no 1

Review of Recent Literature on WMD Arms Control, Disarmament and Non-Proliferation

STOCKHOLM INTERNATIONAL PEACE RESEARCH INSTITUTE (SIPRI)

WMDC
THE WEAPONS OF MASS DESTRUCTION COMMISSION
www.wmdcommission.org

This paper has been commissioned by the Weapons of Mass Destruction Commission. Its purpose is to function as food-for-thought for the work of the Commission. The Commission is not responsible for views expressed in this paper.

Weapons of Mass Destruction Commission (WMDC)
The WMDC is an independent international commission initiated by the Swedish Government on a proposal from the United Nations. Its task is to present proposals aimed at the greatest possible reduction of the dangers of weapons of mass destruction, including both short-term and long-term approaches and both non-proliferation and disarmament aspects. The Commission will issue its report in early 2006.

The commissioners serve in their personal capacity. The Commission is supported by a Secretariat based in Stockholm, Sweden.

Weapons of Mass Destruction Commission
Postal address: SE-103 33 Stockholm, Sweden
Visitors' address: Regeringsgatan 30–32
E-mail: secretariat@wmdcommission.org
Website: www.wmdcommission.org

Review of Recent Literature on WMD Arms Control, Disarmament and Non-Proliferation

Stockholm International Peace Research Institute
Revised 1 October 2004

Table of Contents

Review of recent literature on WMD arms control, disarmament and non-proliferation

Revised version, 1 October 2004

A. Introduction

This review of recent arms control, disarