kill Ikeda Daisaku, the president of a rival new religion, Soka Gakkai, by releasing the agent near his house. In all, according to Tsuchiya's later confessions to the authorities, Aum made five batches of sarin – from the 20 gram sample in November 1993 to five kilograms in March 1995, with an overall total of some 30 kilograms over two years. Besides these successful batches, there were several failed manufacturing attempts as well, along with several accidents, including the near-death of Niimi in April 1994 when he accidentally ingested sarin during an experiment, and an accidental release of sarin at Kamikuishiki on 26 June 1994 – the day before the Matsumoto attack. It was this accident that caused the burnt vegetation around the commune that later provided the evidence linking Aum to sarin. Around 20 kilograms of the sarin was used in the Matsumoto attack, a small quantity was used on 9 May 1994 in an attack on Takimoto Taro, a lawyer who was campaigning against Aum, and the remainder appears to have been either poured away in panic in January 1995, when articles in the national newspapers drew attention to Aum and suggested links between it and the Matsumoto attack, or secretly buried. The remainder of the sarin was dug up in March 1995 and used as the basis for making the sarin that was taken onto the subway. Aum also converted a truck, equipping it with refrigeration and other equipment that could be used to pump out clouds of sarin, in November 1993, and used it in the Matsumoto attack – its most successful use of any form of technology for dispensing nerve gases or other forms of WMD. However, because it feared police attention as a result of the attack, and because it was reported that locals in Matsumoto had spotted a strange truck in the vicinity, it then broke the vehicle up and concealed it, so as to erase any links between itself and the attack.

The Russian connection

While Aum procured chemicals and equipment through legitimate purchases inside Japan, it also engaged in a prominent campaign in Russia where, in the aftermath of the collapse of Communism, it used money and contacts both to set itself up as a legitimate religion (gaining more followers, thirsty for any form of

spiritual hope after the years of Communism, than it ever had in Japan) and to gain influence and access to weapons. The post-1989 situation in Russia of course had created a corrupt and open market for all manner of materials, weapons and the like, which Aum used to its advantage.

In 1992 Asahara met Aleksandr Rutskoi (Yeltsin's vice-president) and Oleg Lobov (secretary of the Russian Security Council) to discuss joint projects including Aum's support of Lobov's pet project, the formation of a Russo-Japanese University. Aum donated funds to this and in return Lobov provided support and letters that enabled Hayakawa Kiyohide to get access to military training sessions and equipment. Aum members attended a Russian MoD centre near Moscow, where Hayakawa and 44 others were provided with military training and lessons in gun handling by members of the Spetznaz. They obtained 20 volumes of KGB military manuals in Japanese (which were later discovered along with hundreds of reference books at Aum centres during the March 1995 raids), an AK-74 rifle (which was to be used as a model for making further guns) and an MI-17 helicopter that Hayakawa purchased and managed to import to Japan. It passed through Japanese customs in 1994 carried by Azerbaijan Air. Kibe Tetsuya (who served as chief of Aum's 'Defence Agency' in the 1994 'government' established by Aum) trained both in Russia and then in the USA as a helicopter pilot, during 1993.

The helicopter was not operational, and Aum never managed to get it to fly. Yet the astonishing thing is that Aum managed to import it into the country, apparently without anyone in authority taking much notice of this. As the website of the Japanese Institute of Global Communications states (2006): 'Perhaps Aum's most astonishing feat in building up its deadly arsenal was their success at importing a Soviet military helicopter into Japan without the police trying to stop them'. It is possible that the authorities just assumed that a new religious leader such as Asahara wanted a helicopter for personal use while visiting his centres around the country. Other leaders of other new religions had opulent means of moving around the country, and at times were known for their excesses, so perhaps the authorities assumed that the helicopter was desired for similar reasons. At any rate, there appear to have been no questions asked about the matter.

The general assumption, based on a combination of the materials found at Kamikuishiki after the raids, and on the testimonies of those arrested who subsequently cooperated with the police (many senior figures, starting with Hayashi Ikuo, a 48-year-old doctor who ran Aum's medical facility in Tokyo but who was one of the five subway attackers, eventually cooperated with the police and made full confessions, many also recanting their faith in Aum and Asahara), is that the group planned to make a huge quantity of sarin and either drop or spray it from the helicopter over Tokyo, thereby killing millions, rendering the capital helpless and enabling Aum to take over. Indeed, this deed appears to have been Aum's goal, its acting out of the apocalypse, and was probably timed for late in 1995 (thereby enacting Asahara's prophecy that the apocalyptic final war would come about during 1995). The sheer scale, potential murderous extent and,

indeed, seeming implausibility of such an act indicates both the extreme state of thinking that characterised Aum by this stage and the detachment from reality that permeated the movement. So, too, did the motives behind the 20 March subway attack. As has been confirmed by members of the movement in subsequent confessions and court testimonies, the March 1995 subway attack was a somewhat desperate attempt to throw the capital into chaos, to confuse or perhaps (since the attack occurred at the subway station servicing the Police HQ) so to emasculate the police that they could not carry out the raids that Aum knew were about to occur as a result of earlier events. By stopping the raids (an idea that says much about Aum's capacity to engage in fantasies, although there is a suggestion (Reader 2000: 22–23) that the March attack was intended to draw attention to Aum and give it immortality), Aum would have chance to continue with its plan to make enough sarin to slaughter or at least incapacitate the capital. This would enable it, if not to conquer the world, to carry forward its desire, premised in its radically polarised division of the world into good and evil, to eradicate the evil and to save the world by destroying it. In doing this, it was doing no more than other radical millennialist groups have done in the past (and will in future).

Other escapades and fantasies

Aum's search for WMD and other means of destruction became increasingly widespread, overt and expensive, as well as chaotic. Inside Japan, illegal attempts to steal technical and other know-how led to attempted break-ins at the laboratories of the Japanese electronics firm NEC, where Aum sought to garner information and secrets about laser technology, and a burglary at Mitsubishi's Research Centre in Hiroshima in December 1994 (which led to the arrests of several Aum followers). Beyond Japan, it also crossed legal lines and acted in ways that drew attention to the group and raised anxieties about its true intent. In 1993–1994, it purchased a mining concession and ranch in the Australian outback, where Aum tried to extract uranium, possibly in order to try and make a bomb, experimented with chemical weapons production and tested sarin on sheep. However, the purchase and Aum's activities surrounding the facility at Banjawarn in Western Australia, were in many ways carried out so incompetently as to draw Aum to the attention of the Australian authorities. The rather striking presence of Asahara and his entourage, and their interest in buying remote outback facilities, coupled with a rather high-handed attitude to locals, aroused suspicion. Aum members who came to work at the facility appear not to have got the correct visas (they entered as tourists even though intent on working) and on one occasion a party of members arrived by plane in Perth, the capital of Western Australia, carrying, in their luggage, large amounts of chemicals and other equipment that, they said, was for gold mining. The excess baggage cost them $30,000 and aroused the suspicion of Australian Customs, who searched it and found chemicals and laboratory equipment that were not permitted to be transported by plane. Two Aum officials, Nakagawa and Endō,

ended up in court and were fined for this breach of the law. Aum used the facility for a while, but several of its senior figures were refused subsequent visas to enter Australia again, and eventually the Banjawarn facility was left abandoned.

Other foreign escapades included a much noted (in the mass media) visit by Aum doctors and nurses to Zaire in 1992, under the guise of offering medical assistance to a region beset by the Ebola virus, but generally believed to have been an attempt to get hold of a strain of the virus and bring it back to Japan. There were also visits by members of Aum's Science and Technology unit, to Belgrade in 1995 to study the works of Nikolai Tesla and to seek details about his apparent discoveries relating to seismic weapons. The notion that powers such as the USA and Russia had weaponry that could cause earthquakes, and that such weaponry would be used in the coming apocalyptic war, appeared in various Aum publications, and Aum's leaders appear to have believed that they, too, could discover their secrets. These instances are mentioned because they are indicative of a wide-ranging and chaotic search for all manner and modes of potential and sometimes fantasy weapons, and also because they are examples of how Aum dispensed large sums of money (the Australian facility was purchased, and with large sums spent on airfares, and then abandoned), in its pursuit of WMD, and of how such escapades occurred in the public domain and were noted by at least some authorities.

In addition, some senior figures mused, or fantasised, about nuclear weaponry. Much has been made of a comment scrawled in a notebook belonging to Hayakawa Kiyohide, along with Murai Hideo, Aum's leading procurer of arms, and the man who was especially responsible for its Russian activities, in which Hayakawa mused about the cost of buying a nuclear weapon. No empirically viable evidence has emerged to show that Hayakawa ever actively negotiated with anyone in Russia for such a device, or that there were any coherent schemes or plans, were such a purchase to have been made, for it to be brought into Japan. The likelihood is that, along with laser and seismic weapons and the failed attempt to collect the Ebola virus in Zaire, it was yet another manifestation of Aum's fantasies running riot, and its obsession with (and fetishisation of) weapons. Hayakawa not only jotted down notes about acquiring nuclear weapons but also laser weapons (US Congress 1995: 21).

It is unclear exactly what Aum's plans and strategies were – if, indeed, they had strategies at all. We have been unable to discern any clear-cut strategy to the attacks using, or the accumulation of, WMD: rather, there was a paranoid, fantasy-driven emphasis on personal spiritual superiority that gave them the 'right' to kill and led them to see themselves as being attacked. There was no indication that Aum ever intended to use its WMD as a form of deterrence or threat to get concessions out of the authorities. Indeed, its polarised world view was such that it regarded worldly authorities with such contempt that it would barely deal with them – a point indicated by its recurrent conflicts with local authorities around its communes (Takeuchi and Kumamoto 1992). Moreover, Aum's wishes (an end to the current society, defeat of the 'forces of materialism' and of the 'evil conspiracy' against it (i.e. the USA, Japan, the

Japanese Imperial family, Freemasons, Jews, etc.)) were so extreme that they were non-negotiable, as is generally the case with religiously impelled extremist groups.

Weapons as objects of reverence and fetish

Another point to consider is that WMD, and especially sarin, became embedded in Aum's thinking and rituals, in a way that transformed it from being merely a poison and a weapon that could be used to kill others, into something approaching a sacrament and object of devotion. Religion (speaking in the general sense) is at some levels concerned with fetishistic behaviour and practices, and the veneration of ritual objects, which are transformed via prayers, chants and practices into something specially significant – a point evident in the recurrent usage and prominence in religious traditions around the globe of pieces of bone that are revered as relics and as symbols of the power and living presence of a sacred figure or founder, or of pieces of paper inscribed with fragments of scripture, that become sacred talismans and charms.

In Aum, WMD in general, and sarin in particular played this sort of role. It was not merely manufactured and used as a means to an end, merely a 'poor man's nuclear weapon', a means of defence against an aggressive opposition (in the context of Aum's paranoid conspiracy theories), but was imbued with sacred properties, as an agent of the sacred mission of world transformation. Asahara made repeated references to sarin in his sermons, especially from late 1993 onwards, initially speaking of it as something that the Japanese should manufacture forthwith in order to protect themselves against American domination. A frequent refrain from Asahara was that the Japanese were being subverted by their own government, which needed to come to its senses and fight against the USA. He also advocated a programme of making arms, complaining that when Japan had been defeated in the Second World War this had been because it had not been sufficiently well armed. Gradually, though, the references to sarin became more and more focused on praising it and chanting its uses and benefits. It became familiarised via nicknames and terms of endearment in Aum; at times it was referred to as *mahō* (a word normally translated as 'magic' but with connotations in Japan of the 'black arts' or even witchcraft) but also frequently with diminutives or shortened names, including *sari-* and *sacchan*. In Japanese, using diminutives, shortening names or adding suffixes (as with *-chan* above, to turn sarin into *sacchan*) are ways of indicating intimacy, while the use of *-chan* suffix is especially significant, giving sarin a familiar, familial and feminine nuance; the suffix *-chan* is commonly affixed to girls' (and sometimes young women's) names (e.g. Sachiko would be Sacchan), especially by family members, friends and work mates. In such ways, Aum dealt with and referred to sarin as something both familiar, feminine and sacred.

It also developed a number of songs that its members sang or chanted – either composed by Asahara or senior disciples – in which martial images, the need to fight and the virtues of weapons such as sarin, occurred frequently. Indeed, some

songs were devoted wholly to sarin, as with the following 'Song of Sarin the Magician' that went thus (US Congress 1995):

> It came from Nazi Germany, a little dangerous chemical weapon,
> Sarin Sarin –,
> If you inhale the mysterious vapour, you will fall with bloody vomit from your mouth,
> Sarin–, Sarin–, Sarin–, the chemical weapon.
> Song of Sarin, the Brave In the peaceful night of Matsumoto City
> People can be killed, even with our own hands,
> The place is full of dead bodies all over,
> There! Inhale Sarin, Sarin,
> Prepare Sarin! Prepare Sarin! Immediately poisonous gas weapons will fill the place.
> Spray! Spray! Sarin, the Brave, Sarin.

Extraordinarily, given that the sarin attack in Matsumoto had occurred, and the authorities were investigating who was responsible (and given that rumours were circulating in Japan by autumn 1994 that Aum was responsible) the above song quite brazenly hints at Aum's involvement in that attack. Such songs, available on Aum cassettes, and printed in Aum magazines and books, were chanted religiously during Aum meetings and rituals, and sarin became a totemic symbol of the movement's power and intentions. Aum publications also prominently featured illustrations and drawings of other forms of weaponry, depictions of what the apocalyptic war would look like, and what forms of futuristic weaponry would be used in it. The recurrent and often fantasy-based attempts to seek out weaponry both of an actual and of a futuristic and imagined nature (as with seismic weapons that could cause earthquakes) suggest not just a fixation of apocalyptic fantasy but also a fascinating devotionalism to the mechanics of destruction. It is important to emphasise this point, and be aware of the sacramental dimensions of such weaponry, because these make the weapons themselves acceptable and amenable to the religious devotees who used them.

We can draw a link and parallel with the videos released by suicide bombers, wrapped in their bomb belts and swathed in insignia such as Islamic symbols and flags and preparing (in their view) for martyrdom and the spiritual rewards that flow from this, after they have carried out their deeds, and to the photographs of them that may be displayed in their communities and family homes. Such photographs and videos indicate that the bomb belts and the uniforms that are worn are not just mechanical devices to be used in a 'war' on opponents. Hung up in houses, displayed on websites, and associated in rhetoric with 'martyrs' and 'martyrdom' (terms deeply imbued with sacred resonance within the rhetoric of their cultures), they are more than just displays of weaponry: they become objects of sanctification, that make the act of bombing a 'holy' one, and help provide a mystical dimension to violence and murder. Such graphic

depictions resonate with and complement the images of destruction that may be found in many religious texts (Aum, for example, was deeply influenced by the images of cosmic war and final battles between good and evil, that occur in texts from the Book of Revelations to the Buddhist millennialist text the Kalachaktra Tantra) and – as was the case with Aum and sarin – may form a complementary strand in a movement's framework of sacred violence.

This is an area that both requires more study and thought and that will be essential for understanding both the turn to violence and the acquisition of weapons by religiously motivated groups. It is worth noting – and this too requires further discussion – that the images of weapon as fetishistic objects and as sources of great imaginative yet destructive power, permeate much of Japanese popular culture, in manga and anime – and that they also hang over Japanese consciousness in a very real way, as a result of war memory. The mushroom clouds of Hiroshima and Nagasaki are deeply rooted images in Japan's modern consciousness, and their spectre of destruction and transformation (aligned to a quasi-religious imagery of light and atomic change) and their presence as a potent symbol of the power of modern technological weaponry to change the world, featured prominently in Aum as well. The terrible beauty of the mushroom cloud, and the blinding light of the bomb, themselves contribute to an underlying visual culture in which destruction and transformation are intimately associated. Beyond just any mechanistic dynamics (in which weapons are a means to an end, whether of fighting a 'sacred war' or committing acts of terror as part of a wider strategy that contains political and religious dimensions) one needs to be aware of how weapons form part of a wider religious construct in which objects that are the media of expressions of power are venerated and elevated into sacred objects because of the power they contain.

For offence or deterrence?

In such a climate of fetishisation and reverence, the impetus to use the weapons that were endowed with sacred meaning and were seen as part of Aum's sacred mission, was to become overwhelming – as it may well be in any religious movement that accords spiritual status to weapons. Certainly the religious groups that have thus far made biological and/or chemical weapons, have used them almost immediately on the general public, if one judges from the two known cases (Rajneesh in Oregon in 1984–1985, and Aum in the 1990s).[6] In Rajneesh's case only a small number of illnesses were caused among the population of Antelope, Oregon, with whom the movement was in conflict (but with evidence that the movement's leaders intended much worse (Gordon 1987: 182–183)), while Aum's activities led to over 20 deaths in two major public incidents at Matsumoto in June 1994 and Tokyo, March 1995, plus several individual incidents of attacks on perceived enemies of Aum. Beyond the attacks that killed, there were others (for example, in May 1995, the attempt to release cyanide through the air ducts at Shinjuku, Tokyo's busiest station, and the attempts to release botulinum spores in Tokyo after the 1990 election) that failed.

My observation from these cases, and from examining the views expressed in Asahara's sermons, in the comments made by Aum disciples and in the attitudes that the movement and its leaders manifested, is that the whole programme of manufacture was centred not around deterrence (i.e. we have these weapons so leave us alone) or even as a means of threat and negotiation ('we have these weapons and will use them if you do not acceded to our demands'). Rather, Aum's rhetoric – and its readiness to turn to violence whenever a problem occurred, for example in attacking an opponent such as the lawyer Takimoto Tarō or the journalist Egawa Shōkō, both of whom were attacked with chemicals because of their anti-Aum activities – indicates that the *aim* of making WMD, whether sarin, VX gas, botulism spores or any of the other weapons that Aum sought to acquire or manufacture, was linked to a desire and readiness to use them. While both Rajneesh and Aum claimed, in the internal rhetoric that enthused their members, that they were creating biological and other weapons in order to defend the group against external attack, and as a means of preparation for an 'inevitable' final war or Armageddon, in reality the reasons for possessing such weapons was to strike out at those they wanted to punish and kill. They did not have the scope for using their weapons as a deterrent because they could not make their possession of them public – a necessary step if their use as a means of deterrent were to be viable. They had to make them and keep them in secret (albeit, in Aum's case, in a rather chaotic secrecy) because to do otherwise would have led to police investigations and arrests.

It is certainly the case that Aum quickly used its chemical and biological weapons soon after making them. Indeed, as far can be seen, Aum attempted to use every form of biological or chemical weapon that it made, with attempts to release anthrax and botulism spores in public places, cases in which VX gas was sprayed on dissidents and opponents, and the uses of sarin at Matsumoto and Tokyo. Its first attempts at making biological weapons – shortly after the failed election of February 1990 – were followed rapidly by an attempt at their deployment in April 1990. Indeed, the very act of releasing the botulism as a punishment for the citizens of Tokyo who had rejected Aum, suggests that the botulism was in effect made for the purpose, rather than that Aum had begun to stockpile the toxin and that an occasion to use it had then occurred. The same is true of the first time that Aum acquired sarin. Tsuchiya was able to make around 20 grams of the nerve gas in November 1993, and almost immediately, on 18 December 1993, this was used in a failed attempt to kill Ikeda Daisaku, the president of a rival new religion, *Soka Gakkai*, by releasing sarin near his house. The same pattern of manufacture followed by almost immediate use was followed in March 1995, when Asahara gave the order (to Endō, Tsuchiya was apparently taking part in a meditation retreat and it was decided not to disturb him) to make sarin. The order went out on 18 March, when Asahara learnt that the police were planning an imminent raid on Aum's facilities to search for an opponent who, it was widely believed, had been abducted by Aum. Endō managed to make an amount of sarin that was 30 per cent pure by late on 19 March and Asahara sent out five devotees with this sarin on the morning of 20 March.

In other words, Aum's pattern of manufacture largely correlates with its use of WMD. In this context, it appears that the vast quantities of materials found when the police raids occurred, may not have signified a planned programme of making and stockpiling WMD for some future use or as a means of deterrence against, or a bargaining chip with, the authorities, so much as indicative of a plan to make and use a vast quantity in one go. It is generally believed, based on testimonies from convicted and other Aum members, that there was a grand plan to release, probably by helicopter, a very large amount of sarin in the air over Tokyo in November 1995. Indeed, it is generally considered that a key aim of the March attack was to cause such confusion in the police that they would be unable to carry out the raids on Aum that were being planned – causing a postponement that would give Aum time to make the sarin with which to realise its grand apocalyptic designs.

This is of immense importance in understanding the relationship between manufacture and use. Having invested energy and money in making chemical and biological weapons, and unable publicly to proclaim and make use of such facts, Aum was not only ready but extremely keen to use its new 'toys' and sacred objects. The paranoid mindset that led Asahara to believe and proclaim that Aum was under attack and that a vast conspiracy was striving to destroy it and to dominate the world, coupled with the view that the world was intrinsically evil, headed towards doom and in need of an apocalyptic catastrophe or cosmic war through which the evil could be destroyed, and that people living in this world were therefore themselves deserving of punishment and in need of being 'purified' and 'saved' from accruing more bad karma, meant that Aum became increasingly predisposed towards violence. As it did so, and as it became increasingly in conflict with the society around it – from lawyers representing unhappy parents of devotees, to local communities whose lives had been disturbed by the presence of an aggressive and uncooperative neighbour – the impetus to use its weapons as a way of 'punishing' others and of fighting the sacred war that was central to its millennialist visions became stronger. Such a context, and its religious visions that enabled it to see its use of chemical and other weapons as sacred acts, part of its mission to save the world, meant that there were few if any restraints on its use of violence.

Why didn't anyone notice? Or, rather, what factors inhibited action?

There was palpable evidence, from at least late 1989, that Aum was engaged in activities that broke the law. On several occasions, senior Aum figures were arraigned on charges including infringing laws that restricted the sale of land designated for forestry and agricultural purposes. Aum had bought land in the southern island of Kyushu under such laws and then built a commune there. Suspicions of much more serious breaches – from the disappearance of a lawyer, Sakamoto Tsutsumi and his family, who had been waging a campaign against Aum in 1989, to later evidence that Aum may well have been involved in a

series of attacks using nerve gases on the public and on its enemies – were widely voiced in Japan, and occasionally surfaced in newspapers and in the writings of the journalist Egawa Shōko.[7] Yet, despite hints of murder, incarceration of dissident followers and much else, and despite indications that Aum was somehow involved in making poisonous substances, there was no real attempt by the police to investigate Aum. Even after the June 1994 poisoning of seven people in Matsumoto (an attack that, as became clear later on, was directed against a panel of judges sitting in judgement on a case involving Aum), the police initially blamed a local man, whose house was near the centre of the sarin cloud, suggesting that he had inadvertently made the poison by mixing weed-killers together to apply to his garden. They persisted with this line even after copious evidence emerged about the 'veneration' of sarin that was going on in Aum, after evidence surfaced – in November 1994 – that the vegetation that had been destroyed in the area around Aum's commune had been affected by sarin, and after national newspapers published, in January 1995, stories very clearly linking Aum to the Matsumoto attack. The recurrent failure of the authorities to do anything about Aum (it took a further two and a half months and a subway attack after the January 1995 revelations, for raids to occur) has been widely attributed to police inertia (Croddy 1995: 520–523) and as a graphic illustration of how the Japanese police failed to protect the public (Japanese Institute of Global Communications 2006).

Inertia and timidity might have been factors, as indeed were Japanese police structures, which meant that (at least in the case of Matsumoto) cases in a locale are handled by the local force no matter how grave they are. In a quiet, law-abiding town such as Matsumoto, the scale of the crime was so enormous that the police appear to have been overwhelmed and to have assumed that, since the level of criminality was so alien to them, the incident must have been an accident and case of inadvertent production of chemicals. But there were other significant factors too, which have been discussed extensively elsewhere. For example, Christopher Hughes (2001: 53–69) suggests that, when the Aum affair blew up, the Japanese police and security agencies were simply looking in a different direction; they had not expected that trouble would come from religious groups, and hence had neither kept an eye on them nor were able to conceive that they might be a cause of trouble. Rather, they remained hidebound by residual and rigid Cold War attitudes and assumed that any terrorist problems would come from the extreme left. In the 1960s and 1970s the extreme left, in the guise of groups such as Rengō Sekigun, the Red Army, had perpetrated a number of violent acts in Japan and this helped reaffirm this view. As a result, even in the 1980s and 1990s, the police and security forces were focusing their attention on such radical left-wing groups while discounting any possibility that religious groups might prove a threat (Reader 2001: 225–234; Hughes 2001: 53–69).

Another critical factor that conditioned the lack of attention paid to Aum related to collective memories of the past relating to the role of Japanese police and security forces in the rise of Japanese fascism from the late 1920s until 1945. In that period the Japanese state assumed monolithic control over all

aspects of life, suppressed many religious groups and pursued an aggressively nationalistic militarist agenda that led Japan to war initially against its Asian neighbours and then against the Allies, and resulted in defeat and the occupation of 1945.

The memory of how the police had intervened in the affairs of religious groups in order to crush any dissent against the state influenced views of the relationship between state and religion in the post-war era, in which a consensus emerged that in order to prevent such thing from happening again, a distinct separation of state and religion, in which the state could not intervene in religious affairs, nor control/repress religious groups, nor fund them, as had happened pre-war with the state's adoption of *Shinto* as a quasi-state religion, was inscribed into the new Japanese Constitution of 1946. While this separation was initially imposed by the American Occupation authorities it was gradually embraced by the Japanese political class, by religious groups and the public in general because it provided protection from police excesses of the sort that had contributed to pre-1945 Japanese fascism. Thus Japan's 1946 Constitution formally declared the separation of state and religion. Religion was placed entirely in the private sphere and no longer were people under any obligation to pay reverence to specific traditions (a contrast from the pre-war period, when everyone was forced to kowtow to state *Shinto*). The Constitution crucially affirmed the principle of freedom of religious belonging and worship and instituted provisions to protect religions from state interference. Central to such protection – and to subsequent laws affirming freedom of religious belief and worship and also providing financial help via tax breaks for religious groups – was a public consensus that religions were entities that operated for the public good (Mullins 1997: 37–46).

Although scandals, unavoidably and unsurprisingly, at times arose especially concerning some of Japan's new religions, several of which faced attacks in the mass media for alleged financial and other malpractices, there were relatively few problems caused by religious groups in the period 1945–1995, a period in which the general consensus was that religions should be protected from the state, and in which the assumption was that it was the state and its agencies that required monitoring and reining in, rather than religious groups. It was such a context that in effect formulated the mindset of the police. Unaccustomed to religiously produced problems, highly cautious because of their past guilt and complicity in the suppressions of the pre-war era (in which police repression of religious groups in the 1920s and 1930s is seen by many as having been the first major step on the road to fascism), and deeply worried that any attempt to scrutinise a religious group or intervene in its affairs would be seen as a potential violation of the Constitution and a step back to the past, the police and other agencies simply did not want to become embroiled in Aum in case they got it wrong. In effect, the fear inside the forces of law and order was that, although they heard suspicions against Aum, they at no time had conclusive proof or evidence that would, in their eyes, suffice to justify upsetting the delicate consensus on religious freedom and protection from state intrusion. On a couple of

occasions in the early 1990s, when suspicions were raised about Aum activities, local police forces did attempt to investigate aspects of Aum's dealings – only to be greeted by vociferous Aum campaigns, led by the skilled legal practices of Aoyama, with cries of police repression and calls to civil rights organisations about alleged breaches of constitutional protection.

As a result, the police forces of Japan effectively buried their collective heads in the sand with regard to Aum. Even as late as spring 1995, when a great deal of evidence had come into the public sphere linking Aum to the Matsumoto attack, the police remained frightened of intervention. It has been suggested that a critical factor here was that a general election was due in April 1995, in which *Kōmeitō*, the political party closely associated with *Sōka Gakkai*, Japan's largest religious organisation, was expected to do well and might hold the balance of power. Political authorities, notably in the governing LDP, but also in the upper echelons of the police force, were fearful that any state-associated intervention into religious affairs (as a massive intervention into Aum would be) might backfire if the police found nothing. Thus, the police sat on their hands. Rumour was that raids were initially planned for shortly after the election. In other words, it was not so much that Aum was 'off the radar' in Japan, as that the social, cultural, legal and political climates were such that the police themselves felt constrained in dealing with Aum because of its nature as a religious movement, and because of the shadows of the past. That situation has changed drastically now, of course, as a result of the affair, which has led to a new paradigm of consensus in which greater emphasis has been placed on the role of the state and of civil authorities in protecting citizens from religious organisations, and in which the tacit notion that religious groups were inviolable from state monitoring and intervention has been cast aside.

Concluding comments

The acquisition by Aum of WMD occurred in essence because of a number of interlocking factors that have been outlined in this chapter. Chief amongst them was Aum's developing apocalyptic millennialist vision, in which the movement saw itself as engaged in a mission to purify the world, destroy contemporary material civilisation and bring about a new spiritual age under its leadership. These three themes are interwoven parts of an integrated whole. The devoted and zealous mindset that framed this vision, and that enabled Aum practitioners to risk their lives in their attempts to make chemical and biological weapons, and fired them with a sense of mission to use them, were utterly crucial to the whole process. A key lesson to be drawn from the affair is that religiously inspired people, when driven by apocalyptic visions and a sense of righteous mission, can go to great lengths to fulfil such visions – and that, as the foregoing indicates – if and when they are able to manufacture WMD, they are likely to be ready to use them. Killing people in large numbers fitted into Aum's theology of violence. Its religious visions gave it no reason to hold back on its murderous activities or to limit the nature of its intent, but rather the reverse. Hence WMD

were themselves attractive to Aum because they offered the potential to implement such visions of mass destruction – whilst also serving as the only viable means of (in Aum's eyes) confronting vastly superior military forces. In addition, though, it should be noted that without the particular climate and context of pre-1995, when state scrutiny of religious groups was almost non-existent and the police would only intervene in religious affairs in very special circumstances (and not at all if they could help it), Aum could not have carried out the programme of WMD acquisition and crimes that its mindset and religious orientations led to. And without these contextual factors, the actual programme of acquisition (which also involved experimentation and danger) would not have occurred.

On 30–31 October 1995 the US Senate subcommittee on Government Affairs, which was examining the issue of 'Global Proliferation of Weapons of Mass Destruction', devoted two days to looking at Aum's activities. The hearing confirmed the shock that the Aum Affair had caused US authorities because it had been so unexpected.[8] It had been assumed that any such event would come from an Islamic group in the Middle East or perhaps from an extreme Christian Identity group in the USA, not from a quasi-Buddhist movement in Japan. The shock waves that this first serious use of WMD on the general public by a religious (indeed any non-government) group at the time appeared to be the precursor of many future acts and to herald a new age in the history of weapons and civil defence. As Senator Sam Nunn, a member of the Senate subcommittee, commented during the hearing:

> The cult, known as Aum Shinrikyo, thus gained the distinction of becoming the first group, other than a nation during wartime, to use chemical weapons on a major scale. I believe this attack signals the world has entered into a new era.
>
> (US Senate 1995)

At the time Nunn's comment certainly appeared to represent a new reality. Yet it is worth considering that, over a decade on, and despite 'global terrorism' having been propelled above far more pressing and important issues to the top of the international agenda, Nunn's fears have not been realised. Over a decade after Aum's uses of chemical weapons in Tokyo, there have been no further cases or incidents of such a sort. The acts of violence and terror against civilian populations that have been carried out have largely centred on 'conventional' means such as bombs and aeroplane hijackings. Even states thought to have chemical weapons in their possession (Iraq) have turned out not to have them, as far as can be told.

What Aum did would not be possible in Japan now, where suspicion of religious and quasi-religious groups is such that monitoring and scrutiny of their activities is carried out in earnest. Aum may have been 'off the radar screen' but its activities have ensured that every other religious group in Japan is now very much 'on the screen', subject to increased public scrutiny and registration

processes, while the mass media have become far more open in their readiness to expose or campaign against any group that even remotely looks suspect,[9] while the police, stung by charges of inertia over Aum, have become much quicker to intervene. In 1999, for example, the police raided the offices of a new religious group, *Hōnohana Sanpōgyō*, that had been the subject of numerous media stories about corruption and allegations of fleecing or defrauding members. While there was never any hint of violent or dangerous activity involved, the police did find enough evidence of fraud and financially dubious goings on, to have the movement closed down and its founder, Fukunaga Hōgen, charged and then gaoled for criminal deeds. The *Hōnohana* case indicated that the police, so slow to move after Aum, were not going to allow any subsequent case to lapse. (One might add that institutional turf wars have clearly added impetus to the readiness of the police to act: after the Aum affair, the Public Security Intelligence Agency (PSIA) in Japan lobbied hard to be given rights of surveillance over religious groups, and it was given powers to check up on Aleph, the 'reborn' Aum.) The police and PSIA are to some extent competing to show who can most reliably monitor dangerous groups, with the result that an added level of surveillance and a heightened readiness to intervene, are the pattern now.

Financial and other regulations have been tightened up so that no group can – at least so brazenly – set up laboratories, acquire and smuggle in weapons from Russia, purchase vast quantities of equipment, and make WMD even while bungling so often that their activities become evident to outsiders – and while making such a noise (via songs about sarin and public sermons going on about the need to make sarin and other such weapons) about the very substances they were illegally manufacturing. The physical processes of acquisition and manufacture would now appear to be impossible, at least without far more sophisticated practices and skills, and it is highly unlikely, in Japan at least, that relatively unsophisticated young men with science degrees, yet not specialists in advanced technologies, could turn their hands to making both biological and chemical weapons and sing loudly about it, without the authorities rather quickly noticing or reacting to stories that would appear in the mass media.

Yet one should caution that this does not guarantee that others in other religious-driven groups may not, at some later stage, emerge with the desire, the passion, the spiritual commitment and motivations to risk life and limb, in pursuit of their apocalypse, and seek to find their own way to manufacture the means of enacting that endgame. Perhaps attempts to develop chemical and biological weapons will not be as commonplace a phenomenon in the world of terrorism as Senator Nunn assumed, but this does not mean that religious groups, at least, might not in future be attracted to this means of apocalyptic destruction. After all, a fascination with poisonous means with which to terminate life or strike at opponents has characterised a number of groups, from Aum to the Rajneesh movement, to the Peoples Temple at Jonestown, whose suicidal demise in 1978 was occasioned by ingesting cyanide and which had been characterised by frequent 'suicide drills' centred around the imagined ingestion of

cyanide (Moore 2000: 121–137; Maaga 1998: 131–135). Indeed, nothing is surer in religious history than that we will see other millennialist movements with catastrophic visions that are intrinsic to their spiritual reading of the world, and in which the need to destroy the world, or to take steps to bring about the apocalypse, will be central to their purpose. The set of circumstances that galvanised Aum in this way, however – the emergence of an influential group of emboldened young men with science backgrounds who were caught up in a dystopian fantasy that imagined a coming futuristic war, and who believed they were sacred warriors capable of defeating evil forces and saving/transforming – may be unique, yet Aum's devotees did show that, inspired by extremes of devotion and spurred by millennialist visions of destroying an old corrupt order and bringing about a new spiritual realm, people may be prepared to risk immense dangers and turn to WMD if the opportunity arises.

Weapons that explode and gases that poison have the same effect no matter what the motives of their users are. Yet to understand how their users got where they were – whether the Aum devotee with his bags of sarin on a Tokyo commuter subway train or the Palestinian bomber on a 'martyrdom' expedition – requires us to recognise that weapons are not merely means of advancing a particular viewpoint through means of violence and war. They can also be deeply tied into the religious imagery and motivations of the groups that use them. Aum's songs about sarin and the devotional ways in which the movement spoke about the substance transformed it from just being a destructive substance that could be used in any confrontation or sacred war against its enemies, into being the equivalent of a sacrament, a devotional substance that becomes part of the ritual processes and mindset of the movement. Similar themes may be discerned in the photographs and videos of suicide bombers and their 'uniforms'. In such contexts, the acquisition of weapons, whether chemical, biological or conventional, goes beyond just the physical acquisition of means of destruction and violence and becomes part of a wider framework of religiously inspired and oriented violence, in which the means of destruction themselves become sacred, and even sacramental, objects.

Notes

1 All Japanese names in this chapter are given in standard Japanese format, i.e. family name first, followed by given name.
2 For a fuller discussion about differing forms of millennialism, and especially about the concept of 'catastrophic millennialism' see Wessinger (1997: 47–59; 2000: 4–10).
3 Asahara Shōkō (no date) *Vajrayana kōsu. Kyōgaku shisutemu kyōhon*. (Asahara VK). Internal unpublished Aum document dating from *c.*1994, p. 19. This document of 368 pages was a collection of 57 of Asahara's sermons given over the period 1988–1994 and was considered in Aum to be the core of his teaching, and read only by initiated disciples for whom it was seen as a form of training manual.
4 'Largely' because it would appear that there was no clear-cut structure of responsibility in Aum beneath Asahara, the leader, and the general understanding is that Murai and Hayakawa in effect competed with each other to show who could be the most effective and radical in their activities – a contest that may well have spurred Aum on to more extreme activities.

5 Space does not permit a discussion of Aum's structure here save to note that the movement was intensely hierarchic and that an inner core effectively ran the WMD manufacture and usage programme concealed from the eyes of ordinary devotees.
6 In addition, there have also been other incidents, such as the Peoples Temple and its manufacture and use of cyanide in Guyana in 1978, but this was only directed within the movement.
7 Egawa was the first person to write about Aum's activities and to suggest it posed a danger to society, in various newspaper and magazine articles from the late 1980s, and in books such as Egawa (1991).
8 Comments at the hearing were in essence repeated to the author three years later when visiting the FBI Academy at Quantico, Virginia, to lead a seminar for the FBI's Critical Incident Response Group (CIRG) on Aum and its dynamics. US intelligence agencies and authorities had expected that, at some time, a non-governmental agency would acquire and use WMD in public places, yet when this event happened, it had come from a direction that no one had expected. As a senior FBI official said to the author in 1998, the movement was 'off the radar screen' and no one had given any thought to Japan as the likely first place for such an incident.
9 For how a small religious group called Panawave, which turned out to be benign, quickly became the centre of a national furore because of the seemingly odd behaviour of its followers, and was briefly seen as the 'next Aum', see Dorman (2005: 83–103).

References

Asahara Shōkō (no date) *Vajrayana kōsu. Kyōgaku shisutemu kyōhon* Asahara: VK.

Croddy, Eric (1995) Urban Terrorism–Chemical Warfare in Japan. *Jane's Intelligence Review* 7(11).

Dorman, Benjamin (2005) Pana Wave The New Aum Shinrikyō or Another Moral Panic? *Nova Religio* 8(3).

Egawa Shōko (1991) *Kyūseisha no yabō* Tokyo: Kyōikushiryō Shuppankai.

Gordon, James S. (1987) *The Golden Guru* Lexington, VA: Stephen Greene Press.

Hughes, Christopher (2001) The Reaction of the Police and Security Authorities to Aum Shinrikyō, in R.J. Kisala and M.R. Mullins (eds) *Religion and Social Crisis in Japan: Understanding Japanese Society through the Aum Affair* Basingstoke: Palgrave.

Japanese Institute of Global Communications (2006) Online, available at: glocom.org/special_topics/social_trends/20040302_trends_s70/index.html (accessed 2006).

Kisala, Robert J. and Mark R. Mullins (eds) (2001) *Religion and Social Crisis in Japan: Understanding Japanese Society through the Aum Affair* Basingstoke: Palgrave.

Lifton, Robert Jay (1999) *Destroying the World to Save It: Aum Shinrikyō, Apocalyptic Violence and the New Global Terrorism* New York: Metropolitan Books.

Maaga, Mary (1998) *Hearing the Voices of Jonestown* Syracuse, NY: Syracuse University Press.

Moore, Rebecca (2000) American as Cherry Pie: Peoples Temple and Violence in America, in C. Wessinger (ed.) *Millennialism, Persecution, and Violence: Historical Cases* Syracuse, NY: Syracuse University Press.

Mullins, Mark R. (1997) The Political and Legal Response to Aum-Related Violence in Japan. *Japan Christian Review* 63.

Nishimura, Masashi and Miyaguchi Hiroyuki (eds) (2003) *Oumu Shinrikyō daijiten* Tokyo: Tōkyō Kirarasha.

Reader, Ian (2000) *Religious Violence in Contemporary Japan: The Case of Aum Shinrikyo* Richmond, UK and Honolulu, US: Curzon Press and University of Hawaii Press.

Reader, Ian (2001) Consensus shattered: Japanese Paradigm Shifts and Moral Panic in the Post-Aum Era. *Nova Religio* 4(2).

Robbins, Thomas and Susan Palmer (eds) (1997) *Millennium, Messiahs, and Mayhem* New York: Routledge.

Shimazono Susumu (1997) *Shūkyō no kanōsei: Oumu to bōryoku* Tokyo: Iwanami Shoten.

Takahashi Hidetoshi (1996) *Oumu kara no kikan* Tokyo: Sōshisha.

Takeuchi and Kumamoto Nichinichi Shinbun (eds) (1992) *Aum Shinri Kyō to mura no ronri* Fukuoka: Ashi Shobō.

US Congress (1995) Online, available at: fas.org/irp/congress/1995_rpt/aum/part07.htm (acessed 2007).

Wessinger, Catherine (1997) Millennialism With and Without the Violence, in T. Robbins and S. Palmer (eds) *Millennium, Messiahs, and Mayhem* New York: Routledge.

Wessinger, Catherine (ed.) (2000) *Millennialism, Persecution, and Violence: Historical Cases* Syracuse, NY: Syracuse University Press.

Part II

Chemical and biological

3 Chemical and biological terrorism and multilateral conventions

Edward M. Spiers

'Conventions do not work against terrorists', asserted Major-General William F. Burns, when head of the US Arms Control and Disarmament Agency. At the time (10 February 1989) his agency was of all branches of the State Department arguably the most closely identified with the negotiation of further measures of multilateral disarmament, specifically the Chemical Weapons Convention (CWC). As terrorists operated outside the law, he insisted that they could not be dealt with by conventions but reckoned, conversely, that chemical weapons could prove 'very attractive' to terrorists because they were cheap and could terrify 'and those are two things that terrorists require' (Burns 1989: 107). In raising this issue at a time when only a few terrorists had employed or tried to employ chemical or biological weapons,[1] and only a handful of commentators were sounding the tocsin about this prospect (Hurwitz 1982: 36–40; McGeorge 1986: 56–61; Douglass and Livingstone 1987; Spiers 1989: 135–8), Burns was raising critical issues for debate. Were terrorists likely to employ chemical and biological weapons and, if so, how should target states respond, and, if this was a problem with global implications – the context in which he was testifying – were multilateral agreements of any relevance whatsoever? These questions aroused fresh salience in the wake of the Aum cult revelations in the mid-1990s, when speculation erupted about the so-called 'new terrorism', and then contemporary resonance in the wake of the 9/11 atrocities. Multilateral disarmament had taken further root with the signing of the CWC in 1993 and its entry into force four years later, while diplomats and their technical advisers had sought to enhance the effectiveness of the Biological and Toxin Weapons Convention (BTWC) by devising a protocol for the Convention. Whether such conventions can assist in curbing terrorism remains a matter of contention.

Although this chapter will focus primarily upon the aftermath of 9/11, the parameters of the debate were set, at least partially, by the controversies of the 1990s. The attack with the nerve agent, sarin, upon commuters travelling on five trains towards Kasumigaseki station on the Tokyo underground (20 March 1995) represented, in Brian Hoffman's opinion, the crossing of a threshold: 'This is the cutting edge of high-tech terrorism for the year 2000 and beyond. It's the nightmare scenario that people have quietly talked about for years coming true'. (Staff Statement 1995: 47).

Twelve people died from the gas and another 5,500 sought hospital treatment in an attack that had a precedent (when a previous attack killed seven and injured another 200 at Matsumoto on 27 June 1994). Widespread panic and disruption followed threats of further attacks as many members of Aum Shinrikyo (Supreme Truth) cult, including its leader, Shōkō Asahara, were arrested. Large quantities of chemicals were found in the premises of the cult and it was later revealed that the cult had experimented with biological warfare, sending a team to Zaire in the hope of acquiring the Ebola virus and mounting some nine abortive biological attacks (Robinson 1995a: 10; Robinson 1995b: 9; Olson 1995: 106; Broad 1998: A1, A10; Kaplan and Marshall 1996).

In responding to the Tokyo attack, the much-criticised Japanese government promptly ratified the CWC and passed domestic implementing legislation. It thereby criminalised the development, production and possession of chemical weapons and facilitated the monitoring and inspection of chemicals on the CWC schedules at designated facilities (Tucker 1997: 95–112). Beyond doing *something* in the wake of this disaster, it was none too clear that the Japanese government had done very much. When Dr Gordon G. Oehler, director of the Non-Proliferation Center, CIA, was asked whether the Aum cult would have found it harder to make chemical weapons had the CWC been in force since 1993, he completely disagreed. Curtailing its activities, he argued, was unlikely because the cult had neither imported chemicals across international borders nor incurred a criminal record and so could move chemicals legitimately within Japan (Oehler 1995: 283–4). A US Inter-Agency Report on Terrorism subsequently declared that 'in the case of Aum Shinrikyo, the CWC, the Chemical Weapons Convention, would not have hindered the cult from procuring the needed chemical compounds used in its production of sarin', a conclusion endorsed by George J. Tenet, then acting director of the CIA. He accepted that the CWC might have made it more difficult and costly to acquire chemical weapons but insisted that a determined group could have circumvented its provisions (Tenet 1997: 51).

More significantly the Aum case spawned a fresh wave of studies of the so-called 'new terrorism'. These included an invaluable Canadian survey of the existing literature (Purver 1995), lively debates in scholarly journals (Tucker 1996; 167–83; Falkenrath 1998: 43–65; Kamp 1998–99: 168–83; Lederberg 2000) and conferences involving scholars and politicians (Drell *et al.* 1999). John F. Sopko, who served on the staff of the US Senate's Permanent Sub-Committee on Investigations during the investigation of the Aum cult, provided a challenging account of the new proliferation threat. He claimed that the actors had changed and that these fanatical groups or deranged individuals had gained access to the requisite materials. It was now quite possible, he argued, that terrorists could acquire the technical know-how and equipment to make a crude chemical or biological device, 'enough to kill thousands and cripple a major metropolitan area', and that they may wish to cause large-scale casualties (Sopko 1996–7; 3–20). Walter Laqueur, the doyen of terrorism studies, agreed that the danger of CBW terrorism had increased because of the confluence of two trends: the increasing accessibility

of mass-casualty weapons and the emergence of more ruthless forms of religious and ideological fanaticism (Laqueur 1998: 169–78). Richard Falkenrath reckoned that many of the factors that had hitherto inhibited terrorists from recourse to nuclear, biological or chemical (NBC) terrorism were diminishing, and that even if the likelihood of NBC terrorism remained rare, it remained a 'low-probability, high-consequence' option, one that challenged modern states with porous borders, free and open societies and high population densities in cities. The consequences, he argued, ranged beyond mass casualties to include contamination of large areas, panic, degraded response capabilities, economic damage and possibly adverse socio-psychological, political and strategic effects upon the target state (Falkenrath 1998: 61).

William Cohen, then US Defense Secretary, dramatised the biological threat by claiming on the ABC television programme, *This Week* (16 November 1997), that a five-pound bag of sugar, if filled with *Bacillus anthracis* spores, could kill at least half the population of Washington DC. Theoretically, this could happen but only if the atmospheric conditions were perfect, the anthrax very potent and the dispersal system highly efficient. Unabashed by criticisms that he had somewhat simplified the nature of the threat (Miller *et al.* 2001), Cohen wrote subsequently that the US superiority in conventional weapons was 'prompting adversaries to seek unconventional, asymmetric means to strike our Achilles' heel'. Weapons of mass destruction (WMD) were finding their ways 'into the hands of individuals and independent groups – fanatical terrorists and religious zealots beyond our borders, brooding loners and self-proclaimed apocalyptic prophets at home'. The speed and scope of modern air travel, he asserted, could carry a 'highly contagious virus across hemispheres in hours', with hospitals becoming 'warehouses for the dead and dying'. As Cohen advised his readers: 'Welcome to the grave New World of terrorism – a world in which traditional notions of deterrence and counter-response no longer apply' (Cohen 1999: A19).

If overdramatising the issue in public, Cohen reflected the concerns of an administration increasingly anxious about terrorists employing WMD, especially biological agents. This anxiety had waxed and waned, as reflected in the gap between Presidential Decision Directive (PDD)-39 of June 1995 (aimed at deterring, pre-empting, apprehending and prosecuting terrorists) and PDD-62 of May 1998 (creating a national coordinator for 'security, infrastructure protection and counterterrorism'). Underpinning the revival of presidential interest in late 1997 and early 1998 were the continuing Iraqi crisis, particularly Saddam's defiance of the United Nations Special Commission (UNSCOM), the revelations of the Soviet BW capability by the defector Ken Alibek (formerly Kanatjan Alibekov, the second in command of the Soviet BW programme, Biopreparat) and intelligence reports on a growing number of states engaged in BW research. Richard Preston's popular novel, *The Cobra Event* (1997) captured the interest of President Bill Clinton; it coincided with the agendas of congressional legislators (Defense Against Weapons of Mass Destruction Act of 1996), the Pentagon's plans to inoculate service personnel against anthrax and the findings of specialist committees (notably the report of the Defense Science Board Summer Study on

Transnational Threats). Ultimately, on 22 January 1999, Clinton requested that $10 billion should be spent on counterterrorism programmes, domestic preparedness and critical infrastructure protection. All this represented a national response to the perceived terrorist threat; it did not involve, as some advisers hoped, any American commitment to enhance the Biological and Toxin Weapons Convention (GAO 1999: 4; Miller *et al.* 2001; Spiers 2000: 92–3; Clarke 2004).

Scepticism towards multilateral conventions had already taken root in the administration and in influential committees on Capitol Hill. The Clinton administration may have worked deftly to secure the Senate's ratification of the CWC but it showed scant willingness to use the Convention as a diplomatic tool. Despite harbouring deep suspicions about the declarations of some states parties, the Clinton administration never requested a challenge inspection. It also preferred to act unilaterally (and almost certainly erroneously) in its missile strike upon a Sudanese chemical plant (20 August 1998) (Spiers 2000: 116–17), and monitored the chequered fate of the UNSCOM inspections, which raised further questions about the purported value of on-site inspections. Despite being supported by unprecedented rights of entry and access in a uniquely focused undertaking, backed by the authority of the UN Security Council, with extensive sharing of intelligence and the use of many data-collection and analysis techniques, the UNSCOM inspections encountered extensive Iraqi obstruction. Although the inspectors destroyed some 22,000 filled chemical munitions (1991–94), they depended upon a fortuitous defection of Saddam's son-in-law, Hussein Kamel Hassan, before the full extent of the BW programme could be revealed in 1995. After seven years Richard Butler, the executive chairman of UNSCOM, conceded that his inspectors could not 'provide 100 per cent verification of the claimed fate or disposition of prohibited weaponry' (Spiers 2000: 37–9, 111–13; UN 2006: 11; UN 1998).

As the UNSCOM inspections also proved corruptible, with intelligence passed on to the CIA (in violation of UNSCOM's mandate) for use in Operation Desert Fox (Weiner 1999), the viability of the inspection process remained suspect. Quite apart from those American commentators, including the former director of the CIA, R. James Woolsey, who questioned whether the CWC would eliminate all chemical weapons, even more professed scepticism about the ability to detect or verify conclusively evidence of non-compliance with the BTWC (Hoeber and Woolsey 1994: 93, 163; Roberts 1997a: 37).

Nevertheless, Larry C. Johnson, a former deputy director, Office of Counterrorism, State Department, found reassurance from the failure of Aum. The cult, he observed, despite a five-year effort, the investment of millions of dollars, the employment of some PhD scientists and the acquisition of several laboratories specifically designed and equipped to make CBW agents, had had only limited success. As he explained:

> They tried twice unsuccessfully to produce and use Botulinus Toxin A (one of the deadliest biological agents). They had a similar failure with anthrax.

> They successfully produced the nerve agent sarin, but it lacked the purity and effectiveness associated with military-grade weapons. Their attack on the Tokyo subway system injured five thousand people and killed 12. Despite the attack the subways were back in operation the same day.
>
> (Johnson 1998: 36)

What is overlooked in this account is that the diluted sarin, and a primitive dispersal system, derived from a premature attack, hastily conceived over a weekend, intended to divert the police from an imminent raid on Aum premises. Nor did Johnson reflect on the mass panic caused on the morning of the attack, and on subsequent occasions thereafter, including a much more sophisticated attack prepared for Shinjuku Station, Tokyo, on 5 May 1995 (Staff Statement 1995: 66–9).

Yet Johnson was making a substantive point, namely that the production of these weapons in improvised facilities was more demanding and dangerous than often claimed, and that dispersing them effectively was even more problematic. Aum reportedly encountered difficulties in acquiring potent strains of anthrax and any strains of *Clostridium botulinum* (Leitenberg 2005; Tucker 2001: 6–7) and, by producing microbial agents in a liquid slurry, only dispersed a small proportion of agent in aerosolised form, with most of the agent instead forming heavy droplets when sprayed into the air. To inflict mass casualties, terrorists would have to disperse BW agents as an aerosol, with the infectious particles between one and five microns in size. Aerosols can be delivered as either a wet mist or in a dry powdery form but the latter is easier to transport and generally travels farther on the wind, thereby enhancing the potential to inflict casualties over a wider area. Delivering agent in dry form requires drying the bacteria to a solid cake and then milling it into a fine powder – technically challenging tasks that might require state sponsorship or the recruitment of experienced scientists from the Soviet Union, South Africa or some other country that had an advanced BW programme (Tucker 2001: 8; Lowe 1997: 53–64).

Had Aum then broken the taboo against the use of chemical and biological weapons and ushered in a new era of mass casualty terrorism? The 'US intelligence community' contended that 'conventional weapons continue to be the weapons of choice for terrorists', even if the likelihood of using chemical and biological materials might increase 'over the next decade' (GAO 1999: 1–2).

Apart from the technical hurdles, using CBW agents had operational disadvantages inasmuch as they were hazardous to handle and unpredictable in open areas (other than in tactical operations, like the assassinations undertaken or attempted by Aum with VX). Unlike conventional munitions, CBW agents would not produce shocking or dramatic effects that could be captured readily on television, and so would hardly appeal to those terrorists, whom Brian Jenkins once described as preferring to see 'a lot of people *watching*, not a lot of people *dead*' (Jenkins 1985: 511). Moreover, the reluctance to murder on the grand scale reflected not merely operational constraints but also the political

purposes driving some terrorist actors and organisations. Terrorists, argued Jenkins, would have to balance:

> The capability to kill on a grand scale … against the fear of alienating perceived constituents (a population that terrorists invariably overestimate), provoking widespread revulsion, and unleashing government crackdowns that have public approval. The practical consideration of maintaining group cohesion also tends to impose limits on terrorist violence.
>
> (1985: 512)

If the technical, operational and political reasons failed to inhibit recourse to chemical or biological terrorism, Ron Purver, a Canadian intelligence analyst, catalogued a range of other factors that had apparently prevailed before Aum. Coupled with the unpredictability of using such weapons was the possibility that they might arouse moral qualms among the terrorists or fears about their personal safety, and so increase the possibility of defections from the groups involved. Hitherto most terrorists felt it unnecessary to use such weapons in mounting attacks. State sponsors probably dreaded any usage lest retribution fall upon themselves as the supplier states, and threats or acts of mass destruction seemed disproportionate to the demands normally made of target governments. Admittedly, Purver found evidence in the open literature that contradicted nearly all these points, including claims that all the technical and political inhibitions to CBW use were steadily eroding, that some groups, as Aum proved, might relish using chemical and biological agents, and that the taboos against the terrorist use of CB agents were largely illusory. The balance of the argument was shifting, not least in the nature of contemporary terrorism with suicide bombers, recourse to mass indiscriminate killing (as in the Oklahoma City bombing) and the capacity of a paranoid leader, such as Shōkō Asahara, to combine charismatic appeal, technical sophistication and group cohesion over an extended period in a difficult and dangerous task. 'A sufficient number of countervailing trends', concluded Purver, had eroded 'important past constraints, lending support to the widespread consensus among analysts that the likelihood of terrorist use of CB agents in the future' was 'both real and growing' (Purver 1997: 73; 1995: 112–24).

This consensus did not presume any rash of copycat attacks in the wake of Aum. As Michael L. Moodie, then president of the Chemical and Biological Arms Control Institute, argued, the technical barriers, particularly those inhibiting chemical terrorism, had never been 'all that high in the past' and were now becoming 'less restrictive as a result of proliferation, technology diffusion, and the internet', but they had not disappeared (Moodie 1999: 32; Roberts 1997b: 127–9). Even if terrorists were imbued with brutalised aims, religious millenarianism or hatred for particular societies or religious/racial groups, and even if they revelled in the prospect of killing civilians indiscriminately, they might struggle to acquire, develop or utilise chemical weapons effectively. They might find biological weapons more difficult to employ other than in assassinations or

in economic terrorism (where the use of only trace amounts of poison could contaminate or threaten to contaminate food, agricultural or pharmaceutical products). On the other hand, employing biological agents in particular circumstances might prove tempting as they would not leave a distinct signature, and take effect several days or weeks after the attack. This could enhance their appeal for covert, discreet operations and enable the perpetrators both to leave the scene of the attack, or the country concerned, and deny any involvement in the ensuing outbreak of disease. Similar reasoning might tempt terrorists into undertaking more catastrophic attacks upon civilians but they would still have to acquire the necessary scientific and technical expertise, and possibly test their capabilities in advance, so increasing the opportunities for detection by intelligence and law-enforcement agencies. Facing such risks, terrorists might prefer to rely upon conventional weapons. Several commentators concluded that a massive terrorist attack with NBC weapons was neither inevitable nor 'even likely' (Sprinzak 1998: 113) but this confidence would only apply if the intelligence and police organisations were alert and trained to counter such events, assumptions that failed to apply in the case of Aum.

Quite apart from all the liaison difficulties between the FBI and the Japanese National Police, Aum had not been a target of CIA inquiry prior to the Tokyo attack. Criticised for this oversight, Gordon Oehler defended the CIA's preoccupation with the proliferation of WMD at state level: 'I really do not see any inclination here or abroad to have the CIA running around peering into religious groups around the world to see who is naughty and nice'. When reminded about the cult's preaching of Armageddon between Japan and the United States, its global links and recruitment of thousands of members in Russia, Oehler added that:

> The world is full of very crazy organizations that have designs against the US … we have not followed religious cults around the world and we do not have the resources to be able to do that … the first line of defense … is the local in-country police force, and if there is some indication that there is some problem that goes beyond that, then it is, of course, a very critical role for the intelligence community outside the US, from the FBI and others inside the US, to recognize that and take whatever action is necessary.
>
> (Oehler 1995: 276)

Understandably, the congressional staff inquiry on the Aum affair questioned the priorities of US intelligence, its allocation of resources to WMD terrorism and the lack of coordination between US government agencies, especially as evidence on foreign groups was likely to come from a diverse array of sources. In advocating the case for a national clearing house on all sources of intelligence, it claimed that a 'critical need apparently exists for US law enforcement and intelligence agencies to share information and coordinate activities in regard to WMD terrorism' (Staff Statement 1995: 82).

Many of these criticisms resurfaced in the wake of 9/11, when commentators asked how the United States could spend nearly $30 billion annually on

intelligence but fail to predict the 11 September attacks (Cilluffo *et al.* 2002: 61–74). Al Qaeda's assault upon the American homeland was not only the most costly ever in loss of life, economic destruction and psychological shock but it also exposed the vulnerability of the United States and challenged its sense of exceptionalism. In the aftermath officials speculated on future terrorist attacks with weapons of mass destruction but President George W. Bush deliberately refrained from mentioning this concern in his address to Congress and the American people on 20 September 2001 (Woodward 2003: 106). Instead he focused on the 'enemies of freedom' who had committed 'an act of war against our country', intending to kill Americans 'military and civilian, including women and children'. Throwing down the gauntlet to Al Qaeda and the Taliban regime in Afghanistan, he proclaimed that 'Our war on terror begins with al Qaeda, but it does not end there. It will not end until every terrorist group of global reach has been found, stopped and defeated'. He maintained that Americans 'should not expect one battle, but a lengthy campaign, unlike any other we have ever seen' (Bush 2001).

During the preparation for, and conduct of, Operation Enduring Freedom, the Bush administration remained concerned about the possibility of Al Qaeda possessing weapons of mass destruction. In the absence of 'definitive intelligence' (Woodward 2003: 218), this remained only a possibility but a worrying one as it coincided with the distribution of letters containing a dry-powder, high-quality preparation of anthrax spores in the USA during October and November 2001. Tenet reportedly thought that Al Qaeda might be involved in these incidents, using spores supplied by a state sponsor, but the spores were later thought to have come from an American bio-defence laboratory (an assumption questioned after five years of investigation). The attacks killed five people, sickened another 17 and caused massive panic, with over 30,000 people in Washington DC alone taking prophylactic antibiotics. They required the US postal service to spend over $1 billion to decontaminate mail-sorting offices and closed the Hart Senate Office Building for several months. Compounding these effects was a criminal investigation that proved slow, costly and inconclusive, at odds with the need for a prompt and decisive response (Woodward 2003: 248; Shane 2001; Grotto and Tucker 2006: 6–7; Lengel and Warwick 2006: A1; Brooks 2006).

Evidence, including computer files and videos, was then uncovered in Kabul, confirming that Al Qaeda had begun its research and development on chemical and biological weapons. Following the declaration of Osama bin Laden that 'We don't consider it a crime if we tried to have nuclear, chemical, biological weapons', (*Newsweek* 1999: 13), it was now evident that between $2,000 and $4,000 had been earmarked in 'start-up' costs for the programme, that experiments with nerve gas had been conducted on dogs and rabbits at a camp near Jalabad, and that instructions had been given for building a laboratory. A progress report complained that the use of non-specialists had 'resulted in a waste of effort and money', and that the recruitment of experts was the 'fastest, safest and cheapest' route to follow (Cullison and Higgins 2001: A1, A3). In his next State of the Union message (29 January 2002), President Bush seized upon

such reports to claim that the depth of Al Qaeda's 'hatred' was only equalled by 'the madness of the destruction they design'. The evidence 'found in Afghanistan', he argued, 'confirms that, far from ending there, our war against terror is only beginning'. Tens of thousands of terrorists, he affirmed, were still at large, viewing the entire world as their battlefield and 'we must pursue them wherever they are'. US objectives were twofold: 'First, we will shut down terrorist camps, disrupt terrorist plans, and bring terrorists to justice. And, second, we must prevent the terrorists and regimes who seek chemical, biological or nuclear weapons from threatening the United States and the world'. In denouncing the so-called 'axis of evil' – North Korea, Iraq and Iran – he claimed that:

> By seeking weapons of mass destruction, these regimes pose a grave and growing danger. They could provide these weapons to terrorists, giving them the means to match their hatred … . We will work closely with our coalition to deny terrorists and their state sponsors the materials, technology, and expertise to make and deliver weapons of mass destruction.
>
> (Whitehouse 2002a)

Lest there be any doubt about the aims and approach of US counterterrorism following the regime change in Afghanistan, Bush spelt out the implications before the graduates at West Point (1 June 2002). 'For much of the last century', he declared:

> America's defense relied on Cold War doctrines of deterrence and containment. In some cases, these strategies still apply. But new threats also require new thinking. Deterrence – the promise of massive retaliation against nations – means nothing against shadowy terrorist networks with no nation or citizens to defend. Containment is not possible when unbalanced dictators with weapons of mass destruction can deliver those weapons on missiles or secretly provide them to terrorist allies.

While homeland defence and missile defence would become part of a stronger security posture, reliance on the use of multilateral arms conventions was conspicuous by its absence. The United States, declared the president, could not put its 'faith in the word of tyrants, who solemnly sign non-proliferation treaties, and then systematically break them'. Moreover, although homeland security and missile defence would enhance American security, the war on terror would 'not be won on the defensive': Americans must be 'forward-looking and resolute … ready for preemptive action when necessary to defend our liberty and to defend our lives' (Whitehouse 2002b).

All these measures represented a transformation of the US security posture, reflecting the perception that the United States had incurred a revolutionary military challenge, involving a direct attack (not simply a criminal incident), and one that warranted a radically different military and diplomatic response. If it was understandable that the Bush administration would seek to protect

American citizens by creating 'coalitions of the willing', finding new bases, securing over-flight rights and moving onto the offensive against the Al Qaeda terrorist network and its state sponsors, it was striking that some diplomatic instruments were not utilised. Despite the perception that these terrorist groups could pose an even greater threat by employing weapons of mass destruction, the administration displayed scant interest in either using or enhancing the CWC or the BTWC. Reflected in this disdain was a fundamental scepticism about the value of these conventions, particularly in respect of biological weapons, scepticism already displayed in the months preceding 9/11.

If there is no need to repeat the extensive commentary upon the role of the United States in thwarting negotiations upon a protocol regime for the BTWC in July 2001 (Sims 2001; Dando 2002; Littlewood 2005; Guillemin 2005), the reasoning of the administration remains instructive. While not disputing the seriousness of the BW threat, which the USA would soon experience at first hand (October 2001), nor the Convention's lack of any verification mechanism, which had prompted the Ad Hoc Group (AHG) in Geneva to convene 23 sessions, spanning six and a half years of negotiation, in the hope of devising a legally binding protocol, the administration contended that the Convention was 'inherently difficult to verify'. As Dr Edward J. Lacey, Principal Deputy Assistant Secretary of State for Verification and Compliance, argued, 'effective' verification would require information on the intent of specific biological programmes and activities, many of which are 'dual use in nature', particularly as the production of biological agents can be undertaken 'in a relatively small space inside a building without specific distinguishing features'. In these circumstances the composite text on the protocol as prepared by the chairman of the AHG, Tibor Tóth, with its national declarations, 'randomly-selected transparency' visits and challenge inspections, seemed unable to achieve 'an effective international verification regime'. Illicit activities could be concealed within legitimate biological facilities or continued in small-scale non-declared facilities; transparency visits, tied to the annual declarations, would not cover all declared facilities; and challenge inspections, whether in the field or in a facility, could suffer from delays in securing approval for the investigations, enabling evidence to be cleaned up, concealed or 'explained away' at dual-capable facilities. Even if these provisions helped to deter some cheating, and enhance transparency, Lacey doubted that the protocol 'would improve our ability to verify compliance or non-compliance with the Convention' (Lacey 2001).

Addressing the AHG in Geneva on 25 July 2001, US Ambassador Donald Mahley amplified this critique. He asserted that biological weapons posed a 'unique' threat and that it would be useless 'to patch or modify the models … used elsewhere' (implicitly the declarations and inspections employed in the Chemical Weapons Convention). The protocol mechanisms, he argued, would not enhance confidence in compliance, doing 'little to deter those countries seeking to develop biological weapons', while proving sufficiently intrusive, despite their safeguards, 'to put national security and confidential business information at risk'. Such scepticism was not new, he added; US spokesmen had

voiced it repeatedly in Geneva since the initial negotiating sessions in 1995. 'New and innovative paradigms' were needed to deal with the 'magnitude' of biological activity, the 'explosively changing technology' and the 'varied potential objectives' of a biological weapons programme (Mahley 2001).

Denounced by critics at home and abroad, the Bush administration incurred censure for its unilateral approach, for an ideological hostility towards arms control that bolstered a consensus against the protocol at an inter-agency level, and for abandoning 'an effective strengthening of the Convention' (Olson 2001: A7; Dando 2002: 147). Yet critics could hardly deny that the Bush administration enjoyed expert support on this issue within the United States. Fred C. Iklé, a former Assistant Secretary of Defense under the Reagan administration, regarded the protocol as a 'fraud' since 'the 200-page draft does not include a single meaningful enforcement provision' (Iklé 2001: A8). Alan P. Zelicoff, senior scientist in the Center for Arms Control and National Security at Sandia National Laboratories and a former US delegate to the Geneva negotiations (1991–99), described the protocol as impractical since 'current technologies' could not identify violations with a probability of 50 per cent or greater (Zelicoff 2001; Kadlec *et al.* 2000: 95–111).

Even Mike Moodie queried whether the protocol would bolster 'confidence in compliance' and 'help deter BW proliferation'. He doubted whether the logic of deterrence would apply in the case of the draft protocol as:

> The risks of discovery of noncompliant activity are uncertain at best; the ability to reach definitive conclusions about noncompliance is questionable (especially if the proliferator handles the situation adeptly); and the potential costs for noncompliance are not convincingly high.
>
> (Moodie 2001)

These doubts reflected a broader scepticism about the value of inspections after the failure of any state to request a challenge inspection under the CWC, and the UNSCOM experience in Iraq where even the most intrusive inspection regime had failed to ensure compliance (Moodie 2001; Kadlec 2001). The administration's critics, nonetheless, insisted that the protocol was a 'necessary compromise' that could have strengthened 'a valuable but very weak convention' (Chevrier 2001; Pearson and Chevrier 2000: 113–34). As some of the protocol's shortcomings, notably the restrictions on mandatory declarations had been introduced largely at American insistence, 'against the inclination of major European governments', several commentators reckoned that the administration, or its successor, would have to rethink its position and endorse a variant of the protocol (Steinbruner 2001; Leonard 2001). While a *volte face* by a future administration had precedents, Kathleen C. Bailey doubted that the US biotechnology sector would follow suit, and suspected that sustained industrial opposition could influence US senators, two-thirds of whom would have to vote in favour of ratifying any BTWC protocol. In any case, as Bailey observed, 9/11 and the ensuing bioterrorist attacks had accentuated the unilateral focus

(with greater expenditure upon military bio-defence, domestic preparedness for biological attack and strengthened liaison between the US Centers for Disease Control and the World Health Organization (WHO) in monitoring global outbreaks of infectious disease) (Bailey 2002: 19–20).

Internationally, the Bush administration launched several initiatives intended to restrict the possibility of terrorists acquiring weapons of mass destruction. On 1 November 2001 the president outlined new proposals to deal with the 'scourge of biological weapons'. Claiming that the United States and others since 9/11 had had to face 'the evils these weapons can inflict', Bush declared that 'rogue states and terrorists possess these weapons and are willing to use them'. He recommended that all 144 state-parties to the BTWC should enact national criminal legislation against prohibited BW activities, establish an effective UN procedure for investigating suspicious outbreaks or allegations of BW usage and procedures for addressing BTWC compliance concerns. Bush urged states to seek improvements in the international response to disease control, establish national oversight mechanisms for the security and genetic engineering of pathogenic organisms, devise a universal code of ethical conduct for bioscientists and promote responsible conduct in the study, use, modification and shipment of pathogenic organisms (Whitehouse 2001b).

However welcome these proposals, they hardly constituted a comprehensive solution to the shortcomings of the BTWC, a rare point of consensus between the president and his critics (Whitehouse 2001; Miller 2003: B7, B9). Underpinning these measures, though, was a pivotal assumption that guided much of the administration's subsequent policy making, namely that 'America and the world' had witnessed 'a new kind of war' on 9/11. The readiness of a stateless network to inflict mass civilian casualties, in this case 'armed with box cutters, mace and 19 airline tickets', only raised 'the prospect of even worse dangers – of other weapons in the hands of other men'. As Bush informed an audience at the National Defense University in February 2004, 'The greatest threat before humanity today is the possibility of secret and sudden attack with chemical or biological or radiological or nuclear weapons'. No longer could states assume that the possession of such weapons would serve the purpose of deterrence (as in the Cold War when they remained weapons of last resort):

> What has changed in the 21st century is that, in the hands of terrorists, weapons of mass destruction would be a first resort – the preferred means to further their ideology of suicide and random murder. These terrible weapons are becoming easier to acquire, build, hide, and transport. Armed with a single vial of a biological agent or a single nuclear weapon, small groups of fanatics, or failing states, could gain the power to threaten great nations, threaten the world peace.
>
> (Whitehouse 2004b)

Whether intentional or not, the commentary distorted the political ideology of bin Laden that was intent upon expelling the 'crusader military forces' of the

United States and the United Kingdom from Saudi Arabia, on establishing a caliphate in Saudi Arabia and on removing all 'apostate rulers' from the Arabian peninsula and later from the Middle East. This ideology, rooted in the imperative of individual jihad and acts of collective revenge, involved building an array of Islamic states, including those armed with nuclear weapons, to wage war on the United States and its allies (Gunaratna 2002: 119; Burke 2003: 23; Hoffman 2003). However random and opportunistic the targeting, the ideology had a purpose and threw down a military challenge to the United States that could hardly be ignored after 9/11.

The Bush administration chose to respond with a diverse series of measures and initiatives in counter-proliferation, non-proliferation and consequence management (Whitehouse 2002c; Sanger 2002: A20) all in the context of the wars in Afghanistan and Iraq, a matrix testifying to a preference for action over arms control. Even when some of these measures, particularly the occupation of Iraq, proved increasingly controversial, costly and unpopular, the critique of multilateral disarmament remained undiminished. As recently as 14 February 2006 Carolyn Leddy, senior adviser to the State Department's Bureau of International Security and Nonproliferation, informed a conference in Tokyo that 'times have changed, and therefore we must be prepared to part company with Cold War approaches to arms control' (USinfo.state 2006a). Similarly, in unveiling developments within the Bush counter-WMD strategy before a conference hosted by the Fletcher School of Law and Diplomacy on 21 October 2005, Robert Joseph, Under Secretary of State for International Security and Arms Control, insisted that there could not be any return to an era when proliferation was regarded 'more as a political challenge than a security threat'. Preventing terrorists from acquiring WMD, he added, remained a key objective because 'if terrorists acquire them, they are likely to employ them, with potentially catastrophic effects'. Although some counter-proliferation measures applied against rogue states and WMD terrorism, such as securing stocks of and curbing trade in dangerous materials (notably the commercial network built and operated by the Pakistani scientist, A.Q. Khan), improving detection capabilities, and interdicting the 'illicit traffic in nuclear and biological materials', the intelligence challenge posed by WMD terrorists was peculiarly daunting. Anti-terrorist intelligence had to focus on individuals and groups and not merely state-based programmes. The United States, argued Joseph, was 'working hard to close any gaps in our intelligence collection, analysis and action on WMD terrorism' (USembassy 2005a).

Intelligence difficulties underpinned the doubts about the value of resuscitating existing treaties and agreements. The Bush administration, like its predecessor, did not request any challenge inspections under the CWC, despite suspecting 'nearly a dozen countries of violating the treaties banning chemical and biological weapons'. As officials conceded, they usually lacked ' "smoking gun" evidence of such cheating' (Miller 2003: B9; Jehl 2003: A13; DeSutter 2006), a point confirmed officially when the State Department issued a report on its compliance concerns with existing treaties on 30 August 2005 (State 2005). More substantively, several US arms control experts doubted that the existing

treaties could be used to address the daunting array of threats that the United States faced in the aftermath of 9/11. W. Seth Carus, deputy director of the Center for Counterproliferation Research (National Defense University), maintained that 'terrorists cannot be deterred by existing treaties or emerging tools'. Judith Miller agreed that if nations no longer needed to stockpile vast quantities of micro-organisms or chemicals for weapons but could produce them by means of 'fast new production techniques', treaties could not stop them (Miller 2003: B7, B9). Facing such formidable threats and technological challenges at a time when the USA perceived itself engaged in a 'long war' against terrorism (Rumsfeld 2004; US Department of Defense 2006), the Bush administration was not going to revert to the consensual processes of multilateral arms control. Leddy confirmed that the administration supported 'meaningful, dynamic and proactive strategies to confront proliferation' and would not pursue 'lowest common denominator approaches which will have little, if any, effect'. Multilateral commitments, she characterised, as only as effective 'as the actions undertaken by the states themselves to implement such commitments'. In the absence of such action, 'multilateral obligations were only rhetoric' and 'we know all too well that rhetoric does not make us any safer from the proliferation of weapons of mass destruction' (USinfo.state 2006a).

The Proliferation Security Initiative (PSI), announced by President Bush in Krakow on 31 May 2003, and codified by the 11 founding participants in Paris on 4 September 2003 (Bush 2003; Winner 2005: 129–43), represented a commitment to interdict WMD-related cargoes, whether by sea, land or air. Hailed as an innovative counter-proliferation measure, John Bolton, then Under Secretary for Arms Control and Disarmament, dubbed it characteristically as 'an activity, not an organization' (Bolton 2004).

After the triumphal interdiction of centrifuge technology on board the *BBC China* in the Italian port of Taranto (October 2003), a key factor in Libya's capitulation before the coercive diplomacy of the United States and Britain (Jentleson and Whytock 2005/06: 74), the PSI has attracted support from over 70 countries. By April 2006, Stephen G. Rademaker, another State Department official, described it as 'not a treaty-based organization, but rather … an active security cooperation partnership to deter, disrupt and prevent WMD proliferation' (Rademaker 2006).

If the PSI seemed primarily a counter to state-centred proliferation, the American proposal of UN Security Council Resolution 1540 (adopted 28 April 2004) contained a more implicit anti-terrorism message. Professing grave concern about 'the threat of terrorism', and the risk of non-state actors obtaining nuclear, biological and chemical weapons and their means of delivery, the Security Council invoked its Chapter VII authorisation to require states to act in response to a general rather than a specific threat to international peace and security. It urged all states to criminalise the manufacture, acquisition, development, transport, transfer or use of these weapons, and their means of delivery by non-state actors. It required states to institute effective export controls and enhance security for nuclear, biological and chemical materials. It also

established a Security Council Committee to monitor reports from states on their implementation measures but, in spite of an injunction requiring states to report within six months, 62 states had not reported to the Committee by 19 April 2006 (Rademaker 2006; UN 2006).

Even in states like Britain, where a raft of such legislation already exists (the Biological Weapons Act 1974, the Chemical Weapons Act 1996 and the Anti-terrorism, Crime and Security Act 2001), enforcing the law has proved problematic. The infamous arrest of nine North Africans in north and east London in January 2003 on the charge of conspiracy to spread poisons, including ricin, resulted in just one conviction two years later (Cowell 2005: A11). Another blunder occurred in east London on 2 June 2006, when 250 police apprehended two Asians, shooting one of them, on 'specific intelligence' that they were planning to use a chemical bomb but then failed to find any evidence in an operation costing £2.2 million (Leppard 2006: 1–2; Steele 2006a: 1–2; Steele 2006b: 2).

Even export controls proved difficult to enforce, with only five successful prosecutions since 2000. Despite the claims of HM Customs and Revenue that it had 'thoroughly disrupted' a WMD trafficking operation by 25 May 2006, it admitted that the individuals involved were not yet in custody. As explained in a departmental memorandum, prosecutions were hampered by the complexity of the process, including the need to provide sufficient evidence, the requirement to disprove the defence and the difficulty of disclosing all relevant information to the defence. 'Far more cases', it observed, 'are carefully considered for prosecution and rejected than are taken forward' (Skinner 2006: 8).[2]

Counter-proliferation, nonetheless, remained a core priority of the Bush administration, involving the US Treasury Department in efforts to detect and disrupt terrorist financing, money laundering and the financial and other support networks of terrorists and WMD proliferators. Launched on 24 September 2001, this was one of the earliest initiatives in the war on terror and one that recognised the need for multilateral support as terrorists 'don't have much money in the United States' (Whitehouse 2006; Boese 2005; USinfo.state 2006b), hence the promotion of UN Resolution 1373 (28 September 2001), requiring states to criminalise the financing of terrorism and to deny terrorists safe havens, and the launching of a G8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (Kananaskis summit, June 2002) (UN 2001; Whitehouse 2002d). The latter built upon a decade of US non-proliferation assistance for former Soviet states, derived from the Co-operative Threat Reduction (Nunn-Lugar) programme of Fiscal Year 1992. By 2005 the United States had invested over $9 billion in the programme, which not only involved nuclear weapons and materials, but also included enhanced security at 35 per cent of Russia's chemical weapons facilities, funding a nerve agent destruction facility, improving security at four former BW sites and conducting peaceful joint US–Russian research at 49 former biological weapon facilities (USembassy 2005a; Eisler 2006).

However laudable in their own terms, the effectiveness of such measures remains a matter of dispute. On 30 May 2006, US Ambassador Jackie W. Sanders

upbraided UN members for their failure to implement counterterrorism and non-proliferation obligations under Resolutions 1373 and 1540 (USinfo.state 2006b). Implementation notwithstanding, these measures met with a measure of scepticism. Al Qaeda, as M. Basile argued, had built a strong network of financiers and operatives that hid terrorist finances in legitimate and illegitimate businesses, transferred money informally in under-regulated Islamic banking networks and utilised a base of Islamic charities in Saudi Arabia (Basile 2004: 169–85).

Complementing the measures of counter-proliferation and non-proliferation was the commitment towards enhancing national defence and consequence management. Quite understandably, after 9/11 the Bush administration, often buttressed by cross-party support in Congress, invested huge resources in improving airport, border (and belatedly port) security, in chemical and biological detection, protection and response measures (including Project BioShield), and in federal funding for the training of first responders and state public health preparedness programmes. Institutional reform buttressed this massive expenditure, with the creation of a Department of Homeland Security (DHS) in January 2003, merging some 22 separate organisations and agencies, and the reorganisation of the intelligence agencies, following the criticisms of the 9/11 Commission and the Intelligence Reform and Terrorism Prevention Act of 2004. John D. Negroponte became the first Director of National Intelligence (Whitehouse 2004a; Gaouette and Curtius 2005: A18; Tyson 2006: A11; USinfo.state 2006b; Jervis 2006: 3–52).

Despite promising advances in research and development of biological (and chemical) detectors and in public health capacity (Casagrande 2002: 59–63; Koch 2006: 28; Brief Report 2005: 549–50), scepticism about the capacity and effectiveness of defensive measures remains pervasive. Doubts about the ability of the USA to detect and respond to the many potential forms of a chemical or biological attack (Miller 2004: A17; Kaufman 2005: A5), or about the inadequacy of critical infrastructure protection (Flynn 2004a: 20–33; Flynn 2004b) or about the effectiveness of the measures undertaken (Ervin 2006) recur.

Defensive measures perforce come at a considerable price, especially in a liberal democratic society that thrives on a largely laissez-faire economy, freedom of movement of goods and peoples, and has open borders to facilitate trade and commerce. Spending on security whether by federal or state authorities, or by private enterprise (and incentives for the latter may be variable at best) (Flynn 2004a: 27–9), can only reduce but never eliminate elements of risk, and so the Bush administration always envisaged waging the war on terror or the 'long war' (as it became known) on the offensive. The pre-emptive wars and regime change practised in Afghanistan and Iraq were part of a deliberate policy, as President Bush acknowledged, to 'engage … enemies in these countries and around the world so we do not have to face them here at home' (Whitehouse 2004a; Whitehouse 2006). As ever, Vice-President Dick Cheney summarised this point neatly. Prior to 9/11, he argued terror attacks against Americans were

treated as isolated incidents, and answered, if at all – on an *ad hoc* basis – largely 'as criminal acts, to be handled primarily through law enforcement'. However the current terrorist enemy, who seeks 'weapons of mass destruction, to blackmail and murder on a massive scale' holds:

> no territory, defends no population, hides among the innocent and seeks their death by the thousands. Such as adversary cannot be deterred, contained, appeased, or negotiated with. Nor can we hope that defensive actions are enough to protect our country. Wars are not won on the defensive. To fully and finally remove this danger, we have only one option – and that's to take the fight to the enemy.
>
> (Whitehouse 2004b)

Debates over the rectitude of the pre-emptive war and regime change, and the mismanagement of the Afghan and Iraqi occupations (Mearsheimer and Walt 2003: 50–9; Diamond 2004: 34–56; Dunn 2006: 1–29) reopened issues that were momentarily stifled in the aftermath of 9/11. After the invasion of Afghanistan, reporters found documents and computer files confirming Al Qaeda's interest in developing chemical and biological weapons, some glassware and chemical reagents at an Al Qaeda training camp, and a video showing tests of a toxic agent on a dog. General Tommy Franks claimed that this evidence demonstrated 'that Al Qaeda had a desire to weaponize [a] chemical and biological capability, but we have not yet found evidence that indicates that they were able to do so' (Shanker 2002: A1, A16; Miller 2002: A1, A8; WMD Report 2005: 270–1). These findings, as President Bush's WMD Commission confirmed, only revealed how little US intelligence knew about Al Qaeda, especially the scarcity of information from human intelligence sources (WMD Report 2005: 273–4, 276). Similar failings recurred in the case of Iraq: 'We were almost all wrong', admitted Dr David Kay, the former head of the Iraq Survey Group (ISG), with reference to the pre-war assessments of Saddam's NBC programmes and capabilities. The ISG found that Iraq had abandoned its WMD programmes since the mid-1990s, was neither producing nor weaponising stocks of chemical and biological weapons, and had not engaged in any WMD-sharing with Al Qaeda (Kay 2004).

All the many failings of allied intelligence – poor human intelligence collection operations, dependence on unreliable single sources of information, over-reliance on ambiguous imagery indicators and chronic failures of analysis, reflecting the dominance of preconceived assumptions, a discounting of alternative explanations, a lack of critical thinking and the prevalence of conventional wisdom – have been examined extensively (WMD Report 2005: 65, 71, 110, 130, 157, 162; Jervis 2006: 14–33; Russell 2005: 466–85; Blix 2004: 260–4, 278–9, 284–5; US Senate Select Committee 2004; *Review of Intelligence* 2004).

They fed the critique of the strategy and policies pursued by the Bush administration, reinforced the scepticism of WMD terrorism (despite the findings in Afghanistan) and revived claims that a package of policies, including

multilateral arms control might serve US interests more effectively than one largely unilateralist in conception and highly militarised.

The critics comprised three broad schools of thought, overlapping in part, but all sceptical in their own way of the official response to the threat posed by terrorists armed with WMD. Gregg Easterbrook questioned whether chemical or biological weapons in light of their historic usage and the botched efforts of Aum Shinrikyo really constituted weapons of mass destruction. Milton Leitenberg agreed that the threat of bioterrorism has been 'systematically and deliberately exaggerated' in the decade since the Aum revelations, and that resources invested in 'Bioshield' should be diverted to procuring vaccines against pandemic flu strains. The US government, he asserted, should make 'every effort to strengthen the Biological Weapons Convention' (Easterbrook 2002: 22–5; Leitenberg 2005: 88, 90; Carr 2006: 270–1). Another group focused upon the gulf between Al Qaeda's professed interest in, and willingness to use, unconventional weapons and their apparent inability to do so. In analysing the rarity of terrorism employing chemical or biological weapons, John Parachini reflected upon the difficulty of obtaining materials and of designing effective means of delivery, the tactical flexibility of terrorists who have demonstrated an interest in, but not any obsession with, WMD, and the problems that WMD might pose for terrorists in maintaining group cohesion and political and financial support (Parachini 2003: 37–50; Stevenson 2004: 33, 99). Finally, some commentators maintained that the terrorist WMD threat has been overstated, and that a disproportionate and heavily militarised response, as launched in the wake of 9/11 and foreshadowed for the future in the US Department of Defense *Quadrennial Defense Review* (2006), was unwise. Resources devoted to bioterror defence, argued 758 microbiologists, could be better spent on public health programmes of higher importance, a priority challenged by Tara O'Toole, director of the Center for Biosecurity, Pittsburgh Medical Center: 'It is true', she claimed, 'that pandemic flu is important and we're not doing nearly enough, but I don't think pandemic flu could take down the United States of America. A campaign of moderate biological attacks could'. (*Washington Post* 2005: A20; Warrick 2006a: pp. A1, A7).

Critics rarely doubted that the military, especially special forces, had an important role to play in counterterrorism but they claimed that excessive reliance on the military option had proved counter-productive politically, rationalizing the 'defensive jihad' proclaimed by bin Laden (Gunaratna 2005: 14–23; Kucera 2006; Stevenson 2006: 37–54). The risks posed by terrorism, argued Clarke and Mueller, should be placed in perspective, and traditional counterterrorist measures, involving protection, penetration of terrorist networks to gain intelligence and efforts to separate terrorists from their bases of political support, should take precedence in operational terms (Clarke 2005: 59–68; Mueller 2005: 487–505).

Like Leitenberg, and other arms controllers, Hans Blix seized the opportunity to revive the case for enhancing multilateral arms agreements. Thwarted by Bush and Blair in Iraq, he lauded multilateral and legal agreements as a

means of restoring 'a great deal of stability and predictability'. Despite admitting that Iraq and North Korea had evaded and exploited existing agreements, he defended 'relatively inexpensive independent international inspection' as more 'reliable' than national intelligence agencies (Blix 2004: 292–4).[3] By reviving these claims, Blix was harking back to the pre-9/11 era, when arms controllers contended that multilateral agreements could provide obstacles to proliferation and terrorist acquisition. By establishing international norms, buttressed by national legislation, the CWC would purportedly outlaw 'possession of CW both by states and by their nationals' (Gee 1996: 203–4; Pearson 1996: 210–12). If such an option is still less feasible for the BTWC, following the debacle over the protocol, committed supporters advocated promoting the universality and national implementation of the regime, coupled with additional transparency and confidence-building measures, all to boost the Convention as a disarmament treaty (Sims 2006; Isla and Hunger 2006).

The Bush administration could doubtless endorse these aspirations. Despite its doubts about the declarations of some states parties, and a reluctance to employ challenge inspections, it has been actively involved in the development of the CWC. In addressing the first review conference of the CWC on 28 April 2003, Stephen G. Rademaker declared that the US government 'has utilized the consultative provisions of Article IX on numerous occasions to address … compliance concerns, often with great success' (Rademaker 2003: US State Department 2005).

It was also committed to a chemical demilitarisation programme, whose total costs could exceed $32 billion, quite apart from over $9 billion invested in the Co-operative Threat Reduction Programme by 2005 (Javits 2006).

However, Paula A. De Sutter, Assistant Secretary for Verification and Compliance, State Department, doused any supposition that a second-term Bush administration, chastened by events in Iraq, might revise its assessment of international organisations. In a series of speeches, she dubbed 'international organizations such as the OPCW … as useful fora for sharing information, for sharing judgements and for deliberating response options', but, unlike the states parties, they do not make final compliance judgements. 'It is a common misperception', she argued:

> that a combination of international data declarations, international cooperative measures (including technical measures) and on-site inspection regimes by themselves will be sufficient to detect noncompliance … . However, inspections provide information according to the agreed access and collection capabilities … and only provide such information as is available at the specific time and place of the inspection … . Time and again, determined cheaters have proven capable of evading arms inspectors.
>
> (DeSutter 2004; 2005)

Similarly the massive investment in US bio-defence, including the construction of the $128 million, 160,000 square-foot National Biodefense Analysis and

Countermeasures Center at Fort Detrick, Maryland, will continue despite the claims of some arms controllers that this research contravenes the BTWC treaty. Of particular importance will be its study of the risks posed by emerging technologies, such as new DNA synthesising techniques that may create genetically altered or artificial viruses made from non-living parts. As Penrose Albright, the former Homeland Security assistant secretary observed, 'how can I go to the people of this country and say, "I can't do this important research because some arms control advocate told me I can't"?' (Warrick 2006b).

Of course US policy could change in the wake of the Bush administration but a return to pre-9/11 assumptions about the value of multilateral agreements seems unlikely. Whatever its political complexion, the post-Bush administration will wish to reassure its domestic audience over the robustness of its counterterror policies, to work with Congress, which has hardly evinced much enthusiasm for international agreements since its non-ratification of the Comprehensive Test Ban Treaty, and to carry industrial support (including the biotechnology industries which, unlike their chemical counterparts, never supported an inspection regime) (Bailey 2002:19). Any return, even partially, towards the use of conventions as part of a package of diplomatic (and military) tools in the new security environment could only work not as a 'web of deterrence' (Pearson 1993: 145–62) (as terrorists, with a few exceptions, are difficult to deter) but as a web of action, committed to respond whenever evidence of terrorist outrages, planned or perpetrated, occurred.[4]

Whether this is possible after the recurrent divisions within the Security Council may seem doubtful, both politically and technically. Determining the source of a CBW incident, recourse to agricultural terrorism or the release of a poisonous cloud from a chemical plant could prove demanding. Sustaining international cooperation may also be problematical over the course of a 'long war', possibly spanning several decades, especially as the array of 'micro' terrorist organisations appears to be growing in number (including over 30 affiliated to Al Qaeda since the attacks of 9/11) (Shanker 2006: 18; Coughlin 2006: 10). CBW usage may seem increasingly possible not only on account of Al Qaeda's declared intentions (Maples 2006; ISP/NSC 2005), its use of a microbiologist, Abdur Rauf, and its experiments to develop dispersal systems (notably, the 'mubtakkar' device intended to spray hydrogen cyanide within a confined area) (Suskind 2006; Warrick, 2006c: A1; Gendar and Maek 2006; Waterman 2006) but also as the organisational and technological obstacles are unlikely to endure indefinitely. In evaluating this likelihood (2 February 2006), John D. Negroponte, as Director of National Intelligence, reported that nearly 40 terrorist organisations, insurgencies or cults had used, possessed or expressed an interest in chemical, biological, radiological or nuclear (CBRN) agents or weapons. He anticipated thereby the judgement of the National Intelligence Estimate (April 2006) – that 'CBRN capabilities will continue to be sought by jihadist groups' – but still regarded a conventional attack as 'the most probable scenario'. He reckoned, nonetheless, that many terrorist groups 'are capable of conducting simple, small-scale attacks, such as poisonings, or using improvised chemical devices'

(Negroponte 2006; Odni 2006). Henry Crumpton, when Special Coordinator of Counterterrorism, State Department, was even more emphatic (Jacoby 2005; Smithson 2006: 11–18):

> I rate the probability of terror groups using WMD (to attack Western targets) as very high. It is simply a question of time. And it is not just the nuclear threat that bothers me … . If you look at a worst-case scenario for a biological attack, it would be difficult to determine whether or not it was a terrorist attack, and it would be far more difficult to contain.
>
> (Coughlin 2006: 10)

Nor is it the case that any such attack in the future would necessarily be intended to inflict massive civilian casualties – a scale of loss and disruption that might galvanise international support for the victim state. The despatch of five letters containing anthrax spores in the United States (October 2001) provoked public anxiety across the country and tied up critical resources in the emergency, health and law-enforcement agencies to deal with this event and the subsequent hoaxes (Zanders 2003: 683–4). Were the terrorists able to use genetically engineered microbes or viruses, they could bypass bio-defences designed to detect and counter traditional agents. Mooted by Joshua Lederberg as early as 1970, this misuse of genetic engineering aroused intense debate in the 1980s. If such usage seemed unlikely to produce novel BW agents with greater potency than naturally occurring agents, genetic engineering might facilitate, as the Office of Technology Assessment argued, the modification of 'standard agents to make them more stable during dissemination or more difficult to detect or defend against' (Office of Technology Assessment 1993: 114–17; Lederberg 1971: 195–7).[5] The JASON study by several American scientists in 1997 agreed that bacteria and viruses could be engineered to imbue them 'with such "desirable" attributes as safer handling, increased virulence, improved ability to target the host, greater difficulty of detection and easier distribution' (Block 2001: 8). More recently scientists, who have created live, artificial viruses or discovered how to preserve the potency of botulinum toxin, have warned that their findings could be misused for the purposes of bioterrorism (Warrick 2006a: A1; Canon 2005).

Such developments may not be inevitable. As Charles E. Allen, chief intelligence officer of the Department of Homeland Security, observed, 'Just because the technology is available does not mean terrorists can or will use it', but he conceded that small groups or even an 'individual with training in the biosciences' might use small-scale production facilities to make a crude but effective biological weapon (Allen 2006). Applying the techniques of genetic modification to produce a more sophisticated weapon would probably require – at present – the resources of a state-level BW programme. Hence British government claims that:

> The development of a sophisticated BW capability using genetic modification techniques requires a high level of expertise, experience and equipment – a

> level which has been attained by few countries. In practice, the deliberate release of 'classical agents', possibly with some features enhanced by genetic modification, currently remains a more likely threat than novel agents or novel concepts of agent/host interaction.
>
> (Secretary of State 2002: 8)

Over the several decades envisaged for the 'long war' many developments may or may not occur. Using a 'generation' as her time frame, Dame Eliza Manningham-Buller, the director-general of MI5, warned on 9 November 2006, that 'today we see the use of home-made explosive devices. Tomorrow's threat may, and I suggest will, include the use of chemical, bacteriological agents, radioactive materials and even nuclear technology' (Evans 2006: 1–2). This possibility and its potential impact (which could range across a spectrum of causing panic and disruption to inflicting mass casualties and significant political/economic costs) place a premium upon bio-security. Bolstering international legal norms whether inside or outside existing conventions seems necessary, including enhanced bio-security laws to license facilities that transfer, possess or use human, animal or plant pathogens. In addition, codes of conduct could be developed for biologists and biotechnologists to enhance awareness of how work in the life sciences might be misused in contravention of the BTWC and, increasingly, of national legislation (Pearson 2006: 21). Finally, in view of the massive expansion of US laboratories handling anthrax (over 100, involving 7,200 scientists and technicians in October 2006, compared with about a dozen before October 2001), and the adverse reports upon bio-safety procedures within laboratories in 16 Asian countries (Associated Press 2006; Genengnews 2006), procedural training could be enhanced in certain facilities to reduce the likelihood of accidental contamination. As national regulations on such issues vary considerably, Grotto and Tucker argue that a global approach would be preferable lest terrorists seek to acquire pathogens and/or dual use production techniques by exploiting gaps in an 'uneven patchwork of national regulations'. They claim that only the agreement of the United States and other leading countries upon a set of specific bio-security measures will offer incentives and inducements to all UN members to fulfil their obligations under Security Council Resolution 1540 (April 2004) (Grotto and Tucker 2006: 11; Smithson 2004–05: 165–78).

At the opening of the Sixth Review Conference of the Biological and Toxin Weapons Convention in Geneva (20 November 2006), US Assistant Secretary of State John C. Rood confirmed that the US government had a continuing interest in enhanced bio-security as well as disease surveillance, national enforcement legislation and greater oversight of research laboratories. He attracted more attention, though, by reaffirming US compliance concerns about the alleged BW activities of North Korea, Iran and Syria in view of 'their support for terrorism'. Rood asserted that Iran 'probably has an offensive biological weapons program in violation of the BWC', that North Korea 'has a biological warfare capability and may have developed, produced, and weaponized for use biological weapons' and

that Syria, 'a signatory but not a party to the BWC – has conducted research and development for an offensive BW program'. He also revealed that 'since the last review conference, the United States has engaged several states through diplomatic channels on issues of possible non-compliance with Article 1 and other BWC obligations' (Rood 2006a).[6] When challenged at a subsequent press conference about the inability to verify compliance issues without a protocol, he reiterated that the United States did not 'see a regime that would be effective in that area' (Rood 2006b; *The Economist* 2006: 72–3).

So the prospects for concerted international action are hardly encouraging, whether measured in compliance with multilateral conventions, the endorsement of counter-proliferation initiatives or the lack of political accord during the war on terror. Claims that a consensus in favour of pre-emptive war is now emerging seem rather far-fetched in view of the dwindling international coalition in Iraq. There may be more support for crisis intervention, peacekeeping, humanitarian aid and nation building (Dombrowski and Payne 2006: 115–36).[7] But relying on this level of response or, more generally, upon a legalistic/regulatory approach may not yield the desired results. Coalitions of the willing have proved fragile since 9/11 and regulations can be evaded. Ultimately concerted action or the implementation of laws, norms and conventions depends upon political will and, if that proves lacking, then a unilateralist response, especially from the United States if its citizens were the victims, must remain all too likely.

Notes

1 One of the more famous incidents occurred in September 1984 when the Rajneesh cult used salmonella to poison local residents in Oregon (Miller *et al.* 2001: Chapter 1).
2 On the value and limitations of legislation in this area, see Walker (2005: 175–200).
3 For the argument that this capacity should be reserved for 'special cases for which the Security Council gives a mandate', see Taylor (2004).
4 The empirical evidence in favour of deterring terrorists is extremely small, largely focused on local terrorists with very specific aims, and, in the case of the Israeli–Hizbollah disengagement agreement of the mid-1990s, not very encouraging (Trager: and Zagorcheva 2005/06: 103).
5 For a synthesis of the debates in the 1980s, see Spiers (1989).
6 Article 1 of the Convention requires that state parties should never develop, produce, stockpile or otherwise acquire or retain microbial or other biological agents or toxins and any weapons, equipment or other means of delivering such agents.
7 Compared with the coalition of 40 states supporting Operation Iraqi Freedom in 2003, only 28 states deployed peacekeeping forces in Iraq by 2006 (IISS 2003: 152; IISS 2006: 166; Franks 2006: 346–8).

References

Allen, C.E. (2006) Statement for the Record before the House Committee on Homeland Security, Subcommittee on Prevention Nuclear and Biological Attacks, 4 May. Online, available at: hsc.house.gov/files/TestimonyAllen.pdf (accessed September 2006).

Associated Press (2006) 'Report: Over 300 U.S. Labs Handle Deadly Biological Agents', from *Hartford Courant*, 8 October. Online, available at: courant.com/news/

local/statewire/hc-09010129.apds.m0067.bc-ct–anthoct09,0,1322057.s (accessed October 2006).

Bailey, K.C. (2002) 'Why the United States Rejected the Protocol to the Biological and Toxin Weapons Convention', National Institute for Public Policy, October. Online, available at: nipp.org/publications.php (accessed December 2003).

Basile, M. (2004) 'Going to the Source: Why Al Qaeda's Financial Network is Likely to Withstand the Current War on Terrorist Financing', *Studies in Conflict and Terrorism*, vol. 27.

Blix, H. (2004) *Disarming Iraq: The Search for Weapons of Mass Destruction*, London: Bloomsbury.

Block, S.M. (2001) 'The Growing Threat of Biological Weapons', *American Scientist online*, vol. 89, no. 1. Online, available at: americanacientist.org/template/AssetDetail/assetid/14284?fulltext=true&print=yes (accessed 29 August 2006).

Boese, W. (2005) 'United States Eyes Proliferators' Assets', *Arms Control Today*, September. Online, available at: armscontrol.org/act/2005_09/USEyesProlifAssets.asp?print (accessed September 2005).

Bolton, J.R. (2004) 'Stopping the Spread of Weapons of Mass Destruction in the Asian-Pacific Region: The Role of the Proliferation Security Initiative', 27 October. Online, available at: state.gov/t/us/rm/37480.htm (accessed February 2006).

Bowen W.Q. and A. Stewart, eds (2005) *The Airey Neave Papers; Terrorism in the UK Broadening the Government's Counter-Terrorist Response – Contest*, Strategic and Combat Studies Institute, Occasional Paper 50.

Brief Report (2005) 'Terrorism and Emergency Preparedness in State and Territorial Public Health Departments – United States', *JAMA*, vol. 294, no. 5, 3 August.

Broad, W.J. (1998) 'How Japan Germ Terror Alerted the World', *New York Times*, 26 May.

Brooks, J. (2006) 'Postal Service adding Defenses', *Indianapolis Star*, 8 October. Online, available at: indystar.com/apps/pbcs.dll/article?AID=/20061008/LOCAL17/610080470/1012 (accessed October 2006).

Burke, J. (2003) *Al-Qaeda: The True Story of Radical Islam*, London: Penguin Books.

Burns, Major-General W.F. (1989) Hearings on 'Global Spread of Chemical and Biological Weapons', before the Committee on Governmental Affairs and its Permanent Subcommittee on Investigations United States Senate, 101st Congress, first session, 10 February.

Bush G.W. (2001) 'Address to a Joint Session of Congress and the American People', 20 September. Online, available at: whitehouse.gov/news/releases/2001/09/print/20010920–8.html (accessed April 2006).

Bush G.W. (2003) Remarks by the President to the People of Poland, 31 May. Online, available at: nuclearfiles.org/menu/key-issues/nuclear-weapons/issues/proliferation/psi/2003-05-3/_remarks-by-the-president-to-the-people-of-poland.htm (accessed August 2007).

Canon, S. (2005) 'Biotech Advances hold Terrifying Possibilities', *Kansas City Star*, 12 December. Online, available at: kansascity.com/mid/kansascity/news/13386071.htm?template=contentModules/printstory.jsp (accessed December 2005).

Carr, M. (2006) *Unknown Soldiers: How Terrorism Transformed the Modern World*, London: Profile.

Casagrande, R. (2002) 'Technology against Terror', *Scientific American*, vol. 287, October.

Chevrier, Marie Isabelle (2001) 'A Necessary Compromise', *Arms Control Today*, May. Online, available at: armscontrol.org/act/2001 05/chevrier.asp (accessed April 2006).

Cilluffo, F.J., R.A. Marks and G.C. Salmoiraghi (2002) 'The Use and Limits of U.S. Intelligence', *Washington Quarterly*, vol. 25, no. 1.

Clarke, M. (2005) 'Principles of Societal Counter-Terrorism for Resilience' in W.Q. Bowen and A. Stewart (eds) *The Airey Neave Papers; Terrorism in the UK Broadening the Government's Counter-Terrorist Response – Contest*, Strategic and Combat Studies Institute, Occasional Paper 50.

Clarke, R.A. (2004) *Against All Enemies: Inside America's War on Terror*, London: The Free Press.

Cohen, W.S. (1999) 'Preparing for a Grave New World', *Washington Post*, 26 July.

Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD (2006) 3 vols, Online, available at: globalsecurity.org/wmd/library/report/2004/isg-final-report/isg-finalreport_vol.1_cover.htm (accessed June 2006).

Coughlin, C. (2006) 'Only a Matter of Time before Terrorists use Weapons of Mass Destruction', *Daily Telegraph*, 17 January.

Cowell, A. (2005) 'Just One of 9 Suspects Convicted in 2003 British Poison Plot case', *New York Times*, 14 April.

Cullison, A. and A. Higgins (2001) 'Files Found: A Computer in Kabul Yields a Chilling Array of al Qaeda Memos', *Wall Street Journal*, 31 December.

Dando, M.R. (2002) *Preventing Biological Warfare: The Failure of American Leadership*, Houndmills, Basingstoke: Palgrave.

DeSutter, P. (2006) 'The Administration's Perspective on China's Record on Nonproliferation', testimony before the U.S.–China Economic Security Review Commission, Washington DC, 14 September. Online, available at: uscc.gov/hearings/2006hearings/written_testimonies/06_09_14wrts/06_09_14_desutter_statement.php (accessed August 2007).

DeSutter, P.A. (2004) 'Statement at the Ninth Session of the Conference of the States Parties of the Organization for the Prohibition of Chemical Weapons', The Hague, the Netherlands, 30 November. Online, available at: state.gov/t/ac/rls/rm/2004/40911.htm (accessed April 2005).

DeSutter, P.A. (2005) 'Statement before the United Nations First Committee', New York City, 17 October. Online, available at: state.gov/t/vci/rls/rm/55225.htm (accessed July 2006).

Diamond, L. (2004) 'What Went Wrong in Iraq', *Foreign Affairs*, vol. 83, no. 5.

Dombrowski, P. and R.A. Payne (2006) 'The Emerging Consensus for Preventive War', *Survival*, vol. 48, no. 2.

Douglass, J.D. Jr and N.C. Livingstone (1987) *America the Vulnerable: The Threat of Chemical and Biological Warfare*, Lexington, MA: Lexington Books.

Drell S.D., A.D. Sofaer and G.D. Wilson (eds) (1999) *The New Terror*, Stanford, CA: Hoover Institution Press.

Dunn, D. Hastings (2006) 'A Doctrine Worthy of the Name? George W. Bush and the Limits of Pre-Emption, Pre-eminence, and Unilateralism', *Diplomacy and Statecraft*, vol. 17.

Easterbrook, G. (2002) 'Term Limits: The Meaninglessness of "WMD"', *New Republic*, 7 October.

The Economist (2006) 'Can the Line against Bio-terror Hold?', vol. 381, 16 December.

Eisler, P. (2006) 'U.S., Russia reach Deal on Securing Soviet WMD', *USA Today*, 15 June. Online, available at: usatoday.com/news/washington/2006–06–15-soviet-wmd.x.htm (accessed June 2006).

Elsner, A. (2003) 'U.S. said still not Prepared for Major Attack', *Washington Post*, 1 October. Online, available at: washingtonpost.com/wp-dyn/articles/A27103–2003Oct1.html (accessed 14 October 2003).

Ervin, C. Kent (2006) *Open Target: Where America is Vulnerable to Terrorist Attack*, New York: Palgrave Macmillan.

Evans, M. (2006) 'More Britons are Turning to Terror, says MI5 Director', *The Times*, 10 November.

Falkenrath, R.A. (1998) 'Confronting Nuclear, Biological and Chemical Terrorism', *Survival*, vol. 40, no. 3 with subsequent commentary by K.-H. Kamp, J.F. Pilat and J. Stern, and Falkenrath's response, 'WMD Terrorism: An Exchange', *Survival*, vol. 40, no. 4, 1998–99.

Flynn, S.E. (2004a) 'The Neglected Home Front', *Foreign Affairs*, vol. 83, no. 5.

Flynn, S.E. (2004b) *America the Vulnerable: How Our Government is Failing to Protect Us From Terrorism*, New York: HarperCollins.

Franks, T. (2006) *Fiasco: The American Military Adventure in Iraq*, London: Allen Lane.

GAO (1999) (United States General Accounting Office) *Combating Terrorism: Observations on Federal Spending to Combat Terrorism*, 11 March, GAO/T-NSIAD/GGD-99–107.

Gaouette N. and M. Curtius (2005) '$31.8-Billion Homeland Security Bill Passes', *Los Angeles Times*, 15 July.

Gee, J. (1996) 'CBW Terrorism and the Chemical Weapons Convention', *Politics and Life Sciences*, vol. 15, no. 2, September.

Gendar A. and J. Gordon Meek (2006) 'Al-Qaeda has had Persistent Interest in Cyanide', 20 June. Online, available at: contracostatimes.com/mid/cctimes/news/nation/14858711.htm?template=contentModules/printstory.jsp (accessed 22 June 2006).

Genengnews (2006) 'Asian Biosafety Practices Fall Short of International Standards', 10 August. Online, available at: genengnews.com/news/bnitem.aspx?name=4490582 (accessed August 2006).

Grotto, A.J. and J.B. Tucker (2006) *Biosecurity: A Comprehensive Action Plan*, Washington, DC: Center for American Progress, June.

Guillemin, J. (2005) *Biological Weapons: From the Invention of State-Sponsored Programs to Contemporary Bioterrorism*, New York: Columbia University Press.

Gunaratna, R. (2002) *Inside Al Qaeda: Global Network of Terror*, New York: Berkeley Books.

Gunaratna, R. (2005) 'The Global Terrorist Environment' in W.Q. Bowen and A. Stewart (eds) *The Airey Neave Papers; Terrorism in the UK Broadening the Government's Counter-Terrorist Response – Contest*, Strategic and Combat Studies Institute, Occasional Paper 50.

Hearings on 'Global Proliferation of Weapons of Mass Destruction' (1995) before the Permanent Subcommittee on Investigations of the Committee on Governmental Affairs United States Senate, 104th Congress, first session, Part 1, 31 October.

Hoeber, A. and R. James Woolsey (1994) Hearings on the 'Chemical Weapons Convention (Treaty Doc. 103–21)' before the Committee on Foreign Relations, United States Senate, 103rd Congress, second session, 9 June.

Hoffman, B. (2003) *Al Qaeda, Trends in Terrorism and Future Potentialities: An Assessment*, Santa Monica: RAND. Online, available at: rand.org/pubs/papers/P8078/P8078.pdf (accessed May 2006).

Hurwitz, E. (1982) 'Terrorists and Chemical/Biological Weapons', *Naval War College Review*, vol. 35, no. 3.

IISS (2003) (International Institute for Strategic Studies) *Strategic Survey 2002–2003*, Oxford: Oxford University Press.

IISS (2006) *The Military Balance 2005–2006*, London: Routledge.

Iklé, F.C. (2001) 'The new Germ Warfare Treaty is a Fraud', *Wall Street Journal*, 27 July.

Isla, N. and I. Hunger (2006) 'BWC 2006: Building Transparency Through Confidence Building Measures', *Arms Control Today*, July/August. Online, available at: armscontrol.org/act/2006_07–08/BWC2006.asp (accessed July 2006).

ISP/NSC Briefing Paper 05/01 (2005) 'Security, Terrorism and the UK', London: Chatham House.

Jacoby, Vice Admiral L.E. (2005) Director, Defense Intelligence Agency, Statement on 'Current and Projected National Security Threats to the United States' before the Senate Armed Services Committee, 17 March. Online, available at: armedservices.senate.gov/e_witness.cfm?id=1395 (accessed September 2006).

Javits, Ambassador E.M. (2006) 'Statement to the Forty-Fourth Session of the Executive Council of the Organization for the Prohibition of Chemical Weapons', The Hague, the Netherlands, 14 March. Online, available at: state.gov/t/isn/rls/rm/63593.htm (accessed July 2006).

Jehl, D. (2003) 'U.S. Intelligence Review is Softening some Judgments about Illicit Arms Abroad', *New York Times*, 18 November.

Jenkins, B. (1985) 'Will Terrorists go Nuclear?' *Orbis*, vol. 29, no. 3.

Jentleson, B.W. and C.A. Whytock (2005/06) 'Who "won" Libya', *International Security*, vol. 30, no. 3.

Jervis, R. (2006) 'Reports, Politics, and Intelligence Failures: The Case of Iraq', *Journal of Strategic Studies*, vol. 29, no. 1.

Johnson, L.C. (1998) Hearing on 'Combating Terrorism: Implementation and Status of the Department of Defense Domestic Preparedness Program' before the Subcommittee on National Security, International Affairs and Criminal Justice of the Committee on Government Reform and Oversight House of Representatives, 105th Congress, second session, 2 October.

Johnson, S.E. (ed.) (1997) *The Niche Threat: Deterring the Use of Chemical and Biological Weapons*, Washington, DC: National Defense University Press.

Kadlec, R.P. (2001) 'First, Do No Harm', *Arms Control Today*, May. Online, available at: armscontrol.org/act/2001_05/kadlec.asp (accessed April 2006).

Kadlec, R.P., A.P. Zelicoff and A.M. Vrtis (2000) 'Biological Weapons Control: Prospects and Implications for the Future' in J. Lederberg (ed.) *Biological Weapons: Limiting the Threat*, Cambridge, MA: MIT Press.

Kamp, K.-H. (1998–99) Commentary on R.A. Falkenrath (1988) 'Confronting Nuclear, Biological and Chemical Terrorism', *Survival*, vol. 40, no. 3.

Kaplan, D.E. and A. Marshall (1996) *The Cult at the End of the World*, London: Hutchinson.

Kaufman, M. (2005) 'Bioterrorism Response Hampered by Problem of Profit', *Washington Post*, 7 August.

Kay, D. (2004) Hearing on 'Iraqi Weapons of Mass Destruction Programs' before the Senate Armed Services Committee, 28 January. Online, available at: ceip.org/files/projects/npp/pdf/Iraq/kaytestimony.pdf (accessed June 2006).

Koch, A. (2006) 'Staying One Step Ahead', *Jane's Defence Weekly*, vol. 43, no. 6, 8 February.

Kucera, J. (2006) 'Realism Required when Assessing Terror Threat', *Jane's Defence Weekly*, vol. 43, no. 18, 3 May.

Lacey, E.J. (2001) 'Testimony before the Subcommittee on National Security, Veterans Affairs, and International Relations, International Relations Committee on Government

Reform, U.S. House of Representatives', 10 July. Online, available at: state.gov/t/vci/rls/rm/2001/5168.htm (accessed February 2006).

Laqueur, W. (1998) 'The New Face of Terrorism', *Washington Quarterly*, vol. 21, no. 4.

Lederberg, J. (1971) 'Biological Warfare: A Global Threat', *American Scientist*, vol. 59, no. 2.

Lederberg, J. (ed.) (2000) *Biological Weapons: Limiting the Threat*, Cambridge, MA: MIT Press, based on a series of articles in the *Journal of American Medical Association*, vol. 278, no. 5, August 1997.

Leitenberg, M. (2005) *Assessing the Biological Weapons and Bioterrorism Threat*, December. Online, available at: strategicstudiesinstitute.army.mil./pubs (accessed February 2006).

Lengel, A. and J. Warrick (2006) 'FBI is Casting a Wider Net in Anthrax Attacks', *Washington Post*, 25 September.

Leonard, J.F. (2001) 'An Essential First Step', *Arms Control Today*, May. Online, available at: armscontrol.org/act/2001 05/leonard.asp (accessed April 2006).

Leppard, D. (2006) 'Cyanide Fear Triggered Terror Raid', *Sunday Times*, 4 June.

Littlewood, J. (2005) *The Biological Weapons Convention: A Failed Revolution*, Aldershot: Ashgate.

Lowe, K. (1997) 'Analyzing Technical Constraints on Bio-Terrorism: Are They Still Important?' in B. Roberts (ed.) *Terrorism with Chemical and Biological Weapons: Calibrating Risks and Responses*, Alexandria, VA: The Chemical and Biological Arms Control Institute.

McGeorge, H.J. (1986) 'The Deadly Mixture: Bugs, Gas, and Terrorists', *NBC Defense and Technology International*, vol. 1, no. 2.

Mahley, Ambassador D. (2001) 'Statement by the United States to the Ad Hoc Group of the Biological Weapons Convention States Parties Geneva, Switzerland', 25 July. Online, available at: state.gov/t/ac/rls/rm/2001/5497.htm (accessed February 2006).

Maples, Lieutenant-General M.D. (2006) Statement on 'Current and Projected National Security Threats to the United States' before the Senate Armed Services Committee, 28 February. Online, available at: dia.mil/publicaffairs/Testimonies/statement24.pdf (accessed September 2006).

Mearsheimer, J.J. and S.M. Walt (2003) 'An Unnecessary War', *Foreign Policy*, January/February.

Miller, J. (2002) 'Qaeda Videos Seem to Show Chemical Tests', *New York Times*, 19 August.

Miller, J. (2003) 'Arms Control Racing Time and Technology', *New York Times*, 6 December.

Miller, J. (2004) 'Censored Study on Bioterror Doubts U.S. Preparedness', *New York Times*, 29 March.

Miller, J., S. Engelberg and W. Broad (2001) *Germs: The Ultimate Weapons*, New York: Simon & Schuster.

Moodie, M.L. (1999) 'The Chemical Weapons Threat' in S.D. Drell, A.D. Sofaer and G.D. Wilson (eds) *The New Terror*, Stanford, CA: Hoover Institution Press.

Moodie, M. (2001) 'Building on Faulty Assumptions', *Arms Control Today*. Online, available at: armscontrol.org/act/2001 05/moodie.asp (accessed April 2006).

Mueller, J. (2005) 'Six Rather Unusual Propositions about Terrorism', *Terrorism and Political Violence*, vol. 17.

Negroponte, J.D. (2006) 'Annual Threat Assessment of the Director of National Intelligence' for the Senate Select Committee on Intelligence, 2 February. Online, available

at: intelligence.senate.gov/0602hrg/0602hrg/060202/witness.htm (accessed September 2006).

Newsweek (1999) 'I am Not Afraid of Death', 11 January.

O'Neill, J.P. (1995) Testimony in Hearings on 'Global Proliferation of Weapons of Mass Destruction' before the Permanent Subcommittee on Governmental Affairs United States Senate, 104th Congress, first session, Part 1, 31 October.

Odessey, B. (2006) 'House Passes Bill for Protecting U.S. Ports from Terrorist Attack', 4 May. Online, available at: usinfo.state.gov/xarchives/display.html?p=washfile-english&y=2006&m=May&x=20060504155504ebyessedo0.3579828&t=livefeeds/wf-latest.html (accessed May 2006).

Odni (2006) 'Declassified Key Judgments of the National Intelligence Estimate Trends in Global Terrorism: Implications for the United States', April. Online, available at: odni.gov/press_releases/Declassified_NIE_Key_Judgments.pdf (accessed October 2006).

Oehler, G.C. (1995) Testimony in Hearings on 'Global Proliferation of Weapons of Mass Destruction' before the Permanent Subcommittee on Governmental Affairs United States Senate, 104th Congress, first session, Part 1, 31 October.

Office of Technology Assessment (OTA) (1993) *Technologies Underlying Weapons of Mass Destruction*, Washington, DC: OTA.

Office of the Press Secretary (2002) 'Fact Sheet: G-8 Summit – Preventing the Proliferation of Weapons of Mass Destruction', 27 June. Online, available at: whitehouse.gov/news/releases/2002/06/print/20020627–7.html (accessed June 2006).

Olson, E. (2001) 'U.S. Rejects New Accord Covering Germ Warfare', *New York Times*, 26 July.

Olson, K.B. (1995) Testimony in Hearings on 'Global Proliferation of Weapons of Mass Destruction' before the Permanent Subcommittee on Governmental Affairs United States Senate, 104th Congress, first session, Part 1, 31 October.

Parachini, J. (2003) 'Putting WMD Terrorism into Perspective', *Washington Quarterly*, vol. 26, no. 4.

Pearson, G.S. (1993) 'Prospects for Chemical and Biological Arms Control: The Web of Deterrence', *Washington Quarterly*, vol. 16, no. 2.

Pearson, G.S. (1996) 'Chemical/Biological Terrorism: How Serious a Risk?' *Politics and Life Sciences*, vol. 15, no. 2, September.

Pearson, G.S. (2006) 'The Blix WMDC Report: Biological and Toxin Weapons Related Issues', *ASA Newsletter*, No. 115, 31 August.

Pearson, G.S. and Marie Isabelle Chevrier (2000) 'An Effective Prohibition of Biological Weapons' in J. Lederberg (ed.) *Biological Weapons: Limiting the Threat*, Cambridge, MA: MIT Press.

Preson, R. (1997) *The Cobra Event* East Mississauga, Ontario: Random House of Canada.

Purver, R. (1995) *Chemical and Biological Terrorism: The Threat According to the Open Literature*, Canadian Security Intelligence Service, June.

Purver, R. (1997) 'Understanding Past Non-Use of CBW by Terrorists' in B. Roberts (ed.) *Terrorism with Chemical and Biological Weapons: Calibrating Risks and Responses*, Alexandria, VA: The Chemical and Biological Arms Control Institute.

Rademaker, S.G. (2003) 'Statement to the Conference', First Review Conference of the Chemical Weapons Convention, The Hague, the Netherlands, 28 April. Online, available at: state.gov/t/isn/rls/rm/20099.htm (accessed 16 July 2006).

Rademaker, S.G. (2006) 'Countering WMD and Terrorism through Security Cooperation', April. Online, available at: state.gov/t/isn/rls/rm/64173.htm (accessed August 2007).

Review of Intelligence on Weapons of Mass Destruction (2004): *Report of a Committee of Privy Councillors*, HC 898, 14 July.

Roberts, B. (1997a) 'Between Panic and Complacency: Calibrating the Chemical and Biological Warfare Problem' in S.E. Johnson (ed.) *The Niche Threat: Deterring the Use of Chemical and Biological Weapons*, Washington, DC: National Defense University Press.

Roberts, B. (ed.) (1997b) *Terrorism with Chemical and Biological Weapons: Calibrating Risks and Responses*, Alexandria, VA: The Chemical and Biological Arms Control Institute.

Robinson, G. (1995a and b) 'Nerve Gas Solvent Found as Police Swoop on Sect' and 'Panic grips Tokyo after Threat of More Gas Attacks', *The Times*, 23 March and 25 March.

Rood, J.C. (2006a) Remarks to the Sixth Biological Weapons Convention Review Conference, Geneva, 20 November. Online, available at: state.gov/t/isnrls/rm76446.htm (accessed November 2006).

Rood, J.C. (2006b) 'Remarks to the Press at the Sixth Review Conference of the States Parties to the Biological Weapons Convention', Geneva, 20 November. Online, available at: state.gov/t/rls/rm/76442.htm (accessed November 2006).

Rumsfeld, D.H. (2004) Speech before the Council on Foreign Relations, New York, 4 October. Online, available at: defenselink.mil/speeches/2004/sp20041004-secdef08081.html (accessed October 2004).

Russell, R.L. (2005) 'A Weak Pillar for American National Security: The CIA's Dismal Performance against WMD Threats', *Intelligence and National Security*, vol. 20, no. 3.

Sanger, D.E. (2002) 'Bush Warns Foes Not to Use Weapons of Mass Destruction on U.S. Troops', *New York Times*, 11 December.

Scoop (2006) 'Countering WMD and Terrorism Through Cooperation', 10 April. Online, available at: scoop.co.nz/stories/print.html?path=W00604/S00151.htm (accessed April 2006).

Secretary of State for Foreign and Commonwealth Affairs (2002) *Strengthening the Biological and Toxin Weapons Convention: Countering the Threat from Biological Weapons*, Cm 5484.

Shane, S. (2001) 'Anthrax Matches Army Spores' and 'Army Confirms Making Anthrax in Recent Years', *Baltimore Sun*, 12 and 13 December. Online, available at: ph.ucla.edu/epi/bioter/anthraxmatchesarmyspores.html (accessed September 2006) and commondreams.org/headlines01/1213–01.htm (accessed September 2006).

Shanker, T. (2002) 'U.S. Analysts find no Sign Bin Laden had Nuclear Arms', *New York Times*, 26 February.

Shanker, T. (2006) 'Pentagon Hones its Strategy on Terrorism', *New York Times*, 5 February.

Sims, N.A. (2001) 'Four Decades of Missed Opportunities to Strengthen the BWC: 2001 Too?' *Disarmament Diplomacy*, No. 58. Online, available at: acronym.org.uk/dd/dd58/58sims.htm (accessed February 2006).

Sims, N.A. (2006) 'Back to Basics: Steering Constructive Evolution of the BWC', *Arms Control Today*, April. Online, available at: armscontrol.org/act/2006_04/bwcfeature.asp?print (accessed June 2006).

Skinner, T. (2006) 'UK breaks up Suspected WMD Trafficking Operation', *Jane's Defence Weekly*, vol. 43, no. 22, 31 May.

Smithson, A.E. (2004–05) 'Biological Weapons: Can Fear Overwhelm Inaction?' *Washington Quarterly*, vol. 28, no. 1, Winter.

Smithson, A.E. (2006) *The Biological Weapons Threat and Nonproliferation Options: A Survey of Senior U.S. Decision Makers and Policy Options*, Washington, DC: Center for Strategic and International Studies Report, November.

Sopko, J.F. (1996–07) 'The Changing Proliferation Threat', *Foreign Policy*, No. 105.

Spiers, E.M. (1989) *Chemical Weaponry: A Continuing Challenge*, London: Macmillan.

Spiers, E.M. (2000) *Weapons of Mass Destruction: Prospects for Proliferation*, Houndmills, Basingstoke: Macmillan Press.

Sprinzak, E. (1998) 'The Great Superterrorism Scare', *Foreign Policy*, No. 112, Fall.

Staff Statement (1995) 'Global Proliferation of Weapons of Mass Destruction: A Case Study on the Aum Shinrikyo', in Hearings on 'Global Proliferation of Weapons of Mass Destruction' before the Permanent Subcommittee on Governmental Affairs United States Senate, 104th Congress, first session, Part 1, 31 October.

State (2005) U.S. Department of State, 'Adherence to and Compliance With Arms Control, Nonproliferation, and Disarmament Agreements and Commitments', 30 August. Online, available at: state.gov/t/vc/rls/rpt/51977.htm#chapter1 (accessed September 2005).

Steele, J. (2006a) 'Police fear Bomb has been Moved', *Daily Telegraph*, 5 June.

Steele, J. (2006b) ' "Chemical bomb" Raid that Found Nothing Cost £2.2m', *Daily Telegraph*, 3 October.

Steinbruner, J. (2001) 'A Tough Call', *Arms Control Today*, May. Online, available at: armscontrol.org/act/2001 05/steinbrunner.asp (accessed April 2006).

Stevenson, J. (2004) 'Counter-terrorism: Containment and Beyond', *Adelphi Paper*, 367.

Stevenson, J. (2006) 'Demilitarising the "War on Terror" ', *Survival*, vol. 48, no. 2.

Suskind, R. (2006) 'The Untold Story of al-Qaeda's Plot to Attack the Subways', *Time*, 26 June. Online, available at: time.com/time/archive/preview/0.10987.1205478.html (accessed July 2006).

Taylor, T. (2004) 'Building on the Experience: Lessons from UNSCOM and UNMOVIC', *Disarmament Diplomacy*, Issue No. 75. Online, available at: acronym.org.uk/dd/dd75/75tt.htm (accessed February 2006).

Tenet, G.J. (1997) Hearings on 'Current and Projected National Security Threats to the United States' before the Select Committee on Intelligence of the United States Senate, 105th Congress, first session, 5 February.

Trager, R.F. and D.P. Zagorcheva (2005/06) 'Deterring Terrorism: It Can Be Done', *International Security*, vol. 30, no. 3, Winter.

Tucker, J.B. (1996) 'Chemical/Biological Terrorism; Coping with a New Threat', *Politics and the Life Sciences*, vol. 15, no. 2.

Tucker, J.B. (1997) 'Policy Approaches to Chemical and Biological Terrorism' in B. Roberts (ed.) *Terrorism with Chemical and Biological Weapons Calibrating Risks and Responses*, Alexandria, VA: The Chemical and Biological Arms Control Institute.

Tucker, J.B. (ed.) (2001) *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, Cambridge, MA: MIT Press.

Tyson, A. Scott (2006) 'Pentagon Adds Initiatives, Retains Old Ones', *Washington Post*, 7 February.

UN (1998) S/1998/920, sixth report of the United Nations Special Commission following the adoption of Security Council Resolution 1051, 6 October, para. 75.

UN (2001) Security Council Resolution 1373, 28 September 2001, S/RES/1373 (2001). Online, available at: un.org/Docs/scres/2001/sc2001.htm (accessed June 2006).

UN (2004) Security Council Resolution 1540, 28 April. Online, available at: disarmament2.un.org/Committee/540/index.html (accessed May 2006).

UN (2006) Security Council, Notes by the Secretary-General, S/2006/342, 25th report of United Nations Monitoring, Verification and Inspection Commission, 30 May.

UN General Assembly (2006) 'Uniting against Terrorism: Recommendations for a Global Counter-terrorism Strategy. Report of the Secretary General', 27 April, A/60/825, p. 10. Online, available at: un.org/unitingagainst terrorism/contents.htm (accessed May 2006).

US Department of Defense (2006) *Quadrennial Defense Review Report*, 6 February. Online, available at: defenselink.mil/qdr/Report20060203.pdf (accessed February 2006).

US Senate Select Committee on Intelligence (2004) 'Report on the U.S. Intelligence Community's Prewar Intelligence Assessments on Iraq', 7 July.

US State Department (2005) 'Adherence to and Compliance With Arms Control, Non-proliferation, and Disarmament Agreements and Commitments'. Online, available at: state.gov/t/vci/rls/rpt/51977.htm (accessed August 2007).

USembassy (2005a) 'Arms Control & Non-Proliferation Documents & Texts from the Washington File: U.S. Recaps Strategy to Stop Spread of Weapons of Mass Destruction', 2 May. Online, available at: usembassy.org.uk/acda411.html (accessed May 2005).

USembassy (2005b) 'Arms Control & Non Proliferation: Documents and Texts from the Washington File', 27 October. Online, available at: usembassy.org.uk/acda454.html (accessed October 2005).

USinfo (2006) 'U.S. Urges "Concrete Action" to Stop Spread of WMD', 14 February. Online, available at: usinfo.state.gov/xarchives/display.html?p=washfile-english&y=2006&m=February&x=20060214173102idybeekcm0.2608606&t=livefeeds/wf-latest.html (accessed February 2006).

USinfo.state (2006a) 'U.N. Members Must Fulfil Nonproliferation Strictures, U.S. Says', 31 May. Online, available at: usinfo.state.gov/is/Archive/2006/Jun/01–184735.html (accessed June 2006).

USinfo.state (2006b) 'Fighting War on Terror a Priority for U.S. Treasury Department, 6 February. Online, available at: usinfo.state.gov/xarchives/display.html?p=washfile-english&y=2006&m=February&x=20060206190012adynnedo.5699732&t=live-feeds/wf-latest.html (accessed February 2006).

Walker, C. (2005) 'Biological Attack, Terrorism and the Law', *Terrorism and Political Violence*, vol. 17.

Warrick, J. (2006a) 'Custom-Built Pathogens raise Bio-terror fears', *Washington Post*, 31 July.

Warrick, J. (2006b) 'Suspect and a Setback in Al-Qaeda Case', *Washington Post*, 31 October. Online, available at: washingtonpost.com/wpdyn/content/article/2006/10/30/AR2006103001250.html (accessed November 2006).

Warrick, J. (2006c) 'The Secretive Fight against Bioterror', *Washington Post*, 6 August. Online, available at: statesman.com/insight/content/editorial/stories/insight/08/6bioterror.html (accessed August 2006).

Washington Post (2005) 'An Acidic Message', 10 March.

Waterman, S. (2006) 'Security & Terrorism Cyanide Gas Device "Probably Didn't Work"', *Post Chronicle*, 26 June. Online, available at: postchronicle.com/news/security/printer_21225050.shtml (accessed June 2006).

Weiner, T. (1999) 'U.S. Spied on Iraq under U.N. Cover, Officials now Say' and 'U.S. Used U.N. Team to place Spy Device in Iraq, Aides Say', *New York Times*, 7 and 8 January.

Whitehouse (2001a) 'President Freezes Terrorists' Assets', 24 September. Online, available at: whitehouse.gov/news/releases/2001/09/print/20010924–4.html (accessed June 2006).

Whitehouse (2001b) 'President's Statement on Biological Weapons', 1 November. Online, available at: whitehouse.gov/news/releases/2001/11/print/20011101.html (accessed May 2006).

Whitehouse (2002a) 'President Delivers State of the Union Address', 29 January. Online, available at: whitehouse.gov/news/releases/2002/01/print/20020129–11.html (accessed April 2006).

Whitehouse (2002b) 'President Bush Delivers Graduation Speech at West Point', 1 June. Online, available at: whitehouse.gov/news/releases/2002/06/print/20020601–3.html (accessed April 2006).

Whitehouse (2002c) Statement by the President, 11 December. Online, available at: whitehouse.gov/news/releases/2002/12/print/20021211–8.html (accessed May 2006).

Whitehouse (2002d) 'Kananasis Accomplishments'. Online, available at: whitehouse.gov/news/releases/2002/06/20020627–8.html (accessed July 2007).

Whitehouse (2004a) 'Biodefense for the 21st Century', 28 April. Online, available at: whitehouse.gov/homeland/text/20040430.html (accessed May 2006).

Whitehouse (2004b) 'President Announces New Measures to Counter the Threat of WMD', 11 February. Online, available at: whitehouse.gov/news/releases/2004/02/print/20040211–4html (accessed May 2006).

Whitehouse (2004c) 'President Celebrates Independence Day', 4 July. Online, available at: whitehouse.gov/news/releases/2004/07/print20040704.html (accessed June 2006).

Whitehouse (2004d) 'Remarks by the Vice President at the 123rd Coast Guard Academy Commencement Ceremony', 19 May. Online, available at: whitehouse.gov/news/releases/2004/05/print/20040519–5.html (accessed June 2006).

Whitehouse (2006) 'President's Address to the Nation', 11 September. Online, available at: whitehouse.gov/news/releases/2006/09/20060911–3.html (accessed August 2007).

Winner, A.C. (2005) 'The Proliferation Security Initiative: The New Face of Interdiction', *Washington Quarterly*, vol. 28, no. 2.

WMD Report (2005) 'The Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction', report to the President of the United States (hereafter the WMD Report), 31 March. Online, available at: wmd.gov/report/wmd_report.pdf (accessed March 2005).

Woodward, B. (2003) *Bush at War*, London: Simon & Schuster.

Zanders, J. Pascal (2003) 'Weapons of Mass Disruption?' *SIPRI Yearbook 2003: Armaments, Disarmament and International Security*, Oxford: Oxford University Press.

Zelicoff, A.P. (2001) 'An Impractical Protocol', *Arms Control Today*, May. Online, available at: armscontrol.org/actg2001_05/zelicoff.asp (accessed April 2006).

4 The Chemical Weapons Convention and the Biological Weapons Convention

Confronting the threat of international terrorism

Daniel Feakes

Introduction

Both the 1972 Biological Weapons Convention (BWC) and the 1993 Chemical Weapons Convention (CWC) are multilateral treaties negotiated between states. In many respects, both are products of the period in which they were negotiated, namely the Cold War, and the context in which they were negotiated strongly influenced their design. For example, the overwhelming threat in the minds of negotiators at the time was the possibility of armed confrontation between the superpowers and their allies and the use of chemical or biological weapons (CB weapons) in such a confrontation. International terrorism emerged as a major issue during the 1970s (and after the BWC had been concluded) but it was not until the mid-1990s that terrorists demonstrated a willingness to inflict mass casualties and an interest in CB weapons. While the precise reasons for the negotiation and conclusion of both treaties were different, the underlying purpose of both is to strengthen the existing taboo against the use of such weapons in warfare and to ensure that states that possess such weapons destroy them. Particularly in the case of the CWC negotiations, the focus of the negotiators was on 'militarily significant' quantities of chemical agent, i.e. those the use of which could change the course of events on the battlefield. Other reasons, such as preventing the proliferation of CB weapons to states that did not possess them, and preventing the acquisition of CB weapons by sub-state actors such as terrorists were either secondary priorities or, as appears to be the case with terrorism, were not expressed at all. Clearly, things have changed since but, as negotiated, neither the BWC nor the CWC were designed to address a threat from international terrorists.

Today, the situation with regard to the perceived threat has in some respects been reversed. The end of the superpower rivalry, the disarmament of some countries (either voluntarily as with Libya or coercively as with Iraq) and the implementation of the CWC means that the problem of militarily significant stockpiles has largely been addressed, or at least limited to a 'small and stable' set of countries, with a low likelihood that CB weapons would actually be used in conflict

between states. Simultaneously however, and particularly since the terrorist attacks in 2001 on the USA and the mailing of *Bacillus anthracis* (anthrax) spores by an unidentified culprit soon after, the increased perception of a threat from international terrorism means that attention is now focused on small quantities of chemical or biological agents and the acquisition and use of them by non-state groups or individuals for the purposes of inflicting terror upon civilian populations. However, neither the BWC nor the CWC were designed or equipped to address this threat. This is not to say that either treaty is irrelevant in the face of this threat, but it is to acknowledge that the BWC and CWC should not be seen as *the* answer to the threat posed by terrorists acquiring CB weapons. It is also not a case of simply changing either treaty to reflect new threats. Each treaty is essentially a package of compromises between different, often competing, national interests and to attempt to unpick those deals now risks unravelling the whole package. In addition, the procedure for amending both treaties is cumbersome and time consuming. Instead, as this chapter will show, adjustments have been made at the level of the implementation of both treaties and, in addition, initiatives have been undertaken outside the framework of either treaty that are in some cases designed to fill perceived 'gaps' in the existing regime.

In the long run, whether any of these instruments, be it treaties or other types of cooperation, on their own can prevent terrorists acquiring and using CB weapons is questionable. However, efforts need to be continued and questions need to be asked of some current counterterrorist efforts that could actually be increasing the likelihood of a terrorist attack. And if such an attack was to take place what would be its implications? Looking back, the use of CB weapons by the Japanese Aum Shinrikyo group in the 1990s did not lead to the widespread acquisition and use of CB weapons by other terrorist groups. Admittedly, times have changed since then, but small-scale or one-off attacks with CB weapons by terrorists are not likely to alter dramatically current thinking. Things would be different however, if CB weapons were to be assimilated into the tactics and techniques of particular groups and their use became part of their 'behavioural repertoires'. Preventing that would seem to call for a focus on those things that uphold the norm against CB weapons (such as the BWC and CWC), as well as on more direct counterterrorism tools.

The origins and design of the BWC and CWC

A shared ancestry

Although the conclusion of the negotiations on each treaty was separated by 20 years, the BWC and CWC share many elements. This ranges from specific items like the use in both treaties of a 'general purpose criterion' ensuring that the prohibitions in the treaties are applied broadly and allowing them to keep pace with advances in science and technology, to the organic way in which provisions from the BWC were incorporated, with modifications, into the CWC (and into intermediate and subsequent arms control treaties). Both are products of the

United Nations' disarmament machinery, principally the Conference on Disarmament (and its predecessors) and the First Committee of the General Assembly. And both treaties can trace their ancestry back to the 1925 Geneva Protocol that is itself rooted in earlier agreements such as those from The Hague peace conferences of 1899 and 1907. This common heritage is expressed in the preambles to both treaties; both refer to the ultimate goal of 'general and complete disarmament', and both refer to the UN Charter and the Geneva Protocol. Most directly however, Article IX of the BWC requires states to 'continue negotiations in good faith with a view to reaching early agreement' on a chemical weapons ban and reference is made to this article in the preamble to the CWC.

The BWC and CWC evolved as constituent parts of what Walker has described as an 'international WMD order' (2004). Over the years, states have developed a generic approach to dealing with WMD based, in part, on concepts such as arms control and verification. This approach emphasises consensus-based multilateral treaty negotiation between states, oversight by an international organisation and referral of state violators to the United Nations Security Council. Walker refers to these as the 'constitutional' elements of the WMD order by which restraint among states was entrenched through 'agreements on norms, rules, institutions and practices, which would guide their behaviour' (2004: 12). Ikenberry notes how this constitutional order was 'organised around agreed-upon legal and political institutions that operated to allocate rights and limit the exercise of power' (2001: 29). A distinct field of international law has developed in which one international agreement borrows elements from another so that treaty provisions are similar whether dealing with nuclear, biological or chemical weapons. This can be seen in the many similarities among the provisions of the 1968 Nuclear Non-Proliferation Treaty (NPT) and its descendants, among them the BWC and CWC. This organic growth with later treaties borrowing from earlier ones has been termed the 'Geneva process' by one former participant after the location of the Conference on Disarmament in which the treaties have all been negotiated. The 'Geneva process' involves 'formal multilateral negotiations by governments of legally binding agreements with inputs from NGOs and others' (Moodie 2004: 46).

Within this international WMD order, states are the key actors, indeed they are often the only actor acknowledged as having any rights or responsibilities: 'From 1899 until the end of the Cold War, WMD policy concentrated almost exclusively on WMD in the hands of states operating under the influence of the anarchical structure and dynamics of the international system' (Fidler 2004: 64). It is states that are the recipients of obligations under the BWC and CWC and it is only states that can be sanctioned as violators of either treaty. For example, the preamble to the BWC expressly refers to 'the importance and urgency of eliminating from the arsenals of States, through effective measures, such dangerous weapons of mass destruction as those using chemical or bacteriological (biological) agents'. Consideration of WMD during the Cold War took place within what de Larrinaga and Turunne Sjolander term a 'state security discourse' in which the state possesses a monopoly on the use of force

as 'necessary' to the preservation of the state, and the possibility of their removal from national arsenals is seen as a threat to the state (1998: 370). Therefore, any discussion or negotiation about the abandonment of a particular weapon is a matter of national security and is the preserve of state institutions. From the perspective of civil society, Carroll wrote that the international consideration of WMD disarmament took place within 'a world view where states are perceived to be the primary agent for analysis and action' (Carroll 2002: 23). The contrast with the situation today is starkly made in the following extract:

> Aum Shinrikyo broke the monopoly that the nation-state has previously held over the most powerful means of organized violence … Indeed, the diffusion of mass destructive power to sub-national groups undermines the ability of the nation-state to protect the security of its citizens – the fundamental source of its political legitimacy.
>
> (Tucker 1996: 175)

Relevant provisions of the BWC and CWC

As products of the Cold War, the BWC and CWC must be seen in that context; they were intended to contribute towards greater reassurance between East and West and to lessen the impact of conflict between the blocs if it did break out. The preamble of the BWC refers to its contribution to the 'strengthening of confidence between peoples and the general improvement of the international atmosphere'. Both treaties, although negotiated within a multilateral setting (i.e. the Eighteen Nation Disarmament Committee for the BWC, and its successor, the Conference on Disarmament, for the CWC), were therefore strongly influenced by bilateral discussions between the USA and the USSR. Indeed, many of the general provisions of the CWC date from bilateral discussions between the superpowers in the 1970s (Kenyon 2006: 1–3). However, both treaties did also look back to their shared ancestry with references to the Geneva Protocol and both also contained longer-term ambitions, which made it clear that the Cold War was not a precondition for their survival. For example, the preamble to the CWC declares that states parties are 'determined for the sake of all mankind, to exclude completely the possibility of the use of chemical weapons, through the implementation of the provisions of this Convention'. The preamble of the BWC includes almost identical wording, to which is added 'convinced that such use would be repugnant to the conscience of mankind and that no effort should be spared to minimize this risk'. In addition, both treaties include provisions offering a degree of 'future-proofing': general purpose criteria that ensure the comprehensive nature of the prohibitions of each treaty; the convening of conferences of states parties to review the operation of the treaties and to take into account any relevant scientific and technological developments; and, in the case of the CWC, a Scientific Advisory Board to offer specialised advice. As a former deputy director-general of the Organization for the Prohibition of Chemical

Weapons (OPCW) states: 'The organs of the OPCW will be able to consider the effectiveness of the convention and adapt it to new needs' (Gee 1996: 203–204). But the clearest expression of the long-term nature of the BWC and CWC was that, unlike the NPT originally, both treaties stated specifically that they were of unlimited duration.

The BWC spells out its primary objectives in its first three articles:

> Article I
> Each State Party to this Convention undertakes never in any circumstance to develop, produce, stockpile or otherwise acquire or retain:
>
> 1 Microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;
> 2 Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.
>
> Article II
> Each State Party to this Convention undertakes to destroy, or to divert to peaceful purposes, as soon as possible but not later than nine months after the entry into force of the Convention, all agents, toxins, weapons, equipment and means of delivery specified in Article I of the Convention, which are in its possession or under its jurisdiction or control.
>
> Article III
> Each State Party to this Convention undertakes not to transfer to any recipient whatsoever, directly or indirectly, and not in any way to assist, encourage, or induce any State, group of States or international organizations to manufacture or otherwise acquire any of the agents, toxins, weapons, equipment or means of delivery specified in Article I of the Convention.

The CWC lists its main objectives in Article I:

1 Each State Party to this Convention undertakes never under any circumstances:

   a To develop, produce, otherwise acquire, stockpile or retain chemical weapons, or transfer, directly or indirectly, chemical weapons to anyone;
   b To use chemical weapons;
   c To engage in any military preparations to use chemical weapons;
   d To assist, encourage or induce, in any way, anyone to engage in any activity prohibited to a State Party under this Convention.

2 Each State Party undertakes to destroy chemical weapons it owns or possesses, or that are located in any place under its jurisdiction or control, in accordance with the provisions of this Convention.

3 Each State Party undertakes to destroy all chemical weapons it abandoned on the territory of another State Party, in accordance with the provisions of this Convention.
4 Each State Party undertakes to destroy any chemical weapons production facilities it owns or possesses, or that are located in any place under its jurisdiction or control, in accordance with the provisions of this Convention.
5 Each State Party undertakes not to use riot control agents as a method of warfare.

As can be seen from the above, all of these obligations fall onto the shoulders of the states party to each treaty. During the Cold War when both treaties were negotiated, the primary threat in the minds of the negotiators was the possession and use of CB weapons by states in military conflicts between each other. At the time that it was negotiated, it was not possible for verification measures to be incorporated into the BWC so it addresses this threat simply and without much detail in the disarmament and non-transfer obligations of Articles II and III.[1] In contrast, the CWC was negotiated with an extremely detailed and complex verification system. In its Articles III and VI it requires states parties to submit declarations of military and civilian facilities of relevance to the Convention. Articles IV and V require the destruction of chemical weapons and related facilities within certain periods and obliges states parties to allow inspectors to verify that destruction takes place. Article VI additionally requires states parties to allow on-site verification of certain industrial facilities under their jurisdiction. Detailed procedures for on-site verification of the destruction and non-production of chemical weapons are provided in the treaty's Verification Annex. Although the CWC applies to all toxic chemicals and precursors by virtue of its general purpose criterion, international verification is limited to three lists or 'schedules' of chemicals contained in the treaty's Annex on Chemicals. The inclusion of a particular chemical on one of the three schedules was the result of long and detailed negotiations, often more political than technical, but the guiding principle was to include chemicals that had been weaponised by states, while at the same time avoiding imposing intolerable burdens on legitimate chemical industry.

While the above demonstrates that the BWC and CWC are primarily agreements between states aimed at restraining the behaviour of states, it would be misleading to give the impression that neither treaty refers at all to sub-state groups or individuals. Indeed, Article III of the BWC prohibits transfers 'to any recipient whatsoever' and states parties have, since the Second BWC Review Conference in 1986, affirmed that this covers recipients 'at the international, national or sub-national level'. In addition, Article IV of the BWC requires its states parties to 'take any necessary measures to prohibit and prevent the development, production, stockpiling, acquisition or retention of the agents, toxins, weapons, equipment and means of delivery specified in Article I of the Convention'. It is this article that requires states parties to enact legislation to implement the Convention

nationally by taking any necessary legislative and administrative measures to ensure that its prohibitions are enforced (Dunworth *et al.* 2006: 94). In a similar fashion, states parties to the CWC are prohibited from transferring chemical weapons to 'anyone' and from assisting, encouraging or inducing 'anyone' to engage in prohibited activities. Furthermore, like the BWC, the CWC also requires states parties to adopt the necessary measures to implement its prohibitions nationally. Article VI obliges states parties to implement the general purpose criterion nationally by requiring them to:

> adopt the necessary measures to ensure that toxic chemicals and their precursors are only developed, produced, otherwise acquired, retained, transferred, or used within its territory or in any other place under its jurisdiction or control for purposes not prohibited under this Convention.

Most specifically however, Article VII of the CWC requires states parties to:

> prohibit natural and legal persons anywhere on its territory or in any other place under its jurisdiction as recognized by international law from undertaking any activity prohibited to a State Party under this Convention, including enacting penal legislation with respect to such activity.

Article VII also goes on to require states parties to extend such penal legislation to cover prohibited activities committed by its nationals when abroad.

There are further references in each treaty that are not directly related to the activities solely of states. Article VII of the BWC requires each state party:

> to provide or support assistance, in accordance with the United Nations Charter, to any Party to the Convention which so requests, if the Security Council decides that such Party has been exposed to danger as a result of violation of the Convention.

While legally this article only relates to states, as strictly only a state can violate the Convention, as will be seen below the Sixth BWC Review Conference acknowledged the willingness of states parties to act in response to the use of biological weapons 'by anyone other than States Parties'. The CWC is more explicit in this regard. Under its Article X, states parties can request expert advice and assistance from the OPCW Technical Secretariat on developing and improving national capabilities to protect against chemical weapons. In addition, states parties can also request assistance and protection from the OPCW if they consider that chemical weapons have been used against them, or if they have been threatened with the use of chemical weapons. Unlike the BWC, Article X of the CWC does not state that the chemical weapons have to have been used by another state (Mashhadi 2001: 24–27). As will be see below, the OPCW has been active in providing expertise and assistance to states parties that request it, both in terms of threats from states and from other actors.

As designed and negotiated then, the BWC and CWC were not intended to address the problem of CB terrorism. For example, in his contribution to the First CWC Review Conference, the OPCW director-general stated that 'the amounts of toxic or precursor chemicals that are regulated under the Convention are well above the quantities relevant for terrorist activities' (OPCW 2003a: 14). As Kadlec, Zelicoff and Vrtis point out 'the BWC was originally drafted to formalize the obligations between nations' (1997: 351–356). Similarly, Smith states that 'the CWC is not principally focused on terrorist activities, but rather on the behavior of states' (1995: 176–178). However, the final paragraphs above should have demonstrated that both treaties do include provisions establishing a foundation upon which a contribution to the prevention of CB terrorism can be built. This is amply demonstrated in the 'Report on the Response to Threats of Terrorist Use of Weapons of Mass Destruction' issued by the White House in February 1997:

> Although the CWC was not designed to prevent chemical terrorism, certain aspects of the Convention, including its implementing legislation and non-proliferation provisions, will augment existing law enforcement efforts to fight chemical terrorism. Implementing legislation required by the CWC will strengthen legal authority to investigate and prosecute violations of the treaty and raise the level of public alertness to the threat and illegality of chemical weapons.

The same argument is also made by Smith, who states that 'many of the Convention's provisions … are also likely to be very useful tools for preventing the use or threat of use of chemical weapons by sub-state entities' (1995: 176–178). Smith identifies a number of such tools: the requirement on states to enact laws criminalising the production of, or attempted production of, chemical weapons; the obligation on states to control the production of chemical weapons; the alerting of chemical industries to the danger that their products may be misused; the creation of national and international agencies that can serve as resources in the fight against terrorism; the discouragement of states from assisting or protecting chemical terrorists; the provision of assistance to states that are the victims of actual or threatened chemical terrorist attacks; the elimination of national stockpiles of chemical weapons that might otherwise fall into the hands of terrorists; and the CWC as a forum for discussing chemical terrorism-related problems. The third part of this chapter will illustrate that many of these tools have indeed been put to use since 11 September 2001 ('9/11').

The changing perception of the threat

Writing in the mid-1990s, prior to the Aum Shinrikyo attack with chemical weapons in Tokyo, Ron Purver of the Canadian Security Intelligence Service pointed out that 'most of the literature on possible terrorist use of weapons of mass destruction has focused on so-called "nuclear terrorism"'. As Purver observed,

entire books had been written on the subject[2] and the USA had established Nuclear Emergency Search Teams to counter threats or acts of nuclear terrorism (Purver 1995: 2). In contrast, according to Purver there was only a 'small body of professional literature on the subject of chemical–biological terrorism'. In fact, neither CB terrorism nor nuclear terrorism were particularly high on any agenda throughout the 1970s, 1980s and early 1990s. This is in stark contrast to the situation in the early years of the twenty-first century. In his first State of the Union address since 9/11, President Bush said:

> States like [Iran, Iraq and North Korea], and their terrorist allies, constitute an axis of evil, arming to threaten the peace of the world. By seeking weapons of mass destruction, these regimes pose a grave and growing danger. They could provide these arms to terrorists, giving them the means to match their hatred … . The United States of America will not permit the world's most dangerous regimes to threaten us with the world's most destructive weapons.
>
> (Bush 2002)

A year later, at their summit meeting in Evian, France, the leaders of the G8 countries declared that 'the proliferation of weapons of mass destruction and their means of delivery poses a growing danger to us all. Together with the spread of international terrorism, it is the pre-eminent threat to international security' (G8 2003). As one senior Russian CWC negotiator has written: 'the perception of the nature of the threat is also different today: superpower arsenals have been supplanted by transnational terrorist organizations and a handful of small states' (Batsanov 2006: 345). This section will briefly describe the transition in the perception of the threat that took place between the 1970s and the 2000s.

As described above, both conventions were negotiated within a paradigm marked by the centrality of states, both in terms of the design and implementation of treaties and in terms of being the subjects of the rules and procedures elaborated by those treaties. In addition, this was an era in which the main threats posed to international security by WMD were seen as coming from states, and focused mainly on nuclear weapons: 'Indeed, much of the research on potential uses of WMD during the Cold War understandably concentrated on nuclear confrontation involving almost exclusively the two superpowers and their allies' (Hoffman 1997: 45). In the 1970s and 1980s the primary threat regarding chemical weapons stemmed from the possibility of their use in major conflicts between states. During the Cold War, both superpowers built up large stockpiles of chemical weapons, with the USSR maintaining a stockpile of 40,000 agent tonnes and the USA maintaining a stockpile of 29,000 agent tonnes, according to official public statements made during the later stages of the CWC negotiations. The situation was somewhat different as regards biological weapons because, from the entry into force of the BWC in March 1975, no state party was meant to possess a stockpile of biological weapons. Indeed, from 1975 in the US and UK defence establishments there was a feeling that

resources devoted to biological defence could be significantly curtailed (Davis 1999: 509). However, almost simultaneously with its signature of the BWC, the USSR began a huge offensive biological weapons programme hidden behind a legitimate biotechnology concern called Biopreparat, and Iraq began its own biological weapons programme in the 1970s (Alibek and Handelman 1999; Mangold 1999; Miller *et al.* 2001).

During the 1970s and early 1980s, although international terrorism was often making news headlines, the possibility of CB terrorism appeared to remain fairly remote, and references to it in the literature were sporadic (Hurwitz 1982; Douglass and Lukens 1984; Livingstone and Douglass 1984: 36). According to Hoffman, the 'potential terrorist use of [WMD] was either addressed within the Cold War/superpower paradigm or else dismissed, given the prevailing patterns of sub-state violence and the aims and objectives of violent non-state groups active at the time' (Hoffman 1997: 45). The conventional thinking at the time among terrorism scholars was that terrorists were limited in their choice of weapons by considerations of technical feasibility and whether the use of non-conventional weapons would alienate their political support base. The guiding principle was summed up by Brian Jenkins: 'Terrorists want a lot of people watching, not a lot of people dead' (Jenkins 1985: 511). Hoffman noted that 'traditional' terrorist groups such as the Provisional IRA or ETA 'engaged in highly selective and mostly discriminate acts of violence' (Hoffman 1997: 46). For these reasons, many scholars in the 1970s and 1980s argued that terrorists would not resort to weapons of mass destruction (Wohlstetter 1976; Mullen 1978; Jenkins 1985). However, it was during the 1980s that the first serious incident of biological terrorism took place. In 1984 members of a religious group called the Rajneeshees contaminated salad bars in ten restaurants in The Dalles, Oregon with *Salmonella enterica* serotype Typhimurium, causing 751 people to fall ill (Carus 2000; Miller *et al.* 2001: 15–33). The attack was an attempt to influence the outcome of a local election in a way favourable to the Rajneeshees, but was ultimately unsuccessful. The incident attracted little publicity at the time, perhaps deliberately: 'When public health officials figured out how easily the Rajneeshees had spread the disease, they decided not to publish a study of the incident. No one wanted to encourage copycats' (Miller *et al.* 2001: 32).[3] However, the attack and its implications were noticed in some quarters: 'Quietly, the small cadre of experts and federal officials who understood the power of germ weapons began to wonder if the attack in Oregon was an anomaly or a harbinger' (Miller *et al.* 2001: 33).

During the mid to late 1980s the perceived threat from CB weapons began to change as awareness grew of the proliferation of chemical weapons to developing countries. This trend gained much public exposure in 1984 with the confirmation by UN investigators that Iraq had used chemical weapons during the war with Iran. Before 1984, there had only been three confirmed possessor states (France, USA and USSR) but, following releases of information from the US intelligence community, by the end of the year the number of alleged possessor

states had risen to at least 30 (Robinson 1985: 171–176). Later in the decade the USA claimed it had evidence that Libya was producing chemical weapons (Gordon 1987: 1; Brummer 1988: 8). The annual UK Ministry of Defence 'Statement on the Defence Estimates', which had previously emphasised the threat from Soviet chemical weapons, from 1986 also focused on chemical proliferation: 'the further use of chemical weapons in the Gulf War illustrates the danger posed by the proliferation of these weapons in the Third World'. A similar situation pertained as to biological weapons. In September 1988, the Director of US Central Intelligence, William Webster, stated that 'at least 10 countries are working to produce biological weapons', and in the 1991 'Statement on the Defence Estimates' the UK Ministry of Defence reported that 'there are indications that in fact about ten countries possess or seek to acquire a biological warfare (BW) capability' (United Kingdom 1991).

Towards the end of the 1980s a new dimension was added to the potential threat from CB terrorism with the rise of 'state-sponsored terrorism' and the realisation that some states alleged to be sponsors of terrorism were also those identified as possessing CB weapons, such as Iraq and Libya. In December 1988, US Ambassador-at-Large for Counterterrorism Paul Bremer told the press: 'the fact you've got the Libyans with a chemical weapons capability, the historic ties and the propensity to turn heavy-duty stuff over to terrorists makes it a concern-raising situation' (AP 1988). In January 1989, US Secretary of State George Shultz told the Conference of States Parties to the 1925 Geneva Protocol that 'terrorists' access to chemical and biological weapons is a growing threat to the international community'. Worries about terrorist acquisition of state CB weapons were heightened further during the 1991 Gulf War against Iraq with its known links to international terrorism and its possession of chemical weapons. While no terrorist attacks with CB weapons took place, some states began thinking about defences against CB terrorism. For example, in 1992 government officials and defence scientists from Canada, the UK and the USA met in Canada for a trilateral conference on responses to CB terrorism. The conference became a recurrent event, with working groups convened under its auspices. The late 1980s and early 1990s were marked by increased attention in the USA to CB weapons and their possible use by terrorists (McGeorge 1986, 1988; Simon 1989: 24; Zilinskas 1990). During 1989, the Senate Foreign Relations Committee and the Senate Governmental Affairs Committee both conducted hearings on CB proliferation and the Office of Technology Assessment began an investigation into the status of research on technological means to protect against terrorist threats. Both of the reports produced by the OTA dwelt at length on the issue of CB terrorism (US Congress OTA 1991, 1992).

The early 1990s were marked by concern that a 'new breed' of terrorist was emerging, driven by religious or apocalyptic goals rather than political or ideological ones (Hoffman 1993; Vegar 1998: 50–55). In addition, greater scholarly attention was being given to the possibility of CB terrorism (Kupperman and Smith 1993; Stern 1993) and concerns about it were raised within policy-making

circles; in 1993 a Pentagon study, 'Terror 2000: The Future Face of Terrorism', declared, according to one of its authors:

> The next 15 years may well be the age of superterrorism, when they gain access to weapons of mass destruction and show a new willingness to use them. Tomorrow's most dangerous terrorists will be motivated not by political ideology, but by fierce ethnic and religious hatreds. Their goal will not be political control, but the utter destruction of their chosen enemies. Nuclear, biological, and chemical weapons are ideal for their purpose.
>
> (Cetron 1994)

In late 1994, the director of the US Defense Intelligence Agency described WMD terrorism as 'a most nightmarish concern' and said 'it is amazing we have not seen any actual incidents' (Starr 1994: 10). In January 1995, the magazine *National Defense* carried three articles under the heading 'mass destruction weapons enter arsenal of terrorists' (Evancoe and Campbell 1995: 24–25; Kupperman 1995: 22–23; Snell and Keusenkothen 1995: 20–21). Whereas previous generations of terrorists had largely acted rationally and carried out attacks that conformed to Jenkins' dictum that 'terrorists want a lot of people watching, not a lot of people dead', it appeared that there was a growing trend towards more spectacular attacks causing large numbers of casualties (Juergensmeyer 1996; Laqueur 1996).

As if to confirm these fears on 20 March 1995 an obscure Japanese cult called Aum Shinrikyo released sarin nerve gas on the Tokyo underground system (Kaplan and Marshall 1996; Reader 2002). The attack, although relatively crude, killed 12 people and caused around 5,000 to seek medical assistance.[4] For many people, the attack was confirmation of their worst fears:

> The scenario of a terrorist group either obtaining or manufacturing and using a weapon of mass destruction is no longer the stuff of science fiction or adventure movies. It is a reality which has already come to pass, and one which, if we do not take appropriate measures, will increasingly threaten us in the future.
>
> (Nunn 1995)

Later investigations revealed that Aum also had a biological weapons programme, and had actually tried to spray *Bacillus anthracis* spores over Tokyo, although the programme was not successful (Broad *et al.* 1998; Leitenberg 1999). Taken together with existing concerns about former Soviet CB programmes and the ongoing revelations coming from Iraq, and against the backdrop of a perceived radicalisation of terrorist groups, the Tokyo attack was a watershed event in the policy debate on CB terrorism: 'the topic broke out of scholarly and closed government circles after Aum Shinrikyo's 1995 poison gas attack in Tokyo, when rapt media coverage ensured that policy makers and the public could hardly avoid it' (Smithson and Levy 2000: 11). In the opinion of many experts, the Aum

attack confirmed their worse fears and with the genie now out of the bottle, they expected many more CB attacks by terrorists. Philip Wilcox, the State Department's coordinator for counterterrorism, told a conference on responding to the consequences of CB terrorism in July 1995 that 'once it has happened, others will take their cue and try it again. Once the barrier has been breached, what was originally unthinkable now becomes more likely' (Miller *et al.* 2001: 163). The Aum Shinrikyo case was analysed in detail in the USA and it strongly influenced how the US government perceived the global terrorism threat: 'apocalyptic, international, equipped with the financial assets and scientific skills to develop and use weapons of mass destruction' (Guillemin 2004: 159).

The policy debate that began in the USA following the Tokyo attacks quickly developed a momentum of its own, in some respects divorced from the reality of the situation. The debate was also driven by the vested interest of defence contractors eager for new business, of government agencies looking to justify their existence in the post-Cold War world and of local politicians looking to attract federal government funding to their constituencies (Sprinzak 1998). Some commentators tried to inject a sense of caution into the debate (Stern 1998; Tucker and Sands 1999) but more powerful forces were pushing a debate that was becoming dominated by 'melodrama and speculation' (Smithson and Levy 2000: 12). By 1998 President Clinton had also become personally interested in the issue, thanks in part to a campaign by the Undersecretary of the Navy Richard Danzig (Miller *et al.* 2001: 155–159, 193–201) but also due to briefings from his counterterrorism adviser, Richard Clarke, and his own reading of fiction, most particularly *The Cobra Event* by the journalist Richard Preston (1998). He held a round table with experts in April 1998 (White House 1998) and launched a new initiative on bioterrorism a month later, stating that:

> we will undertake a concerted effort to prevent the spread and use of biological weapons, and to protect our people in the event these terrible weapons are ever unleashed by a rogue state, a terrorist group or an international criminal organization.

In January 1999, Clinton announced that he would be requesting $1.4 billion to 'protect citizens against chemical and biological terror', more than double the amount spent two years earlier. The day before his speech, the president gave an interview to the *New York Times* focused on bioterrorism, in which he said that the use or threat of use of CB weapons by terrorists in the USA was 'highly likely to happen sometime in the next few years' (Miller and Broad 1999).

With such interest from the highest levels, attention to the threat grew among the security community and the media. In 1999, the new Center for Civilian Biodefense Studies at Johns Hopkins University organised a National Symposium on Medical and Public Health Response to Bioterrorism. The event was attended by over 900 people, with another 300 unable to attend for lack of space. According to one report, a 'sense of urgency pervaded the meeting' (Marshall 1999: 1234–1235). Further books and articles on the subject were published in

the late 1990s, and it became commonplace to hear that 'it is not a question of if, but when' a terrorist attack with CB weapons would occur. In order to prepare for such an eventuality, a large number of exercises were organised at the federal, state and local level. Over 200 such exercises took place between 1998 and 2001. Many congressional committees convened hearings on the threat from bioterrorism. Also in the late 1990s, two high-level commissions were established in the USA to investigate the threat from terrorism. All of this attention meant that 'as the millennium approached, influential politicians and consulting experts broadcast apocalyptic visions of thousands, even hundreds of thousands of Americans dying from unnatural, international epidemics of anthrax, smallpox, or some newly devised disease, invisibly inflicted by barbarous foreigners' (Guillemin 2004: 149). Leitenberg described the years between 1995 and 2000 as being characterised by:

> spurious statistics (hoaxes counted as 'biological' events); unknowable predictions; greatly exaggerated consequence estimates; gross exaggeration of the feasibility of successfully producing biological agents by nonstate actors … the apparent continued absence of a thorough threat assessment; and, thoughtless, ill-considered, counterproductive, and extravagant rhetoric.
>
> (Leitenberg 2005)

Writing in 1999, Tucker pointed out how 'this sensational and at times hysterical coverage may have the unintended effect of popularizing and even glamorizing these weapons in the minds of potential perpetrators' (Tucker 2000a: 3).

By 2001, given the intense attention focused on CB terrorism over the past six years, many in the USA were almost expecting a CB terrorist attack. So, when 9/11 came, many were caught unawares, or expected it to be quickly followed by terrorist attacks with CB weapons: 'America on the eve of 9/11 was expecting a bio-weapon attack rather than a "conventional" attack using commercial airliners' (Sarasin 2006). Indeed, within hours of the attacks, National Guard CB response teams were mobilised and the Centers for Disease Control and Prevention warned health-care workers to be vigilant for any signs of a bioterror attack. A few days after the attacks, all crop-dusting aircraft in the USA were grounded when it was discovered that one of the hijackers had expressed an interest in crop dusting. Within a month, it seemed that these initial thoughts might be right as envelopes containing *Bacillus anthracis* spores were discovered in the US postal system addressed to various media outlets and to senators. Between 4 October and 21 November 2001, 22 people were diagnosed with anthrax. Of the 11 who contracted cutaneous anthrax, all survived. But of the 11 who contracted inhalational anthrax, five died (Cole 2003). However, no links between the 9/11 hijackers and the anthrax letters have ever been proven, so it is important to remember that 'although often conflated with the attacks on the World Trade Center and the Pentagon, the anthrax outbreak in the Eastern United States that followed was a separate event, and American responses to it have a considerable historical lineage' (King 2003: 434). But, in the minds of

many, the letters symbolised the link between terrorists and weapons of mass destruction. Following 9/11 and the anthrax letters, public attention and governmental action to prevent bioterrorism increased massively, not only in the USA but around the world. However, it was the USA that set the pace and increased funding the most. In financial year 2001, the USA spent $414 million on civilian bio-defence, but this had increased to a projected $5.2 billion in the financial year 2007 budget, having reached $7.6 billion in 2005. Over the six years from 2001 to 2006, the USA spent a total of $26.8 billion on civilian bio-defence (Lam *et al.* 2006). Guillemin notes that 'Clinton's fortification of a few public health technologies was dwarfed by sweeping policies to incorporate US biological sciences into the campaign against bioterrorism' (Guillemin 2004: 167).

The terrorist attacks on 9/11 had a profound effect on US thinking towards multilateral treaties like the BWC and CWC. According to Sloan, 9/11 affected the American psyche so deeply that 'most US foreign relations are viewed through the prism of its war on terrorism'. She adds that 'the war on terrorism is as all-pervasive an organizing principle for American foreign and defence policy as the cold war' (Sloan 2003: 301). However, the shift was already apparent even before 9/11, particularly in US attitudes towards international agreements. Guillemin describes how bioterrorism had 'diverted' the Clinton administration from agreement on the BWC protocol during the 1990s and how the USA 'gradually lost its long-range perspective on the importance of states in preventing proliferation' (Guillemin 2004: 149, 151). All of this happened with little real assessment of the actual threat posed by CB terrorism. Indeed, Brian Jenkins labelled it a 'fact-free scaffold of anxieties and arguments – dramatic, emotionally powerful, but analytically feeble'. Often, in the late 1990s, the US General Accounting Office complained that no threat analysis had ever been prepared within the US government. Instead, the government was most influenced by a simplistic, linear perspective that argued that as CB technology was widely available (and becoming more so due to globalisation), its use by terrorists was inevitable. This is illustrated by the following extract from a 1997 White House report:

> The chance of a significant WMD incident occurring in the United States is heightened by several factors, including: Inexpensive production and availability of chemical/biological (C/B) agents; Easily obtainable chemical precursors and biological production processes; Portability of small amounts of C/B agents especially useful for clandestine purposes; Potential for large-scale public impact based on limited ability to quickly identify and/or contain the effects of such substances; Increased WMD stockpiles, with the potential for theft or acquisition of the weapons by terrorists groups; Capability of inflicting mass casualties; and, Increased media coverage of the use of WMD.
>
> (White House 1997)

In contrast, those threat assessments that were carried out, by academics and other non-governmental experts, relied on detailed study of historical cases

and argued that there was nothing inevitable about the use of CB weapons by terrorists. First of all, these assessments found that several of the case studies turned out to be apocryphal (Tucker 2000b). Second, they discovered that a terrorist group's decision to acquire CB weapons was a dynamic decision upon which many factors had a influence; there was nothing inevitable about their decision to use such weapons. Parachini argues that 'a complex of factors shape a group's propensity to acquire and use unconventional weapons'. Among these, he lists the mindset of the leaders of the group, exogenous and internal constraints and a combination of opportunity and the technical capacity of the group (Parachini 2003). Despite these studies, the dominant view regarding CB terrorism from the mid-1990s to the present day has been that of the G8 leaders at Evian in 2003, that it represents 'the pre-eminent threat to international security'. Others have gone further and described bioterrorism as 'the greatest existential threat we have in the world today' or as 'one of the most pressing problems we have on the planet today' (AFP 2005).

By the end of the 1990s then, the threat from CB weapons was very different from that perceived at the beginning of the decade. The assessment of the OPCW Scientific Advisory Board in 2003 could also be applied to biological weapons:

> The threat associated with CW has changed from fully fledged chemical warfare operations to an increased potential of smaller-scale incidents involving other types of toxic chemicals in addition to 'classical' CW agents … . The requirements that need to be met in the context of a terrorist threat involving toxic chemicals differ significantly from those for which military forces have made preparations in the past.
>
> (OPCW 2003b: 25)

The changed perception of the threat from CB weapons could have led to calls for the BWC and CWC to be drastically amended or even abandoned, as the USA did with the 1972 Anti-Ballistic Missile (ABM) treaty when it decided the treaty was no longer relevant to the prevailing international situation. That there were no serious proposals to amend or abandon the treaties signifies not only their relevance to combating terrorism, but also that the threat that they were designed to face, state CB weapons programmes, has not totally gone away either. Instead of amending or abandoning the BWC and CWC, the international community has adopted two broad approaches. The first has been to focus on addressing and strengthening those provisions of both treaties that are relevant to CB terrorism, and to adjust implementation of the treaties accordingly. So, this approach has therefore led to serious attention being focused on issues such as national implementation and the provision of assistance, among others. The second approach has been to identify and fill gaps within the existing international regime as it applies to non-state actors. This approach recognises that there are things that are better done elsewhere, and also that attempting to do them in the context of either treaty might well cause more problems than it

would solve. This approach has led to, for example, the broadening of Australia Group controls to cover agents and equipment that might be of interest to terrorists, the adoption of UN Security Council Resolution 1540 (2004), the establishment of the Proliferation Security Initiative and the strengthening of the World Health Organization's role in the prevention of, and the response to, deliberate releases of chemical or biological agents. The following two sections will examine both of these approaches.

BWC and CWC implementation since 9/11

The BWC and CWC in the 1990s

BWC states parties met for two review conference during the 1990s and a third in 2001. The Third BWC Review Conference took place in 1991 soon after the Gulf War, so concerns about BW proliferation were in delegates' minds, as were concerns about the status of the Soviet BW programme, on which the USA and UK had been pressing Moscow since 1990 (Kelly 2002: 94). Against this background, states parties decided to strengthen verification of the BWC. In September 1994, a Special Conference of BWC states parties agreed to 'consider appropriate measures, including possible verification measures, and draft proposals to strengthen the Convention, to be included, as appropriate, in a legally binding instrument'. The Special Conference established an Ad Hoc Group (AHG) to carry out this mandate. Bioterrorism was not raised during the AHG's five sessions prior to the Fourth BWC Review Conference in November 1996, but it was referred to in the conference's final declaration. Like the second and third review conferences, the fourth reaffirmed that Article III covers 'any recipient whatsoever at international, national or sub-national levels'. For the first time though, states parties also agreed to 'consider ways and means to ensure that individuals or sub-national groups are effectively prevented from acquiring, through transfers, biological agents and toxins for other than peaceful purposes'. Finally, with regard to Article IV, the states parties recognised 'the need to ensure, through the review and/or adoption of national measures, the effective fulfilment of their obligations under the Convention in order, inter alia, to exclude use of biological and toxin weapons in terrorist or criminal activity'. The AHG met for another 19 sessions before the Fifth BWC Review Conference in 2001.

During this time, all discussions and debates about the BWC tended to focus on the AHG and the negotiation of the BWC protocol. One AHG delegate has since commented that the protocol negotiations were 'the only game in town for strengthening of the norm against biological weapons. States parties were focused on one process – the Ad Hoc Group – and on one outcome' (Randin and Borrie 2005: 101). Another former AHG delegate describes the protocol as 'the vehicle through which all the perceived shortcomings of the convention were to be addressed' (Lennane 2006: 7). The protocol was designed to deal with state BW programmes and there was little reference, if any, to bioterrorism during the

24 AHG sessions, indeed the threat of bioterrorism would have been seen by most AHG delegates as a distraction from their work.

A matter of months before 9/11, the new Bush administration announced its rejection of the BWC protocol stating that 'the traditional approach that has worked well for many other types of weapons is not a workable structure for biological weapons' (Mahley 2001). At least according to the public statement, the protocol's relevance or irrelevance to bioterrorism did not feature in the US policy change, its decision was based largely on a belief that verification of the BWC was impossible and that the protocol would put US military programmes and commercial information at risk.

In the time between the CWC's opening for signature in 1993 and its entry into force in 1997, the Preparatory Commission for the OPCW met in The Hague to carry out 'the necessary preparations for the effective implementation' of the CWC. This is not the place for a detailed description of the Commission's activities,[5] merely to note that, like the CWC negotiations that directly preceded it, the issue of chemical terrorism was not on its agenda. The Aum Shinrikyo attack in Tokyo came at a time when the Commission was intently focused on its own activities and when there was a growing realisation that the preparatory phase for CWC entry into force was going to last longer than two years. At the time of the Tokyo attack, the general feeling among delegations was that chemical terrorism was not the concern of the CWC. But the Tokyo attack did not go unremarked in The Hague. The executive secretary of the Commission, Ian Kenyon, noted that the attack indicated 'that the threat of "chemical terrorism" is very real'. In recognition of the slow rate of CWC ratifications, he added that the attack highlighted 'the need for concerted efforts by the international community to bring the Convention … into force at an early stage and thus to reinforce the global and domestic norms against the production and use of such weapons' (OPCW PrepCom 1995).

Although terrorism was not discussed again at the OPCW until after 9/11, in the response of the executive secretary and in statements by a number of signatory states can be seen the outline of future responses to terrorist attacks by the OPCW. This comprised four key elements: an emphasis on the importance of the norm against the use of chemical weapons; the importance of national implementation of the CWC; the availability of assistance and protection; and the role of the OPCW as an expert forum for intergovernmental discussion and coordination. Writing soon after the Tokyo attack, Tucker sums up elements of this approach: 'although the CWC cannot prevent chemical terrorism, it will reinforce the international norm against the use of chemical weapons and create new obstacles for terrorists by requiring parties to criminalize the acquisition and stockpiling of chemical weapons' (Tucker 1996).

Implementation of the CWC since 9/11

In the years immediately after the CWC entered into force, the attention of states parties and the OPCW Technical Secretariat was on the implementation of the

treaty; submitting and processing declarations and conducting inspections, for example. During 2001, the OPCW was also beset by a serious financial crisis that impacted on its ability to perform its operations and created ill feeling between some states parties and the director-general, Jose Bustani. While the period from 1995 until 2001 witnessed increasing attention to CB terrorism in the USA, this had little, if any, discernable impact in The Hague. It was largely a domestic phenomenon and, where it did have international ramifications, these were displayed in other fora such as the G8. However, 9/11 changed this pattern and led to an increasingly proactive approach from the OPCW, particularly from Director-General Bustani.[6] In his address to the first Executive Council session since 9/11, he said:

> Chemical terrorism is a looming real threat. It is that threat which makes it our duty to review the way in which the OPCW has been going about implementing its mandate under the Chemical Weapons Convention … . What might have seemed appropriate and sufficient only a few months ago is simply inadequate in this new reality … . The CWC does provide an international legal foundation for the fight against chemical terrorism.
>
> (OPCW 2001a)

In December 2001, the Executive Council established an anti-terrorism working group to 'examine further the OPCW's contribution to global anti-terrorist efforts, including specific measures, taking into account resource implications'. In the months immediately following 9/11, the Technical Secretariat produced a number of papers on the OPCW's response to global terrorism (OPCW 2001b, 2002a, 2002b). In these papers, the Secretariat outlined the OPCW's mandate to prevent, combat and respond to international terrorism. The papers explained how the OPCW's mandate in this regard stems not only from Article X on assistance and protection, but also from the Article I requirement to destroy chemical weapons, thus making them inaccessible to terrorist organisations or individuals, the industrial and export control regime found in Article VI, and the Article VII requirement to criminalise the prohibitions of the CWC and enact proper penal legislation. The papers emphasised how these provisions ensure that no CWC state party can serve as a 'safe haven' for those who use chemical weapons as tools of terror.

The first real chance that states parties had to assess the implications of 9/11 for the CWC was the First CWC Review Conference in April/May 2003 by which time the OPCW had a new director-general, Rogelio Pfirter. In his contribution to the review conference, Director-General Pfirter stated that:

> The Convention is not a counterterrorism treaty and the OPCW is not a counterterrorism organisation. On the other hand, the full and effective implementation of the Convention, and hence the work of the OPCW, can contribute significantly to the fight against such terrorist threats.
>
> (OPCW 2003a: 8)

During the review conference, a number of states parties made reference to chemical terrorism in their national statements. According to one delegate, 'several national statements referred to the importance of universality, full compliance of all states parties with the CWC national implementation measures, and criminalisation of the convention's prohibitions as means to raise the barriers to chemical terrorism' (Mathews 2003: 115).

In the final report of the conference, the states parties 'noted with concern that, along with the continued threat of possible use of chemical weapons by States, the international community faces a growing danger of the use of chemical weapons by terrorists' (OPCW 2003b: 5). The report noted that 'universal adherence to, and full implementation of, the Convention will contribute to the global anti-terrorist effort and strengthen the security of all states' (OPCW 2003b: 6). The conference therefore directed the Executive Council to develop and implement an action plan on universality. The conference also acknowledged how national implementation 'contributes to meeting new challenges, including the possible use of toxic materials by non-state actors such as terrorists' (OPCW 2003b: 19). The report reminded states parties that while the threat of the use by terrorists of toxic chemicals has given 'added importance and urgency' to the need to enact implementing legislation, the requirement has its origin in the Convention itself (OPCW 2003b: 20). The conference therefore decided to develop an action plan on national implementation. The report also referred to the risk that terrorists might attack chemical facilities and suggested that the OPCW could act as a forum for consultation and cooperation on the subject. Regarding the scope of the CWC, the Scientific Advisory Board pointed out that, with regard to chemical terrorism, 'even toxic chemicals (as well as precursor chemicals) that would not normally be considered to pose a risk to the Convention may be relevant' (OPCW 2003c: 15). Similarly, in his contribution, the director-general pointed out that 'the types of relevant chemicals used in [a chemical terrorist attack] may also differ, given that accessibility would by far be the most important factor influencing the selection of a toxic chemical by a terrorist organisation' (OPCW 2003c: 8). On this point, the final report of the conference reaffirmed the 'comprehensive nature of the prohibition of chemical weapons under the Convention' and, while it did not recommend any new additions to the schedules, it did request the Executive Council to consider developments in relation to additional chemicals.

The action plan on national implementation was adopted by the next session of the Conference of the States Parties in October 2003 (OPCW 2003d). The Action Plan reminded states parties that it had been more than six years since the entry into force of the CWC and set a time frame of November 2005 for the fulfilment of states parties' Article VII obligations. Following its adoption, the Secretariat prepared progress reports on the Action Plan that were reviewed periodically by the members of the Executive Council. At subsequent sessions of the Conference of the States Parties related decisions have been taken: one on 'further action' in 2004 (OPCW 2004); one on 'follow-up' in 2005 (OPCW 2005a); and one on 'sustaining follow-up' in 2006 (OPCW 2006). These

decisions have extended the provisions of the Action Plan and requested states parties and the Secretariat to intensify their efforts. The decision in 2005 also opened the door to those states parties that have still not fulfilled their obligations to be subject to the CWC's provisions on compliance (Onate *et al.* 2005: 9). During the debate on this issue, while some states parties maintained that non-fulfilment of the Action Plan obligations was not significant enough to trigger the compliance mechanisms, others argued that 'failure to implement at the national level may well affect international peace and security given the present threat of terrorism' (Onate *et al.* 2005: 8). When the Action Plan was adopted in 2003 only 33 per cent of states parties had adopted comprehensive CWC implementing legislation but by 2005 this had increased to 40 per cent. However, it is clear that national implementation is a process that will need continuing support from the Secretariat and from states parties.

In the aftermath of 9/11, it has become more acceptable for OPCW activities under Article X to focus on chemical terrorism. States parties have always been able to request assistance in response to the use or threat of use of chemical weapons by terrorists, but since 9/11 a number of OPCW events have focused specifically on chemical terrorism. For example, in September 2002 in Croatia, the OPCW organised its first exercise on the delivery of assistance with a scenario involving a chemical terrorist attack on an airport terminal building. In October 2005 a similar exercise took place in Ukraine after which Director-General Pfirter commented that the exercise 'opens a new chapter of cooperation and partnership between national and international organisations and agencies, bearing a responsibility to respond to acts of chemical terrorism' (OPCW 2005b). The Secretariat has established an Assistance Response System and an Assistance Coordination and Assessment Team, both of which were tested during the Croatia and Ukraine exercises. A number of states parties, particularly those in the Middle East, have requested assistance from the Secretariat in improving their national protective capabilities against chemical terrorism and the OPCW has conducted many civil protection courses for first responders.

Implementation of the BWC since 9/11

The USA rejected the draft BWC protocol in July 2001, a few months before the deadline that the AHG had set for its completion at the Fifth BWC Review Conference in November. The US decision had already changed the likely dynamics of the review conference, but they were to be changed further by 9/11. Speaking just weeks after 9/11, US Assistant Secretary of State for Arms Control Avis Bohlen, said that the attacks had reinforced the US view of the protocol (Bohlen 2001). At the review conference, US Under-Secretary of State for Arms Control and International Security John Bolton criticised 'slowmoving multilateral mechanisms that are oblivious to what is happening in the real world' and argued that neither the BWC nor the draft protocol would stop 'biological terrorism by groups like Al Qaeda or restrain their rogue-state patrons'. For many in the Bush administration, 9/11 seemed to be confirmation that rejection of the

protocol had been the right approach and that a new focus was needed for the BWC to retain its relevance. The review conference was suspended in acrimony for one year with no agreed outcome, thanks to a last-minute US attempt to terminate the AHG mandate. Prior to the reconvening of the review conference in November 2002 the US position seemed to have hardened further, with the USA stating its belief that:

> the measures that can be most effective in enhancing our ability to combat the BW threat can be done best in fora other than the BWC. Therefore we will not support convening any meetings in the context of the BWC before a 2006 RevCon.
>
> (US Department of State 2002)

However, by the time of the reconvened session, the USA had softened its approach, partly due to the need for coalition-building with regard to Iraq and partly due to pressure from key allies (Roberts 2003: 104), and states parties could therefore agree on a three-year programme of annual meetings.

In order to get US support, the work programme for the three years was presented by the chairman as a 'take it or leave it' package with no possibility for changes to be made and no opportunity for discussions on verification to resurface. A number of the topics included in the work programme were taken from US proposals in late 2001, for example national implementation, bio-security, codes of conduct for scientists and disease surveillance. The topics agreed represented a dramatic shift from the concerns of the AHG during the 1990s, away from the concept of verifying the declarations of states through inspections conducted by an international organisation and towards a much broader concept of BWC implementation: 'Many of the measures on the agenda of the BWC new process are directed more at reducing the threat of bioterrorism than at ensuring state-level compliance with the treaty' (Tucker 2004: 11). Whereas CWC states parties and the Technical Secretariat had been able to undertake a gentle realignment of CWC implementation after 9/11 and particularly at the First CWC Review Conference, it was a lot harder for BWC states parties to end their 1990s preoccupation with the BWC protocol and realign BWC implementation. Whether the collapse of the protocol negotiations and the suspension of the Fifth BWC Review Conference were necessary for this to occur is debatable, but together they provided an opportunity for states parties to reassess their priorities and the programme of work implied a much broader concept of BWC implementation. At the November 2003 meeting, the UK representative said that the meetings 'may also in the process establish a new and effective paradigm for multilateral arms control' (Pearson 2003: 24). In contrast to CWC implementation since 9/11, which has still largely been undertaken through the framework of the OPCW, BWC implementation since then has been more challenging given the lack of any central institution. The CWC undoubtedly benefits from the existence of the OPCW with its annual conferences and the resources of the Technical Secretariat. Instead BWC implementation has come to rely upon a network of organisations and initiatives to fill the gap and to coordinate activities.

In 2003, only 31 BWC states parties had national implementing legislation, according to a survey (Ruppe 2003). The survey was a contribution to the 2003 BWC meetings on national implementation and bio-security; an experts' meeting in August and a meeting of states parties in November. At the experts' meeting, the BWC Meetings Secretariat distributed a CD containing information on over 1,000 national implementation measures from over 80 states parties. States parties themselves circulated 66 working papers during the two-week meeting. An observer at the experts' meeting commented afterwards that:

> states parties recognised that many of them face the same legal, technical and political difficulties in implementing the BWC at the national level. And, in sharing experiences and putting substantive information before each other, a few realised they could actually learn from one another and enhance the BWC's implementation.
>
> (Littlewood 2003)

At the meeting in November 2003, states parties agreed on the value of reviewing and where necessary enacting or updating national legal measures, and of the positive effect of cooperation between states parties with differing legal arrangements and of the need for comprehensive national measures to secure pathogen collections (BWC 2003: 5). The minimal outcome of the meeting disappointed some observers at the time (Pearson 2003), but with hindsight a more positive interpretation can be applied. One benefit of the 2003 meetings was that states parties managed to 'meet and survive without drawing blood' (Littlewood 2003). Another was the exchange of information that took place at the experts' meeting. And finally, the focus on national implementation and bio-security fed into an emerging trend within multilateral arms control. As already described, the OPCW had just adopted an Action Plan on national implementation and within a few months the UN Security Council would adopt Resolution 1540 (2004). So, while bioterrorism was not on the agenda of the 2003 meetings, discussions that took place at the meetings contributed indirectly to wider international efforts against CB terrorism.

Following the two other sets of meetings in 2004 and 2005, BWC states parties met again in November 2006 at the Sixth BWC Review Conference. As well as the traditional objective of reviewing the operation of the BWC, the review conference also had to address the results of the annual meetings between 2003 and 2005. During the course of those meetings, the difficulties of 2001 and 2002 had largely healed over and BWC states parties had developed a significantly new approach to implementation of the treaty. While initial expectations of the work programme had been very low, by 2006 one former delegate could comment that 'this pragmatic approach has worked better than expected' (Borrie 2006). Building on this positive outcome, the review conference itself was also a success. Not only did it adopt a final declaration and fully review the operation of the BWC (for the first time since 1996) but states parties also agreed to a new series of annual meetings during the years 2007–2010. In addition, the review

conference encouraged states parties to establish national contact points for BWC implementation and agreed to create a small Implementation Support Unit in Geneva. This national and international institutionalisation of the BWC, although modest, can only help in coordinating the many initiatives relating to national implementation of the BWC that are currently underway.

Responses beyond the BWC and CWC

While the implementation of the BWC and CWC has been adjusted as described above to take account of the terrorist threat, there are a number of areas in which states have decided that action is best pursued outside of the framework of the treaties. As outlined above, neither the BWC nor the CWC were designed to deal with the threat from CB terrorism and states parties have, for understandable reasons, been reluctant to amend the treaties in any way. Therefore, when gaps have been perceived in international responses to CB terrorism, action has taken place elsewhere. According to Moodie, 'the combination of politics, science and technology, and the treaty language of the CWC and BWC ensures that these conventions will be insufficient on their own' to deal with the threat posed by international terrorism (Moodie 2004: 48). However, the vast majority, if not all, of these initiatives have been designed to complement the BWC and CWC and many refer back to the treaties as the normative foundation of international action against CB weapons, whether used by states or by terrorists. This section will describe some of the measures beyond the BWC and CWC that states have adopted; the selection below is intended to be illustrative rather than comprehensive.

The Australia Group

The Australia Group (AG), which began work in 1984/1985, seeks to harmonise supply-side controls on dual use technology, including equipment, chemical agents and biological pathogens, applicable to chemical and biological warfare, by promoting common standards for the formation and implementation of national export-control policies. The AG is one of the earliest plurilateral initiatives on non-proliferation, arising as a direct result of the discovery, confirmed by UN investigators, that the chemical weapons that Iraq used in its war with Iran were not supplied by the Soviet Union as initially suspected, but had been manufactured using 'dual use' commodities and know-how imported from the global marketplace. During 1984, a number of countries therefore implemented national export controls on certain chemical precursors (Robinson 1985: 173–176), but these suffered from a lack of uniformity. Australia therefore proposed a meeting of countries with relevant export controls and the first meeting of what became the AG took place in Brussels in June 1985 (Barton 2006). All subsequent plenary meetings until 2003 took place in the Australian Embassy in Paris, but from 2004 onwards meetings have taken place in the Kleber Centre in Paris (except the twentieth anniversary meeting in 2005, which took place in Sydney).

Australia is chair of the Group and provides its secretariat. The AG now has 39 participating countries, plus the European Commission. All AG participants are states parties to both the BWC and CWC. All agreements are made by consensus, but the participants are self-selecting and can be described as 'like-minded'. The AG is an informal arrangement rather than a legal-constituted organisation, so it has the flexibility to adapt to changes in international relations, science and technology and the security environment.

The membership and range of activities of the AG have expanded over the years, most notably in the early 1990s, when it expanded its scope to include biological as well as chemical export controls (Mathews 2004: 1). The Group maintains lists of chemical weapons precursors, dual use chemical manufacturing equipment and related technology, biological agents, plant pathogens and animal pathogens. The Group has had an, at times, difficult relationship with the BWC and CWC. For some states parties to both treaties that have not been invited to participate in the AG, it has the appearance of a cartel or suppliers' club and seems to be in contradiction to obligations under both conventions not to enact measures that could hamper the economic and technological development of other states parties (Subrahmanyam 1993). For participants in the AG, however, it represents one aspect of their obligation under Article III of the BWC and Article I of the CWC not to transfer chemical or biological weapons. Over the years, states such as Cuba, India, Iran, Pakistan and Sudan have all publicly criticised the AG. However, in recent years, and particularly since 9/11 and the passage of UN Security Council Resolution 1540, opposition to the AG has become muted and public criticism is now more diplomatic ritual than active opposition. Indeed, many of the states that have in the past criticised the AG have now enacted their own national export controls in order to implement the CWC or UNSCR 1540 effectively, and there is now 'a growing acceptance of the AG lists as the international benchmark' (Mathews 2004: 3). This has been helped by a more transparent approach by the AG itself. In recent years it has created a website with translations into French, German, Spanish, Chinese, Arabic and Russian and participants have undertaken more outreach activities.

Like the BWC and CWC, the AG was originally designed in relation to a threat from states, namely the proliferation of chemical agents to the Middle East. However, CB terrorism entered its agenda in 1995 following the Tokyo subway attack. The press release after the October 1995 plenary stated: 'the meeting also discussed the terrorist use of CBW, noting that recent developments had heightened concerns about such risks' (Australia Group 1995). Discussion of CB terrorism was thereafter discussed annually at the plenary meetings. The 2001 AG plenary was held about three weeks after 9/11 and terrorism was therefore high on the agenda. The press release from the meeting states that:

> Participants expressed the resolve of their governments to prevent CBW proliferation, whether by state or non-state actors. Recalling that terrorist groups have used or tried to use chemical and biological agents in the past,

> participants agreed that the Australia Group has an important role to play in reducing the threat of CBW terrorist attacks.
>
> (Australia Group 2001)

One former AG participant describes how at the subsequent plenary in 2002 'several US anti-terrorist proposals were tabled … to expand and strengthen the AG control list' (Seevaratnam 2006: 404). The changes adopted in 2002 demonstrate how much easier it was for an informal arrangement like the AG to agree dramatically new and expanded policies in response to the CB terrorism threat in comparison to the BWC or CWC. The changes included: the lowering of the threshold limit for fermenters from 100 litres to 20 litres, a move the AG press release said would offer 'a substantial increase in security against terrorists seeking equipment for CBW attacks' (Australia Group 2002); the addition of 27 pathogens (that were previously considered 'not to be of sufficient proliferation interest') because of 'concerns over their potential use by terrorists' (Seevaratnam 2006: 412); controls on transfers of intangible technology and knowledge; and the inclusion in the AG guidelines of a 'catch-all clause' to act as a safety net covering items not on the existing AG lists. In 2005, the AG adopted controls on aerosol sprayers to minimise the potential of 'airborne bacterial warfare by terrorists' (Seevaratnam 2006: 412).

The G8

The Group of Eight Nations (G8) comprises eight major industrialised states (Canada, France, Germany, Italy, Japan, Russia, the UK and the USA) whose leaders meet annually to discuss issues of mutual concern.[7] Terrorism has been on the group's agenda since 1978, but concerns about CB terrorism did not arise until the 1995 Tokyo subway attack. In December 1995, G7 ministers met in Ottawa to discuss international terrorism and the communiqué issued after the meeting 'noted with deep concern the chemical gas attacks on the Tokyo subway system which caused deaths and widespread injury'. It went on to:

> urge all Governments to take the strongest measures to prevent toxic chemicals and biological agents from getting into the hands of terrorists and to adopt appropriate national legislation and controls in line with the Chemical Weapons and Biological and Toxin Weapons Conventions.

In addition, the ministers agreed to 'implement measures to deter and respond to chemical and biological terrorist threats and incidents and to investigate and prevent the illicit production, trafficking, possession and use of such substances' (G7 1995). At their summit in Lyon the following June, the G7 leaders issued a declaration on terrorism, partly in response to the attack at Dhahran and other recent attacks but also addressing wider issues: 'Special attention should be paid to the threat of utilization of nuclear, biological and chemical materials, as well as toxic substances, for terrorist purposes' (G7 1996).

The following month in Paris there was a Ministerial Conference on Terrorism at which ministers undertook a thorough review of new trends in terrorism throughout the world and adopted a list of 25 practical steps. Among them were expanding training of personnel connected with counterterrorism to prevent all forms of terrorist action, including those utilising radioactive, chemical, biological or toxic substances and intensifying the exchange of operational information, including on the threat of new types of terrorist activities such as those using chemical, biological or nuclear materials and toxic substances (G7 1996). The list also included recommendations that states parties at the impending Fourth BWC Review Conference:

> confirm … their commitment to ensure, through adoption of national measures, the effective fulfillment of their obligations under the convention to take any necessary measures to prohibit and prevent the development, production, stockpiling, acquisition or retention of such weapons within their territory, under their jurisdiction or under their control anywhere, in order, inter alia, to exclude use of those weapons for terrorist purposes.
>
> (G7 1996)

In the aftermath of the 9/11 attacks, the G8 stepped up its activities regarding WMD terrorism. At their 2002 summit in Kananaskis, Canada, the G8 leaders launched the Global Partnership against the Spread of Weapons and Materials of Mass Destruction. The Global Partnership is a non-proliferation initiative that supports projects, mainly in Russia, such as the destruction of chemical weapons, the dismantlement of decommissioned nuclear submarines, the disposition of fissile materials and the employment of former weapons scientists. However, the statement launching the initiative began by focusing on WMD terrorism:

> The attacks of September 11 (2001) demonstrated that terrorists are prepared to use any means to cause terror and inflict appalling casualties on innocent people. We commit ourselves to prevent terrorists, or those that harbour them, from acquiring or developing nuclear, chemical, radiological and biological weapons; missiles; and related materials, equipment and technology.
>
> (G8 2002)

Under the Global Partnership, the G8 also adopted six principles to 'prevent terrorists or those that harbour them from acquiring or developing nuclear, chemical, radiological and biological weapons; missiles; and related materials, equipment and technology' (G8 2002). These principles included the adoption, universalisation, full implementation and, where necessary, strengthening of multilateral treaties, measures to account for WMD and related materials, physical protection measures at facilities housing WMD and related materials, effective border controls and law enforcement, effective national export and

transhipment controls, and the elimination of all chemical weapons and the minimising of holdings of dangerous biological agents. At Kananaskis, the G8 leaders committed themselves to raising US$20 billion to support such activities over the following ten years. By the 2006 summit, held in St Petersburg, Russia, 13 non-G8 countries had joined the Global Partnership as donors (in 2003: Finland, the Netherlands, Norway, Poland, Sweden and Switzerland; and in 2004: Australia, Belgium, the Czech Republic, Denmark, Ireland, New Zealand and South Korea).

Interpol

The International Criminal Police Organization, better known as Interpol, long active against international terrorism, launched a comprehensive programme to counter the threat of bioterrorism in July 2004, funded by the Alfred P. Sloan Foundation in the USA, the Canadian Department of Foreign Affairs and International Trade and the US Department of State. Within its General Secretariat, Interpol established a Bioterrorism Prevention Unit, overseen by a Steering Committee on Bioterrorism Prevention. In March 2005, Interpol convened a Global Conference on Bioterrorism in Lyon attended by over 500 people from 155 countries, making it the largest international law enforcement meeting ever. Opening the conference, Interpol Secretary-General Ron Noble said:

> The evidence uncovered by law enforcement and concerns voiced at global, regional and national levels regarding the potential use of biological agents by terrorists to perpetrate a mass casualty attack demonstrate that we face a very real and present threat.
>
> (Interpol 2005)

The conference brought together senior police officers and counterterrorism specialists, national and international governmental and non-governmental agencies, scientists and other academics. It also agreed a programme of work, including developing police training programmes, establishing a resource centre at the disposal of law enforcement worldwide, developing an Incident Response Guide for law enforcement and enhancing cooperation and understanding between international organisations, including public health officials, customs and law enforcement officials.

As part of its aim to provide regional training for countries in need of capacity-building in the appropriate responses to a bioterrorist incident, Interpol has convened four regional workshops for law enforcement officials in Africa (South Africa in November 2005), Asia (Singapore in March 2006), the Americas (Chile in July 2006) and Eastern Europe (Ukraine in November 2006), with another planned for Muscat, Oman in March 2007. In September 2006, Interpol launched a bio-criminalisation project with the aim of identifying legislative and regulatory gaps in national implementation and assisting Interpol member states

to draft and enact primary and subsidiary legislation to fill these gaps and thus strengthen their law enforcement capacity. Addressing the Sixth BWC Review Conference in November 2006, the head of Interpol's Bioterrorism Prevention Unit said:

> Interpol is active and innovative in our commitment to help law enforcement do all in its power to confront the threat of bioterrorism. But law enforcement cannot effectively tackle the threat alone. It must do so in partnership with professionals from other relevant disciplines.
>
> (Baciu 2006)

He went on to list these as law enforcement, first responders, health sciences, bio-safety, bio-security, legal, emergency management, intelligence, environmental management, agricultural authorities and other relevant private and public resources (local, national, regional and international). Whereas in 2001 there was no relationship between Interpol and the BWC, by 2006 Interpol has become an important contributor to international efforts to strengthen the national implementation of the BWC, as shown by the invitation extended to it to attend and address the Sixth BWC Review Conference.

World Health Organization

The World Health Organization (WHO) is the UN specialised agency for health established in April 1948 and based in Geneva. It is governed by its 193 member states through the World Health Assembly. The WHO has long been concerned with preventing the hostile exploitation of biology. For example, in 1967 the World Health Assembly resolved that 'scientific achievements, and particularly in the field of biology and medicine – that most humane science – should be used only for mankind's benefit, but never to do it any harm'. In 1969, the World Health Assembly, requested the WHO director-general to continue to cooperate with the United Nations secretary-general on the issue of chemical and biological weapons and the consequences of their possible use. The 1970 WHO report on 'Health Aspects of Chemical and Biological Weapons: Report of a WHO Group of Consultants' was the result of that work and echoed the concerns of member states about the misuse of biology.

In May 2002, the World Health Assembly adopted resolution WHA 55.16 defining a role for WHO in responding to the 'natural occurrence, accidental release or deliberate use of biological and chemical agents or radionuclear material that affect health'. The WHO Secretariat also established a unit focusing on Preparedness for Deliberate Epidemics and a Chemical and Biological Weapons Working Group. In 2004, the WHO issued the third edition of its *Laboratory Biosafety Manual*, which for the first time included a section on laboratory bio-security. Also in 2004, the WHO published *Public Health Response to Biological and Chemical Weapons – WHO Guidance*, a revised and updated version of its 1970 report. In September 2006, the WHO released

Biorisk Management: Laboratory Biosecurity Guidance, which elaborates on the bio-security section of the *Laboratory Biosafety Manual* by providing more detailed guidance on bio-security within a biological laboratory and addresses the basic principles and best practices of bio-security. The WHO is also charged with overseeing the two authorised stockpiles of the smallpox virus at laboratories in Russia and the US. In 2005, the WHO established a Global Smallpox Vaccine Reserve with the intention of acquiring five million doses to be stored in Geneva and a further 200 million doses to be pledged by states, to facilitate an effective international response to a smallpox outbreak.

In 2005, WHO member states unanimously adopted an update to the revised International Health Regulations (IHR). First adopted in 1969 (replacing the 1951 International Sanitary Regulations), the IHR provide an international legal framework for efforts to prevent and control the cross-border spread of communicable diseases. However, under the 1969 IHR, states are only required to notify the WHO if any of three diseases (cholera, plague and yellow fever) occur on their territory. In 1995, after outbreaks of emerging infectious diseases and the resurgence of existing diseases had rendered the IHR increasingly obsolete, WHO member states requested a major updating of the regulations to adapt them to the highly mobile, globalised world of the twenty-first century. After negotiations in 2004 and 2005, the revised IHR text was adopted unanimously by the World Health Assembly at its session in 2005 (Tucker 2005). The updated regulations depart in important ways from the 1969 version, particularly in their expanded scope and the powers they grant to the WHO Secretariat. Rather than being limited to three diseases, the IHR 2005 require states to notify the WHO of any event that may constitute a 'public health emergency of international concern', which is defined as 'an extraordinary event which is determined … (i) to constitute a public health risk to other States through the international spread of disease and (ii) to potentially require a coordinated international response'. The decision of what constitutes a public health emergency of international concern is based on four criteria: (1) the seriousness of the public health impact; (2) the unusual or unexpected nature of the event; (3) the potential for international spread; and (4) the risk of restrictions on international travel or trade. The IHR 2005 will enter into force on 15 June 2007, although member states may apply them immediately.

Global Health Security Initiative

The Global Health Security Initiative (GHSI) was established in the aftermath of 9/11 at the suggestion of US Secretary for Health and Human Services Tommy Thompson who proposed that countries fighting bioterrorism should meet to share information and coordinate their efforts to improve global health security. The first meeting was held in Ottawa in November 2001 and was attended by ministers of health and senior health officials from the European Commission, France, Germany, Italy, Japan, Mexico, the UK, the USA and the World Health

Organization (the latter acts as technical adviser to the GHSI). The GHSI website states:

> The GHSI was envisaged as an informal group to fill a gap for like-minded countries to address health issues of the day, such as global health security. The Initiative was not intended to replace, overlap or duplicate existing fora or networks.

To date, seven GHSI ministerial meetings have been held: Ottawa, 7 November 2001; London, 14 March 2002; Mexico City, 6 December 2002; Berlin, 7 November 2003; Paris, 10 December 2004; Rome, 18 November 2005; and Tokyo, 7 December 2006.

The GHSI is overseen by a Global Health Security Action Group of senior officials who develop and implement activities designed to improve global health security. The Group also serves as a network of rapid communication/reaction in the event of a crisis. The GHSI currently has four working groups/networks (Risk Management and Coordination Working Group; Pandemic Influenza Working Group; Working Group on Chemical Events; and the Global Health Security Laboratory Network) and has projects underway in a number of other areas (Field Epidemiology and Outbreak Investigation; Public Health Aspects of Radiological and Nuclear Threats; Research Collaboration; and Capacity Building and Training for Emerging Infectious Diseases). In 2003, the GHSI conducted a global outbreak simulation called Exercise Global Mercury aimed at evaluating the communications protocols between and among the countries in the face of a terrorist attack with smallpox. GHSI countries have also contributed to the WHO's Global Smallpox Vaccine Reserve.

The Proliferation Security Initiative

The Proliferation Security Initiative (PSI) was launched by US President George Bush during a speech in Krakow, Poland in 2003. Like the Australia Group, the PSI is not a formal organisation constituted by member states. Rather, it is a coalition of states that adhere to a statement of principles and that undertake, on the basis of a web of supporting agreements, to cooperate with each other in the interdiction, by armed force if necessary, of international shipments of goods thought destined for WMD programmes considered illegal by PSI participants. As such, the PSI partially addresses prohibitions in Article I of the CWC and Articles I and III of the BWC relating to transfers and to the prohibitions on assistance, encouragement and inducement in both treaties. Neither treaty contains further provisions for verifying compliance with or enforcing these prohibitions, so the PSI fills the gap. According to its website: 'The PSI is not a formal institution, nor is it a treaty body. It is a statement of purpose: an activity, not an organisation'. The initiative originated in part following an incident in December 2002, when Spain, alerted by a US tip-off, seized a shipment of 15

Scud missiles headed from North Korea to Yemen. The USA allowed the ship to continue after determining that it lacked the authority under international law to detain the vessel and after assurances had been given that the missiles would be used for defensive purposes only.

The scope and aims of the PSI are set out in the 'Statement of Interdiction Principles' adopted by PSI participants at their third plenary meeting in Paris in September 2003. The 'Statement of Interdiction Principles' commits participating states to 'undertake effective measures, either alone or in concert with other states, for interdicting the transfer or transport of WMD, their delivery systems, and related materials to and from states and non-state actors of proliferation concern'. It defines the latter as:

> those countries or entities that the PSI participants involved establish should be subject to interdiction activities because they are engaged in proliferation through: (1) efforts to develop or acquire chemical, biological, or nuclear weapons and associated delivery systems; or (2) transfers (either selling, receiving, or facilitating) of WMD, their delivery systems, or related materials.

To date, PSI participants have convened seven plenary meetings since the first in Madrid, Spain, in June 2003. In addition, there have been around 17 operational experts' meetings in many PSI participant countries. Most significantly, PSI participants have conducted 25 air, ground and maritime interdiction exercises. Few details have emerged of interdictions conducted under the PSI. However, in May 2005, US Secretary of State Condoleezza Rice said: 'In the last nine months alone, the United States and ten of our PSI partners have quietly cooperated on 11 successful efforts'. According to a list maintained by the US Department of State, almost 80 countries have expressed support for the PSI. The USA has signed ship-boarding agreements with six countries (Belize, Croatia, Cyprus, Liberia, Marshall Islands and Panama). While some states have questioned the legitimacy of PSI, particularly in relation to the law of the sea, UN Security Council Resolution 1540 indirectly endorsed the initiative.

2005 Protocol to the Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation

The International Maritime Organization (IMO) is a specialised agency of the United Nations responsible for improving maritime safety and preventing pollution from ships. The IMO was established in 1948 and is headquartered in London. Prompted by crews being kidnapped and ships being hijacked, deliberately run aground or blown up by explosives during the 1980s, the UN General Assembly invited the IMO to study the problem of terrorism aboard or against ships with a view to making recommendations on appropriate measures. This resulted in the 1988 Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation (known as the SUA Convention), which

entered into force in March 1992. After 9/11, IMO member states became increasingly concerned about the risks posed to maritime navigation by terrorism and the possibility of WMD being transported by ship. In response, IMO member states negotiated a Protocol to the SUA Convention that was adopted at a diplomatic conference in London in October 2005.

The Protocol provides the first international treaty framework for combating and prosecuting anyone who uses a ship as a weapon or as a means to carry out a terrorist attack, or who transports by ship terrorists or cargo (including associated delivery systems and related materials) destined to support WMD programmes. Article 2 of the Protocol amends Article 1 of the SUA Convention to include definitions of biological and chemical weapons that use the same wording as the BWC and CWC. In addition, the Protocol adds a new article to the Convention stating that nothing in the Protocol affects states parties' rights, obligations and responsibilities under the BWC or CWC. The Protocol also establishes a mechanism to facilitate boarding of ships suspected of engaging in these activities in international waters. The Protocol was opened for signature in February 2006 and will enter into force after it has been ratified by 12 IMO member states.

UN Security Council Resolution 1540 (2004)

On 28 April 2004, the UN Security Council adopted Resolution 1540 on the non-proliferation of weapons of mass destruction. The resolution affirms that the proliferation and illicit trafficking of nuclear, biological and chemical weapons are threats to international peace and security and it requires all UN member states to enact and enforce laws to prohibit and prevent the manufacture, acquisition, possession, development, transport, transfer or use of nuclear, chemical or biological weapons and their means of delivery by non-state actors. It therefore universalises the obligations under the BWC and CWC, which only apply to states party to those treaties, by requiring all UN member states, whether BWC or CWC members or not, to enact and enforce such laws. The resolution also requires states to take and enforce national measures to prevent the proliferation of these weapons, including means to account for and secure weapons and their means of delivery, physical protection measures, effective border controls and export controls. The resolution also obliges member states to refrain from supporting attempts by non-state actors to acquire WMD capabilities. Along with the Action Plan on national implementation adopted by CWC states parties, the attention to national implementation during the annual meetings of BWC states parties and the activities of Interpol, Resolution 1540 represents a concrete contribution to the prevention of CB terrorism.

All states were required to provide a report on their implementation of the resolution to a committee established by the resolution and by September 2006 over 130 states had done so. The committee originally had a two-year mandate, but this was extended for a further two years by Security Council Resolution 1673 in April 2006. Resolution 1673 calls on states to provide a first report on implementation if

they have not already done so and encourages all states to provide additional information, at any time or upon the request of the 1540 Committee. The 1540 Committee has finalised its fifth work programme (for the period 1 October 2006 to 30 September 2007), under which it will focus on 'increasing its knowledge by examination of information on the status of implementation of SCR 1540' and 'outreach, dialogue, assistance and co-operation to promote implementation of all aspects of SCR 1540' through a range of activities.

Uniting against terrorism and the 'bio-forum'

In May 2006, then UN Secretary-General Kofi Annan issued his response to the 2005 World Summit request for him to 'submit proposals to strengthen the capacity of the United Nations system to assist States in combating terrorism and enhance coordination of United Nations activities in this regard'. The report, entitled 'Uniting Against Terrorism: Recommendations for a Global Counter-Terrorism Strategy', states that 'the most important under-addressed threat relating to terrorism, and one which acutely requires new thinking on the part of the international community, is that of terrorists using a biological weapon'. Reflecting the analysis of Chyba (2006) and others, the report then argues that:

> Preventing bioterrorism requires innovative solutions specific to the nature of the threat … . The approach to fighting the abuse of biotechnology for terrorist purposes will have more in common with measures against cybercrime than with the work to control nuclear proliferation.

The report then goes on to propose that:

> What we need now is a forum that will bring together the various stakeholders – Governments, industry, science, public health, security, the public writ large – into a common programme, built from the bottom up, to ensure that biotechnology's advances are used for the public good and that the benefits are shared equitably around the world. Such an effort must ensure that nothing is done to impede the potential positive benefits from this technology. The United Nations is well placed to coordinate and facilitate such a forum, and to bring to the table a wide range of relevant actors.

Concluding the section, Annan urges UN member states to consider the proposal 'in the near future'.

The report additionally includes recommendations on 'strengthening State capacity to prevent terrorists from acquiring nuclear, biological, chemical, or radiological materials, and ensuring better preparedness for an attack with such materials'. It suggests that the Security Council could promote facilitation of technical assistance to counter terrorist development, acquisition and use of WMD. It also suggests that the General Assembly and the Security Council consider adopting a resolution calling on all states to provide cooperation and

assistance in the event of a terrorist attack using WMD. Regarding chemical terrorism, the report recommends that states ensure that security at chemical plants is kept to the highest standards and it proposes that a mechanism is developed so that the OPCW with other UN bodies can provide assistance and coordinate the relief and response operations in case of a chemical attack. On bioterrorism, the report calls for 'a major initiative … to strengthen States' public health systems'. The report notes the 'good work' done by the WHO in providing technical assistance to states but says that efforts must be stepped up dramatically. Finally, the report says that the UN should 'develop a single comprehensive database on biological incidents and promote information-sharing to facilitate threat and risk assessment and support criminal investigation'.

In September 2006, the General Assembly adopted a resolution containing a 'UN global counterterrorism strategy', picking up many of the ideas in the secretary-general's report. The strategy calls for strengthened 'coordination and cooperation among States in combating crimes that might be connected with terrorism, including … smuggling of nuclear, chemical, biological, radiological and other potentially deadly materials'. From the 'Uniting Against Terrorism' report (Annan 2006), the resolution invites the UN system to develop the 'single comprehensive database on biological incidents' and it also notes the importance of the secretary-general's 'bio-forum' proposal. The resolution invites the UN to improve coordination in planning a response to a WMD terrorist attack by reviewing and improving the existing inter-agency coordination mechanisms and by developing guidelines for cooperation and assistance. The resolution also encourages the OPCW to continue its capacity-building efforts with states and it encourages the WHO to step up its technical assistance to states. The secretary-general has established a CounterTerrorism Implementation Task Force comprising representatives of 24 UN and related agencies, among them the OPCW, WHO, Interpol, the UN Department for Disarmament Affairs and the expert staff of the 1540 Committee.

Before he stepped down from his post as UN secretary-general at the end of 2006, Kofi Annan devoted one of his last speeches to his 'bio-forum' proposal and the thinking behind it. After highlighting the many positive aspects of advances in biology, Annan said:

> [I]f they fall into the wrong hands, they could be catastrophic. When used negligently, or misused deliberately, biotechnology could inflict the most profound human suffering – ranging from the accidental release of disease agents into the environment to intentional disease outbreaks caused by State or non-State actors.

Annan then offered his 'bio-forum' proposal as a possible tool to address these risks:

> Such a forum could discuss how to ensure that biotechnology's advances are used by all for the public good, how to ensure that the efforts of countries to

> harness biotechnology are not hampered by unnecessary impediments and how we can learn to manage the potential risks.

In his speech to the Sixth BWC Review Conference two days later, Annan described the BWC as part of an interlinked array of tools dealing with an interlinked array of problems, among which are traditional concerns about state-owned weapons, but that also now include 'terrorism and crime at the non-state and individual levels'. Annan mentioned the 'bio-forum' in the context of designing a coherent strategy to address these issues and encouraged delegates at the review conference to build bridges with different fields and to explore other possibilities. There was no reference to the 'bio-forum' in the final declaration of the review conference and it is unclear how the 'bio-forum' proposal will be taken forward under a new secretary-general.

Notes

1 Although the use of biological weapons is not specifically prohibited by the BWC, at the Fourth Review Conference in 1996 states parties reaffirmed that:

> the use by the States Parties, in any way and under any circumstances, of microbial or other biological agents or toxins, that is not consistent with prophylactic, protective or other peaceful purposes, is effectively a violation of Article I of the Convention.

2 For example Leventhal and Alexander (1987).
3 In fact a study was not published until more than a decade later: Torok *et al.* (1997).
4 The figure of 5,000 is often described as 'over 5,000 casualties' but, according to a WHO publication, this should be seen in its true perspective; along with the 12 fatalities, 54 people were severely injured and around 980 were mildly to moderately affected. The majority of the 5,000 people, the WHO notes, had psychogenic symptoms and were (understandably) worried that they might have been exposed (World Health Organization 2004).
5 Such a history will be published in the near future: Feakes and Kenyon (2007).
6 Not all states parties welcomed Bustani's proactive approach. The USA was particularly critical and used his advocacy of an anti-terrorism role for the OPCW in its ultimately successful campaign to have him removed from office. The US claimed that Bustani:

> seized on [the] September 11, 2001 terrorist attacks to promote costly initiatives – clearly outside of the Organization's primary mission – verification … . Many of these proposals also had very little connection to terrorism, the genuine competencies of the OPCW staff, or the financial capabilities of an OPCW already embroiled in a financial crisis.

7 The Group was the G7 until Russia joined in 1998.

References

AFP (2005) 'US Senate leader urges "Manhattan Project" against bio-terror threat' *Agence France Presse*, 25 January.

Alibek, K. and S. Handelman (1999) *Biohazard*, London: Hutchinson.

Annan, K. (2006) *Uniting Against Terrorism: Recommendations for a Global*

Counter-Terrorism Strategy, New York, UN General Assembly. Online, available at: isn.ethz.ch/pubs/ph/details.cfm?Ing=en&id=16671 (accessed 2007).

Asocciated Press (1988) 'US says Libya capable of making chemical weapons' *Baltimore Sun*, Baltimore: p. 6.

Australia Group (1995) Press release – Australia Group meeting. Online, available at: australiagroup.net/en/releases/ninety_five.htm (accessed 2007).

Australia Group (2001) 'Tackling the threat of chemical and biological weapons'. Online, available at: australiagroup.net/en/releases/2001.htm (accessed 2007).

Australia Group (2002) 'New measures to fight the spread of chemical and biological weapons'. Online, available at: australiagroup.net/en/releases/press_2002_06.htm (accessed 2007).

Baciu, A. (2006) Message to the Sixth Review Conference of the States Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, delivered on behalf of Interpol Secretary General Ronald K. Noble. Online, available at: unog.ch/80256EDD006B8954/(httpAssets)/1B558DD8E4ECCB8AC125722D00654ACE/$file/BWC-6RC-Statement-061121-Interpol.PDF (accessed 2007).

Barton, R. (2006) *The Weapons Detective: The Inside Story of Australia's Top Weapons Inspector*, Melbourne: Black Inc.

Batsanov, S. (2006) 'Approaching the 10th anniversary of the Chemical Weapons Convention' *Nonproliferation Review* 13(2): 339–353.

Bohlen, A. (2001) Statement by Avis Bohlen, United States Assistant Secretary of State for Arms Control, in the First Committee of the General Assembly. Online, available at: usunnewyork.usmission.gov/01_137.htm (accessed 2007).

Borrie, J. (2006) 'The limits of modest progress: the rise, fall, and return of efforts to strengthen the Biological Weapons Convention' *Arms Control Today* 36(8).

Borrie, J. and V.M. Randin (eds) (2005) *Alternative Approaches in Multilateral Decision Making: Disarmament as Humanitarian Action*, Geneva: UNIDIR.

Broad, W., S. Wudunn and J. Miller (1998) 'How Japan germ terror alerted world' *New York Times*, 26 May.

Brummer, A. (1988) 'US says Libya has poison gas' *Guardian*, London.

Bush, G. (2002) State of the Union Address to Congress. Online, available at: whitehouse.gov/news/releases/2002/01/20020129–11.html (accessed 2007).

BWC (2003) Report of the Meeting of States Parties (Volume I). Online, available at: opbw.org/new_process/msp2003/BWC_MSP_2003_4_Vol.1_E.pdf (accessed 2007).

Cameron, M., R. Lawson and B. Tomlin (eds) (1998) *To Walk Without Fear: The Global Movement to Ban Landmines*, Oxford: Oxford University Press.

Carroll, S. (2002) 'NGO access to multilateral fora: does disarmament lag behind?' *Disarmament Forum* (1): 15–26.

Carus, S.W. (2000) The Rajneeshees (1984) in J. Tucker (ed.) *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, Cambridge, MA: MIT Press, pp. 115–137.

Cetron, M. (1994) 'The future face of terrorism' *Futurist*, 28.

Chyba, C.F. (2006) 'Biotechnology and the challenge to arms control' *Arms Control Today* 36(8)

Cole, L. (2003) *The Anthrax Letters: A Medical Detective Story*, Washington, DC: Joseph Henry Press.

Davis, C. (1999) 'Nuclear blindness: an overview of the biological weapons programs of the Former Soviet Union and Iraq' *Emerging Infectious Diseases* 5(4): 509–512.

de Larrinaga, M. and C. Turenne Sjolander (1998) '(Re)presenting landmines from protector to enemy: the discursive framing of a new multilateralism' in M. Cameron, R. Lawson and B. Tomlin (eds) *To Walk Without Fear: The Global Movement to Ban Landmines*, Oxford: Oxford University Press, pp. 364–391.

Douglass, J. and R. Lukens (1984) 'The expanding arena of chemical–biological warfare' *Strategic Review* 12(4): 71–80.

Dunworth, T., R. Mathews and T.L.H. McCormack (2006) 'National implementation of the Biological Weapons Convention' *Journal of Conflict and Security Law* 11(1): 93–118.

Evancoe, P. and K. Campbell (1995) 'Chemical weapons lurk as terrorists' "surprise"' *National Defense*, January.

Feakes, D. and I. Kenyon (eds) (2007) *The Creation of OPCW: A Case Study in the Birth of an Intergovernmental Organization*, The Hague: TMC Asser Press.

Fidler, D. (2004) 'International law and weapons of mass destruction: end of the arms control approach?' *Duke Journal of Comparative and International Law* 14(1): 39–88.

Findlay, T. (ed.) (2002) *Verification Yearbook 2002*, London: VERTIC.

Findlay, T. (ed.) (2003) *Verification Yearbook 2003*, London: VERTIC.

G7 (1995) Ottawa Ministerial Declaration on Countering Terrorism. Online, available at: g7.utoronto.ca/terrorism/terror96.htm (accessed 2007).

G7 (1996a) Declaration on terrorism. Online, available at: g8.utoronto.ca/summit/1996lyon/terrorism.html (accessed 2007).

G7 (1996b) Ministerial Conference on Terrorism: Agreement on 25 Measures. Online, available at: g8.utoronto.ca/terrorism/terror25.htm (accessed 2007).

G8 (2002) Statement by G8 Leaders: The G8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction. Online, available at: g8.utoronto.ca/summit/2002kananaskis/arms.html (accessed 2007).

G8 (2003) Non-proliferation of weapons of mass destruction: A G8 declaration. Online, available at: g8.utoronto.ca/summit/2003evian/wmd_declaration_en.html (accessed 2007).

Gee, J. (1996) 'CBW terrorism and the Chemical Weapons Convention' *Politics and the Life Sciences* 15(2).

Gordon, M. (1987) 'US thinks Libya may plan to make chemical weapons' *New York Times*, 24 December.

Guillemin, J. (2004) *Biological Weapons: From the Invention of State-Sponsored Programs to Contemporary Bioterrorism*, New York, NY: Columbia University Press.

Hoffman, B. (1993) *Holy Terror: The Implication of Terrorism Motivated by a Religious Imperative*, Santa Monica, CA: RAND Corporation.

Hoffman, B. (1997) 'Terrorism and WMD: some preliminary hypotheses' *Nonproliferation Review* 4(3): 45–53.

Hurwitz, E. (1982) 'Terrorists and chemical/biological weapons' *Naval War College Review* 35(3): 36–40.

Ikenberry, J. (2001) *After Victory: Institutions, Strategic Restraint and the Rebuilding of Order after Major Wars*, Princeton, NJ: Princeton University Press.

Interpol (2005) Bio-Terrorism Conference opens with warning of major threat. Online, available at: interpol.int/Public/BioTerrorism/Conferences/Presentations/Default.asp (accessed 2007).

Jenkins, B. (1985) 'Will terrorists go nuclear?' *Orbis* 29(3): 507–515.

Juergensmeyer, M. (1996) 'The worldwide rise of religious nationalism' *Journal of International Affairs* 50(1): 1–20.

Kadlec, R.P., A.P. Zelicoff and A.M. Vrtis (1997) 'Biological weapons control. Prospects and implications for the future' *JAMA* 278(5).

Kaplan, D. and A. Marshall (1996) *The Cult at the End of the World: The Incredible Story of Aum*, London: Arrow.

Kelly, D. (2002) 'The trilateral agreement: lessons for biological weapons verification' in T. Findlay (ed.) *Verification Yearbook 2002*, London: VERTIC, pp. 93–110.

Kenyon, I. (2006) 'The USA/USSR arms control relationship and its impact on the CWC' *CBW Conventions Bulletin* (72+73).

King, N. (2003) 'The influence of anxiety: September 11, bioterrorism, and American public health' *Journal of the History of Medicine and Allied Sciences* 58(4): 433–441.

Kupperman, R. (1995) 'United States becoming target for terror forays' *National Defense*, January.

Kupperman, R. and D. Smith (1993) 'Coping with biological terrorism' in B. Roberts (ed.) *Biological Weapons: Weapons of the Future*, Significant Issues Series 15, Washington, DC: CSIS, pp. 35–46.

Lam, C., C. Franco and A. Schuler (2006) 'Billions for biodefense: federal agency biodefense budgeting, FY2006–FY2007' *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science* 4(2): 113–127.

Laqueur, W. (1996) 'Postmodern terrorism' *Foreign Affairs* 75(5): 24–36.

Leitenberg, M. (1999) 'Aum Shinrikyo's efforts to produce biological weapons: a case study in the serial propagation of misinformation' *Terrorism and Political Violence* 11(4): 149–158.

Leitenberg, M. (2005) *Assessing the Biological Weapons and Bioterrorism Threat*, Carlisle, PA: Strategic Studies Institute.

Lennane, R. (2006) 'Blood, toil, tears and sweat: the Biological and Toxin Weapons Convention since 2001' *Disarmament Forum* (3): 5–15.

Leventhal, P. and Y. Alexander (eds) (1987) *Preventing Nuclear Terrorism: The Report and Papers of the International Task Force on Prevention of Nuclear Terrorism*, Lexington, MA: Lexington Books.

Littlewood, J. (2003) 'Substance hidden under a mountain of paper: the BWC Experts' Meeting in 2003' *Disarmament Diplomacy* (73): 63–66.

Livingstone, N. and J. Douglass (1984) 'CBW: the poor man's atomic bomb' *National Security Papers*, Cambridge: Institute for Foreign Policy Analysis.

McGeorge, H.J. (1986) 'The deadly mixture: bugs, gas and terrorists' *NBC Defense and Technology Internationa*l 1(2): 56–61.

McGeorge, H.J. (1988) 'Reversing the trend on terror' *Defence and Foreign Affairs* 16(4): 16–22.

Mahley, D. (2001) Statement by the United States to the Ad Hoc Group of Biological Weapons Convention States Parties. Online, available at: state.gov/t/ac/rls/rm/2001/5497.html (accessed 2007).

Mangold, T. (1999) *Plague Wars – A True Story of Biological Warfare*, London: Macmillan.

Marshall, E. (1999) 'Bioterror defense initiative injects shot of cash' *Science* 283: 1234–1235.

Mashhadi, H. (2001) 'The OPCW and the struggle against chemical terrorism' *OPCW Synthesis*, December: 24–27.

Mathews, R. (2003) 'Reviewing the Chemical Weapons Convention: gently does it' in T. Findlay (ed.) *Verification Yearbook 2003*, London: VERTIC, pp. 103–124.

Mathews, R. (2004) 'The development of the Australia Group export control lists of biological pathogens, toxins and dual-use equipment' *CBW Conventions Bulletin* (66): 1–4.

Miller, J. and W. Broad (1999) 'Clinton describes terrorism threat for 21st century' *New York Times*, 21 January.

Miller, J., S. Engelberg and W. Broad (2001) *Germs: Biological Weapons and America's Secret War*, New York: Simon and Schuster.

Moodie, M. (2004) 'Confronting the biological and chemical weapons challenge: the need for an "intellectual infrastructure"' *Fletcher Forum on World Affairs* 28(1): 43–55.

Mullen, R. (1978) 'Mass destruction and terrorism' *Journal of International Affairs* 32(1): 63–89.

Nunn, S. (1995) Opening statement to the US Senate Permanent Subcommittee on Investigations, Hearing on Global Proliferation of Weapons of Mass Destruction. Online, available at: globalsecurity.org/wmd/library/congress/1996_h/s960313a.htm (accessed 2007).

Onate, S., R. Trapp and L. Tabassi (2005) 'Decision on the follow-up to the OPCW Action Plan on Article VII: ensuring the effective implementation of the Chemical Weapons Convention' *CBW Conventions Bulletin* (69 and 70): 5–10.

OPCW (2001a) 'Opening statement by the director-general to the Executive Council at its twenty-sixth session' The Hague: OPCW. Online, available at: opcw.org/synthesis/html/s8/hq_events.html (accessed 2007).

OPCW (2001b) Note by the director-general: initial considerations regarding the OPCW's contribution to the global struggle against chemical terrorism, EC-XXVII/DG.3, 9 November, The Hague, OPCW.

OPCW (2002a) Note by the director-general: possible responses to global terrorist threats. Online, available at: opcw.org/html/global/s_series/2k2/s292_02.html (accessed 2007).

OPCW (2002b) 'OPCW capabilities relevant to the global struggle against terrorism' The Hague: OPCW. Online, available at: opcw.org/html/global/s_series/2k2/s294_02.html (accessed 2007).

OPCW (2003a) Note by the director-general to the First Review Conference. Online, available at: opcw.org/docs/rc1dg01.pdf (accessed 2007).

OPCW (2003b) Report of the First Special Session of the Conference of the States Parties to review the operation of the Chemical Weapons Convention. Online, available at: opcw.org/docs/rc105.pdf (accessed 2007).

OPCW (2003c) Note by the director-general: report of the Scientific Advisory Board on developments in science and technology. Online, available at: opcw.org/docs/rc1dg02.pdf (accessed 2007).

OPCW (2003d) Decision: plan of action regarding the implementation of Article VII obligations. Online, available at: opcw.org/docs/c8dec16_EN.pdf (accessed 2007).

OPCW (2004) Decision: further action under the plan of action regarding the implementation of Article VII obligations. Online, available at: opcw.org/docs/csp9/c9dec04.pdf (accessed 2007).

OPCW (2005a) Decision: follow-up to the plan of action regarding the implementation of Article VII obligations. Online, available at: opcw.org/docs/csp/csp10/en/c10dec16.pdf (accessed 2007).

OPCW (2005b) Chemical terrorism protection and assistance exercise 'Joint Assistance 2005' concludes in Ukraine. Online, available at: opcw.org/html/global/press_releases/2005/PR60_2005.html (accessed 2007).

OPCW (2006) Decision: sustaining follow-up to the plan of action regarding the

implementation of Article VII obligations. Online, available at: opcw.org/docs/csp/csp11/en/c11dec04(e).pdf (accessed 2007).

OPCW PrepCom (1995) Report of the Executive Secretary: The intersessional period 3 December 1994 to 31 March 1995. Online, available at: opcw.org/html/global/p_series/pc12/XII11.html (accessed 2007).

Parachini, J. (2003) 'Putting WMD terrorism into perspective' *Washington Quarterly* 26(4): 37–50.

Pearson, G. (2003) 'Report from Geneva: the Biological Weapons Convention new process. Review no. 20' *CBW Conventions Bulletin* (62): 20–28.

Preston, R. (1998) *The Cobra Event*, London: Orion.

Purver, R. (1995) *Chemical and Biological Terrorism: the Threat According to the Open Literature*, Ottawa: Canadian Security Intelligence Service.

Randin, V.M. and J. Borrie (2005) 'A comparison between arms control and other multilateral negotiation processes' in J. Borrie and V.M. Randin (eds) *Alternative Approaches in Multilateral Decision Making: Disarmament as Humanitarian Action*, Geneva: UNIDIR.

Reader, I. (2002) 'Spectres and shadows: Aum Shinrikyo and the road to Megiddo' *Terrorism and Political Violence* 14(1): 147–186.

Roberts, B. (1993) *Biological Weapons: Weapons of the Future*, Significant Issues Series 15, Washington, DC: CSIS, pp. 35–46.

Roberts, G. (2003) 'Arms control without arms control: the failure of the Biological Weapons Convention Protocol and a new paradigm for fighting the threat of biological weapons' *INSS Occasional Papers*, Colorado: USAF Institute for National Security Studies.

Robinson, J.P. (1985) 'Chemical and biological warfare: developments in 1984' *SIPRI Yearbook 1985*, Stockholm: SIPRI, pp. 159–205.

Ruppe, D. (2003) 'BWC: survey finds many nations lacking required treaty legislation' *Global Security Newswire*, 13 August.

Sarasin, P. (2006) The fantasy link: 9/11, anthrax, and the Iraq war, *openDemocracy*. Online, available at: opendemocracy.net/democracy-americanpower/anthrax_3916.jsp (accessed 2007).

Seevaratnam, J. (2006) 'The Australia Group' *Nonproliferation Review* 13(2): 401–415.

Simon, J. (1989) *Terrorists and the Potential Use of Biological Weapons: A Discussion of Possibilities*, Santa Monica, CA: RAND Corporation.

Sloan, E. (2003) 'Beyond primacy: American grand strategy in the post-September 11 era' *International Journal* 58(2): 303–319.

Smith, J. (1995) 'The Chemical Weapons Convention as a tool for combating chemical terrorism' *Medicine and Global Survival* 2(3).

Smithson, A. and L.-A. Levy (2000) *Ataxia: The Chemical and Biological Terrorism Threat and the US Response*, Washington, DC: The Henry L. Stimson Center.

Snell, A. and E. Keusenkothen (1995) 'Mass destruction weapons enter arsenal of terrorists' *National Defense*, January.

Sprinzak, E. (1998) 'The great superterrorism scare' *Foreign Policy* 112: 110–124.

Starr, B. (1994) 'NBC terrorists a "most nightmarish concern"' *Jane's Defence Weekly*, 10 December.

Stern, J. (1993) 'Will terrorists turn to poison?' *Orbis* 37(3): 393–410.

Stern, J. (1998) 'Apocalypse never, but the threat is real' *Survival* 40(4): 176–179.

Subrahmanyam, K. (1993) 'Export controls and the north–south controversy' *Washington Quarterly* 16(2): 135–144.

Torok, T.J., R.V. Tauxe, R.P. Wise and J.R. Livengood (1997) 'A large community

outbreak of salmonellosis caused by intentional contamination of restaurant salad bars' *JAMA* 278(5): 389–395.

Tucker, J. (1996) 'Chemical/biological terrorism: coping with a new threat' *Politics and the Life Sciences* 15(2): 167–182.

Tucker, J. (ed.) (2000a) *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, Cambridge, MA: MIT Press.

Tucker, J. (2000b) 'Lessons from the case studies' in J. Tucker (ed.) *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, Cambridge, MA: MIT Press, pp. 249–269.

Tucker, J. (2004) 'The BWC new process: a preliminary assessment' *Nonproliferation Review* 11(1): 1–13.

Tucker, J. (2005) 'Updating the International Health Regulations' *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science* 3(4): 338–347.

Tucker, J. and A. Sands (1999) 'An unlikely threat' *Bulletin of the Atomic Scientists* 44(4): 46–52.

United Kingdom (1991) Statement on the Defence Estimates 1991, Britain's Defence for the 90s, London: HMSO, Cm. 1559.

US Congress OTA (1991) 'Technology against terrorism: the federal effort' Washington, DC.

US Congress OTA (1992) 'Technology against terrorism: structuring security' Washington, DC.

US Department of State (2002) US Biological Weapons Convention talking points. Online, available at: armscontrol.org/act/2002_10/bwcoct02.asp (accessed 2007).

Vegar, J. (1998) 'Terrorism's new breed' *Bulletin of the Atomic Scientists* 54(2): 50–55.

Walker, W. (2004) 'Weapons of mass destruction and international order' *Adelphi Papers*, London: IISS.

White House (1997) 'Report on the response to threats of terrorist use of weapons of mass destruction', Washington, DC.

White House (1998) 'Clinton leads discussion of genetics and biological weapons' Washington, DC.

Wohlstetter, R. (1976) 'Terror on a grand scale' *Survival* 18(3): 98–104.

World Health Organization (1970) *Health Aspects of Chemical and Biological Weapons*. Online, available at: who.int/csr/delibepidemics/biochem1stenglish/en/print.html (accessed 2007).

World Health Organization (2004a) *Laboratory Biosafety Manual*. Online, available at: who.int/csr/resources/publications/biosafey/Biosafety7.pdf (accessed 2007).

World Health Organization (2004b) *Public Health Response to Biological and Chemical Weapons – WHO Guidance*. Online, available at: who.int/csr/delibepidemics/biochemguide/en/index.html (accessed 2007).

World Health Organization (2006) *Biorisk Management: Laboratory Biosecurity Guidance*. Online, available at: who.int/csr/resources/publications/biosafey/WHO_CDS_EPR_2006_6/en/index.html (accessed 2007).

Zilinskas, R. (1990) 'Terrorism and biological weapons: inevitable alliance?' *Perspectives in Biology and Medicine* 34(1): 44–72.

5 The status of the Biological Weapons Convention (BWC) in relation to the prevention of bioterrorism

Nicholas A. Sims

Introduction

The status of the Biological Weapons Convention (BWC)[1] in relation to the prevention of bioterrorism is an interesting question. In this chapter the view will be advanced that the relationship between the two is indirect, tangential and incidental. But first the formal history and current legal status of the BWC are summarised.

It was first publicly proposed by the UK in 1968, in the Foreign Office's Working Paper on Microbiological Warfare to the Eighteen Nation Disarmament Committee, ENDC/231, gradually acquired international support through 1969 and 1970, was negotiated multilaterally at Geneva by the twenty-five then participating members of the ENDC's successor the Conference of the Committee on Disarmament (and behind the scenes bilaterally by the United States and the Soviet Union) between March and September 1971 (Goldblat 1971), was commended by the UN General Assembly on 16 December 1971, was opened for signature on 10 April 1972, and entered into force on 26 March 1975, originally for forty-six states parties. The single review conference prescribed by Article XII was held 3–21 March 1980 (Sims 1988). Further review conferences have been held by decision of the states parties in 1986, 1991, 1996, 2001–2002 and 2006.

It is currently in force for 155 states parties. A further sixteen states signatories (of which the two of greatest military significance are Egypt and Syria) are under the standard signatory obligation in international law to refrain from acts that would defeat the object and purpose of the BWC, until and unless they make clear their intention not to ratify their signatures. This leaves at least twenty-two states (of which the one of greatest military significance is Israel) that have not signed. (By way of comparison, the much younger Chemical Weapons Convention, opened for signature on 13 January 1993 and in force since 29 April 1997, has already acquired 181 states parties.)

What the BWC is

The BWC is a multilateral disarmament treaty. Each of these words is rich in implications.

As a treaty it constitutes a set of obligations from which flows a treaty regime: the BWC in operation.

Also, as a treaty, it binds only states directly (though obliging them under Article IV to translate their international obligations into national laws and regulations for enforcement within their respective jurisdictions): states are its subjects, its objects, its governors and its beneficiaries, all at the same time.

As a multilateral treaty, it was negotiated and continues to be reviewed in a UN setting, but one that is no longer dominated by the Cold War alliances but instead by the political dynamics of the US, the EU, the non-aligned movement and other groups of states since the end of bipolarity.

As a multilateral disarmament treaty, it bans an entire class of weapons, present and future. Negotiated at a particular point in time, it is nevertheless intended to endure: adapting it to expectations of permanence is a constant challenge.

What the BWC is not

It is not a non-proliferation treaty allowing a few states to possess biological and toxin weapons while denying them to the rest: all are equally forbidden to all.

It is not primarily intended as a counter-proliferation or counterterrorism device: these are recent concerns to which parts of the BWC can be applied, but no more than that – as the rest of this chapter seeks to demonstrate.

It is not a comprehensive regime governing the uses and abuses of the life sciences: it is silent on research and is limited to generalities on the peaceful uses of microbiology.

It is not an absolute guarantee against biological and toxin weapons: a treaty cannot bind non-parties, and even BWC states parties may cheat.

It is not subject to verification: which is not to say that its provisions are inherently unverifiable (although some take that view), but only that it has no verification machinery at present and verification remains at best a long-term objective.[2]

It is not institutionally strong: indeed it suffers from a chronic institutional deficit. Elsewhere, the case has repeatedly been made that the BWC needs interim strengthening structures to support it in the short term – Annual Meetings of States Parties or an Intersessional Committee of Oversight, supported by a Scientific Advisory Panel, a Legal Advisory Panel and a standing secretariat dedicated to the service of the Convention – pending the eventual establishment of a permanent organisation, an OPBW to match the OPCW (Sims 2001b: 13–19; Sims 2005; Sims 2006c: 17–26).

Paradigm shifts that never quite work

Trying to force the BWC into a counter-proliferation or counterterrorist context is a paradigm shift that never quite works. They are recent concerns to which parts of the BWC can be applied, but no more than that. They are not the

central purpose or the natural habitat of the BWC, which is first and foremost a disarmament treaty.

Counter-proliferation always highlights the problem of rogue states. It is a one-way, top-down or supply-side approach. The Proliferation Security Initiative of 2003 has given it a plurilateral form but it falls short of full multilateralism. The BWC is completely different. It is fully multilateral and thoroughly egalitarian. By nine months at latest from entry into force (the time limit set in Article II addressed to possessors) every state party has to be, and has to remain, fully disarmed. Every one of them has equal obligations towards every other one of them. That includes demonstrating their own compliance, not just questioning other people's, and providing reassurance when ambiguities or suspicions arise, not just demanding it from others. The treaty relationship is one of equality and reciprocity. Those qualities are inherent in it. They are not inherent in the counter-proliferation paradigm (Joyner 2005: 507–548).

Article III of the BWC has some counter-proliferation value, but its context as part of a carefully balanced set of articles within a disarmament treaty means that the obligations in Article III:

> not to transfer to any recipient whatsoever, directly or indirectly, and not in any way to assist, encourage, or induce any State, group of States or international organizations to manufacture or otherwise acquire any of the agents, toxins, weapons, equipment or means of delivery specified in Article I of the Convention

are essentially ancillary to the main object and purpose of the Convention. Moreover, Article III exists in tension with Article X, subtly determining the balance of risk and opportunity in exchanges of materials and technologies for peaceful purposes across the whole range of applications of microbiology.

Counterterrorism always highlights the problem of non-state actors. But the very demanding Article IV of the BWC with its stringent prevention criterion ('shall, in accordance with its constitutional processes, take any necessary measures to prohibit and prevent') makes no such distinction. It applies equally to everyone, including organs of the state and its agents. That is why it is more comprehensive than Security Council Resolution (SCR) 1540 (2004). It is predicated on the principle that biological and toxin weapons are unacceptable in any hands: there are no 'responsible' developers, producers or possessors of such weapons, however governmental their affiliations may be. There are to be no BW possessors at all (Sims 2006a: 17).

Articles III and IV of the BWC have some counterterrorism value, but it is incidental. In 1996 the Fourth Review Conference added a new reference at the end of the inherited text for the Article IV section of its Final Declaration (UN 1996), in which the states parties recognised 'the need to ensure, through the review and/or adoption of national measures, the effective fulfilment of their obligations under the Convention in order, *inter alia*, to exclude use of biological and toxin weapons in terrorist or criminal activity'. In 2006 the Sixth Review

Conference was expected to reaffirm and expand this accumulated text with a reference to SCR 1540 (2004) and perhaps to other counterterrorism measures (Pearson *et al.* 2006: 15–17). But the reference would remain heavily qualified by the words '*inter alia*'. Excluding the use of the prohibited weapons in terrorist or other criminal activity remains incidental to excluding any use whatever. Article IV requires, first, the comprehensive domestication by each state party of its international obligations under the BWC, to a high standard in order to encompass all its prohibitions (Woodward 2003). But that is only the beginning. The resulting national legislation and regulations must then be applied, and enforced with sufficient stringency to satisfy the prevention criterion, to everyone 'within the territory of such State, under its jurisdiction or under its control anywhere'. (This was not 'extraterritorial' enough for some: the Third and Fourth Review Conferences (UN 1992, 1996) 'invited each State Party to consider, if constitutionally possible and in conformity with international law, the application of such measures to actions taken anywhere by persons possessing its nationality'.)

Articles III and IV make sense within the context of a disarmament treaty. Forcing them into a different context would distort their purpose and introduce an imbalance into the overall treaty regime as well as obscuring its essential nature. It would let states and their governments off the hook by restricting its purview to a narrower category of potential sources of threat.

The BWC Sixth Review Conference

At the Sixth Review Conference (Geneva, 20 November to 8 December 2006) expectations were modest and a suitably modest success was achieved, despite earlier fears and continuing apprehensions that acrimony between Iran and the United States would prevent consensus being reached (Sims 2006b: 8–16). As at the Preparatory Committee for the conference (Geneva, 26–28 April 2006), Iran and the United States delayed but in the end did not prevent agreement. Each insisted on pruning the outcome documents of elements it found unacceptable, but the pruning was not so drastic as to make the rest of the conference despair. Valuable 'middle ground' proposals had been advanced by three significant groupings of states parties – the thirty-six European states that endorsed the European Union position, twelve Latin Americans and the seven JACKSNNZ[3] delegations – with an impressive degree of convergence among the three groups on what they wanted. These proposals had sometimes to be diluted to win through, but in essence survived into the consensus.

Moreover, a measure of success not to be neglected is that compared with other multilateral arms control and disarmament meetings in UN settings in 2005–2006, which had ended in deadlock, this conference was at least able to agree a Final Declaration, Decisions and Recommendations (UN 2006b). That in itself was an achievement that produced sighs of relief. Diplomacy succeeded: it had set its sights low, but did not have to lower them much further during the three weeks at Geneva.

The delegates were able to endorse the outcomes of the first (2003–2005) intersessional process and to set a course for the period up to the Seventh Review Conference in 2011, with a second intersessional process consisting of a one-week Meeting of States Parties preceded by a one-week Meeting of Experts each year from 2007 to 2010: with a work programme of six topics allocated to those meetings; a 'concerted effort' to promote universalisation, through national focal points and international coordination; and a three-person Implementation Support Unit given an agreed mandate (inevitably a cautious one) and funded up to 2011 by the states parties collectively. Some might add progress on confidence-building measures (CBM) as an achievement, but here the outcome was more equivocal, with advances in data exchange processes disappointingly limited. The conference soon got bogged down in procedural skirmishes on how and when to consider the subject of CBM, and any substantive decisions to improve the CBM components of the treaty regime were postponed to 2011. Without verification, the BWC depends on CBM reporting to reinforce the original elements of its compliance regime, and the record up to now suggests that it is not much to rely on: better than nothing, certainly, but painfully stuck in the precise modalities agreed in 1986–1987 and 1991 and unchanged since. This aspect of the BWC is in urgent need of reformulation, wider participation (alarmingly skewed as between regions), improvements in the quality as well as quantity of information exchanged and serious rethinking of what is really needed to build confidence in one another's compliance (Hunger and Isla 2006: 27–36).

The conference failed to develop an action plan for national implementation, or for 'comprehensive implementation', which would have embraced the Article X (peaceful uses) alongside Article IV (legislative and other enforcement) aspects of the Convention: it failed to engage fully with developments in science and technology, let alone arrange for regular scrutiny of their implications for the health of the treaty; and it failed to allow the intersessional process for 2007–2010 a continuing agenda of 'recurrent items' or any other of the attributes the absence of which had severely constrained the effectiveness of the process in 2003–2005. The institutional deficit from which the BWC has always suffered continues up to (at least) 2011, mitigated only slightly by the upgrading of successive conference secretariats into an Implementation Support Unit around which cluster the hopes of many who want to see the BWC strengthened in low-key, practical and essentially uncontentious ways.

The main achievement of 2006 was to sweep away the debris of the Fifth Review Conference and the associated debacle in BWC history that followed the collapse of the Ad Hoc Group of 1995–2001, the halting of its negotiations for a strengthened Protocol and recriminations (notably between the United States and Iran) in the course of which verification became a no-go area and multilateralism itself reduced to a bare minimum level of permitted activity (Sims 2003: 11–18). After 2006 it became easier to look forward, even if many key questions – on accountability, on bio-defence, on compliance – remained unresolved and, for the time being, largely unaddressed. But a constructive

evolution for the treaty regime flowing from the BWC, blocked for so long, became a real possibility once more, as the Convention emerged from the diplomatic doldrums at last.

Terrorism as a theme at the Sixth Review Conference

Where was the theme of biological terrorism in all this? At Geneva in 2006 the delegations:

> steered a careful course between the extremes of treating bioterrorism as the only threat worth bothering about and shrugging it off as a remote eventuality. The BWC ban is total: no possessors are permitted, whether states or non-state actors. But it has to be used to prevent any recrudescence of BW activity, whether states or terrorists (or a mixture of the two categories) are implicated. Using it means national implementation, and a heavy emphasis on national precautions and national enforcement is right and proper – but not to the exclusion of international procedures and commitments by the States Parties to what is, after all, an international treaty. Here, too, a careful course has always to be steered; and, at Geneva in 2006, it was.
>
> (Sims 2007)

Solemn Declaration

In the Solemn Declaration which, as in 1991 and 1996, prefaced the Article-by-Article sections of the Final Declaration, the longest element of all was devoted to the issue of terrorism (UN 2006b: 8).

> The States Parties … solemnly declare:
> … (vii) Their conviction that terrorism in all its forms and manifestations and whatever its motivation, is abhorrent and unacceptable to the international community, and that terrorists must be prevented from developing, producing, stockpiling, or otherwise acquiring or retaining, and using under any circumstances, biological agents and toxins, equipment, or means of delivery of agents or toxins for non-peaceful purposes, and their recognition of the contribution of full and effective implementation of UNSC Resolution 1540 by all States to assist in achieving the objectives of this Convention.

This theme was entirely new, having no precursor in the Solemn Declarations of the Third and Fourth Review Conferences. (The Fifth, at its resumed session in 2002, had failed even to attempt a Final Declaration at all, so a Solemn Declaration had been out of the question.)

Including such language, and giving it pride of place in the Declaration, can be seen as signalling collective recognition of a newly prominent source of threat, without however jettisoning established concerns and perspectives. This bears out

the view that the delegations to the Sixth Review Conference 'steered a careful course between the extremes of treating bioterrorism as the only threat worth bothering about and shrugging it off as a remote eventuality' (Sims 2007).

It can also be seen as a graceful gesture towards the United States, whose representative (Assistant Secretary of State for International Security and Proliferation John C. Rood) speaking in the first plenary session had urged the conference to 'recognize the grim prospect of terrorist organizations using biology as a weapon of terror and mass destruction' and had concluded that 'we must gird ourselves to respond to new and evolving threats' (Pearson 2007: 11, quoting John C. Rood). Together with other concessions to US positions, it represented a generous spirit in which the other states parties showed a new-found readiness to overlook the damage done to the BWC earlier in the decade and bring the United States back into the mainstream of BWC diplomacy from its relative isolation of 2001–2005. This was all the easier to do in 2006 because attitudes in the United States towards the usefulness of multilateral approaches had become slightly more favourable (Smithson/CSIS 2006: 29–38) and its own agenda had become less distant from others' concerns. By the time the conference opened on 20 November the United States was understood to be willing to allow (within the same procedural constraints as in 2003–2005) a second intersessional process with meetings each year from 2007 to 2010, and also action plans on universality and national implementation, possibly combined with some strengthening of implementation support (provided it did not lead to a standing secretariat as advocated by the Blix Commission (Blix 2006: Recommendation 34), or worse still to an embryonic organisation). All of this was conditional, as was well understood, on no one rocking the boat at Geneva by attacking the US record, reviving the debate over verification or trying to reactivate the BWC Ad Hoc Group from the suspended animation into which it had been plunged in August 2001.

Would other states, or groups of states, have put terrorism references into the Final Declaration anyway? It is possible, but unlikely.[4] This was not because they underrated the gravity of potential terrorist use of BW. But they were wary of being co-opted into a supposed 'war on terror' when they preferred to tackle such threats in a criminal justice perspective that respected (up to a point) their national legal traditions, and therefore to subsume them under the broader heading (and wider category) of criminality. The 'war on terror' was a highly contentious concept, even for close allies of the United States, while for others it connoted an uncomfortably close alignment with the world outlook of the Bush administration.

Not only were the words 'war on terror' absent from the outcome documents of 2006: even the words 'terrorism' and 'terrorists' were never used again after their appearance in the longest element of the Solemn Declaration.

Instead, the conference addressed terrorist threats within four wider contexts that found expression in the Article-by-Article text of the Final Declaration, as shown below. It also adopted a work programme for the second intersessional programme that largely accepted US priorities, including implied acceptance of

an emphasis on using the BWC to counter terrorists through national enforcement, bio-safety and bio-security. But this acceptance was *only* implicit. The words 'terrorism' and 'terrorists' were still not used in the list of topics for 2007–2010.

Article by-Article sections of the Final Declaration

The Article-by-Article sections of the Final Declaration contained new language, relevant *inter alia* to terrorism, at four points (UN 2006b).

1 In the *Article III* section, the new paragraph 9 reads:
'The Conference calls for appropriate measures by all States Parties to ensure that biological agents and toxins relevant to the Convention are protected and safeguarded, including through measures to control access to and handling of such agents and toxins'.
2 In the *Article IV* section, similar new language is used in paragraph 11, in the context of the objectives of 'legal, administrative, judicial and other measures, including penal legislation' with states parties calling upon one another to adopt such measures. They should be designed *inter alia* to: 'ensure the safety and security of microbial or other biological agents or toxins in laboratories, facilities, and during transportation, to prevent unauthorized access to and removal of such agents and toxins'. It should be noted that until 2006, Final Declarations had commended penal legislation but only as one example among others. The word 'including' in the Final Declaration text at last tightened up this reference to its commendation (Pearson 2007: 51). Penal legislation is still not as mandatory as in Article 7 of the Chemical Weapons Convention (CWC) but constitutes instead a politically binding commitment, as an understanding, recorded as having been agreed by consensus, of one of the implications of Article IV. This position is arguably reinforced since 2004 by the authority of the UN Security Council through its Resolution 1540.
3 Still in the Article IV section, paragraph 17 contains the important statement that the conference accepts Resolution 1540 as consistent with the BWC and reassures states parties that their overall compliance load is not doubled, because the same information may be used for both 1540 and BWC purposes:

> The Conference recalls UN Security Council Resolution 1540 (2004) that places obligations on all states and is consistent with the provisions of the Convention. The Conference notes that Resolution 1540 affirms support for the multilateral treaties whose aim is to eliminate or prevent proliferation of nuclear, chemical or biological weapons and the importance for all States Parties to those treaties to implement them fully in order to promote international stability. The Conference also notes that information provided to the United Nations by states in

> accordance with Resolution 1540 may provide a useful resource for States Parties in fulfilling their obligations under this Article.

The wording of the final sentence shows the conference making the assumption that governments will give priority to their reporting obligations towards the UN Security Council, a fair assumption given that 1540 was adopted under Chapter VII of the UN Charter, with attendant follow-up machinery and authority renewed in 2006 by Resolution 1673, while reporting obligations under the BWC are woefully underdeveloped. They are only politically binding and as yet consist merely of the few CBMs agreed in 1986–1987 and enhanced and expanded in 1991. The hope must be that more states parties will henceforth participate in the exchange of CBM information and provide more detail on their national implementation. However, this can be no more than a hope, given the weakness of BWC Article IV, compared with the requirements of CWC Article 7, and the patchy record of CBM participation.

Paragraph 17 interestingly does not mention 1540's concentration on non-state actors. References instead to 'proliferation' and 'international stability' broaden the context. Article IV concerns national implementation, and must constrain governments as well as non-state actors. Once again, the conference rightly ensured that governments would not be let off the hook.

4 The fourth and last innovation in the Final Declaration with an implicit relevance to terrorism occurs in the Article VII section. Here non-state actors are bracketed with states outside the BWC as 'anyone other than States Parties', in another entirely new passage of text. Paragraph 38 reads:

> The Conference takes note of the willingness of States Parties, where appropriate, to provide or support assistance to any State Party which so requests, when that State Party has been exposed to danger or damage as a result of the use of bacteriological (biological) agents and toxins as weapons by anyone other than States Parties.

Only attacks that constitute a breach of the Convention trigger assistance under Article VII (not to mention the further hurdle of having to satisfy the Security Council). After some reported initial confusion over how to construe Article VII, this new paragraph was drafted and accepted. It does not purport to draw out (how could it?) a freshly discovered implication of Article VII. It does not proclaim a new-found obligation. Instead, all it does is to record an additional expression of willingness to act, outside (but consistently with) the terms of the BWC, in certain eventualities: qualifies that expression of willingness with the words 'where appropriate'; ensures by the words 'which so requests' that a state can still decline international assistance (as the USA did during the anthrax letters episode of 2001, when France offered to take the lead in organising international assistance under a Security Council resolution); and places it in the section of the Final Declaration to which it is most closely related.

Sources for proposed additions to Final Declaration text in 2006

Observers on the margins of the Sixth Review Conference were able to trace the origins of proposed language for the Final Declaration through the paper trail of early suggestions, and in particular the conference room paper into which they were consolidated at the end of the first week (UN 2006a). By this time the European Union, India and the United States had proposed language for most of the Article-by-Article sections, and other states or groups of states for particular sections. China, Japan and the Latin American and Non-Aligned Movement groups made significant contributions, as more sparingly did Australia and New Zealand. (The JACKSNNZ group – Japan, Australia, Canada, [South] Korea, Switzerland, Norway and New Zealand – had taken the tactical decision to refrain from submitting text systematically, preferring to rely on their individual working papers issued in advance in consultation with one another and on offering comment on other draft texts during the committee stage of the conference.)

Scrutiny of the 24 November compilation shows the origin of the four additions discussed above. It also shows that one state party wanted stronger language dispersed through more sections of the Final Declaration to drive home the new emphasis it sought on bioterrorism. Not surprisingly, this was the United States. Here the unsuccessfully proposed US language will be set out, too.

Article III

The addition under Article III has its origin in proposals from the European Union, Japan and the United States. But the United States proposed a much fuller body of text placing a notably stronger emphasis on non-state actors and 'unauthorised entities' in seeking to add to the conference's agreed understanding of Article III and its implications for states parties.

If the United States had had its way, the following language would have been added to the Final Declaration under the heading of Article III:

> The Conference emphasises that the provisions of Article III that 'Each State Party to this Convention undertakes not to transfer to any recipient whatsoever, directly or indirectly…' obligates States Parties not only to refrain from direct transfers of items that are prohibited by the Convention, but also to take the steps necessary and foreseeable to preclude their indirect transfer. This step can be completed in part by enacting adequate security measures and export controls that prohibit the diversion of such items to either State or non-state actors, foreign or domestic, for purposes prohibited under the Convention.
>
> The Conference notes that, in order to minimise the possibility that an indirect transfer to a State or non-state actor may occur through negligence on the part of a State Party rather than from an intentional act, States Parties

should implement laws that define who may rightly receive, hold, and work with dangerous biological agents.

The Conference encourages States Parties to ensure that all dangerous biological agents are adequately protected and safeguarded to avoid transfer to unauthorised entities.

The Conference notes that Article III does not preclude sharing information concerning prohibited items and activities that supports peaceful activities, including bio-defence and public health, at the international, national or sub-national level.

The Conference also encourages States Parties to ensure that appropriate pathogen security practices are in place at facilities to adequately control access and transfer of dangerous biological agents, and that programmes to assess the adequacy of such practices and the security of pathogens are established on a site-specific basis.

The Conference urges States Parties to support the development of training and education programmes for those granted access to dangerous agents to ensure they know the risks of working with such agents as well as their country's obligations under the Convention that impact the use of dual-use agents.

Article IV

The 'terrorist or criminal activity' language of the Article IV section in the 1996 Final Declaration, noted earlier, was lost in the thoroughgoing reconstruction of that section for the purposes of the 2006 Final Declaration, which took place during the Sixth Review Conference. Its retention had been proposed by the European Union, India and Japan in their respective proposals (which all antedated the reconstruction) but perhaps surprisingly not by the United States. Instead the United States had proposed a quite different body of text spelling out the responsibility of states parties for preventing diversion to non-state actors:

The Conference calls to the attention of the States Parties two key phrases contained in Article IV relevant to the new biological weapon threat. Those phrases are 'take any necessary measures' and 'within the territory of such State, under its jurisdiction, or under its control anywhere'.

The Conference notes that these phrases clearly define an obligation for States Parties to ensure that the prohibitions of the Convention not only are applied and enforced, not only to government entities, but also to non-state actors within the jurisdiction or control of a State Party.

The Conference urges States Parties not only pass laws but to take necessary steps for effective enforcement of those laws.

> The Conference understands that 'necessary measures' to be taken by States Parties should include the promotion of public awareness of the need to report activities conducted within their territory that could conceivably be a violation of the Convention, and take action to mitigate the risk of Convention violations.

Instead, the two successfully proposed additions noted above, in paragraphs 11 and 17 of the Final Declaration of 2006, have their origins in the language proposed by the European Union and by Japan, although this was much rewritten during the conference.

Article VI

Much the same emphasis on non-state actors is found in United States proposals for the Article VI section, none of which succeeded:

> The Conference recognises that, since States Parties are obligated under Article IV of the Convention to take 'any necessary measures' to prohibit and prevent BWC-relevant activities within its territory, or under its jurisdiction or under its control anywhere, non-compliant activities, even if committed by non-state actors, could qualify for referral for investigation by the United Nations Security Council.
>
> In this connection, the Conference stresses that it is therefore incumbent upon States Parties to provide the technical resources to the Security Council that it may need to conduct an investigation, and urges States Parties to maintain lists of technical experts and laboratories within their jurisdiction that could assist the Security Council with investigations and should update and provide those lists to the United Nations Security Council regularly.
>
> The Conference understands that the possibility of having an investigation by the United Nations Security Council based on illicit actions by non-state actors within the territory of a State Party or under its jurisdiction or control anywhere underscores the importance of having effective national implementation measures.

Article VII

The addition agreed as paragraph 38 of the 2006 Final Declaration does not appear in any of the textual proposals from the first week. It was an outcome of later negotiation, after it had become clear that a new paragraph at the end of the Article VII section was the only way of handling this matter that would be workable, in view of its externality to the scope of Article VII. International assistance when the BWC has *not* been breached is *stricto sensu* outside the Convention and its review conferences. However, the new category invented for

this purpose – 'anyone other than States Parties' – constitutes the reciprocal of the category for which states parties *do* have responsibility; and it was this category to which the United States had drawn attention in its textual proposals:

> The Conference takes notes (*sic*) of the fact that, since violations of the Convention are not limited to the actions of States Parties, but also to the actions of individuals or groups within the territories of States Parties or territories under their jurisdiction or control anywhere, attacks by non-state actors that are determined by the UNSC to expose a State Party to danger are subject to Article VII, and, as such, entitle the aggrieved State Party to assistance from other States Parties, upon request and within the capacity of States Parties to provide assistance.
>
> In this connection, the Conference urges States Parties to develop effective national implementation measures that include criminal penalties, operating together with bilateral and multilateral legal assistance agreements that are standard among States which will greatly facilitate the type and extent of assistance that states will be able to provide to each other in such a situation.

Article XII

The United States wanted the Sixth Review Conference to recognise bioterrorism as a new source of threat and this informed its proposal for a drastic expansion of the Article XII section. In its view, the Seventh Review Conference in 2011 should have a much expanded agenda, oriented towards new threats from non-state actors (with 'terrorists' an explicit subset of that category) in 'a dynamic security environment' or 'the strategic environment':

> The Conference notes that, since Article XII states that review must take into account 'any new scientific and technological developments relevant [to] the Convention', it must also take into account how such developments might be misused, not only by States, but also by terrorists or other non state actors, thereby altering out [*sic*] perspective on the security of dangerous biological agents. As a result, the threat of illicit access to biological agents and toxins by non-state actors must be considered in any review of the Convention.
>
> The Conference further notes that this Article also requires States Parties to consider how a dynamic security environment may or may not alter our perspective of the BW threat. The Conference calls to the attention of States Parties scientific reports in recent years that continue to show that biological materials that have the potential for uses contrary to the Convention are not adequately protected.
>
> The Conference decides that the Seventh Review Conference should consider the Convention in the context of the strategic environment as well as

> in light of the progress that States Parties have made on implementing their obligations, as discussed during the 2003–2005 work program, and as reviewed at the Sixth Review Conference.
>
> In addition, the Conference decides that States Parties should work to reduce the threat of non-state actors and should report on their progress to thwart these actors from escalating the biological weapons threat, and that States Parties should also constantly review risk and vulnerabilities of collections of dangerous biological materials and new developments for reducing those risks and, if appropriate, vulnerabilities should be regularly shared among States Parties.

This bold attempt to reorient the review process was unsuccessful. It was probably too ambitious for 2006.

What *was* agreed (UN 2006b: Final Declaration paragraph 61) was a much less specific mandate for the Seventh Review Conference, which:

> should review the operation of the Convention, taking into account, *inter alia*:
>
> i new scientific and technological developments relevant to the Convention;
> ii the progress made by States Parties on the implementation of the obligations under the Convention;
> iii progress on the implementation of the decisions and recommendations agreed upon at the Sixth Review Conference**.**

Article XIV

The United States also tried without success to have its distinctive emphasis on new sources of threat included in the Article XIV section, as a further reason for promoting universal adherence to the Convention:

> Conference notes that all collections of biological agents with the potential for use as biological weapons pose a potential risk to the global community, whether or not those collections are located in the territory of a State Party or under its jurisdiction or control.
>
> As a result, the Conference urges all States Parties to work to universalize the Convention and to assist States in implementing their obligations under the Convention [and] United Nations Security Council Resolution 1540.
>
> (UN 2006a: paragraphs 234–235)

The second intersessional programme, 2007–2010

The intersessional programme agreed for 2007–2010, with its US-oriented agenda, offers the United States the possibility of getting parts of its ‘lost’ language of

November 2006 (as set out above) recouped into the outcome documents of relevant Meetings of States Parties. However, its own insistence on denying those Meetings of States Parties any powers of decision will militate against their 'conclusions or results' enjoying any status until they fall to be considered as part of 'the work and outcome of these meetings' by the Seventh Review Conference in 2011 (UN 2006b: Decisions and Recommendations paragraph 7).

Topic (i) 'Ways and means to enhance national implementation, including enforcement of national legislation, strengthening of national institutions and coordination among national law enforcement institutions' resembles the first topic of the first intersessional programme, which was considered in 2003, but with 'enforcement of national legislation' (which had been emphasised by the US representative in his national statement in the General Debate) replacing 'the adoption of penal legislation', and with 'strengthening of national institutions and coordination among national law enforcement institutions' added. In practice it is becoming increasingly difficult to disentangle Article III and Article IV implementation measures, as both articles converge on similar requirements for legislation, for enforcement and for coordination – and, one might add, for vigilance directed towards governmental and non-state actors alike.

Topic (ii) 'Regional and sub-regional cooperation on BWC implementation' with which it is combined for attention in 2007 comes straight from a UK/France working paper, issued on 19 September 2006 on behalf of the European Union, where it is envisaged as involving regional and sub-regional organisations sharing their experiences with the states parties to the BWC:

> The regional and sub-regional organisations of all five continents could be invited in this connection to express their views on the actions they have undertaken to facilitate BTWC implementation. Exchanges of views might cover the areas likely to be the focus of future effort and how to ensure complementarity to relevant work undertaken in other fora. The EU could give feedback on its experience of the implementation of its Joint Action in support of the BTWC.
>
> (UK/France 2006)

Here too it should be possible for the United States to encourage the Meetings of Experts and of States Parties in 2007 to encompass the full spectrum of threats, including those deemed terrorist, in the context of comprehensive prevention.

Topic (iii) 'National, regional and international measures to improve bio-safety and biosecurity, including laboratory safety and security of pathogens and toxins' is paired with *topic (iv)* on codes of conduct for attention in 2008 and affords a good opportunity for different approaches to bio-safety and bio-security to be compared.

There are further opportunities for the 'lost' language of 2006, or at least the perspectives represented, to be fed back into the meetings of 2009 and 2010, which have to consider disease surveillance and assistance in case of alleged use of biological weapons – *topics (v) and (vi)* respectively.

In other words, there is much to play for. The United States has plenty of chances to persuade other states parties to accept its preferred emphases and perspectives before the Seventh Review Conference; but, by the same token, it may benefit from exposure to other views of the BWC and its priorities. There is much to be learned from the European Union and Latin American groups but especially perhaps from the JACKSNNZ, whose seven members, preserving much individuality through loose coordination rather than tight group control, bid fair to occupy a pivotal position in the intersessional process and at the Seventh Review Conference in 2011.

The way ahead for the BWC

States parties to the BWC have a full agenda, now that the debris of the Ad Hoc Group/Fifth Review Conference debacle has been cleared away and the treaty is out of the doldrums in which it had been becalmed. It has put the past behind it. For the foreseeable future it cannot realistically expect to find reinforcement from a strengthened Protocol, however desirable the legally binding quality of obligations assumed under such a Protocol and the greater certainty they might offer. The Ad Hoc Group is not about to be awakened from its suspended animation. Verification remains a long-term objective for the European Union (still committed to developing measures for verifying compliance), which has to be played down out of consideration for US sensitivities. And an organisation in the service of the BWC remains as unattainable as a Protocol, the United States being dogmatically and intransigently opposed to both.

So instead of incurring yet further vehement denunciation from that quarter, the BWC has to proceed on the principle of endogeny. It must continue to draw out the implications of its articles as they stand, and develop them endogenously by recording extended understandings whenever these can be agreed by consensus, using the modest resources of its Implementation Support Unit and the national focal points to keep up a certain momentum of activity between meetings. There is much that can be done to put flesh on the bones without amending the Convention or doing violence to its essential character and history.

To treat it as solely, or even primarily, a counterterrorist device will benefit no one. It has to preserve a wider perspective than that of bioterrorism alone, if by bioterrorism is meant the activity of non-state actors.

The BWC needs steering into a course that assures a well-balanced evolution across the various sectors of its overall treaty regime (Sims 2001a), characterised by a growing acceptance of mutual accountability as the organising framework within which states parties seek to demonstrate their compliance with all aspects of the Convention (Canada 2006). Treaties require trust, as well as equality of obligation and reciprocity of performance; but trust has to be earned. In the absence of verification it is all the more incumbent upon individual states parties to find ways of demonstrating their own compliance, rather than only questioning that of others, and upon all states parties to devote ingenuity and resources to the task of building up their trustworthiness.

States parties need to maximise their commonality of interest: in high standards of public health for detection, identification and control of naturally occurring outbreaks of disease, and in working together for ever more effective detection, identification and control of the weaponisation of disease before such weapons can be used. This applies equally whether the alleged or suspected perpetrators have governmental or other affiliations.

In steering the way ahead for the BWC, it is difficult to see why the labels 'criminal' and 'terrorist' should be confined to non-state actors. Anyone caught developing agents, toxins or weapons in breach of the BWC or making preparations for weaponisation should be equally liable to prosecution under penal legislation without being able to shelter under the protection of the state; in some cases the state may share their guilt. An international convention to criminalise such activity (Meselson and Perry Robinson 2001) would bolster the BWC by helping to pinpoint individual criminal responsibility; but even without such a legal instrument there is plenty of material in the BWC and in the corresponding norm of customary international law to indicate the illegality of biological weapon-related activity under any circumstances whatever.

Back to a disarmament paradigm

So the BWC must continue to be understood – and made to work – within a disarmament paradigm.

The trouble is that many people have lost (or never acquired) the vocabulary of disarmament, so they are unfamiliar or uneasy with the analysis of a treaty in terms of its disarmament value. It is not just the BWC which suffers. Consider the CWC. Throughout the twenty-one years of its negotiation at Geneva it was drafted and elaborated – and criticised by the sceptics – as a disarmament treaty. Waverers among the CW-possessor states that might supposedly have benefited from a 'chemical NPT' may occasionally have been tempted to deviate but never got far with that concept. On the contrary, the disarmament objective remained the one straightforwardly simple element in an otherwise complex and often unwieldy negotiating process for the CWC. Article I (General Obligations) is as full a statement of disarmament obligations as any disarmer could ask for. Yet the word *disarmament* was treated with distaste, and is hardly used at all in the treaty text. Indeed, so far as I can tell, after the first preambular paragraph[5] it disappears from sight altogether – exactly as it does in the much shorter text of the BWC. Significantly, the CWC's Article VIII creates an Organisation for the Prohibition of Chemical Weapons, and not (as proposed in my 1987 book under this title (Sims 1987)) an International Organisation for Chemical Disarmament: a putative title that produced a certain raising of eyebrows and wrinkling of noses, entirely on account of its last word.

From the perspective of the classical disarmament paradigm, having regard to the nature of the two treaties rather than their vocabulary (after the first preambular paragraph), the BWC and CWC are the first building blocks in the

construction of a permanent structure on the international scene, which institutionalises disarmament as class after class of weapons is successively banned.

Anti-personnel landmines have proved to be the next class of weapons by virtue of the 1997 Ottawa Convention. Arguably one *might* add (although the following constraints banned use in war, not possession as such) the plastic flechettes or other fragments not detectable in the human body by X-ray, and blinding laser weapons, banned respectively by Protocol I and Protocol IV to the 1981 UN Convention on Certain Conventional Weapons. But after those bans, what? The 'laws of war' tradition favours continuing to pursue an agenda leading to bans on other weapons that cause unnecessary suffering (the classic *maux superflus*) or that are indiscriminate in their effects, and within this tradition analogical reasoning casts its critical eye over cluster bombs (by analogy to landmines) and certain kinds of small-calibre ammunition (by analogy to the flattening or expanding bullets banned at The Hague in 1899).

On the other hand, taking seriously the UN's 'new disarmament agenda' and especially the 'micro-disarmament' that Boutros Boutros-Ghali promoted with such passion as secretary-general in 1992–1996 ('I mean practical disarmament in the context of the conflicts the United Nations is actually dealing with and of the weapons, most of them light weapons, that are actually killing people in the hundreds of thousands' (Boutros-Ghali 1995: 23)) means continuing to highlight the small arms and light weapons (SALW) with which people are actually being killed in the wars that are actually being fought. Their very ubiquity gives SALW priority, rather than the inhumane/indiscriminate criteria of the 'laws of war' agenda. The same justification may be offered for the Arms Trade Treaty project.

But where does *either* disarmament agenda leave nuclear weapons?

If the BWC and CWC were historically only made possible, and remain unofficially underwritten, by the existence of nuclear weapons, then it follows that nuclear disarmament is undesirable and any progress in widening disarmament has to be restricted to the non-nuclear area. This is an unpalatable conclusion from the perspective of the classical disarmament paradigm. It drives a permanent divide between biological and chemical weapons on the one side and nuclear weapons on the other. Worse than exploding – if that were needed – the artificially constructed (and always questionable) category of 'weapons of mass destruction', which is no great loss, it leaves nuclear weapons unassailable and even to some extent legitimates their continued existence into perpetuity, as something to be regulated but not abolished: arms control, but not disarmament.

This is bad news for nuclear disarmament; but it also, of course, undermines the conviction, expressed in that first preambular paragraph, that the BWC 'will facilitate the achievement of general and complete disarmament under strict and effective international control' and its authors' expressed determination 'to act with a view to achieving effective progress towards general and complete disarmament'. The teleological value of general and complete disarmament (GCD) as the distant goal providing the context within which treaties such as the BWC and CWC have their meaning – the building blocks notion again – is severely diminished, if not lost altogether.

The BWC and CWC will then need a new disarmament paradigm (neo- or post-classical) within which they can make sense without the teleology of GCD or a comparably synoptic framework. But it should be emphasised that this is only required if the retention of nuclear weapons as the guarantor of biological and chemical disarmament is accepted as a correct and necessary assumption.

Conclusion

It has been said that the BWC is a blunt instrument for preventing bioterrorism. One reason for this is historical: its text antedates by several decades the wave of anxiety over biological or toxin weapons getting into the hands of non-state actors. Another reason is structural: its adaptability to changing circumstances such as the fear of bioterrorism in the early years of the twenty-first century is hampered by an institutional deficit that makes normative evolution, through agreement on extended understandings and procedures at review conferences, all too slow and uncertain a process. But a third reason is conceptual. The BWC is predicated on a traditional view of the omnipotent sovereign state: omnipotent, at least, to the extent of possessing the monopoly of force. Articles III and IV assume that the state can impose, by force if necessary, and maintain in practice effective constraints over everyone within its jurisdiction or on its territory or under its control anywhere, as well as being (by a logical corollary) internationally accountable for their actions. It is a traditional view because it emphasises the separateness and the supremacy of each sovereign state within its own territory and jurisdiction. It is easy to criticise such a view as being outdated, but it is difficult to see on what alternative conceptual basis an international structure of accountability could be founded. 'Global governance' is too glib an answer.

Meanwhile the BWC remains 'the only multilateral treaty with a broad consensus that provides an international standard by which biological activities can be judged' (Blix 2006: 116). It makes sense to use Article IV to drill down below the level of the state, as an international obligation to apply national implementation to a high level of stringency. But its limitations must be borne in mind. It does not incorporate an unequivocal obligation to enact penal legislation (unlike Article 7.1a of the Chemical Weapons Convention) nor to extend it extraterritorially to natural persons possessing its nationality (unlike CWC Article 7.1c). It does not incorporate an obligation to designate or establish a National Authority (unlike CWC Article 7.4). It does not contain an international legislative reporting obligation (unlike CWC Article 7.5) (Krutzsch and Trapp 1994: 107–122). Some of these things can be – and have been – encouraged by BWC review conferences, through recording in their final declarations the extended understandings and politically binding commitments on which they are able to agree by consensus. But that is not the same thing as having them built into the treaty as explicit, legally binding obligations from the beginning.

The BWC has only an indirect, tangential and incidental relationship to bioterrorism. Governments that have taken the decision to renounce the BW option

have every interest in ensuring that every other government not only reciprocates their own renunciation, but prevents anyone else – terrorists, other criminals or rogue elements within their own ranks – from breaking the ban either. That is what the BWC is for. The best thing it can do is to maintain its comprehensiveness of scope and effectiveness of implementation and thereby keep potential miscreants of all kinds in their place: terrorist activity is only a subset of criminal activity, which is only *inter alia* the concern of Article IV, which in turn is only one Article in the BWC but is integral to the overall balance of that Convention properly understood as a disarmament treaty.

Notes

1 The longer form 'Biological and Toxin Weapons Convention' (BTWC) is favoured by the European Union and its member states, and by some non-EU states. BWC remains the standard UN usage. Practice varies as between governments and among academic and scientific commentators on the Convention.
2 Verification was a major preoccupation of the BWC's 'lost decade' (1991–2001) through the successive efforts of the Third Review Conference (1991), the VEREX exercise, examining verification possibilities from a scientific and technical standpoint (1992–1993), the Special Conference (1994) and the Ad Hoc Group (1995–2001), in negotiating mode from July 1997. Its failure is comprehensively and authoritatively told by Littlewood (2005).
3 JACKSNNZ (pronounced 'Jacksons') is an acronym formed from the initial letters of seven non-nuclear-weapon, non-EU members of the Western Group: Japan, Australia, Canada, [South] Korea, Switzerland, Norway and New Zealand.
4 None of the 19 working papers issued in advance of the Conference was on bioterrorism, although the European Union was known to be divided over the wisdom of adding one to its seven papers it had issued on 19 September 2006. Eventually Italy's working paper on bioterrorism (BWC/CONF.VI/WP.22) was cleared for delivery by Ambassador Carlo Trezza on behalf of the EU in a resumed plenary session at the end of the first week of the Conference (24 November 2006). The JACKSNNZ and Latin American 12 that were responsible for seven and five working papers respectively issued in advance of the Conference did not include bioterrorism among their chosen topics. Working papers issued during the Conference, apart from Italy's WP.22 on behalf of the EU, did not address bioterrorism either.
5 The first preambular paragraph of the Chemical Weapons Convention reads: '*Determined* to act with a view to achieving effective progress towards general and complete disarmament under strict and effective international control, including the prohibition and elimination of all weapons of mass destruction'.

References

Blix, H. (chair) Weapons of Mass Destruction Commission (2006) *Weapons of Terror: Freeing the World of Nuclear, Biological and Chemical Arms*, Stockholm: Weapons of Mass Destruction Commission.

Boutros-Ghali, B. (1995) 'Supplement to AN AGENDA FOR PEACE: position paper of the Secretary-General, 3 January 1995' in B. Boutros-Ghali (ed.) *An Agenda for Peace*, 2nd edn, New York: United Nations, 1995.

Canada (2006) 'A BTWC Accountability Framework', working paper for the Sixth Review Conference (BWC/CONF.VI/WP.1).

Goldblat, J. and SIPRI (1971) *The Problem of Chemical and Biological Warfare, Volume IV: CB Disarmament Negotiations, 1920–1970*, Stockholm: Almqvist & Wiksell; New York: The Humanities Press.

Hunger, I. and Isla, N. (2006) 'Confidence-building needs transparency: an analysis of the BTWC's confidence-building measures', *Disarmament Forum* (UNIDIR) 2006/3, September.

Joyner, D.H. (2005) 'The Proliferation Security Initiative: nonproliferation, counterproliferation, and international law', *Yale Journal of International Law*, vol. 30.

Krutzsch, W. and Trapp, R. (1994) *A Commentary on the Chemical Weapons Convention*, Dordrecht: Martinus Nijhoff.

Littlewood, J. (2005) *The Biological Weapons Convention: A Failed Revolution*, Aldershot, Hampshire: Ashgate.

Meselson, M.S. and Perry Robinson, J.P. (2001) *A Draft Convention to Prohibit Chemical and Biological Weapons under International Criminal Law*, Brighton, East Sussex: Harvard-Sussex Program on CBW Armament and Arms Limitation.

Pearson, G.S. (2007) 'The successful outcome of the Sixth BTWC Review Conference', Review Conference Paper no. 19, January 2007, in the series *Strengthening the Biological Weapons Convention* (Pearson, G.S. and Dando, M.R. (eds)) Bradford, West Yorkshire: Department of Peace Studies, University of Bradford.

Pearson, G.S., Sims, N.A. and Dando, M.R. (eds) (2006) *Key Points for the Sixth Review Conference*, Bradford, West Yorkshire: Department of Peace Studies, University of Bradford.

Sims, N.A. (1987) *International Organization for Chemical Disarmament*, SIPRI Chemical and Biological Warfare Studies no. 8, Oxford: Oxford University Press.

Sims, N.A. (1988) *The Diplomacy of Biological Disarmament: Vicissitudes of a Treaty in Force, 1975–85*, London: Macmillan; New York: St. Martin's Press.

Sims, N.A. (2001a) *The Evolution of Biological Disarmament*, SIPRI Chemical and Biological Warfare Studies no. 19, Oxford: Oxford University Press.

Sims, N.A. (2001b) 'The case for a BWC Committee of Oversight: draft commentary and mandate', *Disarmament Diplomacy*, no. 60, September.

Sims, N.A. (2003) 'Biological disarmament diplomacy in the doldrums: reflections after the BWC Fifth Review Conference', *Disarmament Diplomacy*, no. 70, April/May.

Sims, N.A. (2005) 'Remedies for the institutional deficit of the BTWC: proposals for the Sixth Review Conference', Review Conference Paper no. 12, March 2005, in the series *Strengthening the Biological Weapons Convention* (Pearson, G.S. and Dando, M.R. (eds)) Bradford, West Yorkshire: Department of Peace Studies, University of Bradford.

Sims, N.A. (2006a) 'Back to basics: steering constructive evolution of the BWC', *Arms Control Today*, vol. 36, no. 3, April.

Sims, N.A. (2006b) 'Towards the BWC Review Conference: diplomacy still in the doldrums', *Disarmament Diplomacy*, no. 82, Spring.

Sims, N.A. (2006c) 'Strengthening structures for the Biological and Toxin Weapons Convention: options for remedying the institutional deficit', *Disarmament Forum* (UNIDIR) 2006/3, September.

Sims, N.A. (2007) 'The future of biological disarmament: new hope after the Sixth Review Conference of the Biological Weapons Convention', *Nonproliferation Review*, vol. 14, no. 2, July.

Smithson, A.E. and CSIS (Center for Strategic and International Studies) (2006) *The Biological Weapons Threat and Nonproliferation Options: A Survey of Senior U.S. Decision Makers and Policy Shapers*, CSIS Report, November, Washington, DC: The CSIS Press.

United Kingdom/France (2006) 'EU paper on the intersessional programme of work: its utility and contribution to fulfilling the object and purpose of the BTWC between 2003–2005 and a case for further intersessional work after 2006', working paper for the Sixth Review Conference (BWC/CONF.VI/WP.8).

United Nations (1992) BWC Third Review Conference: Final Document, 27 September 1991 (BWC/CONF.III/23).

United Nations (1996) BWC Fourth Review Conference: Final Document, 6 December 1996 (BWC/CONF.IV/9).

United Nations (2006a) BWC Sixth Review Conference: Proposed Language Submitted to the Committee of the Whole, 24 November 2006 (BWC/CONF.VI/CRP.1).

United Nations (2006b) BWC Sixth Review Conference: Final Document, 8 December 2006 (BWC/CONF.VI/6).

Woodward, A. (2003) *Time to Lay Down the Law: National Legislation to Enforce the BWC*, London: Verification Research, Training and Information Centre (VERTIC).

6 Verification under the Chemical Weapons Convention

Ron G. Manley

Introduction

The Convention on the prohibition of the development, production, stockpiling and use of chemical weapons and on their destruction or, as it is more conveniently known, the Chemical Weapons Convention (CWC) came into force on the 29 April 1997 (UN 1993). The body responsible for overseeing the implementation of the CWC is the Organization for the Prohibition of Chemical Weapons (OPCW). Its headquarters are located in The Hague, where a Technical Secretariat of approximately 500 staff, including around 200 inspectors, are responsible for the day-to-day administration of the CWC and the implementation of its verification regime. A 41 member Executive Council, which meets regularly four times per year – with additional sessions being held as and when the need arises, provides oversight of, and guidance to, the Technical Secretariat. It also reports to the Conference of States Parties on the progress of the implementation of the Convention and makes recommendations on any actions that need to be considered and taken by the Conference. The Conference of states parties, which is open to all states parties and normally meets once a year, is the primary decision making body of the OPCW.

Since the entry into force (EIF) of the CWC, the OPCW has assigned a high priority to achieving universal membership of the Convention, as this is seen as the surest way of achieving its primary objective of permanently eliminating the global threat from chemical weapons. Considerable progress has been made towards achieving universality and, at the time of writing, 182 countries are states parties to the CWC. A further six countries have signed the CWC, thereby indicating their political commitment to its aims and objectives, but have yet to complete the process by ratifying it and depositing their ratification document with the United Nations. Only seven countries remain completely outside the CWC. At least five of the remaining 13 non-states parties are suspected of either having or having had stocks of chemical weapons or chemical weapons programmes and their continuing absence from the CWC is of particular concern. The five countries are; Egypt, Democratic People's Republic of Korea, Iraq, Israel and Syria (Arms Control Association 2002). While Israel has signed the CWC, it has, so far, not ratified it. The newly

elected government of Iraq, however, has expressed its commitment to accede to the CWC and discussions between the government and the OPCW, on this issue, are currently in progress (Guthrie *et al.* 2006: 716). Efforts continue to persuade the remaining 12 non-states parties either to ratify or accede to the CWC, as its ultimate success will depend on universal adherence to its aims and objectives.

States parties to the CWC undertake a number of obligations including the general obligations reproduced below.

1 Each State Party to this Convention undertakes never under any circumstances:

   a To develop, produce, otherwise acquire, stockpile or retain chemical weapons, or transfer, directly or indirectly, chemical weapons to anyone;
   b To use chemical weapons;
   c To engage in any military preparations to use chemical weapons;
   d To assist, encourage or induce, in any way, anyone to engage in any activity prohibited to a State Party under this Convention.

2 Each State Party undertakes to destroy chemical weapons it owns or possesses, or that are located in any place under its jurisdiction or control, in accordance with the provisions of this Convention.
3 Each State Party undertakes to destroy all chemical weapons it abandoned on the territory of another State Party, in accordance with the provisions of this Convention.
4 Each State Party undertakes to destroy any chemical weapons production facilities it owns or possesses, or that are located in any place under its jurisdiction or control, in accordance with the provisions of this Convention.
5 Each State Party undertakes not to use riot control agents as a method of warfare.

(CWC, Article I)

Each state party also undertakes to put in place appropriate national legislation to implement its obligations under the CWC, to establish a National Authority to oversee the implementation and also to act as a focal point for communications with the OPCW and to meet its obligations under the verification regime of the CWC.

The CWC is considered to have the most intrusive verification regime of all of the current arms control treaties. This regime is not only applied to chemical weapons and their dedicated production facilities but, uniquely, also to those parts of the commercial chemical industry that produce, process or consume chemicals that have a legitimate peaceful use but which, because of their dual purpose nature, could also be used as chemical weapons or key precursors in their production.

The negotiation of a verification regime that would include on-site inspections, by teams of international inspectors, of both military sites and commercial industry sites was a complex and lengthy process. In order to maintain the involvement of the global chemical industry, for example, it was essential to minimise the impact on its legitimate commercial business. This was by no means an easy task and the verification regime had to be carefully constructed to maintain a balance between the need to ensure a high level of confidence of compliance with the CWC while, at the same time, minimising its impact on the chemical industry. It was also essential to ensure that companies were able to protect their commercial business information. As a result, the verification regime is a carefully constructed system of checks and balances, designed to increase international security and confidence while at the same time protecting national and commercial interests. While the resulting regime has proved to be highly effective, the need to achieve and maintain these balances has, inevitably, placed some limits on the level of verification that can be achieved. It should also be remembered that the CWC is a voluntary agreement between states. Its verification regime is also primarily aimed at the activities of states rather than sub-state groups or individuals.

Before considering how the verification regime might be strengthened it is first necessary to understand its present limitations and the reasons why they exist. The detailed rules and guidance for the implementation of the verification regime are contained in a separate annex to the CWC. The Verification Annex (VA), as it is known, provides details of the information that states parties are required to provide to the OPCW and when it is to be provided and, where appropriate, details of the inspection regime that will be used to verify this information. It is made up of 11 parts, each dealing with a specific aspect of the regime. For the purpose of the current discussion, however, it is more convenient to consider the regime as being made of three main sections; one dealing with chemical weapons and their associated facilities, one dealing with chemical industry facilities and one dealing with clarification issues, such as challenge inspections and investigations of alleged use.

CW verification

The key to this aspect of the verification regime is the actual definition of a chemical weapon. Arriving at a comprehensive definition for a chemical weapon was by no means an easy task and required many months of intensive negotiation by those responsible for drafting the CWC. Too narrow a definition could lead to circumnavigation of the CWC's objectives while too broad a definition might have an unacceptable impact on legitimate national and commercial interests. The end result is, as before, an attempt to carefully balance these two competing interests.

Definition of a chemical weapon

The general conception of a chemical weapon is that it is a toxic (poisonous) chemical contained in a delivery system, such as a bomb or a shell. This is

of course correct, as these are chemical weapons. For an effective CWC, however, a much wider definition was necessary. One could imagine, for example, a situation where the toxic chemical was stored separately from its delivery system. The CWC resolves this particular problem by considering each of these components of a chemical weapon to be a chemical weapon whether they are together, as in a filled munition, or stored separately.

The CWC defines a toxic chemical as one that causes either temporary or permanent harm to humans or animals. If a toxic chemical is produced or stockpiled and has no legitimate use for peaceful purposes then, under the CWC, it meets the definition of a chemical weapon. This interpretation also applies to 'precursors' – the chemicals that form the building blocks from which these toxic chemicals are made. This particular part of the definition is known as the 'general purpose criterion' and plays a vital role in ensuring that the CWC continues to remain effective irrespective of developments in science and technology. Its potential for ensuring that the CWC's verification regime remains effective despite such changes is discussed more fully later in this chapter. The need for such a definition arises from the fact that many toxic chemicals that either have been or might be used as chemical weapons also have legitimate uses for peaceful purposes. Examples of this are hydrogen cyanide and phosgene, both of which are very toxic. Hydrogen cyanide and phosgene have been weaponised by a number of countries in the past. They are, however, also key ingredients in the production of commercial products such as synthetic fibres, plastics and dyes and, for this reason, they are routinely manufactured in millions of tonnes each year by a number of countries throughout the world. Some other toxic chemicals, such as the nerve agent GB, on the other hand have no known use other than as a chemical weapon and their production or stockpiling is totally banned under the CWC.

The second part of the CWC's definition of a chemical weapon deals with unfilled munitions and devices. Unfilled chemical munitions or devices are also defined as chemical weapons. Once again, however, without some clarification of what is an unfilled chemical munition problems can arise. Sometimes a standard munition, such as an artillery shell, may be used for different purposes. The same shell, for example, may be filled with high explosives or a non-toxic chemical used to produce a smoke screen or a toxic chemical agent depending on the current military requirement. Clearly if every empty shell were to be considered a chemical weapon then life would become very difficult. The CWC overcomes this problem by adding a caveat to the definition of a munition or device, which states that it is a chemical weapon if it was specifically designed for the purpose of disseminating a chemical agent.

The final part of the definition of a chemical weapon covers any equipment specifically designed for use directly in the employment of a chemical munition or device. Once again the key words are 'specifically designed'. The same standard artillery gun, for example, can be used to fire high explosive munitions or chemical munitions. It would clearly be impractical to ban the production and stockpiling of all artillery guns on the basis that they could be used to fire

a chemical weapon. If, however, an artillery gun had been specifically designed for the purpose of firing chemical weapons then it would meet the definition of a chemical weapon and as a result be subject to the CWC.

The CWC's definition of a chemical weapon, even with its careful and detailed wording, is by no means perfect and a number of grey areas will always remain. It endeavours to achieve an optimum balance between the need to prevent the production and stockpiling of chemical weapons while, at the same time, not imposing unnecessary constraints on a state party's right to produce chemicals for legitimate peaceful purposes, nor on its right to acquire and retain conventional weapons and their associated delivery systems.

Chemical weapons

Within 30 days of EIF for a state party it is required to declare whether or not it owns or possesses any chemical weapons or whether there are any chemical weapons located in any place under its jurisdiction or control. It must also provide details of the precise location, aggregate quantity and a detailed inventory of any such weapons. States parties must also declare any chemical weapons that they have abandoned on the territory of another state party or have been abandoned on their territory, at any time since 1925. Those states parties declaring chemical weapons must also submit a general plan for their destruction. The CWC requires that the chemical weapons be destroyed within ten years of EIF, i.e. by 29 April 2007. There is, however, a provision to extend this deadline by a maximum of five years, to April 2012, in situations where the OPCW's Conference of States Parties is satisfied that the request for such an extension is justified.

Once declared, a chemical weapon may only be moved from its declared location for the purpose of its destruction at a declared destruction facility. All declared storage sites for chemical weapons are subject to routine on-site inspection by OPCW inspectors who will carry out an initial inspection shortly after the submission of the declaration for the purpose of confirming its accuracy. Each storage site will be regularly re-inspected, at a frequency determined by the Technical Secretariat, until all of the weapons have been destroyed. The state party will be given 48 hours' advance notice of each inspection.

A state party possessing chemical weapons must also provide full details of each chemical weapons destruction facility that it proposes to use to destroy its chemical weapons. These facilities are also subject to on-site inspection and, during those periods when chemical weapons are being destroyed, OPCW inspectors will be continuously present at the site to verify their destruction. The choice of destruction method is left to the state party but destruction or disposal by burial, sea dumping or open pit burning is not permitted. States parties have opted for a range of destruction methods primarily based on either incineration or chemical degradation or a combination of both. As a result the on-site verification activities need to be adapted to suit the destruction technology being used at each site. The OPCW and the state party concerned will negotiate and agree

on a detailed verification plan for each facility and this will form the basis for on-site verification at the facility.

Since entry into force of the CWC, more than 8.6 million chemical weapons have been declared by the six 'possessor' states parties. OPCW inspectors have inspected all of these weapons and by July 2006 they had observed the destruction of approximately 2.5 million of them. Around 6.1 million, located at 35 storage sites, however, still await destruction (OPCW 2007). The vast majority of these weapons belong to the two possessor states with the largest stockpiles of chemical weapons, the Russian Federation and the United States of America. It is now clear that neither will be able to meet the April 2007 deadline and both are seeking an extension to 2012 (OPCW 2003). There is also a significant risk that, without additional support from other member states, at least one of these countries may have difficulty meeting the 2012 deadline.

All the chemical weapons are safely stored at storage sites within the six 'possessor' states and are regularly monitored by inspectors from the OPCW. The states parties concerned have also undertaken action to increase, significantly, the level of security at these storage sites and also at the sites where the weapons are being destroyed. Nevertheless, the continued existence of such large numbers of stockpiled chemical weapons, albeit stored at secured locations, does pose an ongoing risk, particularly with respect to the problem of non-state actors seeking access to such weapons. Increasing the level of verification by the OPCW at either storage or destruction sites, however, would be unlikely to lead to any significant reduction in this risk. The best solution is for these weapons to be destroyed as soon as possible. It is, therefore, important to maintain the pressure on the states parties possessing these weapons to speed up the destruction process and, where appropriate, for other states parties to provide support and assistance.

Old chemical weapons

Historic chemical munitions left over from the First and Second World Wars pose another problem. Large numbers of these weapons were abandoned or intentionally buried in many countries throughout the world following both wars (Manley 1998: 1–16). Even greater numbers were disposed of by dumping at sea (Noblis 2007). While these munitions continue to meet the definition of a chemical weapon they are considered, due to their age and condition, to pose a greatly reduced threat. In order to deal with this problem the CWC recognises two subclasses of chemical weapons, namely, chemical weapons manufactured before 1925 and chemical weapons manufactured between 1925 and 1946 that are no longer usable as chemical weapons. When chemical weapons meeting these definitions are recovered they must be declared and destroyed. The verification regime, applied to them, however, is less stringent than that applied to modern stockpiled chemical weapons. It will be based on the assessed risk that the recovered munitions pose to the object and purpose of the CWC and can range from the same level of verification as that applied to stockpiled chemical

weapons down to a single, initial inspection, to confirm their identity and condition.

The drafters of the CWC recognised that it would be impractical to require states parties to declare and destroy chemical weapons buried on their territories if their location and condition were unknown. The situation with sea dumped munitions was even more complicated. It was accepted that, while these buried or dumped weapons might well pose an environmental threat, it was unlikely that they would pose any significant military threat. In accordance with the CWC, therefore, chemical weapons dumped at sea before 1 January 1986 or buried on land before 1 January 1977 are not to be covered by the CWC unless they are recovered. Where such weapons are subsequently recovered they must be declared and destroyed in accordance with the requirements of the CWC. It should be noted that the above dates were chosen for purely historical and political reasons and are not linked in any way to the technical design or condition of the munitions themselves.

By their very nature it is likely that these dumped and buried munitions will continue to be recovered for many years, well beyond the 2012 destruction deadline. While, due to their age and condition, these munitions are generally regarded as posing no significant military threat, they could, nevertheless, still be attractive to non-state actors seeking access to chemical weapons for use as a terrorist weapon. Once again, increasing the level of verification of these old chemical weapons would not bring about any significant reduction in this risk and ensuring that, when such weapons are recovered, they are securely stored and destroyed at the earliest opportunity remains the best solution to the problem.

CW production facilities

These are the facilities used to produce the toxic chemical agents, the specialised munitions and components and the facilities used to fill the chemical agents into the munitions. Each state party must declare whether it has or has had any chemical weapons production facilities under its ownership or possession, at any time since 1946, and, where appropriate, provide the required detailed information on these facilities. All operational chemical weapons production facilities must be closed and inactivated within 90 days after the CWC enters into force for the state party. The CWC normally requires the state party to destroy its CW production facilities completely and all related facilities and equipment within ten years of EIF. In exceptional cases of compelling need, however, a state party can request permission to convert a CW production facility permanently for purposes not prohibited under the Convention. The granting of such a request is not automatic and rests solely with the Conference of States Parties who will determine each request on its own merit. Where permission is given to convert a facility, all specialised equipment and all specialised features of buildings necessary for the production of chemical weapons must be removed and destroyed. Once converted the facility must pose no more risk to the CWC than a normal commercial chemical plant built to the prevailing chemical industry standards.

CW production facilities are subject to systematic on-site inspection by OPCW inspectors until they are certified as destroyed. Where facilities are being converted they will be subject to regular inspection until the conversion is complete. The OPCW also has the right to continue inspecting such facilities for a period of at least ten years after their conversion.

Since EIF, 65 CW production facilities in 12 states parties have been declared. It is important to note that only a handful of these facilities were still capable of being used for the production of chemical weapons. The majority had either been destroyed or partially destroyed prior to EIF. In order to be certified as destroyed all specialised and standard equipment and all buildings must be destroyed. By July 2006, 55 of the 65 declared facilities had been certified either as destroyed or converted to peaceful use. The remaining ten facilities are all inactivated and in the process of being destroyed or converted for peaceful purposes.

In summary, while the destruction of chemical weapons is behind schedule, the CW verification regime has been shown to work well. Over the nine years since EIF, its application has been refined to ensure that it is carried out in an efficient and effective manner. This is particularly true in relation to verification at CW destruction facilities. The requirement for the continuous presence of inspectors during destruction operations that, in many cases run 24 hours per day and seven days per week, has proved to be very resource intensive. Since EIF, therefore, considerable efforts have been made, by both the OPCW and the states parties concerned, to overcome this problem. By careful design and the extensive use of installed instrumentation it has gradually proved possible to reduce, significantly, the number of inspectors necessary to monitor these destruction operations. This has freed up valuable inspector resources for deployment on other verification activities.

Riot control agents

Riot control agents (RCAs) such as, for example, CS (o-chlorobenzylidene malononitrile) and CN (chloroacetophenone) receive special treatment under the CWC. They occupy one of the grey areas in the definition of a chemical weapon. While these chemicals were primarily designed for civil law enforcement they have, on a number of occasions, also been used on the battlefield. In the latter case they clearly fall under the definition of a chemical weapon and their use for this purpose is prohibited under the CWC. In accordance with their obligations under Article I of the CWC, states parties undertake not to use RCAs as a means of warfare. They may, however, continue to produce, stockpile and use these chemicals for law enforcement, including domestic riot control purposes. States parties are required to declare the chemical name and structural formula of any chemicals that they hold for this purpose. RCAs, however, are not subject to routine verification under the CWC. Control of the production, stockpiling and trade in these chemicals is left to individual states parties.

During the CWC negotiations a number of countries were not prepared to accept that RCAs should be classed as chemical weapons. Some even wanted

them specifically excluded from the CWC. As a chemical weapon they would not only have had to be declared but both the chemicals and the facilities producing them would have had to be destroyed. Clearly this was not going to be acceptable. On the other hand, as stated above, they have and could still be used on the battlefield. The solution to this problem was the 'general purpose criterion' contained in the definition of a chemical weapon. If law enforcement, including riot control, is a permitted activity then toxic chemicals produced for this purpose are not chemical weapons as long as the types and quantities produced are consistent with this purpose. Even with this approach it would still have been possible to add RCAs to the list of chemicals, annexed to the CWC, that were to be subject to routine verification. The general issue of which chemicals should be included in this list was, in itself, however, highly contentious and, at the time, there was no willingness to complicate matters even further by adding the status of RCAs to this debate. The consensus view was that the general obligation for states parties not to use RCAs as a means of warfare and the requirement for them to declare which chemicals they held for riot control purposes would be sufficient to meet the objectives of the CWC.

In the years since EIF, however, the problem of non-state actors and their desire to acquire chemical weapons has increased sharply. While, by definition, riot control agents are relatively non-toxic they can, nevertheless, under the right conditions, still be used as an effective terrorist weapon. Given these new factors, the question becomes: should these compounds now be added to the list of chemicals annexed to the CWC and subject to routine verification? While the CWC does contain a mechanism for adding or removing chemicals from the list, obtaining the necessary political consensus to add RCAs to the list would be extremely difficult. It would be necessary to convince states parties that subjecting these chemicals to declaration and, where appropriate, on-site inspection would bring about a significant reduction in the risk of their being acquired by non-state actors. To achieve such an aim would require a very low declaration threshold and a high level of verification of their production, stockpiling and use. Given the global scale of their production and the fact that, in a number of countries, these chemicals are sold on the open market, for example, in personal protection devices, such an intense level of verification would simply not be a practical option. There is, thus, very little chance that these compounds could be added to the list of those chemicals subject to verification under the CWC. The solution to the problem will continue to lie with individual states. Those wishing to reduce the risk of the potential use of these materials, by individuals or groups, on their territory will need to put in place effective national legislation to control their production, possession and sale. Some countries, such as the United Kingdom, have already taken such steps (Firearms Act 1968).

Industry verification

As mentioned previously, many of the toxic chemicals that have been used as chemical weapons or have the potential to be used for that purpose are also key

intermediates in the production of chemicals for the legitimate commercial chemical industry. The same is true of many of the precursor chemicals used to produce toxic chemicals for use as chemical weapons. The inevitable question, therefore, was which chemicals should be subjected to verification and what form this should take. Given the scale of the global chemical industry it was clearly going to be impractical to apply the verification regime to the production, processing and consumption of all toxic chemicals and their precursors. The solution was to draw up and agree on a list of those chemicals that were considered to pose the greatest risk to the object and purpose of the CWC. Only chemicals on the list would be subject to routine verification.

Annex on chemicals

This list of chemicals forms an annex to the CWC. As mentioned previously, reaching agreement on which chemicals should or should not be included on this list was extremely difficult. Clearly, due to the dual nature of the majority of these chemicals, each chemical added to the list placed an additional burden on the chemical industry producing it. States and their chemical industries, therefore, needed to understand fully the reasons for the proposed inclusion of each chemical on the list. Whilst in many cases this was obvious, in others the reasons were not so clear. In some instances the proposal to add a particular chemical to the list was based, partially, on intelligence information, which those making the proposal were neither in a position to, nor prepared to share. There was also a marked reluctance to add to the list toxic chemicals or related precursors that were the subject of ongoing research as potential chemical weapons, as to do so might itself lead to further proliferation. Reaching agreement on the list was not the end of the matter. It was also necessary to agree on the level of verification to be applied to the listed chemicals. Clearly, some of these chemicals posed a greater risk than others and would need to be subjected to a more intense level of verification than those that were perceived to pose a lesser risk. To overcome this problem the list was broken down into three groups or schedules. Very toxic chemicals that either have been, or have the potential to be, used as chemical weapons (e.g. the organophosphorus nerve agents and the nitrogen and sulphur mustard gases) and the key precursor chemicals necessary to produce them and that have little or no legitimate use for peaceful purposes were placed on schedule 1. Toxic chemicals that are produced in limited quantities for peaceful purposes but could also potentially be used as chemical weapons or as key precursors for their production were placed on schedule 2. Chemicals that have been used as chemical weapons (e.g. phosgene and hydrogen cyanide) or are important intermediates for their production but are also produced in large quantities for peaceful purposes were placed on schedule 3. Each schedule was assigned a different declaration threshold and inspection regime, the most stringent requirements being placed on schedule 1 chemicals. As a further confidence building measure, states parties are also required to make a declaration, providing basic information, on plant sites that have produced, during the previous

year, more than 200 tonnes of any discrete organic chemical (DOC) not listed on the above schedules or more than 30 tonnes of a DOC containing the elements phosphorus, sulphur or fluorine (PSF). Plants that produce exclusively hydrocarbons, explosives or polymers are excluded from this particular declaration requirement.

The production of chemicals listed on schedule 1 is strictly controlled and may only be undertaken for the purposes of research, medical, pharmaceutical or protective purposes. With one exception all facilities producing schedule 1 chemicals must be declared and provide, on an annual basis, full details, including the quantities, of all schedule 1 chemicals produced. These facilities are also subject to frequent inspection by the OPCW. The exception is for facilities producing less than 100 grams of these chemicals per year for research, medical and pharmaceutical purposes. Such facilities are not considered to pose any significant military risk and need not be declared. As a result they are not subject to routine monitoring under the CWC. The total quantity of schedule 1 chemicals held by a state party must not exceed 1 tonne. The declaration thresholds for the dual use chemicals listed on schedules 2 and 3 are much higher, ranging from one kilogram to one tonne per year for chemicals on schedule 2 and over 30 tonnes per year for chemicals on schedule 3. In the case of schedule 2 chemicals, declarations are required for plants producing, processing or consuming them while for schedule 3 chemicals, only their production need be declared. The thresholds for on-site inspection are even higher, ranging from ten kilograms to ten tonnes per year for schedule 2 facilities and over 200 tonnes per year for schedule 3 facilities. Facilities that do not exceed these thresholds will not be subject to on-site inspection. Those below the declaration threshold will be totally transparent to the OPCW.

Inevitably, both the list of chemicals and the declaration and inspection thresholds are a compromise. They are designed to provide a balance between the perceived chemical weapon risk and the need to protect national chemical industries and the international trade in chemicals. As a result, while the 'Annex on Chemicals' contains the most militarily significant toxic chemicals and their precursors it is by no means exhaustive and many known toxic chemicals and potential precursors, judged not to pose a significant military risk, are either not included or only subjected to limited verification. Both ammonia and chlorine, for example, which are moderately toxic and produced globally in many millions of tonnes per year, are excluded from the list. Phosgene and hydrogen cyanide, with a global production of around 3 and 1.5 million tonnes per year respectively, are included but only on schedule 3. All four chemicals are key intermediates in the production of a wide range of commercial chemicals and despite the fact that both the latter chemicals have a long history of use as chemical weapons, banning their production or submitting them to an intense verification regime would simply not have been a viable option. Many other toxic chemicals that have the potential to be used as chemical weapons or might serve as precursors for their manufacture posed similar problems.

Inspections

The inspection regime for facilities declared under Article VI (chemical industry facilities) varies depending on which of the CWC's three schedules the chemicals being produced – in the case of schedule 2 produced, processed or consumed – appear. Facilities producing schedule 1 chemicals, for example, are subjected to inspection at a rate ranging from once to twice per year. The aim of the inspection is to confirm the accuracy of the declaration. Currently only 27 such facilities are under verification and most of these are laboratories with the capacity to produce only gram quantities of schedule 1 chemicals. The majority have produced less than 100 grams of schedule 1 chemicals during the nine years since EIF.

For the approximately 150 schedule 2 plant sites currently subject to inspection, the inspection frequency is determined by the assessed potential risk posed by the chemicals and the capabilities of the facility producing, processing or consuming them. While the majority of schedule 2 plant sites will receive an average of three inspections over a period of ten years, a small number, those judged to pose a more significant risk to the object and purpose of the CWC, will receive more frequent inspections. The duration of each inspection is limited to 96 hours. The aim of the inspection is to confirm: that the levels of production, processing or consumption are consistent with the declaration; the absence of schedule 1 chemicals; and that schedule 2 chemicals are not being diverted for non-permitted purposes.

Approximately 400 sites are currently subject to inspection under schedule 3. Individual sites are selected for inspection on the basis of agreed weighting factors using a specially developed computer programme. For schedule 3 facilities the inspection duration is limited to 24 hours. Once again the aim of the inspection is to confirm that the activities are consistent with the declaration provided and the absence of schedule 1 chemicals.

The inspection regime for DOCs/PSFs is somewhat different from the other Article VI inspections in that the focus of the inspection is on the capability of the plant rather than on the chemicals: the primary aim being to confirm that the plant is not being used, and has not been used, to produce schedule 1 chemicals. Sites are selected for inspection from the list of approximately 4,000 declared sites using a similar process to that used for the selection of schedule 3 facilities. Once again the duration of each inspection is limited to 24 hours.

International trade in chemicals

The CWC and its 'Annex on Chemicals' tries to establish a careful balance between the need to prevent the proliferation of chemical weapons while at the same time fostering the free trade in chemicals between its states parties. Transfers to non-states parties of chemicals listed on schedule 1 are prohibited. While transfer of these chemicals between states parties is permitted for research, medical, pharmaceutical or protective purposes, both parties must declare the proposed transfer

before it takes place. There is no minimum declaration threshold for transfers of schedule 1 chemicals. Export to non-states parties of chemicals listed on schedule 2 is also prohibited. Transfers of schedule 3 chemicals to non-states parties are permitted but subject to specific conditions. Each state party is required to submit an annual declaration of the aggregate amount of each schedule 2 chemical produced, processed, consumed, imported and exported and each schedule 3 chemical produced, imported and exported. Included within this declaration are the quantities of each schedule chemical imported or exported from each country involved in the exchange. These declarations are intended to provide the OPCW with a means to monitor the global movement of these dual use chemicals. Initially there were a number of difficulties associated with these aggregate declarations, particularly in matching import figures with export figures. Most of these problems arose from different interpretations among states parties on the method to be used to arrive at the aggregate data; for example, how to deal with mixtures containing schedule 2 or 3 chemicals. States parties have now, largely, agreed on a common approach to the calculation of this national aggregate data and the quality and usefulness of this information should improve in future years.

Modifying or updating the industry verification regime

States parties to the CWC have voluntarily agreed to forgo the production, stockpiling and use of chemical weapons. As previously stated the primary aim of the verification regime for the chemical industry was to enable them to demonstrate that toxic chemicals and their key precursors were not being diverted for purposes not permitted under the CWC. Over the nine years since EIF, the implementation of the verification regime has proved to be highly successful and during this period more than 1,000 inspections of commercial sites have been carried out in 76 states parties.

The regime was and remains, however, primarily targeted at tracking militarily significant quantities of these chemicals. In order to produce a stockpile of chemical weapons for military purposes a country would need to divert hundreds or, in some cases, thousands of tonnes of scheduled chemicals and the chances of such a diversion being detected are very high. Diversion of these chemicals for potential use by non-state actors, however, is a very different matter. Unlike in the military scenario, the diversion of kilogram quantities of a toxic industrial chemical or, in the case of a schedule 1 chemical, a few grams may be sufficient to mount a terrorist attack (Manley 2007: 73–85). As currently configured, in the majority of cases the verification regime is simply not capable of detecting diversion at this level. First, it is focused on the production of these chemicals, except in the case of schedule 2 chemicals where processing and consumption are also monitored. Second, many schedule 2 and 3 chemicals are routinely transported by road, rail and sea and their movement, within a state party, is not subject to verification under the CWC. Even their movement between states parties is only subject to minimal verification in the form of an annual declaration of transfers. The opportunities, for individuals or groups, to divert

small quantities of these chemicals for terrorist purposes are, therefore, almost limitless. A single road tanker or rail car filled with chlorine, for example, would be more than adequate for their needs.

A mechanism has been incorporated within the CWC to enable the verification regime to be reviewed and if deemed necessary amended. Using this mechanism the regime could be strengthened by taking one or more of the following actions; adding chemicals to the schedules, lowering the declaration and inspection thresholds or increasing the inspection frequencies. Doing this, however, would be unlikely to bring about any significant reduction in the risk of the potential diversion of toxic industrial chemicals for use by non-state actors and might increase the burden on the global chemical industry to unacceptable levels. While some minor adjustments to the verification regime may well take place in future years, obtaining the required consensus for major changes will be extremely difficult, if not impossible to achieve. Alternative solutions to the problem of the potential diversion of toxic industrial chemicals by non-state actors will, therefore, need to be found. In particular additional consideration needs to be given to monitoring the trade and movement of toxic chemicals of types and quantities that might be useful to non-state actors planning to engage in terrorist activities and, where practicable, further action taken to restrict their access to such materials.

A number of states have already taken action with respect to the international trade in chemicals and put in place additional arrangements to monitor and control the export of certain chemicals and the equipment that could be used in the production of chemical weapons. The 39 countries belonging to the 'Australia Group', for example, have agreed on lists of both chemicals and dual use chemical manufacturing equipment that they will subject to such additional controls (Australia Group 2007). The Australia Group chemical list currently contains 54 dual use chemicals that are routinely traded internationally, 20 of which are not included in the CWC's 'Annex on Chemicals' such as, for example, sodium and potassium cyanide. The CWC of course has no mechanism to monitor or control the export of dual use equipment and the equipment list is, therefore, specific to the Australia Group. It is important to note that the declared purpose of these additional controls is to prevent the potential misuse of the listed chemicals and equipment and not to obstruct legitimate trade in them. All current members of the Australia Group are also states parties of the CWC and have, therefore, undertaken an obligation to foster the legitimate trade in chemicals between states parties to it.

Challenge inspections

Those responsible for the drafting of the CWC recognised the potential limitations of the routine on-site inspection regime and, to restore the balance, an additional verification mechanism was incorporated into Article IX of the Convention. Article IX provides a range of mechanisms by which a state party that has concerns about the possible compliance of another state party can have them addressed. These include, for example, bilateral consultations, informal visits

and exchanges of information, a formal request for clarification through the Executive Council or a formal request for a challenge inspection. This last option enables a state party to have its concerns addressed by having inspectors from the OPCW's Technical Secretariat carry out a short notice, on-site inspection of the location giving rise to the concern.

A challenge inspection may be requested at any location within a state party whether it has been previously declared or not. The state party requesting the inspection must, however, provide sufficient information to the Executive Council of the OPCW to demonstrate that their request for such an inspection is valid. An Executive Council meeting will be called to consider the request immediately the director-general receives it. The inspection will proceed automatically, unless, within 12 hours of receipt of the request, the Executive Council votes by a three-quarters majority of all 41 of its members not to go ahead. Achieving such a majority would not be easy and, therefore, it is anticipated that the requested inspection will invariably go ahead. The challenged state party is required, within a very short time frame, to permit the inspection team to visit the location and investigate the allegation.

The inspection team will be made up of inspectors from the Technical Secretariat, drawn from a wide geographical background. Inspectors who are nationals of either the requesting state party or the receiving state party will be automatically excluded from the team. The requesting state party may, at its own expense, send an observer. While the observer has the right to remain in contact with their state party and be briefed at regular intervals by the head of the inspection team, he or she will have no automatic right of access to the inspection site. Any such access granted to the observer will be at the sole discretion of the receiving state party.

The inspection will be carried out in accordance with the rules set down in Article IX of the CWC and Part X of its Verification Annex. These rules have been carefully constructed to ensure that the inspection can achieve its aims while at the same time enabling the inspected state party to protect information that is not relevant to the CWC. The inspected state party is entitled to take action to protect sensitive information of this nature. It may, for example, remove sensitive papers, shroud sensitive displays and equipment, log off computer systems and turn off data-indicating displays, restrict sample analysis to schedule 1, 2 or 3 compounds and their degradation products, and use random, selective access techniques. In taking these actions, however, the state party must, at the same time, meet its obligation to provide sufficient access to the inspection team to enable it to fulfil its mandate. The inspected state party's response to a challenge inspection will, therefore, need to be carefully balanced. If it imposes too many restrictions then the inspection team may well report to the Executive Council that it has been unable to gather the information necessary to complete the inspection. The director-general will transmit the inspection team's preliminary report to the requesting state party, inspected state party and the Executive Council within 72 hours of its return to The Hague. After taking note of any comments from the inspected state party, a final report will be submitted to the Executive Council for its consideration within 30 days following

the completion of the inspection. The responsibility for determining whether or not non-compliance with the CWC has occurred or whether the right to request a challenge inspection has been abused rests with the Executive Council. The Council will also, where appropriate, make recommendations to the Conference of States Parties on any further action required.

Since EIF, no state party has requested a challenge inspection. States parties have instead chosen to make use of the other clarification mechanisms available under Article IX to resolve their concerns. Bilateral discussions, for example, have been successfully used on a number of occasions to address and resolve a range of potential non-compliance concerns. The logistics and procedures for undertaking a challenge inspection are, however, regularly monitored and, as appropriate, updated. OPCW inspectors, with the cooperation of states parties, undertake regular training exercises in the conduct of challenge inspections and remain ready to undertake such an inspection should the need arise.

The challenge inspection regime continues to be the most powerful component of the CWC's verification regime. Unlike the other parts of the verification regime it is not limited to declared locations or to facilities above a certain size. A challenge inspection can be mounted against any location within a state party and makes no distinction between the activities of states or individuals or groups of individuals.

National implementing legislation

A key factor in ensuring the success of the CWC's verification regime is the quality of the national implementing legislation put in place, by each state party, to support it. In order to be able to make the required annual declarations, for example, a state party will need to have in place appropriate mechanisms to collect the necessary data. It will need to be able to guarantee access by OPCW inspection teams to the relevant sites, within the required time period, and ensure that the companies or organisations owning or operating them provide the support and information necessary to enable the inspection team to fulfil its mandate. It will also need to put in place mechanisms to control and monitor the import and export of scheduled chemicals. To meet these and the rest of its obligations under the CWC each state party is required, in accordance with Article VII, to put in place appropriate national legislation or administrative arrangements.

Effective national implementing legislation is also an important tool in increasing the effectiveness of the CWC with respect to the potential acquisition or use of chemical weapons by non-state actors. In accordance with Article VII:

> Each State Party shall, in accordance with its constitutional processes, adopt the necessary measures to implement its obligations under this Convention. In particular, it shall:
>
> a Prohibit natural and legal persons anywhere on its territory or in any other place under its jurisdiction as recognized by international law from

undertaking any activity prohibited to a State Party under this Convention, including enacting penal legislation with respect to such activity;

b Not permit in any place under its control any activity prohibited to a State Party under this Convention; and

c Extend its penal legislation enacted under subparagraph (a) to any activity prohibited to a State Party under this Convention undertaken anywhere by natural persons, possessing its nationality, in conformity with international law.

(CWC, Article VII, paragraph 1)

The existence of such legislation will ensure that the obligations of the CWC apply not only to the states parties but also to individuals or groups of individuals operating within them. It also provides the state party with the necessary mechanisms to deal with individuals or groups of individuals who do not comply with these obligations.

Putting in place effective national implementing legislation is, therefore, an important step in a state party meeting its obligations under the CWC. Regrettably, in the years immediately following EIF, only a few states parties fully appreciated the importance of this step and took the necessary action to meet this requirement. By October 2002 only 48 per cent of states parties had reported that they had put in place their national implementing legislation or administrative arrangements and only 27 per cent of states parties were considered to have in place legislation or arrangements covering all of the key areas required by the CWC (Onate *et al.* 2005: 6). The Conference of States Parties became so concerned over this issue that at its eighth session, in 2003, it established a two year action plan to encourage states parties to fulfil this particular obligation and provide the Technical Secretariat with details of their national implementing legislation. This plan despite being extended for a further year in November 2005 has met with only limited success. By November 2006, 112 (62 per cent) of the states parties had reported that they had put in place their national implementing legislation or administrative arrangements. Only 72 (40 per cent) of these states parties were judged, by the Organization, to have adopted and reported national legislation covering all of the key areas required by the CWC (OPCW 2006). At its eleventh conference, in December 2006, the states parties noted that, while the indications were that those states parties that had failed to meet fully their Article VII obligations were actively working to resolve this matter, much still needed to be done and agreed to extend the action plan for a further 12 months. Without such compliance the CWC and its states parties will not have the mechanisms in place to deal adequately with the problem of non-state actors and their potential activities in relation to the acquisition or use of chemical weapons.

Conclusion

The CWC continues to move steadily towards universal membership and adherence. Its verification regime, despite the in-built limitations, has proved to

be highly effective. Access by governments or individuals to the most toxic chemicals, as listed on schedule 1 of the Annex on Chemicals appended to the CWC, is now strictly controlled and the opportunities for their acquisition and misuse are steadily decreasing. The major problem in relation to these chemicals remains the large stockpiles of chemical weapons still awaiting destruction. While they are securely stored and subject to routine verification by the OPCW their continued existence poses a risk to the object and purpose of the CWC. Changes to the CWC's verification regime, however, would have little or no impact on the rate of their destruction or on the risk that they pose. The CWC's verification of dual use chemicals and the chemical industries that produce them has also been shown to be an effective means for states parties to demonstrate that they are not diverting these chemicals for use either as chemical weapons or for the production of chemical weapons. The industry verification regime was neither designed to, nor is it capable of, detecting the diversion of dual use chemicals at the levels likely to be sought by non-state actors for terrorist purposes. The opportunities for such groups to acquire these moderately toxic industrial chemicals during production, storage, transport and use are so vast that no routine verification regime could ever provide an effective deterrent against such misuse. Any additional controls on the production, movement and use of these dual use chemicals will be dependent on actions taken by individual states parties. In taking any such action, however, governments will need to give due consideration to the likely impact on their national chemical industries and whether the potential benefits would justify this impact.

The CWC's challenge inspection mechanism has the potential to deal with the activities of non-state actors and, providing states parties have in place the appropriate national implementing legislation, it could play an important role in the ongoing campaign to prevent the acquisition and use of chemical weapons by non-state actors. Effective national implementing legislation that criminalises the preparation, possession, use or intent to use toxic chemicals for terrorist or criminal purposes is the most effective means of strengthening the CWC. It will also provide individual states with a valuable tool in their fight to prevent the diversion and misuse of toxic chemicals by non-state actors.

References

Arms Control Association (2002) 'Fact sheet: chemical and biological weapons proliferation at a glance' September 2002. Online, available at: armscontrol.org/factsheets/cbwprolif.asp (accessed 2007).

Australia Group (2007) 'Export control list: chemical weapons precursors'. Online, available at: australiagroup.net/en/control_list/precursors.htm (accessed 2007).

Guthrie, R., J. Hart and F. Kuhlau (2006) 'Chemical and biological warfare developments and arms control', *SIPRI Year Book 2006*, Oxford: Oxford University Press.

Manley, R.G. (1998) 'The problem of old chemical weapons which contain mustard gas or organoarsenic compounds: an overview', in J.F. Bunnett and M. Mikolajczyk (eds) *Arsenic and Old Mustard: Chemical Problems in the Destruction of Old Arsenical and Mustard Munitions*, the Netherlands: Kluwer Academic Publishers.

Manley, R.G. (2007) 'Restricting access by non-state actors to chemical weapons and related materials', in O. Bosch and P. van Ham (eds) *Global Non-Proliferation and Counter-terrorism: The Impact of UNSCR 1540*, Washington, DC: Brookings Institution Press.

Noblis (2007) 'Ocean Dumping of Chemical Weapons'. Online, available at: noblis.org/OceanDumpingOfChemicalWeapons.htm (accessed 2007).

Onate, S., R. Trapp and T. Tabassi (2005) 'Decision on the follow-up to the OPCW action plan on Article VII: ensuring effective implementation of the CWC', *CBW Conventions Bulletin*, Issue No. 69 and 70, September/December, Sussex University, UK: Science Policy Research Unit.

OPCW (2003) 'Extension of the intermediate and final deadlines for the destruction by the Russian Federation of its category 1 chemical weapons', and 'Extension of the intermediate and final deadlines for the destruction by the United States of America of its category 1 chemical weapons', Eighth Session of the Conference of States Parties, document reference C-8/DEC.13, 24 October. Online, available at: OPCW.org (accessed 2007).

OPCW (2006) Note by the director-general, *Report to the Conference of States Parties at its Eleventh Session on the Status of Implementation of Article VII of the Chemical Weapons convention as at 1 November 2006*, C11-DG.6, 23 November, The Hague, the Netherlands: OPCW.

OPCW (2007) 'The chemical weapons ban: facts and figures'. Online, available at: opcw.org/factsandfigures/index.html#CWDestructionUnderWay (accessed 2007).

The Firearms Act 1968 (1968) Section 5(1)(b), London: HMSO.

United Nations (1993) 'Convention on the prohibition of the development, production, stockpiling and use of chemical weapons and on their destruction', 32 I.L.M. 800. Online, available at: OPCW.org (accessed 2007).

Part III

Nuclear

7 The diversion of nuclear materials for terrorist use

Stephen M. Francis

> Inspections by an impartial, credible third party have been a cornerstone of international nuclear arms control agreements for decades. Where the intent exists to develop a clandestine nuclear weapons programme, inspections serve effectively as a means of both detection and deterrence.[1]

Introduction

The use of nuclear power and associated nuclear technologies is widespread around the globe. Currently over 30 countries are operating more than 400 commercial nuclear power reactors, with a further 250-plus research reactors operating in a much wider range of states. There are also over 100 major facilities involved in conversion, enrichment, fuel fabrication and reprocessing activities to support the global nuclear fuel cycle. Add to this list up to another 1,000 'other locations' involved in the storage and use of nuclear materials and the scale of the task of monitoring and assuring the peaceful use of nuclear materials becomes apparent.

The International Atomic Energy Agency (IAEA) is the world's nuclear inspectorate, with now 50 years of verification experience. Inspectors work to verify that safeguarded nuclear material and activities are not used for military purposes. So-called 'safeguards' are the set of activities or measures by which the IAEA endeavours to verify that states are complying with their international non-proliferation obligations in not using nuclear materials for nuclear weapons purposes.

The cornerstone of the IAEA safeguards system is the Nuclear Non-Proliferation Treaty (NPT), which was agreed in 1968. Under the NPT, governments worldwide have committed to three common principles: preventing the spread of nuclear weapons; pursuing global nuclear disarmament; and encouraging the peaceful uses of nuclear energy. By signing the NPT states agree to place all nuclear material in nuclear use under IAEA safeguards and subsequently to conclude what is termed a 'Comprehensive Safeguards Agreement' with the IAEA. The NPT has been uniquely successful in the area of disarmament and non-proliferation treaties in signing up all but a few of the world's states as states parties to the NPT. The NPT at its inception recognised the

existence of China, France, the (now) Russian Federation, the UK and the USA as Nuclear Weapons States (NWS) and does not entertain the possibility of further states being added to this list.

World events over the past 15 years have brought the activities of the IAEA sharply into focus and to a large extent have shaped far reaching changes to the international safeguards regime. Issues surrounding the discovery of a clandestine nuclear weapons programme in Iraq, the current North Korean and Iranian situations, the self-declared and dismantled programmes in South African and Libya and the uncovering of the 'A.Q. Khan Network' have all acted as catalysts for change.

The more recent focus on global terrorism issues is also now sharpening the focus on non-proliferation activities that do not necessarily apply at the level of the state. At one extreme this now recognises the possible existence and involvement of non-states parties in nuclear proliferation activities but, more plausibly, their involvement in the procurement of nuclear materials suitable for use in what is now commonly termed a 'dirty bomb' or some other device for the widespread dispersal of radioactive materials into the environment.

Nuclear materials and technology – the extent of the challenge

What nuclear material is covered by international nuclear safeguards?

For the IAEA, nuclear material is split into two categories, these are defined as 'special fissionable material' and 'source materials'. The formal definitions are as follows (Statute of IAEA 2007):

> Special fissionable material means plutonium-239; uranium-233; uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing; and such other fissionable material as the Board of Governors shall from time to time determine.
>
> Source material means uranium containing the mixture of isotopes occurring in nature; uranium depleted in the isotope 235; thorium; any of the foregoing in the form of metal, alloy, chemical compound, or concentrate; any other material containing one or more of the foregoing in such concentration as the Board of Governors shall from time to time determine; and such other materials as the Board of Governors shall from time to time determine.

IAEA safeguards take into account all 'source and special fissionable material' in countries under their remit. However, verification activities are concentrated more on those nuclear materials and activities that are deemed most significant in terms of the manufacturing of nuclear weapons devices. Hence IAEA safeguards

concentrate to a greater extent on activities involving the production or processing of materials containing plutonium-239 and uranium enriched in the isotope 235 (enriched uranium). At the point when uranium becomes enriched in the U-235 isotope to levels above 20 per cent, the material moves from the 'low enriched' (LEU) to the 'high enriched' category (HEU).

What about 'other nuclear materials'?

The term 'other nuclear materials' is most usually used to describe materials in the form of radioactive sources. Sources containing isotopes such as caesium-137, americium-241, strontium-90, cobalt-60 and iridium-192 are good such examples and can be found in widespread use throughout the developed world. None of these materials is currently considered in terms of IAEA safeguards, although the IAEA has a number of initiatives aimed at improving security and control of these materials. Most of these initiatives require the voluntary adherence of states to guidelines. These measures are described later in this chapter.

Another term that has come to prominence in terms of IAEA safeguards in recent years is ANM or 'Alternative Nuclear Materials'. The term ANM refers to alternative fissionable materials, alternative that is to uranium-233 and 235 and plutonium-239. This basically comes down to americium and neptunium. In the early 2000s there was much debate about the usefulness or otherwise of these materials in nuclear devices and whether or not IAEA safeguards should be applied to them to some extent. After much debate a compromise was reached. Although it was considered as theoretically possible to manufacture nuclear weapons with these materials, it was not seen as an attractive proposition – even for technically advanced and experienced weapons makers. Add to this that separated americium and neptunium are not routinely produced in conventional nuclear fuel cycles, and the overall conclusion drawn was that these materials only posed a very small, if not virtually zero threat in terms of nuclear proliferation. As such, limited controls were introduced based around verification of nuclear material flowsheets, coupled to periodic declarations in relation to any separated americium and neptunium in existence.

What is a significant quantity?

The most commonly asked question when the subject of the manufacture of nuclear weapons is addressed is 'How much do you need to make a bomb?' This question is the cause of great argument amongst even the most educated of people, however in reality much of the quarrelling is actually undertaken from a position of ignorance and/or prejudice. The main source of argument stems from the fact that the IAEA has declared target values in terms of detecting the diversion of nuclear material from peaceful to weapons use. These target values are termed 'Significant Quantities' – usually shortened to SQ. For plutonium, an SQ is considered as 8 kilograms, for highly enriched uranium (HEU), 25 kilograms constitutes a SQ. These values were determined by a panel of international

experts in the field. For other nuclear materials such as natural or low enriched uranium, an SQ is calculated on the basis of the potential to generate an SQ of HEU or plutonium. Hence a significant quantity of natural uranium may be several tonnes and several hundreds of kilos of low enriched material.

The argument normally begins with the statement that you can make a nuclear device with amounts of plutonium considerably smaller than eight kilograms. Although precise details of weapons designs remain the subject of stringent classification restrictions, it is widely accepted that it is indeed possible that a finished nuclear device may use as little as three kilograms of plutonium or less. However, the IAEA SQs are structured to indicate the amount of material that a first time proliferator would need to manufacture their first device. Therefore the SQ is not calculated merely to reflect the amount of material in the finished device, but also to take into account material that would be generated as scrap in the course of manufacture. Therefore losses in the course of chemical conversion, casting and machining need to be addressed – these could quite easily amount to at least 50 per cent of the initial feedstock; even a developed weapons builder may lose 30 per cent to recycle as a matter of course. Hence a five kilogram plutonium weapon could easily require at least eight kilograms of plutonium feed material.

The other point to take into account is that the IAEA is looking at total plutonium and does not take any account of the quality of the plutonium. This then raises the question of what constitutes 'weapons grade plutonium'. Although there is obviously no declared or precise figure, a Pu-239 content in excess of 90 per cent is widely accepted as weapons grade. The figures quoted of three kilograms plutonium required for a device would only be valid for a device made from weapons grade material. Given that the vast bulk of the world's separated civil plutonium is at levels much below weapons grade, then a three kilogram device would not be a practical proposition with such material. Similar arguments can also be used for HEU, where the majority of civil HEU is well below the accepted weapons grade of at least 90 per cent U-235.

The conclusion of this section therefore is that the current SQs in use by the IAEA remain valid and weapons experts from the NWS remain comfortable with their continued use.

History of the IAEA

The IAEA was founded in 1957 against a background of international concerns as a result of the spreading development of nuclear power technology – seen at the time as a posible source of virtually limitless, cheap energy for the future – but against the backdrop of implications for the proliferation of nuclear weapons. It was originally foreseen that the IAEA would have the role of acting as an international hub, offering assistance in the development of nuclear technology to member states and overseeing global nuclear trade in nuclear materials and technology.

The seeds for the creation of the IAEA were sown by President Eisenhower's 'Atoms for Peace' speech to the UN General Assembly in December 1953. This

was followed by the drafting of the IAEA Statute that was unanimously approved by 81 countries in October 1956. The statute covered the following three main objectives: preventing the spread of nuclear weapons; pursuing global nuclear disarmament; and encouraging the peaceful uses of nuclear energy.

Why then was it not until the signing of the NPT some 11 years after its founding, did the work of the IAEA come to the fore? In the years immediately following 1957, the world's political climate changed so dramatically that it was virtually impossible for the IAEA even to start to implement many of the elements of the Statute. However, events of the early 1960s proved to be a strong catalyst for a global non-proliferation regime. France in 1960 and then China in 1964 tested their first nuclear devices (thus completing the five recognised Nuclear Weapons States) leading to widespread international concern that further states might pursue the development of nuclear weapons. This, coupled with the fact that there was at least some US–Soviet dialogue in terms of arms control in the aftermath of the Cuban Missile Crisis, gave impetus to the final conclusion of the NPT in 1968.

The 1970s proved very successful for the NPT in terms of the sheer numbers of developed and developing states who signed up to the treaty, putting the treaty into legal force, and concluding comprehensive safeguards agreements with the IAEA (so-called INFCIRC/153 agreements). Over time the IAEA has worked relentlessly and successfully to encourage the universal uptake of the NPT. To this end there are currently more than 180 non-nuclear weapons states party to the NPT. All five NWS have also signed up to the NPT and concluded safeguards agreements with the IAEA. China was the last NWS to conclude such an agreement, in September 1989.

As the use of nuclear power throughout the world spread rapidly throughout the 1970s and early 1980s, so did the demands made of the IAEA's nuclear inspectors, with the level of inspection required being directly proportional to the number of nuclear facilities. The burden of verification falls primarily on the IAEA's Department of Safeguards. However, the Chernobyl accident in 1986 and the rise to prominence of 'green' and environmental pressure groups meant that the development of nuclear power was not sustained through into the 1990s, with only modest global growth, due primarily to the commissioning of new reactors in the Far East.

The next major landmark in the development of IAEA safeguards followed the discovery of Iraq's clandestine nuclear weapons programme in the aftermath of the 1991 Gulf War. This raised questions as to the adequacy of an IAEA safeguards regime that was only really designed to verify what was declared to it and not to search for indications of clandestine activity. Developments in North Korea (DPRK) and the new South African regime's voluntary declaration and dismantling of its clandestine nuclear weapons programme gave further impetus to the call for change.

The outcome of several years of deliberation was the conclusion of the Additional Protocol (INFCIRC/540 (2007)) in 1997. The Additional Protocol gave the IAEA additional powers and responsibilities in its mandate, most noticeably

in the area of searching for and identifying evidence of undeclared nuclear activities. Uptake of the Additional Protocol was initially high, but delays were experienced by many states in implementing domestic legislation to enable the protocol to come into force. The IAEA's Safeguards Implementation Report (SIR) for 2005 reported that some 70 countries had both Comprehensive Safeguards Agreements and Additional Protocols in force.

At the 1995 NPT Review Conference, the NPT was made permanent. The non-proliferation regime was potentially strengthened further in 1996 when the UN General Assembly approved a Comprehensive Test Ban Treaty (CTBT) and initiated the formation of a new verification body, the CTBTO, also to be based in Vienna (but the failure of the USA to ratify has meant that the CTBT is not firing on all cylinders).

The final years of the 1990s was a time for the IAEA to consolidate and implement the changes required to enable it to meet the reqirements of its expanded mandate. This was made difficult in many respects by the unreasonable budgetary constraint of 'cost neutrality' imposed on it by UN member states. As more states implemented the Additional Protocol and the IAEA gained experience of its implementation, so then a new 'Strengthened Safeguards System' emerged. The application of the new regime, which encompassed a carefully constructed balance of traditional verification activities together with new measures from the Additional Protocol has come to be known as 'Integrated Safeguards'.

In more recent years, the IAEA's work has started to encompass new dimensions. As such it is looking at security-related issues and considering countermeasures to the threat of nuclear terrorism.

International nuclear export controls

As well as considering the international safeguards regime, it is equally important to remember that there is in place a system of international nuclear export controls aimed at stopping trade in key nuclear materials, equipment and supporting technology. Export controls, like security arrangements, are always considered a prerogative of the state rather than the international sphere. However, in the case of the nuclear arena, many states have seen the benefits of close cooperation, resulting in the establishment of two key groups. In many ways the origins of modern nuclear export controls can be traced directly back to the establishment of the NPT. As a result the 1970s saw the establishment of two separate bodies for dealing with nuclear export control. The first of these was the Zangger Committee in 1971 followed by the Nuclear Suppliers Group (NSG) in 1975.

Zangger Committee

The Zangger Committee's inception had direct roots in the NPT and resulted from a regular series of meetings held between the world's major nuclear suppliers at which they attempted to reach a consensus on how to interpret Article III.2

of the NPT. The work culminated in 1974 with the publication of the so-called 'Trigger List' as INFCIRC/209 (2007).

The idea was that the export of the items on the list to a non-nuclear weapons state would 'trigger' certain prescribed requirements of the exporting country. These require that peaceful use assurances must be sought prior to the export of the item, that the receiving country submits to full-scope IAEA safeguards and that conditions are laid down concerning any potential re-transfer of the item to a third party at a later date. The items covered by the Trigger List were essentially those that were especially designed or prepared specifically for nuclear use. No so-called 'dual use' items were incorporated.

Nuclear suppliers group

In 1974, India, a 'non-nuclear weapons state' and outside the NPT detonated its first nuclear device. It was widely accepted that this event demonstrated how nuclear technology legally obtained for peaceful purposes could be misused for clandestine nuclear weapons development. As a direct result of the Indian test, the NSG was formed shortly afterwards. Originally called the 'London Group', it comprised representatives of countries who were already members of the Zangger Committee as well as some countries who were not yet signed up to the NPT.

The NSG took due account of the work undertaken by Zangger and in 1978 produced its own guidelines for export control that incorporated its own 'Trigger List'. These guidelines were published as INFCIRC/254 (2007) and set out to establish the main principles of nuclear export control and went beyond that set out by the NPT. After publication of INFCIRC/254 the NSG remained inactive until after the first Gulf War in 1991. Prompted in part by discoveries made in the uncovering of Iraq's clandestine nuclear weapons programme and the implications it had for the effectiveness of the existing nuclear export controls, the NSG embarked on work to look at controls of dual use equipment and materials.

Dual use

The definition of materials or equipment that falls into the dual use category is not a precise one. Whereas the classification of especially designed items was relatively straightforward, the difficulty with dual use was maintaining the distinction between that and 'multi-use'. It was intended that dual use would encompass items having both significant nuclear use and use in a limited number of non-nuclear applications. If the non-nuclear usage was too wide then export controls would become too hard to impose and regulate.

A good example of a dual use material is high strength (7000 Series) aluminium alloy that can be used in the manufacture of nuclear gas centrifuge rotor tubes as well as having specific uses in areas of the aerospace industry. In contrast, the 6000 Series alloy, while still having potential use in nuclear centrifuges, has many uses in the aerospace and automotive industries and widespread use in numerous other engineering applications requiring light, high strength materials.

These new deliberations of the NSG resulted in the publication of 'Dual Use Guidelines' as INFCIRC/254 Part 2, with the original Trigger List based guidelines of 1978 republished as INFCIRC/254 Part 1. The new guidelines set out the principles to be applied in terms of the notifications and consultations to be followed by exporting countries with other states adopting the guidelines prior to any export.

Export control remains essentially a prerogative of individual states. This is reflected by the fact that although published by the IAEA as INFCIRC documents, the NSG guidelines are not actually IAEA documents, they are independently produced by the NSG members. The IAEA merely acts as a conduit for their issue. Membership of the NSG has steadily increased over the years to over 40 states and now includes all five nuclear weapons states and all states with significant nuclear fuel cycle facilities. Members of the NSG are required to enact appropriate national legislation to give legal force to a domestic export control system including a commitment to act in line with the guidelines.

The A.Q. Khan network

Much has been documented in recent times about the so-called A.Q. Khan network and how it managed to subvert nuclear export controls around the world. An employee of Urenco, A.Q. Khan, managed to obtain and steal key technical specifications relating to Urenco's centrifuge enrichment technology. Initially these designs and information were transferred back to his home country of Pakistan, and undoubtedly led to the construction of enrichment facilities in Pakistan capable of producing highly enriched uranium for weapons use. Although a major enough issue in its own right, it is perhaps the subsequent transfer of the technology and materials to other states that poses more searching questions to the international export control regime.

The procurement by Libya of centrifuges and centrifuge components, and the construction of the current Iranian centrifuge programme, centred at Natanz, were both achieved through the A.Q. Khan network via a myriad of international trade linkages, trading companies and intermediaries. For many years all trade in technology and shipments of components managed to evade customs and export control agencies (and seemingly without the knowledge of the Pakistani government!). Although the unmasking of the A.Q. Khan network will probably not result in any step change in international export control regimes, it does highlight how a sub-state actor can operate without detection. However, as a result of this case the IAEA now has a unit dedicated to monitoring aspects of nuclear related-trade worldwide and it must be considered likely that the security services of the world's major powers will be also be doing so.

The nuclear safeguards regime

As the world's nuclear inspectorate, the IAEA performs an indispensable role in furthering nuclear non-proliferation. IAEA verification provides a level of

assurance that nuclear materials are not diverted or misused for the purposes of manufacturing nuclear weapons and that no materials that are required to be declared under safeguards remain undeclared. IAEA safeguards activities are applied routinely at over 900 facilities in 71 countries. In a typical year, 250 IAEA inspectors will spend more than 20,000 calendar days in the field, devoted to verifying hundreds of tons of special fissionable material.

At the heart of its safeguards system, the IAEA uses a system of nuclear material accountancy. Under this system, each declared nuclear facility provides monthly reports on the status of its inventory of nuclear materials. The basic report of this system, known as an Inventory Change Report (ICR) monitors the quantities of nuclear material present in defined areas of the nuclear facility and details the changes in these quantities that take place over time. These reports, along with others related to the annual physical inventory-taking exercise required at all declared facilities, form the basis against which IAEA physical inspection activities can be conducted.

Under the traditional safeguards system based on INFCIRC/153 (2007) alone, the capability of the IAEA to detect undeclared nuclear activities was very limited. This is because inspections focused on declared nuclear material at declared nuclear facilities, and were centred on strategic points at these facilities, with defined intervals between inspections. A rigid set of rules known as the Safeguards Criteria determine the periodicity of inspections at the facility level and also spell out the precise inspection activities that should be carried out at each facility. The criteria also define the measures of success or inspection goal attainment targets that would determine whether or not each inspection was considered a success or not. Under this regime, equivalent facilities in different countries would be subjected to identical safeguards inspection activities.

It is important to note that the whole IAEA safeguards regime, including the actual safeguards requirements set out in the Safeguards Criteria are actually risk based. That is, greater emphasis and control is placed on material of higher strategic significance, hence separated plutonium and HEU materials have more controls and higher frequency inspections than natural or low enriched uranium are subject to. To aid in this concept the IAEA uses the term ‘timeliness’. Timeliness is seen as the minimum time period that it is assessed would be required for a proliferator to take a significant quantity (SQ) of material and manufacture a nuclear device. For example the timeliness period for separated plutonium is one month, while for natural uranium it is one year. This determines that plutonium facilities would be inspected at least on a monthly basis, whereas natural uranium facilities may only be visited on an annual basis. There are of course other factors and inspection requirements that come to bear, but that is the main principle of timeliness.

Overall success of the inspection regime in each year in a given country is indicated by overall achievement of inspection goals at the individual facilities. It is fair to say that the IAEA really did not pay any attention to detection of potential clandestine activities in its day to day safeguards activities. This was

reflected in the mindset of its team of professional inspectors who, whilst being highly educated and trained, were really only fulfilling the role of 'bean counting' whilst performing safeguards inspections. The sole aim of the IAEA inspector whilst carrying out an inspection would be to meet the goal attainment levels set out in the Safeguards Criteria.

All this being said however should not detract from the importance of materials accountancy-based inspection activities as part of any nuclear safeguards regime. Such inspections play an important part in providing assurance that all declared civil nuclear materials stay under international control and that there is no possibility of diversion to weapons use. In this regard the traditional IAEA safeguards regime has been extremely successful. There is no evidence from any of the discovered covert weapons programmes that diversion of safeguarded civil nuclear materials has formed a credible part of the overall weapons programme. Instead, the success of the safeguards regime has ensured that proliferators have had to look elsewhere for their nuclear materials, either through undeclared indigenous programmes or through covert procurement from overseas.

The Iraqi nuclear weapons programme

Prior to the 1991 Gulf War, Iraq had a small declared nuclear programme. The programme was centred around the Tuwaitha Nuclear Research Centre situated a short drive to the east of Baghdad. The site was home to two research reactors. The Russian IRT-1000 reactor was still in operation prior to the Gulf War, but the French-built reactor had long since been 'decommissioned' by an Israeli air strike in the early 1980s. Following this action, the Iraqis built huge earth berms some 30 metres high around the perimeter of the site to hamper any further strikes. Access to the site was thereafter through a narrow tunnel in the berm. The site was known to be host to small-scale nuclear research activities, including some for agricultural use.

The Iraqis had a well established State System of Accounting and Control (SSAC) that was seen as being a generally cooperative and helpful example of a SSAC. Inspections were carried out regularly by IAEA inspectors in line with the requirements of the IAEA Safeguards Criteria. After the discovery of the clandestine weapons programme, the inspectors would come to understand why their very cooperative hosts would pick them up from their Baghdad hotels, and drive them in comfortable Mercedes cars with specially blacked out windows, directly to and from their intended inspection location. There was therefore no opportunity to observe in any detail any other activities that were being carried out at the Tuwaitha site.

Initial UNSCOM inspections rapidly identified that the Iraqis had in fact embarked upon a very extensive and far reaching clandestine nuclear weapons programme for many years. Some people argue that this programme was actually not really known to the world's intelligence communities, while others speculate that the programme was very well known and that Saddam Hussein

was somehow encouraged to invade Kuwait, in order to give the outside world an excuse to go in and dismantle the WMD programme.

The Iraqi nuclear weapons programme was reasonably well developed, with some facilities having been through active commissioning and moved into the production phase. These activities were mainly in the area of the production of uranium and various uranium compounds that would be required to feed the more technologically difficult process of uranium enrichment. It fair to say that the Iraqis had established a viable process for the production of uranium ore concentrate from uranium contained in phosphate rock. This raw material was already processed into phosphate fertiliser products at the Al Qaim facility in the west of Iraq, close to the Jordanian border. The Iraqis simply built a uranium extraction process alongside the fertiliser plant and succeeded in producing over 100 tonnes of uranium ore concentrate, commonly known as Yellow Cake. Further uranium processing facilities were established at other locations around Iraq, the main drive of these was the production of uranium tetrachloride that was required for the EMIS (or calutron) enrichment programme.

Although the Iraqi scientists at Tuwaitha did carry out experiments in hot cell facilities to extract a few grams of plutonium, no substantial effort was put into developing the plutonium weapon route. Instead the majority of effort was dedicated to the production of an HEU device, using uranium enrichment techniques to generate the required quantities of weapons usable fissile material. The great surprise to outside observers was the fact that the Iraqi scientists resurrected the electromagnetic isotope separation methods that were developed and used in the US Manhattan project in the 1940s. The USA had long since abandoned this technology due to its low efficiency and high cost, but the technology worked and substantive details had been declassified, thus giving the Iraqis access to a blueprint for a demonstrated enrichment technique. The Iraqi EMIS facilities at Tarmiya (and later at Ash Sharqat) were identified for what they were by a US inspector who realised that the buildings were identical to those he was familiar with at the Y-12 facility at Oak Ridge in the USA. These facilities had commenced operations and had generated limited quantities of enriched material, but were obviously not working very well, with much lower efficiencies than expected.

In a parallel, but much less advanced programme, development had also commenced with centrifuge enrichment, but work had not progressed beyond laboratory-scale work. The Iraqis had managed to procure a small number of centrifuge rotor tubes and associated components from a range of sources in Europe. In some cases employees of nuclear companies acted illegally to manufacture and export centrifuge rotor tubes, in other cases companies were able to export centrifuge components without obtaining the legally required export licences.

The final piece of the weapons jigsaw was the so-called weaponisation activities. Aside from theoretical weapons design studies, the Iraqis had embarked on the construction of weapons testing and assembly facilities at Al Atheer, including bunkers for high explosives testing. The Iraqis also had in their possession

large quantities of the 'fast' explosives HMX and RDX. These were stored at the Al Qaqa chemical facility. Unfortunately, following the second Gulf War, the US forces who came through the Al Qaqa facility en route to Baghdad, omitted to secure this material, which subsequently fell into the hands of insurgent groups. Consequently, many of the insurgent attacks that have persisted in Iraq following the war can be proven to have used these fast explosives.

Post-1990 Gulf War challenges to IAEA

The discovery of Iraq's nuclear weapons programme demonstrated very clearly to the IAEA that the traditional safeguards regime of declaration–verification, with its inherent limitations on access to both facilities and information, was not by itself the most suitable tool for the detection of clandestine weapons programmes. However, the Iraqi case study would provide the IAEA with both the impetus to change and to some extent the knowledge of how to change its safeguards regime.

Clearing up the mess of the Iraqi nuclear programme after the Gulf War was a huge international exercise. The aftermath saw the creation of the United Nations Special Commission (UNSCOM/687). This commission was charged with investigation and dismantling of the discovered Iraqi programmes for the production of weapons of mass destruction. Separate teams were set up to look at the fields of nuclear weapons, missile technology, chemical weapons and biological weapons. Whereas the latter three fields were new teams specially set up at the inception of UNSCOM, the nuclear team was staffed from existing IAEA personnel in the Department of Safeguards, plus selected experts from UN member states. As such, the operational management of the team, which was known as the 'Action Team', remained under IAEA control, but with reporting lines back through UNSCOM to the UN. The field offices in Iraq were run and managed by UNSCOM and the IAEA worked within this framework.

The work of the Action Team highlighted that when dealing with complex nuclear weapons programmes, knowledge limited to nuclear materials and processes for their production proved only a small element of the whole picture, and it was for this reason that experts from UN member states were drafted in to assist in the processes of uncovering and rendering useless the Iraqi programme.

The process of piecing together the Iraqi programme was very lengthy due to a persistent lack of cooperation from the Iraqi authorities. Although to the world the Iraqis claimed they were cooperating with the international inspectors, on the ground the inspectors had constantly to 'force' information out of the Iraqi authorities. At no time would the Iraqis volunteer any fresh information, they would only confirm facts when confronted by clear and unambiguous evidence. As such, the UNSCOM inspection process was a true war of attrition, with the inspectors chipping away at the story and the Iraqi authorities defending their position.

In reality, the bulk of the Iraqi programme was largely uncovered in the 12–18 months immediately following the end of the Gulf War. Major facilities were identified and subsequently destroyed and key documents relating to the

so-called 'PC-3' were discovered and translated. What was missing was much of the finer details of the programme, and it was these that the Action Team would spend much of their time and effort trying to uncover. A good example of the behaviour of the Iraqi authorities came in the middle of 1995 with the defection of Hussein Kamel to Jordan. Kamel was actually Saddam Hussein's son-in-law. At this time the Iraqis obviously took a judgement as to what the defector would say to the UNSCOM and Action Team inspectors and took steps to release information 'voluntarily'.

In Baghdad, UNSCOM was initially told of a location just out of the city where they suspected important documents had been hidden. This was supposedly Hussein Kamel's summer house. However, after two days of searching the buildings and digging up the garden with bulldozers and JCBs the inspectors drew a blank – some even had to stay overnight in their vehicles to protect such an important site. This was a blatant diversionary tactic by the Iraqis, as another location was quickly notified to UNSCOM; the 'Chicken Farm' was itself actually not too far out of Baghdad. At the farm, inside a building that had at some time been used for the intensive rearing of chickens, were discovered some 80 or so boxes, crates and tea chests filled with information on the Iraqi nuclear and other WMD programmes. The Iraqis maintained that the boxes had been secretly hidden at the farm by the defectors, but local sources indicated that the boxes had in fact arrived on the back of a lorry 24 hours earlier.

Whilst to some extent the volume of material gave the inspectors problems in terms of information overload, it provide further details on the Iraqi programme and helped to fill in many of the gaps in the inspectors' overall knowledge and confirm many of the details that had already been assumed. At this point in the inspection process as a whole, the Action Team were confident that they had uncovered at least 90 per cent of the Iraqi weapons programme and they were confident they knew about and understood another 5 per cent, but were just lacking some real evidence. They also judged that the remaining unknowns probably didn't really matter in the overall scheme; there were no major discoveries left to make with the nuclear programme.

What the Iraqi experience did for the IAEA was to show what was involved in the piecing together of a secret nuclear programme, given only limited cooperation by the state authorities involved. The IAEA would also benefit from their South African experience, but in this case the state authorities would be wholly cooperative and forthcoming. This would enable the IAEA to define the key elements of a strengthened safeguards regime that could legitimately be claimed to be targeting the identification of covert nuclear weapons programmes.

Strengthening the IAEA safeguards regime

International developments during the 1990s in Iraq, South Africa and DPRK prompted the IAEA, under pressure from its member states, to develop and implement new measures designed to improve its ability to detect undeclared nuclear material and nuclear-related activities. To do this effectively it was

judged that the IAEA would require more wide-ranging information from states on their nuclear and nuclear-related activities, improved access for IAEA inspectors, as well as more simplified administrative procedures for inspections than those established under existing comprehensive safeguards agreements.

The initial development programme devised in 1993 and subsequently developed over the next two years became known as 'Programme 93+2', subsequently to be called the 'strengthened safeguards system'. The result of these years of deliberation and negotiation with the member states was the conclusion of the Additional Protocol (INFCIRC/540 (2007)) in 1997. The Additional Protocol gives the IAEA extra powers and responsibilities within its legal mandate, most importantly to do with hunting for and identifying evidence of covert nuclear activities. However, several new measures were also implemented to strengthen IAEA safeguards under existing safeguards agreements. Good examples of this include the use of satellite imagery and imagery analysis as a means of detecting covert facilities and covert activities at declared facilities, and also the taking and analysis of environmental samples at declared facilities to check that nuclear materials detected actually match the declared operation and history of the facility.

Under the Additional Protocol, which is the key to the strengthened safeguards system, a state is required to provide the IAEA with broader information covering all aspects of its nuclear fuel cycle-related activities, including research and development and uranium mining. States must also grant the Agency broader access rights and enable it to use the most advanced verification technologies. Specific measures provided for in an Additional Protocol include:

- information about, and access to, all aspects of a state's nuclear fuel cycle, from uranium mines to nuclear waste, as well as any other locations where nuclear material, even if intended for non-nuclear uses, is present;
- short-notice access to all buildings on a nuclear site for IAEA inspectors;
- information on companies and facilities involved in the manufacture and export of sensitive nuclear-related equipment and technology;
- access to other nuclear-related locations, including places where nuclear-related research and development is undertaken, even if this does not involve the use of nuclear material;
- collection and analysis of environmental samples beyond declared locations, when deemed necessary by the IAEA.

With wider access, broader information and better use of technology, the Agency's capability to detect and deter undeclared nuclear material or activities is significantly improved. In the final analysis the strength of the IAEA safeguards system depends upon a number of interrelated elements. Of prime importance is the extent to which it, the IAEA, is aware of the full extent and nature of the state's nuclear facilities and nuclear-related activities. Equally important is the extent to which IAEA inspectors have physical access to the relevant nuclear facilities and other locations for the purpose of providing independent verification of the exclusively peaceful intent of a state's nuclear programme.

It must be remembered that this new information-driven safeguards regime is still underpinned by a regime of actual physical inspection activities at known and declared civil nuclear facilities. The real challenge for the IAEA is how to marry their criteria-driven traditional safeguards inspection regime with the much more qualitative techniques brought in through the advent of the Additional Protocol. A further issue of concern to the IAEA in this period of change was the requirements the strengthened safeguards system would make on its inspectors, and in many ways this was one of the biggest problems that faced the IAEA at the time. Changing the mindset of an inspectorate that had basically had the same mindset for over 20 years was not an easy challenge. Whilst some could adapt to change quite easily, many were either unwilling or unable to accept a change in mandate, despite an extensive programme of training introduced specifically to aid with the transition to strengthened safeguards. Fortunately, in this regard, the IAEA policy of rotating a high percentage of its staff every seven years for once proved a positive measure. A constant influx of new inspectors over the last ten years has largely seen the removal of any negative influences that may have existed in the past.

By entrusting and empowering an impartial international inspectorate with the task of verifying the peaceful use of nuclear energy, the world as a whole does take a meaningful and important step in the direction of peace and international security. However, despite all the aspects of a demonstrably strengthened safeguards system that is now well established and moving in a positive manner towards universal coverage across IAEA member states, the system still requires the international political will for it to be ultimately successful.

The IAEA safeguards system has no legal mandate for the imposition of legal sanctions should it identify that a state is in non-compliance with its safeguards obligations. The IAEA must therefore take action against states that are non-compliant with their safeguards commitments through the United Nations Security Council. As recent events show, even in the case of Iraq, mustering unanimous support in the UN Security Council is not a straightforward proposition. As the recent debates on the supposed Iranian nuclear weapons programme show, issues are not clear cut, reaching international agreement is not a fast process and numerous politically motivated unilateral actions can frequently delay or even stop the process of debate within the UN.

Potential acquisition routes for weapons usable nuclear material and nuclear devices

Naturally the most attractive option to a terrorist with designs on obtaining a functional nuclear device would be to obtain this as a complete device. However, the process of creating such a device is generally split into two main activities; first the manufacture of suitable fissile material and second the development and manufacture of a weapon itself and the development of a means of delivery; this is usually referred to as the weaponisation stage. These are two entirely independent problems requiring different areas of expertise and therefore separate development teams.

In considering the case of fissile nuclear material being obtained by terrorist or sub-state groups, consideration must be given to where this material will actually come from. There are of course a number of acquisition options, which could include purchase, theft and manufacture or maybe some combination of these. In the world today the two main sources of nuclear material are civil nuclear programmes and nuclear weapons programmes, but there is potential for completely clandestine material to exist outside either of these programmes. Of course legal purchase of the weapons usable material is not possible so any purchase would have to be through means of illicit trafficking and undoubtedly would involve smuggling routes.

Procurement from existing nuclear weapons programmes

The most obvious source of weapons usable material and complete nuclear devices is an existing nuclear weapons manufacturer. It may seem incomprehensible that nuclear devices could be available through such a route, but rumours from the break-up of the Soviet Union suggest that control over the entire Soviet arsenal of devices was far from complete, particularly at the outer edges of the empire. That said there is no concrete evidence in the public domain that complete nuclear devices or even discrete components ever were actually available on the black market. Stories of the infamous 'briefcase bombs' are much exaggerated and overstated.

It is considered inconceivable that one of the five recognised NWS would ever knowingly pass a device or weapons usable material to a terrorist or sub-state operator. Given the inherent security measures employed within the NWS, the possibility of theft can be completely discounted. However, some doubts must remain over whether material, components, equipment and devices that exist in the other states with known and viable weapons programmes, could or would be passed into the hands of terrorists, other sub-state operators or in fact other states with nuclear weapons aspirations. There is some evidence of the trade in nuclear technology between these states.

Diversion from the civil nuclear fuel cycle

Diversion of nuclear material from the civil nuclear energy cycle is a possible route for the clandestine acquisition of nuclear materials. However, the question must be posed as to what material may possibly be procured through this route and how suitable would it be for use either directly in a nuclear device or as an input to a more wide ranging and extensive manufacturing programme. The main drawback in terms of attractiveness of the civil nuclear fuel cycle to a terrorist group as a means of obtaining nuclear material is that much of the material present in the cycle would require considerable further processing to make it weapons usable, and in some cases it would anyway be completely unsuitable for this purpose.

The other consideration in terms of diversion is the application of IAEA

safeguards. Safeguards should provide assurances as to the non-diversion of material from the civil nuclear fuel cycle. However, IAEA safeguards provide no defence against the theft or one-off diversion of a significant quantity of nuclear material – it would detect that theft or diversion had taken place, but by then the material would be long gone. In terms of a more protracted diversion of nuclear material, it must still be considered possible that small quantities of material may be diverted from civil facilities without detection by the IAEA, but that the collection an SQ of material would take a period of many years or involve diversion from a number of different facilities.

Even if material is successfully obtained it is not going to be immediately usable – Table 7.1 highlights the issues surrounding various types of material that may be thought as attractive to a terrorist.

Table 7.1 naturally highlights the attractiveness of obtaining material at a point nearest to that of actual weapons grade. However, it can equally be seen that the measures in place to deter and detect diversion of civil material

Table 7.1

Material	*Required further processing prior to weaponisation*
Uranium ore concentrate and other uranium compounds	Conversion, enrichment, HEU conversion All stages of the nuclear fuel cycle required
Natural uranium hexafluoride (UF6)	Enrichment, HEU conversion Removes the need for uranium conversion facilities
Low enriched UF6	Enrichment, HEU conversion As for natural uranium, but requires only 20% of the enrichment capacity and therefore much smaller enrichment cascades
Unirradiated commercial nuclear fuel assemblies	Nuclear reactor, reprocessing, Pu conversion Requires the operation of a nuclear reactor, fuel storage and handling facilities and reprocessing or hot cell facilities
Irradiated commercial nuclear fuel assemblies	Fuel storage, reprocessing Pu conversion Removes the need for a reactor, but still requires reprocessing or hot cell facilities
Separated plutonium (commercial grade)	Pu conversion Commercial separated Pu is usually stored as oxide and needs to be converted to the metallic form In addition commercial fuel will typically have less than 85% Pu-239 that makes building a viable nuclear device extremely difficult and most likely impossible for a clandestine weapons programme
Unirradiated HEU research reactor	Extraction/conversion to HEU metal Depending on the actual enrichment of the fuel, conversion and enrichment may also be required Very high enrichment unirradiated HEU fuel is probably the most desirable form to obtain; however there is now a global move for all research reactors to operate on low enriched fuel

necessarily become more rigorous with more attractive material, the principle of timeliness sees to that. It should also be noted that with the plutonium route for the acquisition of a nuclear device, the radioactive nature of spent nuclear fuel provides significant barriers in itself to both handling and processing.

Misuse of civil nuclear facilities

Another possible scenario to consider is the misuse of civil nuclear facilities. This means that the civil facilities could be used covertly to process or produce nuclear material that exists outside of the civil fuel cycle. The operators would therefore have to hide such processing from the IAEA inspectors. Naturally such a scenario needs the full complicity of the facility operators and would therefore most likely be a state-sponsored undertaking. It does not seem credible that a sub-state operator would be able to deal directly with civil nuclear facility operators who by and large retain some links back to state authorities.

A good example of possible misuse may be the employment of a declared centrifuge enrichment facility to produce HEU secretly. This is not a simple problem and would require one of several possible actions on behalf of the operator. These could include the reconfiguration of cascade pipework, the re-feed of material through existing cascades or even the installation of completely clandestine cascades. Each of these described actions would not be without considerable risk of detection, particularly where the IAEA was operating inside a state signed up to the Additional Protocol. One tool that is particularly good for the IAEA in terms of detecting the illicit production of HEU at enrichment facilities is environmental sampling and analysis. Analysis of swipe samples taken from inside, and to some extent outside, enrichment cascade halls is particularly efficient at detecting any production of HEU.

Another classic case of misuse may be the clandestine irradiation of fertile targets inside a civil power or research reactor. The IAEA takes this possibility very seriously and has developed various strategies to counteract it. It is also the case that modern nuclear reactors are finely engineered to such an extent that little space actually exists for the insertion of fertile targets. Even if this were achieved at any significant level, say at the expense of fuel rods, then the equilibrium operation of the reactor would be considerably affected and such changes should be detectable by IAEA inspectors.

Clandestine fuel cycles

Probably the scenario of most concern would be the existence of a clandestine fuel cycle in a rogue state. This may prove a route for the terrorist acquisition of nuclear materials or, in an extreme scenario, a complete device. There has been much international speculation regarding North Korea's nuclear trade links over the past decades with various other states, and it is maybe only one step further for Pyongyang to consider dealing with terrorist groups. The detection of such trade would not really be considered a matter for the IAEA, but more something

that would be a subject of interest to the intelligence services of the main world powers.

There have of course now been several examples of clandestine weapons programmes in the past two decades, some of which have had more technical success than others and some of which have avoided detection better than others. Nonetheless, it is clear that the outside world and the UN through IAEA are now much more vigilant to the possibilities of clandestine nuclear programmes, and the detection of such programmes is now a priority. In some ways the recent issues with Iran highlights this heightened state of vigilance.

There is very little real evidence openly available to support the existence of a clandestine Iranian nuclear weapons programme. However there is a large amount of suspicion abroad and this, coupled to some limited contraventions of its safeguards obligations by Iran, has led to the current situation. In some ways the early detection and addressing of the possible existence of clandestine programmes does not lend itself to a clear resolution of the issue. Ultimately it is much easier to deal with a well-developed programme, where clear evidence of the existence of clandestine facilities and materials actually exists.

So the question remains, in the current political climate, is it possible for a completely clandestine weapons programme to exist without detection? Of course it would never be possible to give 100 per cent assurances to that question, but the experiences of the past 20 years must give strong credence to the assertion that it is unlikely that such a programme could completely evade detection at the current time.

Clandestine sub-state operator/terrorist fuel cycles

Setting aside issues relating to the detection of a clandestine terrorist nuclear facility, it does seem extremely unlikely that a terrorist organisation would be able to construct and operate a nuclear facility of any degree of size or complexity. Initially there would be huge problems surrounding the recruitment of sufficient numbers of technical specialists to design the facility, coupled with difficulties surrounding the design and procurement of all the necessary plant and equipment. Then there would be the issue of how such a facility could be constructed and subsequently operated without fear of detection.

It may be conceivable that small-scale laboratory facilities could be built and operated, and indeed this has been seen with terrorist groups (e.g. Aum) looking at the development of chemical weapons. However, nuclear facilities demand a much higher degree of safety standards/precautions than conventional laboratory facilities, particularly if the operator is keen to protect his limited team of trained specialists and to avoid detection of the facility itself. Modern techniques for detecting and identifying the smallest amounts of nuclear materials make it extremely difficult for a facility processing nuclear material not to emit some kind of signature into the environment.

It is often said that terrorists or clandestine proliferators would not be too concerned over the safety and health of their workers. However, in some cases at

least nothing could be further from the truth. If the terrorist only has a few people with the required technical knowledge, such people would be indispensable and irreplaceable within his operation.

IAEA activities related to the prevention of nuclear terrorism

The IAEA has been actively involved in the promotion of a number of initiatives in the areas relating to the prevention of nuclear terrorism and the detection of illicit trafficking of nuclear material. The IAEA considers that prevention is the first line of defence against nuclear terrorism. As such 'prevention' can include measures to protect radioactive materials against loss or theft, illegal possession or smuggling. It can also mean measures to ensure that nuclear facilities and nuclear transport activities are protected against sabotage and other malicious acts. At all times the aim is to guard against any activity that could result in radiation exposure to the public or the environment.

In terms of nuclear security, whilst still unambiguously the prerogative of the state, the IAEA has initiated a Nuclear Security Series of Documents to provide a coherent and integral framework for nuclear security, and also oversees a number of international legal instruments relevant to enhancing nuclear security. These include the following documents.

Convention on the Physical Protection of Nuclear Material (CPPNM)

The CPPNM was signed on 3 March 1980 and exists as IAEA document INFCIRC/274 (2007). The Convention is the only international legally binding undertaking in the area of physical protection of nuclear material. It establishes measures related to the prevention, detection and punishment of offences relating to nuclear material. In July 2005 a strengthened Convention was drafted. The amended Convention makes it legally binding on states to protect nuclear facilities and material in peaceful domestic use and storage as well as material in transit. It also provides for expanded cooperation between and among states regarding rapid measures to locate and recover stolen or smuggled nuclear material, to mitigate any consequences of sabotage and to prevent and combat related offences. However, the strengthened Convention has yet to come into force as it still awaits the required ratification by two-thirds of the states parties of the Convention.

International Physical Protection Advisory Service (IPPAS)

With the help of IPPAS missions, the IAEA assists member states to strengthen and enhance the effectiveness of their physical protection of nuclear materials and facilities. IPPAS missions are voluntarily requested by member states and can be conducted on a nationwide basis or be facility specific. During the IPPAS

mission, the state's physical protection system is reviewed and compared with the international guidelines, namely INFCIRC/225/Rev.4 (2007) and internationally recognised best practice. Based on this review, recommendations for improvements are provided in a report to the member state, including recommendations for follow-up activities and assistance. Following the recommendations from IPPAS missions, actual upgrades of physical protection systems have been initiated in several member states.

International Nuclear Security Advisory Service (INSServ)

An integral part of INSServ is the evaluation of a state's capabilities to combat illicit trafficking in nuclear and other radioactive materials. To assist in this regard, the IAEA conducts periodic evaluation missions to assess the capabilities at a state's borders to detect and respond to illicit trafficking in nuclear and other radioactive materials. Education and training are fundamental to the IAEA's activities in this area and a three-tier training strategy has been implemented. The strategy involves regional awareness seminars in the combating of illicit trafficking, regionally focused training on methodologies and practices to detect nuclear and other radioactive materials in illicit trafficking and finally specific training in using detection equipment. Again, participation in this initiative is voluntary on the part of any state.

Illicit Trafficking Database (ITDB)

In the field of detection of illicit trafficking, the IAEA offers evaluation and advisory services, education and training, new and improved methodologies, and technical advice and support to a requesting member state. In a limited number of cases, and to a limited extent, the IAEA will actually provide states with equipment for the detection of smuggled radioactive substances at its borders. This is usually achieved through the development of nuclear security and technical cooperation programmes. The IAEA has already established a small Nuclear Security Equipment Laboratory (NSEL) at its Vienna headquarters and work is ongoing on the implementation of the Co-ordinated Research Project (CRP) – 'Improvement of Technical Measures to Detect and Respond to Illicit Trafficking of Nuclear and other Radioactive Materials'.

The IAEA has also developed an Illicit Trafficking Database (ITDB), which as of 31 December 2005 had signed up 89 participating member states, and contained records of some 827 confirmed incidents reported by the participating states. On a number of occasions the Database has also received notifications from non-participating states. Of the 827 confirmed incidents, 226 involved nuclear materials, 510 involved other radioactive materials (mainly sources), 25 involved both nuclear and other radioactive materials, 56 involved radioactively contaminated materials and ten involved other materials. In 2003–2005, the number of incidents reported was higher than in previous years. This increase is not actually seen as indicative of a global increase in illicit nuclear trafficking,

but more as a reflection of the improved reporting measures now in place as a result of the ITDB. Analysis of the incidents reported in 2003–2005 has shown that the majority actually showed no evidence of criminal activity.

Nuclear materials and the 'dirty bomb'

The remaining issue to address in this chapter is the use of nuclear materials in a 'dirty bomb'. Activities surrounding contamination with polonium-210 in the UK in late 2006 highlight how a small amount of nuclear material can easily cause widespread public health issues and attract worldwide publicity. As already described, materials such as caesium-137, cobalt-60 or even polonium-210 are not covered by international nuclear safeguards treaties and controls rely on a state's own internal legislation. The purpose of this section is to describe how materials from the nuclear fuel cycle may fit into the realm of the dirty bomb.

A dirty bomb would involve the detonation of a device resulting in the dispersion of the radioactive material involved into the environment, thus causing widespread disruption to the civilian population along with the inherent risks of exposure to radioactive materials. The main problem to be solved by the maker of a dirty bomb is how to effect the best possible dispersal of the material. Similar issues would have to be confronted by terrorists intent on causing disruption through the use of chemical or biological agents. It can be foreseen that even the dispersal of a small amount of relatively low grade radioactive material could have wide ranging consequences for a modern society, even if the medical risks of exposure were deemed to be very low.

Much has been written about Gulf War syndrome and the possible links of exposure to the depleted uranium in conventional armaments during the Gulf War. Such effects are very difficult to quantify and the possible effects will always leave doubt in the minds of those affected. Similarly, some restrictions imposed following the Chernobyl reactor accident in 1986 are still in place in some locations in the UK, again highlighting how a small amount of contamination can have far reaching consequences.

In several respects many of the materials currently employed in the civil nuclear fuel cycle are not immediately attractive to a would-be terrorist. First, they are well controlled under international and national inspection and security regimes, and second many of them are actually not all that radioactive. It is really only after material has been irradiated in a nuclear reactor that it becomes attractive for the purposes of a dirty bomb. What should perhaps be of most concern in terms of dirty bombs is nuclear waste and its possible acquisition by terrorist groups. In many cases the material has high specific activity for a given volume and may in some cases be in a powder form that would make it suitable for easy dispersion.

In conclusion it must be said that the acquisition of nuclear materials or nuclear waste for use in a dirty bomb would be the difficult option for a terrorist to take. Acquisition of other nuclear materials, most probably in some form of radioactive source material, must be seen as a far easier option.

Conclusions

In the current political climate of concerns over global warming and demands for 'greener' sources of energy (which have gone full circle), it is inevitable that a renaissance in the use of nuclear energy will be seen in the twenty-first century, including its use in many countries with hitherto no nuclear power programme. Such a spread of nuclear technology will only serve to heighten international concerns over the control of nuclear materials and nuclear technology. It is likely that any new designs for nuclear reactors will have to prove their 'proliferation resistance' before being accepted for widespread use.

Over the past 15 years the international safeguards regime has adapted to meet challenges presented by the evolving political climate and is now in a strong position to move forward and implement its strengthened and refocused safeguards system. The IAEA system is now concentrated at the state rather than the facility level and is much more flexible than in the past, allowing for resources to be concentrated on areas of most concern. The focus in the years immediately ahead must be to encourage universal implementation of the Additional Protocol. Concerns will undoubtedly persist as to the possible existence of clandestine nuclear weapons programmes in rogue states, but it must be recognised that the IAEA safeguards system is now extremely well placed to meet these challenges going forward.

Export controls will continue to be an important aspect of the non-proliferation regime. The recent uncovering of the A.Q. Khan network has highlighted inadequacies in the current systems. It has also shown that there is a need for greater monitoring of global nuclear-related trade and for improved cooperation and the sharing of information.

The IAEA, while remaining the cornerstone of the world nuclear safeguards regime, must also be seen as having a positive role to play in the prevention of nuclear terrorism. This may not be in terms of effecting change within the larger and more developed states of the world where security is seen as a solely national prerogative and intrusive international regulation is not welcomed. However, the IAEA can be seen as having a positive role to play in developing, implementing and assessing systems in smaller developing countries, particularly those in the early stages of embracing nuclear technology.

Note

1 ElBaradei (2002).

References

ElBaradei, Mohammed (IAEA Director General) (2002) *Washington Post*, October.

INFCIRC/153 (2007) Online, available at: f40.iaea.org/worldatom/Documents/Infcircs/Others/inf153.shtml (accessed 2007).

INFCIRC/209 (2007) Online, available at: f40.iaea.org/worldatom/infcircss/inf209.html (accessed 2007).

INFCIRC/225 Rev. 4 (2007) Online, available at: f40.iaea.org/worldatom/program/protection/inf225rev4/rev4_content.html (accessed 2007).
INFCIRC/254 (2007) Online, available at: f40.iaea.org/worldatom/infcircss/inf254.html (accessed 2007).
INFCIRC/274 (2007) Online, available at: f40.iaea.org/worldatom/Documents/Infcircs/Others/inf274r1.shtml (accessed 2007).
INFCIRC/540 (2007) Online, available at: f40.iaea.org/worldatom/infcircss/infcirc540.pdf (accessed 2007).
Statute of IAEA (2007) Online, available at: ola.iaea.org/OLA/statute/index.asp (accessed 2007).

8 Arms control, game theory and the twenty-first century

D. Marc Kilgour

Introduction

Although its roots can be traced much further back, arms control did not become a major issue in international politics until the 1960s. But in the aftermath of the Cuban Missile Crisis, when it seemed that nuclear war had been narrowly averted, arms control became a very appealing idea. Arms control proposals that the superpowers could agree on started to appear, supporting organisations and structures became established, and inspection procedures developed. Cynics did not fail to note, however, that almost equal effort went into figuring out how to circumvent arms control, or undermine it. As later developments in the Cold War made clear, the success or failure of arms control is determined by the decisions of the participants, and these decisions reflect their values and motivations. Precisely because of these features, the academic study of arms control came to rely on game theory.

But by the turn of the millennium the Cold War was over, and commentators were proclaiming the death of arms control. Some hard-won arms control agreements, like the Treaty on Conventional Forces in Europe (CFE Treaty) became meaningless, simply falling by the wayside. Others, like the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), were still seen as important, but were surrounded by doubts, as states parties either ignored their treaty obligations or carried them out half-heartedly. The era that replaced the Cold War has given prominence to different issues and new risks, and it now seems to us that the problems of the twenty-first century, such as terrorism and global environmental change, are at least as threatening as the Cold War ever was. Is arms control still relevant? Can game theory make it more so?

In the first part of this chapter, I will review the application of game theory to arms control and related issues during the Cold War, and to summarise a few of the lessons learned from these studies. Then some new international security problems will be discussed, and the extent to which arms control applies to them will be assessed. Finally, some new directions for future research will be charted out. I will focus on whether arms control ideas can be adapted to help solve new problems, and consider whether the discoveries of the past can be adapted to help us face the future.

History: game-theoretic analysis of arms control, 1965–95

In the 1960s, it became clear that game theory is the natural tool for the study of arms control decisions. The non-cooperative branch of game theory can be defined as a set of principles and procedures for the modelling and analysis of interacting decisions by rational decision makers; the term 'rational' means that decisions serve the decision maker's own interests as much as possible. The recognition that game theory could be applied to such a politically important matter as arms control gave rise to much research, some of which even led to important advances in game theory itself. Another significant outcome was, of course, the accumulation of evidence that some practical arms control questions had game-theoretic answers.

The 'golden era' of game-theoretic research on arms control is summarised by Avenhaus *et al.* (1996, 2002).[1] Roughly, there were three phases, each characterised by research on a particular issue that is associated with a particular treaty or set of treaties. In the first phase (1960s), the focus was the Partial Test Ban Treaty (PTBT), which motivated several prominent game theorists to study strategic behaviour under incomplete information.[2] In the second phase (1970s), the difficulties faced by the IAEA as it implemented its principle of *material accounting* in inspections under the NPT led Rudolf Avenhaus and his colleagues to find ways to link statistics and game theory.[3] The fact that treaties like CFE and Intermediate Nuclear Forces (INF) treaty had multiple parties or multiple sites was recognised to affect significantly the strategies of parties to an arms control agreement, and motivated research in the concluding phase (1980s and 1990s) of this golden era.[4]

Some of the themes that arose during these studies will be mentioned below in connection with the problems of the twenty-first century. First, Avenhaus *et al.* (1991a) gave special attention to *timeliness*, the idea that it is important not just to detect violations but to detect them as early as possible. Second, statistical analyses led naturally to a focus on inspection *effectiveness*, which in this context meant finding inspection strategies that support the strongest possible conclusions (in a statistical sense). Third, the effects of different operating procedures (inspection protocols) were identified, especially with the principle of inspector leadership (Avenhaus *et al.* 1991b).

The class of arms-control game models was recently generalised to the class of inspection games in the *Encyclopedia of Game Theory and Applications*.[5] This distinct category consists of game models that take a broad view of the inspection process, and include not only arms control but also accounting and auditing, environmental control and law enforcement. This viewpoint facilitates the organisation of knowledge not only about behaviour in inspection systems, but also about how the systems themselves can be structured so as to shape behaviour as desired. It also encourages a more comprehensive view of the inspection process which, it is argued below, is sorely needed. Inspection games are natural models for enforcement of rules (laws, regulations or proscriptions on behaviour) by right of inspection. As such, they are almost always essential

to the maintenance of institutions, and even more often to the initiation of new institutions or the adjustment of old ones. The too-little-appreciated relevance of inspection games is the main conclusion of this chapter.

Inspection: motivations and behaviour

We illustrate how game theory is relevant to the understanding of inspection using two very simple game models. The first considers a basic problem of arms control as usually implemented, namely how to allocate a limited number of inspections over inspectable objects, called 'sites'. We will assume that there are two decision makers, Inspector and Inspectee, and that both are rational. We will further assume that Inspectee prefers to violate, but only if the violation is not detected. Since there is an allocation problem for inspections, there must be more sites than inspections.

Consider the simple two-person non-cooperative game shown in the upper part of Table 8.1. One player, Inspector, must choose to inspect either site 1 or site 2; the other player, Inspectee, can violate at either site, both or neither. This game captures some crucial aspects of arms control – how inspections should rationally be allocated and, more generally, whether violations can rationally be deterred. Note that our assumptions that Inspectee prefers an undetected violation to the status quo, and the status quo to a detected violation imply that it is possible to deter violation – if the risk of detection is high enough. We assume that Inspector prefers to detect violations, and receives a bonus, relative to the status quo, for doing so. Another feature of this model is that undetected violations at the two sites can have different values to the players, though both must have positive value for Inspectee and negative value for Inspector. Table 8.1 includes the assumption that inspection is *perfect* in the sense that any violation at an inspected site will be detected for certain.

To add more detail, some symbols are needed. Let the value (utility) of the *detection* outcome be $-P$ to Inspectee and B to Inspector. Suppose that the value

Table 8.1 Site Selection Game (2, 1)

Inspectee	*Inspector*	
	Search 1	*Search 2*
Comply	Status quo	Status quo
Violate 1	Detection	Undetected violation at 1
Violate 2	Undetected violation at 2	Detection
Violate Both	Detection	Detection
	e, 0	e, 0
	$-P$, B	v_1+e, $-w_1$
	v_2+e, $-w_2$	$-P$, B
	$-P$, B	$-P$, B

Source: Adapted from Kilgour (1992).

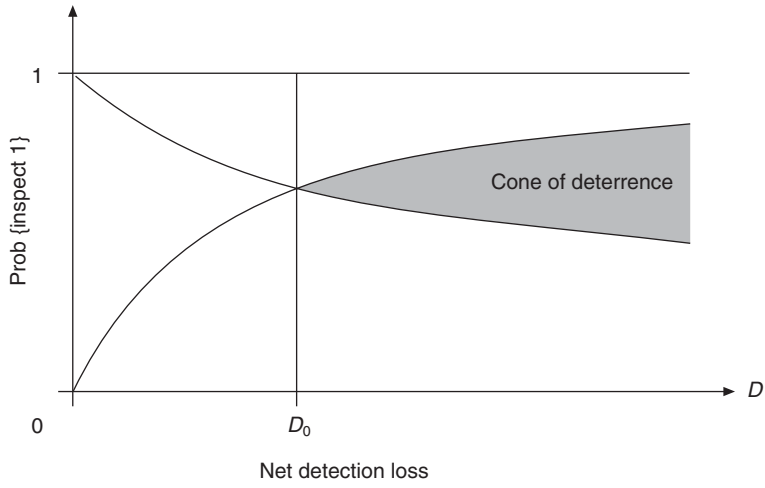

Figure 8.1 Deterring violations in Site Selection Game (2, 1).

of an undetected violation at site I is v_i to Inspectee and $-w_i$ to Inspector, and that Inspectee receives a 'positive publicity' bonus of e whenever there is a clean inspection. Note that if there is a detected violation, the penalty to Inspectee and the bonus to Inspector do not depend on the site where the violation occurred.[6] The problem can be reduced to the 4×2 bimatrix game shown in the lower part of Table 8.1; in each cell, the payoff (utility) to Inspectee is shown first, then the payoff to Inspector.

One important aspect of the solution of this game, which is discussed in Kilgour (1992), is shown in Figure 8.1. Define Inspectee's *net detection cost* to be $D = P + e$.[7] Violations can be deterred if, and only if, the value of D exceeds the *critical value* D_0, which is $D_0 = \sqrt{v_1 v_2}$. If $D \geq 0$, Inspector's probability of inspecting site 1 need only lie between the two bounds shown in the figure to make Inspectee prefer to comply, rather than to violate and risk detection.[8] But if the value of D falls below the threshold D_0, violations cannot be deterred, although a judicious choice of inspection probabilities can minimise Inspector's losses. More generally, analysis of models larger than the one of Table 8.1 suggests optimal allocations of inspections, but also answers the important 'treaty design' question: how severe a punishment is required to deter violation?

As is clear from Table 8.1, the Site Selection Game incorporates the assumption that Inspector *will* inspect a site – in this case, one of the two sites.[9] This model of inspection is in fact quite specific to arms control, because in arms control an inspector, typically a national or international inspection agency, is committed to inspect. This is not to say that inspections are costless; rather, Inspector's costs for inspections are *sunk* in the sense that they have already been paid, and are incorporated into Inspector's values. But if Inspector represents, say, an agency enforcing an environmental regulation, the situation is very different.[10] When inspections have a direct cost that must be paid by the

Table 8.2 Basic Inspection Game

Inspectee	*Inspector*	
	Accept	*Inspect*
Comply	Status quo	Status quo
Violate	Undetected violation	Detection
	0, 0	$e, -c$
	$v, -w$	$-P, B-c$

inspector, then whether to inspect, or more generally the amount of inspection, is an important decision by the inspector itself. When budgets are limited, the cost of carrying out one more inspection may be significant. To show that costly inspections are bound to have significant consequences, we consider the Basic Inspection Game model shown in Table 8.2.

The Basic Inspection Game is very general. It is even simpler than the Site Selection Game of Table 8.1 because there is only one 'site', where Inspectee chooses to comply or violate. Meanwhile, Inspector chooses whether to inspect or not, referred to here as 'accept'. There is a new symbol, c, representing the amount Inspector must pay in order to inspect. In other words, the cost of inspection is an immediate issue for Inspector, who must decide whether to pay it in hopes of 'catching' a violation, or avoid it in hopes of not missing one.

It is clear from the literature that many authors have been aware of the properties of the Basic Inspection Game, but the feature of game-theoretically optimal behaviour illustrated in Figure 8.2 may never have been discussed

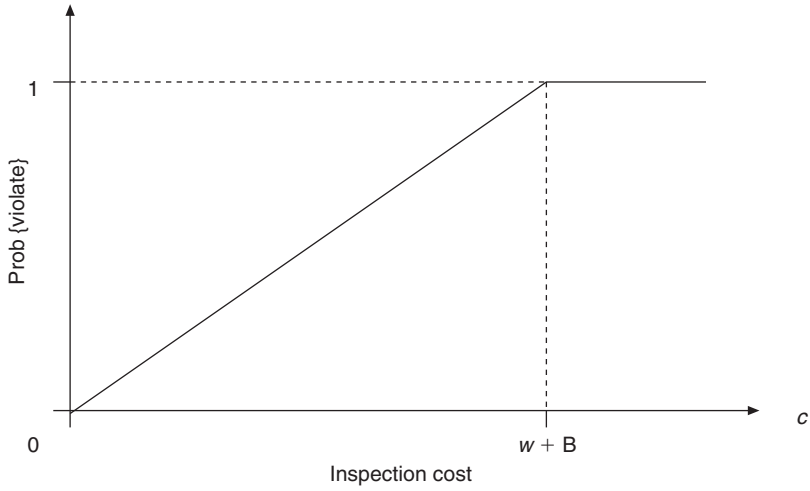

Figure 8.2 Violation probability in Basic Inspection Game.

explicitly before. It can be seen as rather alarming, in that violation is impossible to deter completely whenever inspection cost is positive. Even if you keep the cost of inspection down, and no matter how small the incentive to violate, Inspectee will violate sometimes. If the cost of inspection is very high, Inspectee will violate all the time; in fact, Inspector will prefer to accept even when it is certain that Inspectee is not in compliance. A strategic explanation of why positive costs imply that it is never possible to deter violation is that the situation in which Inspector inspects so often that Inspectee prefers never to violate cannot be stable. For if the inspection frequency were to be reduced slightly, costs would be reduced without inducing any violations. Thus, inspection cost matters, and Inspector's motivation to reduce costs means that we inevitably face a certain frequency of violation.[11]

Including inspection costs means that the issue of inspection effectiveness is overtaken by the issue of inspection efficiency. A measure of the success of an inspection system is the extent to which violation is deterred or minimised, relative to the cost of inspection. In the simple game of Table 8.2, this measure is the frequency of compliance divided by the frequency of inspection, which is easily seen to drop to zero as the inspection cost c, approaches the threshold value $w+B$.

In summary, efficiency – defined as violation costs avoided versus inspection effort expended – is usually an issue in enforcement. It doesn't really apply in arms control, when inspection costs can usually be regarded as sunk. There are other contexts in which inspection costs are negligible, such as inspection by automatic monitoring equipment, and costless inspection is much easier to make effective (Kilgour 1994). But costly inspections are inevitably a part of most inspection processes, so efficiency is an objective that designers will have to face, and that we will return to later. But first, we explore why enforcement will become increasingly important in addressing twenty-first century problems.

The problems of the twenty-first century

The twenty-first century certainly has its share of problems. Two that seem particularly important in our era are global environmental change and terrorism. These two problems will be the focus here, partly because, as will be argued below, efficient inspection procedures are essential to address them. This is not to suggest that these are the only problems, or that inspection is irrelevant to the others, but only that these two problems provide clear illustrations of the importance of inspection in the immediate future.

In fact, inspection is an essential component of any effort to establish new institutions – self-sustaining systems or patterns of behaviour – which we will surely have to do to ensure success. To change our situation, of course, new rules that we create, or new laws that we pass, must be enforced, and enforcement requires that behaviour be monitored, assessed and – if found to be violation of the rules – punished. Of course, this implies that all of the obvious issues about authority, evidence and judicial decision making have to be faced. But

here we are concerned only with inspection, without which most new rules will not be effective. Moreover, the required inspection is likely to be costly and, as noted above, costly inspection is more difficult to make successful.

To address climate change, for example, dramatic long-term reductions in greenhouse gas emissions are required, and probably cannot be achieved without a worldwide *cap-and-trade* system, as in the Kyoto Protocol. Emitters, which may be industries or countries, are assigned an emissions quota, or cap. Actual emissions are measured and made public, and every emitter's performance is measured relative to the appropriate cap. Emitters whose emissions fall below their cap can sell the unused 'cap room' in some public market; emitters whose emissions are too great must purchase cap room from others. There is evidence that this cap-and-trade system works; for example, it has reduced sulphur dioxide (SO_2) emissions in the USA. But 'the SO_2 market isn't remotely laissez-faire: regulators demand a steady decrease of emissions over time, and transactions are regulated down to small details and vigorously enforced' (Bell 2005).

The principal cap under the Kyoto Protocol would be on carbon dioxide (CO_2) emissions. To work, of course, a cap would entail a threat of punishment that would motivate the more extreme emitters to trade. A worldwide CO_2 cap-and-trade system would require not just markets for trading quotas, but also reliable CO_2 watchdogs, who would need not only resources and equipment for measurement and evidence gathering, but also procedures, rules and the ability to punish. A complicating issue is that many countries that are prime candidates for emission reductions seem to lack reputations for reliable and disinterested law enforcement. So if our environment cannot be made liveable without enforcement of emissions quotas, there is much work to be done to establish appropriate behavioural norms. Such new norms will probably include a 'polluter pays' principle – for example, including in the price of any activity causing carbon emission to the atmosphere the cost of returning an equal or greater amount to the earth.

Another major issue of our time is our vulnerability to terrorism, which can be defined as politically motivated violence against non-combatants and their property. Of course, our ability to enforce rules will be an enormous help in reducing the risk of losses due to terrorism. Border security and passenger screening are two obvious examples. But this presentation will focus on another objective, one that has not had as much emphasis as it deserves. In an age of terror, the need to maintain control of dangerous materials is particularly important. Materials that might explode or contaminate if misused are a particular point of vulnerability in advanced societies; the terrorist does not need to import secretly what is already at hand.

Examples of such risky materials abound in the chemical and biochemical industries. At least in principle, no chemical weapons are being manufactured anywhere in the world, but there is a huge civilian sector making and trading so-called precursors, which are relatively easy to turn into weapons.[12] For some chemicals, industry has strong economic incentives to careful husbandry of materials. But other chemicals may be so cheap that only with specific measures

and great care can we deny access to terrorists. The fertiliser and diesel fuel recipe is very well known. Moreover, it is possible, though far from certain, that there are material control issues related to terrorist access to biological weapons.

Another area in which enforcement is vitally important is the safeguarding of nuclear and other materials, which would pose grave public danger in the hands of terrorists. In this chapter, the security of nuclear materials held by militaries will not be addressed; instead, the focus will be on the nuclear power industry, a potential source of radioactive materials ranging from the somewhat dangerous to the unquestionably lethal. Nuclear waste, in fact, constitutes both an environmental and a security risk. In the absence of techniques for permanent disposal, it must be sealed and stored well away from the human environment for many years to allow the radioactivity to attenuate. The security dimension of nuclear waste includes not only its deliberate release, as an act of war and terrorism, but also its inadvertent release, as a consequence of careless or incompetent storage and handling.

A release of radioactive materials from a nuclear reactor could contaminate a wide area, thereby giving rise to a second set of security risks associated with the nuclear power industry. Security of power plants against acts of war or terrorism is crucial because a conventional bomb could turn a nuclear facility into a radiation weapon. Theft of nuclear materials is a related problem, since even if they are not used for bomb making – a difficult technical challenge – they may lead to contamination in the vicinity of the facility or, if transport is available, far from it. So far, much of the public seems rather blasé about these risks, which is surprising because – as Three Mile Island in 1979 and Chernobyl in 1986 demonstrated – people are very edgy about large-scale radioactive pollution.

Nuclear power is already a mature industry in many parts of the globe, so its problems have a huge scope.[13] Electricity is now generated in approximately 440 commercial nuclear power plants, which together account for about 16 per cent of the earth's electricity supply, and about 7 per cent of all energy consumed. While some countries do not use nuclear power or are phasing it out, others rely on it: in France, 78 per cent of electricity is generated at 58 nuclear plants; in the USA, 20 per cent of electricity comes from over 100 nuclear plants; in Canada, about 15 per cent of electricity comes from 18 facilities.

The first commercial nuclear power station opened in Cumbria, England, in 1956. Worldwide, about 550 nuclear plants came into operation prior to 2005, and about 110 of them have already been phased out. Currently, 80 per cent of operating power reactors (representing 80 per cent of total generating capacity) are more than 15 years old. New nuclear power generation capacity is being built, though at a much lower rate than 10 or 20 years ago. Perhaps the most notable exception is India, which currently has 16 reactors and proposes at least 30 more, including seven already under construction.

For economic reasons, nuclear power generation is probably here to stay. But, as argued above, nuclear power provides many opportunities for terrorism, not just because it requires fissionable material that might be used for a nuclear explosion or a radiation bomb, but also because widespread contamination

would follow an explosion at a site where radioactive material is stored. Unless it maintains tight control of its nuclear materials, a society that depends on nuclear power is vulnerable to terrorism.

In fact, a substantial fraction of the cost of nuclear power is already attributable to safety and security. Security of nuclear materials come from the following three sources:

- national nuclear regulatory agencies, the 'health and safety' arms of national governments, which are typically charged with ensuring the safety of citizens, and with promoting the domestic nuclear industry;
- the International Atomic Energy Agency (IAEA), which has the right to inspect and practise *material accountancy* on the domestic nuclear industries of all declared non-nuclear states party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT);
- the nuclear power station operator itself, which has economic and business incentives to maintain control of their own operations, and to keep track of expensive materials.

Despite these sources of security, there are reasons for concern. The IAEA has no authority to carry out material accountancy or any other form of inspection of nuclear facilities and operations, within declared nuclear weapons states (except by *ad hoc* arrangement) nor, of course, within states not party to the NPT. Finally, there is a tension between a reactor operator's need to make a profit and the costs of avoiding security lapses that terrorists could exploit. Perhaps operators can be trusted to keep valuable materials secure, but this economic incentive is obviously lacking for radioactive waste and decommissioned facilities.

Why not simply require all civilian nuclear power industries to maintain tight control of power-generation facilities and dangerous materials? Of course, this would work if it were done reliably, but who would impose this requirement, and who would ensure compliance? As argued above, enforcement requires an institution for inspection, evidence gathering and assessment, judgement, and the threat of effective punishment. As suggested above, the economic incentives and the risks are not balanced, and terrorists can be expected to seek out the weakest link. True, countries in the developed world are typically very concerned to regulate their nuclear industries carefully, and they may already do so, but even these countries might value the extra security of an internationally mandated inspection system.

In summary, to address climate change, the threat of terrorism and other problems of the twenty-first century, will require a great deal of additional inspection in many forms. This inspection will support efforts to modify institutions in order to change behavioural norms, or simply to keep control of facilities and material that could be vulnerable to abuse. The remainder of this chapter is a brief summary of some of our knowledge of inspection processes, much of which has is derived from studies that aimed to improve the effectiveness of arms control.

Game theory, inspection and enforcement

We know surprisingly little about the strategic issues connected with the use of the threat of inspection to enforce a behavioural rule. We would like to make this inspection as efficient as possible, in the sense of (1) deterring violations of the rule, (2) minimising violations that cannot be deterred and (3) keeping inspection costs to a minimum. The analysis of simple models, such as the game of Table 8.2, and much practical experience, suggests that there can be a tension between the first two objectives and the third – if violations are inevitable, then they may be reduced by more inspection, at higher cost of course.

The game models of Tables 8.1 and 8.2 make many simplifying assumptions, one of which is *perfect inspection.* In the real world, inspections fall short of perfection in two ways, which can be taken to correspond to the Type I and Type II errors of statistics – a violation site may be inspected, but no violation found, and 'violation' may apparently be found at a site where there is compliance. The second of these errors is strategically important because inspecting and inspected sides have a common interest to avoid *false alarms*. In contrast, their interests regarding other events of the game – violations and their detection – are assumed (at least in such models) to be opposite; for example, the inspecting side prefers to detect violations, whereas the inspected side prefers that they be missed.

To provide some indication of the kind of studies that will throw light on the situation, and in particular give us some clues about how to structure inspection systems efficiently, we will now review and reinterpret an earlier study (Kilgour 1997) of whether, and when, an inspector will rationally make use of a costly, imperfect inspection. To indicate the change in focus, we call the side that might carry out an inspection the Agency, and the side that might be inspected the Subject. Of course, most of the simplifying assumptions in the game model of Table 8.2 remain. For example, there is only one way to violate, and there is no time dimension, so only one specific compliance or violation decision is under study. The analysis assumes that players know their payoffs, which may be true only later when actual choices become public knowledge.

In this set of models, Subject is a decision maker who has an obligation to obey a rule that it would prefer to break, but risks punishment if it does so. In all models, subject chooses Comply or Violate. In the simplest models, Agency's choice is whether to Accuse Subject or Accept Subject's behaviour (or claimed compliance). The resulting four outcomes are shown on the left-hand side of Table 8.3. The notation coincides with the game models of Tables 8.1 and 8.2 as much as possible; but note the new symbols here, $-F_S$ and $-F_A$, that represent Subject's and Agency's costs for a False Accusation.[14]

The models in Table 8.3 address Agency's decision to invoke a costly, imperfect inspection process, or not. Whether there is an inspection or not, one of the four outcomes of Table 8.3 must occur. If there was an inspection, the costs are c_S to Subject and c_A to Agency, so Subject's payoff (utility) is reduced by c_S and Agency's by c_A whenever an inspection occurs. If there is an inspection, Agency receives a signal which is either Green, indicating likely compliance, or Red,

Table 8.3 Possible outcomes of costly inspection enforcement games

Outcome	*Symbol*	*Subject (S)*	*Agency (AG)*	*Utilities with no inspection*	*Utilities with inspection*
Accepted compliance	(C, Ap)	Comply	Accept	(0, 0)	($-c_S$, $-c_A$)
False accusation	(C, As)	Comply	Accuse	($-F_S$, $-F_A$)	($-F_S - C_S$, $-F_A - C_A$)
Successful violation	(V, Ap)	Violate	Accept	(v, $-w$)	(v, $-c_S$, $-w - c_A$)
Apprehension	(V, As)	Violate	Accuse	($-P$, B)	($-P - c_S$, $-B - c_A$)

indicating likely violation. If Subject has complied, the inspection process transmits Red, i.e. makes an error, with probability α. If Subject has violated, the inspection process transmits Green, i.e. makes an error of a different type, with probability β. The error probabilities, α and β, are assumed small *but not zero*.

The extensive-form game models in Figures 8.3 and 8.4 represent several ways in which this enforcement system could be operated. They should be read downward; decisions are indicated by larger solid dots, end points by smaller solid dots and random events, or *chance nodes*, by open circles. A dotted line indicates that a player lacks the information to distinguish certain decision nodes, which in the usual terminology is that the decision nodes form an *information set*. In Model A, for instance, Agency (AG) does not know the choice already made by Subject (S) – Comply (C) or Violate (V) – at the time it must decide to Accept (Ap) or Accuse (As). The inspection process always results in Green (G) or Red (R), with probabilities reflecting whether there was compliance or violation has occurred. Payoffs (utilities) for the two players are listed below each terminal node, Subject's first, then Agency's. Other features of the game models will be described below.

The models of Figures 8.3 and 8.4 indicate some ways that have been suggested for an Agency to make use of a costly, imperfect inspection process with the objectives of enforcing a rule or regulation. Each one will be summarised in turn.

Model A: No inspection. Agency does not use the inspection system; its choice of Accept or Accuse is simply a guess based on its own, and Subject's payoffs. This model is included as a baseline – to be worth using, an inspection system should significantly improve on Model A.

Model B: Automatic. In this model (technically a one-person game, since Agency never has to make a choice), Agency automatically Accepts after a Green signal, and Accuses after a Red signal. Whether and how Agency could make this commitment is not addressed here; Model B is included to focus on what its consequences would be.

Model C: Inspect and decide. There is always an inspection, and then Agency must decide whether to Accept or Accuse. Note that Agency's decision can be different depending on the signal it receives but (as the dotted lines indicate) it

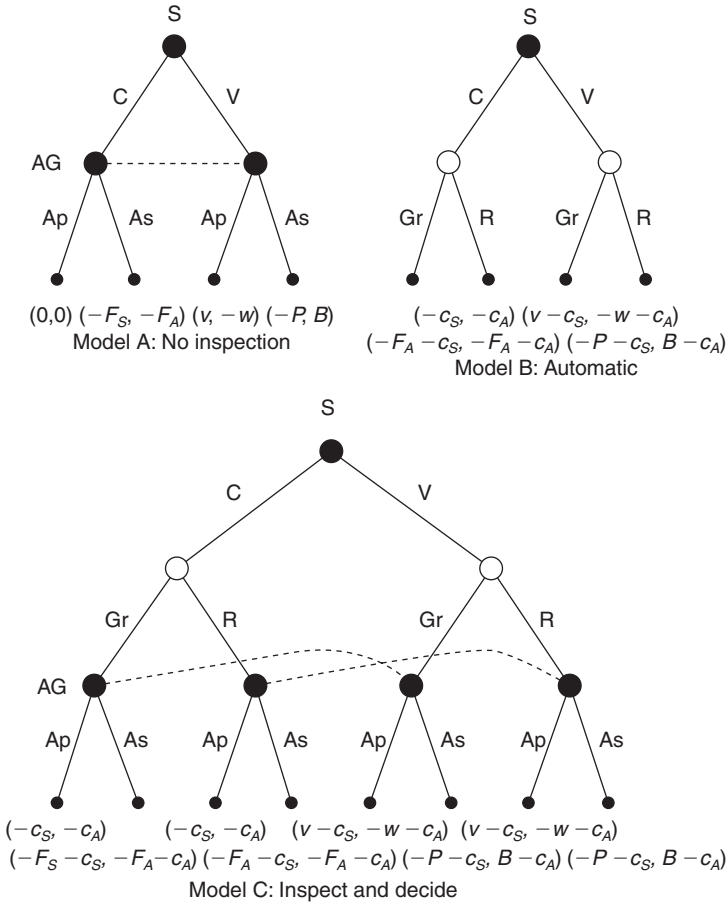

Figure 8.3 Three models of enforcement by inspection.

has not other information. Model C is the natural way to capitalise on inspection capability – always inspect, and then decide what to do based on as much information as possible.

Model D: Wittman Enforcement. This model is based on a suggestion of Wittman (1989). Agency first decides whether to Inspect, or simply to Accept or Accuse without inspection. If there is an inspection, Agency is committed to choose Accept if a Green signal is received, and Accuse if Red. A simple-minded analysis suggests the potential advantage of this approach – in Model D, many of the end points do not include the cost of inspection. This approach will be useful if it achieves a high level of compliance with a reduced reliance on inspection.

Model E: Rule of evidence. This model is based on a suggestion of Kilgour *et al*. (1992), based on analogy with principles of law – inspect first, and then, if there is evidence of a crime, Accuse if the evidence is 'sufficient'. In this simple context, Agency is committed to Accept if the inspection process returns

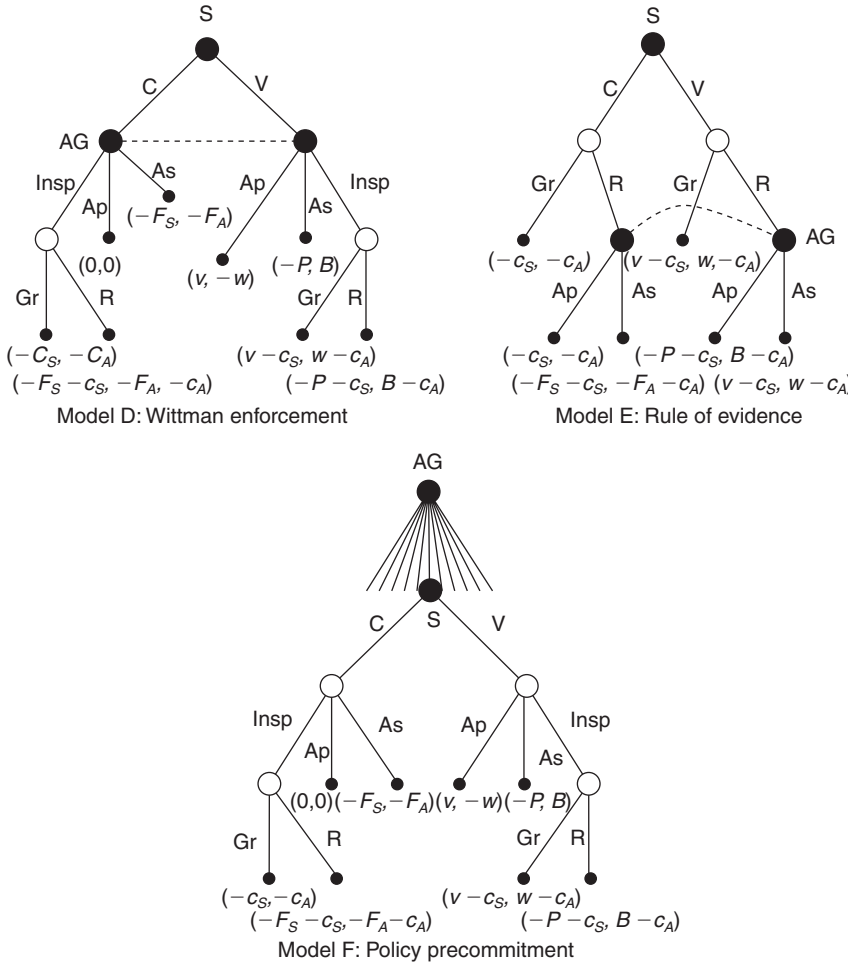

Figure 8.4 Three more models of enforcement by inspection.

a Green signal, whereas Agency must decide whether to Accept or Accuse if the signal is Red. It is obvious that this system is safe if the Green signal is 'safe'; i.e. if it is (almost) never received after a Violation. In the notation introduced above, β must be small.

Model F: Policy precommitment. This model is based on a study by Avenhaus *et al.* (1991b), and can be traced to an idea of Maschler (1966). Agency has a random device, which it uses to decide whether to Accept, Accuse or Inspect; after Inspection, it Accepts if a Green signal is received, and Accuses after a Red signal. In the first move in this game model, Agency sets the probability distribution that will govern the two Accept-Accuse-Inspect chance nodes. As previously, the model does not address how Agency could make a particular

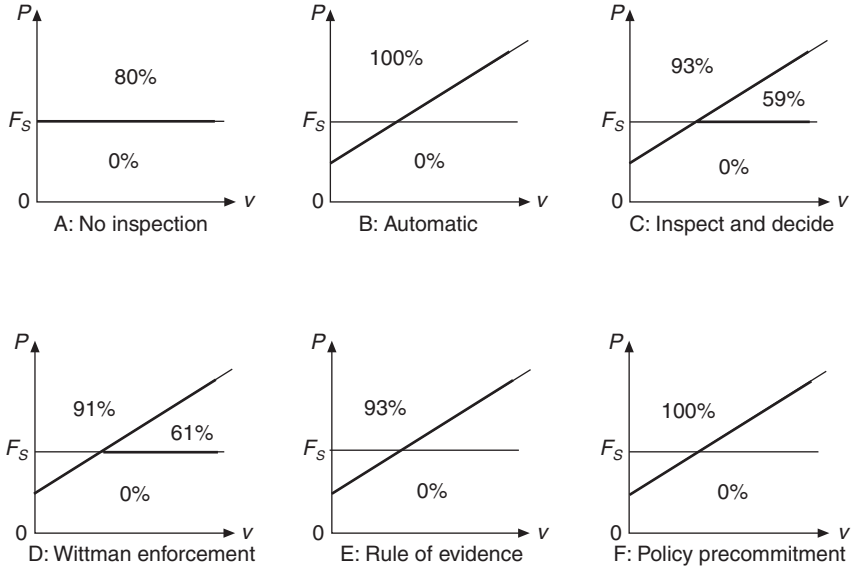

Figure 8.5 Compliance measures for models of enforcement by inspection.

announced probability distribution credible, it simply focuses on the consequences of such an announcement, and asks whether this model could effectively minimise violation.

One point of comparison among inspection models is the extent to which they induce compliance.[15] Even this is not a simple measure, but it can be well illustrated using an example. Figure 8.5 shows compliance frequencies as a function of Subject's gain for an undetected violation, v, Subject's loss for a detected violation, P, and the false accusation cost to Subject, F_S.

The example is defined by Agency's payoff parameters, namely Agency's False Accusation Cost is $F_A = 1.0$, Agency's Undetected Violation Loss is $w = 9.0$ and Agency's Detected Violation Bonus is $B = -4.0$. (The fact that this 'bonus' is negative means that Agency is highly motivated to deter all violations – its greatest utility comes from the status quo outcome, where there is compliance and acceptance.) The inspection system is characterised by a Type I error probability of $\alpha = 0.3$, a Type II error probability $\beta = 0.2$, and an Inspection Cost to Agency of $c_A = 0.1$. The results shown in Table 8.5 do not depend on the specific value of Inspection Cost to Subject, c_S.

The six separate diagrams in Figure 8.5 show that the Enforcement by Inspection models in Figures 8.3 and 8.4 are very different in their abilities to induce compliance. The upward sloping line appearing in most of the figures is a characteristic of the inspection system – its slope is an increasing function of β that approaches zero as β approaches zero; its intercept is an increasing function of both α and β that approaches zero as α approaches zero. Note that, at least according to the compliance criterion, there is a region where the inspection

system should not be used, namely below the sloping line and above the horizontal line at height F_S. Also, the only model that uses inspection and requires no precommitment, model C, is not very good at inducing compliance. The two models that score the best on this criterion, B and F, have the greatest precommitment requirement.

Of course, the ability to induce compliance is not the only criterion on which the models of enforcement by inspection can be judged. Another approach would be to compare these systems on grounds of costs; it was suggested above that models D and F would score well on this criterion, and generally they do. But to make a comparison on grounds of costs requires more assumptions, since the cost of additional inspections must be weighed against the cost of the violations that they may deter. For this reason, no such comparison is attempted here. Finally, these models cannot be compared on the third criterion suggested above, minimisation of violations that cannot be deterred, because they include only one way to violate, so there is no way to minimise in these models.

Conclusions

The theme of this chapter has been that many ideas about arms control, including some that were originally obtained by applying game theory, are still relevant to the twenty-first century. It was argued that enforcement by inspection is an inevitable issue if norms and standards of behaviour are to be modified, and human behaviour, and the norms which shape it, cannot remain the same if we are to address climate change. It is becoming very clear that limiting, and coping with, anthropogenic climate change will be the defining problem of the twenty-first century.

Another important problem of the twenty-first century is the need to reduce vulnerability to terrorism. The major issue, it was suggested, is simply making society less vulnerable to the terror tactic by maintaining tighter controls. In the context of critical materials, for example, the objective should be to make it as difficult as possible for terrorists to obtain from within a society the means to do harm. The nuclear power industry was discussed in detail, but the conclusions apply equally to counterterror measures in the chemical industry, and possibly to other controls such as travel and the purchase of sensitive materials. In all these cases, there are regulations to be enforced, and inspection must be part of the process.

Despite many simplifying assumptions, a few conclusions can be drawn from the idealised studies of enforcement by inspection, or the threat of inspection, described above. One is that costs are crucial – not only the amounts, but the party to whom they fall. Bearing the costs of inspection and enforcement, it was argued, produces behavioural incentives that tend to lead to less effective or less efficient enforcement. Similarly, there is plenty of evidence that the particular enforcement protocol, including the operating procedures of an inspector, has an important influence on the success of any enforcement process. But the main conclusion is that more analysis is needed, and a few specific research questions are suggested.

The twenty-first century will insist on certain social changes. It is not clear how these changes can be brought about most effectively, but enforcement is inevitably part of that process. Arms control may remain important, but lessons that were originally learned in the context of arms control will be crucial. It is natural to hope that, at the end of the twenty-first century, our descendents will have more opportunities for health and happiness than we do. If that is to be the case, we must teach ourselves to live with some restrictions. The aim of this chapter is to explore one important means to that end.

Notes

1 These works contain original references to the research described in the remainder of this paragraph.
2 Some of their work has been reprinted as Aumann and Maschler (1995).
3 The major reference for this work is Avenhaus (1986).
4 Some of this material appears in Avenhaus and Canty (1996).
5 The article is cited above as Avenhaus *et al.* (2002).
6 For simplicity, we assume that $P > 0$, $v_i > 0$ and $v_i > 0$ for $I = 1$ and 2, and $e \geq 0$. The value of B might be positive (if Inspector sees a positive value in detection) or negative (if Inspector aims to deter all violation). In any case, B and e are interpreted to be small in absolute value. Except possibly for B, all payoff symbols non-negative numbers; in fact, only e could equal zero.
7 Net detection cost represents Inspectee's net loss for violating and being detected, relative to the status quo. Note that it does not depend on the site of the violation.
8 The strategy of violating at both sites is never chosen because another strategy, namely compliance, always gives a preferred result. Technically, the strategy *Violate Both* is strictly dominated.
9 The *Violate Both* strategy would not be dominated if this assumption were to be dropped.
10 Kilgour (1994) is a study of the implications of costless inspection for enforcement.
11 This property has been noted by many, including Russell (1990), Tsebelis (1990), Kilgour and Brams (1992) and Kilgour *et al.* (1992).
12 For example, trhiodiglycol (TDG), an 'organic specialty chemical' with many civilian industrial uses, is also a 'dual-use' chemical. As demonstrated during the Iran–Iraq war, it is easy to convert TDG to mustard gas. The feasibility of worldwide monitoring of TDG was explored in Lundin (1991).
13 The data on nuclear power plants quoted below are from Wikipedia (2007) and National Energy Institute (2007).
14 For simplicity, the clean inspection bonus e has been fixed at zero henceforth.

References

Aumann, Robert J. and Michael B. Maschler with Richard E. Stearns (1995) *Repeated Games with Incomplete Information*, Cambridge, MA: MIT Press.

Avenhaus, Rudolf (1986) *Safeguards Systems Analysis,* New York: Plenum Press.

Avenhaus, Rudolf and Morton J. Canty (1996) *Compliance Quantified*, Cambridge, UK: Cambridge University Press.

Avenhaus, Rudolf and D. Marc Kilgour (2004) 'Efficient distributions of arms control inspection effort', *Naval Research Logistics*, 51, 1, 1–27.

Avenhaus, Rudolf, Morton J. Canty and Bernhard von Stengel (1991a) 'Sequential

aspects of nuclear safety: interim inspections of direct use material', in *Proceedings* of the American Nuclear Society Conference, Albuquerque, NM, 104–110.

Avenhaus, Rudolf, Akira Okada and Shmuel Zamir (1991b) 'Inspector leadership with incomplete information', in *Game Equilibrium Models* IV (Reinhart Selten, ed.), Berlin: Springer, 319–361.

Avenhaus, Rudolf, Bernhard von Stengel and Shmuel Zamir (2002) 'Inspection games', in *Handbook of Game Theory with Economic Applications* (Robert J. Aumann and Sergiu Hart, eds), Amsterdam, the Netherlands: Elsevier, III, 1947–1987.

Avenhaus, Rudolf, Morton J. Canty, D. Marc Kilgour, Bernhard von Stengel and Shmuel Zamir (1996) 'Inspection games in arms control', *European Journal of Operational Research,* 90, 383–394.

Bell, Ruth Greenspan (2005) 'No magic solutions: what is wrong with current plans to manage climate change', *Resources*, 159, 11–12.

Kilgour, D. Marc (1992) 'Site selection for on-site inspection in arms control', *Arms Control*, 13, 439–462.

Kilgour, D. Marc (1994) 'The use of costless inspection in enforcement', *Theory and Decision*, 36, 207–232.

Kilgour, D. Marc (1997) 'Improving efficiency in environmental enforcement', in *Economic and Environmental Risk and Uncertainty: New Models and Methods* (Robert Nau, Erik Grønn, Mark Machina and Olvar Bergland, eds), Dordrecht, the Netherlands: Kluwer Academic Publishers, 33–52.

Kilgour, D. Marc and Steven J. Brams (1992) 'Putting the other side "on notice" can induce compliance in arms control', *Journal of Conflict Resolution*, 36, 3, 395–414.

Kilgour, D. Marc, Liping Fang and Keith W. Hipel (1992) 'Game-theoretic analyses of enforcement of environmental laws and regulations', *Water Resources Bulletin*, 28, 1, 141–153.

Lundin, S.J. (ed.) (1991) *Verification of Dual-Use Chemicals under the Chemical Weapons Convention: The Case of Thiodiglycol*, SIPRI, Oxford, UK: Oxford University Press.

Maschler, Michael (1966) 'A price leadership method for solving the inspector's non-constant-sum game', *Naval Research Logistics Quarterly*, 13, 11–33.

Nuclear Energy Institute (2007) 'Decommissioning of nuclear power plants'. Online, available at: nei.org (accessed 20 April 2007).

Russell, Clifford S. (1990) 'Game models for structuring monitoring and enforcement systems', *Natural Resource Modelling*, 4, 143–173.

Tsebelis, George (1990) 'Penalty has no impact on crime: a game-theoretic analysis', *Rationality and Society*, 2, 225–286.

Wikipedia (2007) 'Nuclear power'. Online, available at: wikipedia.org (accessed 14 April 2007).

Wittman, Donald A. (1989) 'Arms control verification and other games involving imperfect detection', *American Political Science Review*, 83, 3, 923–945.

Index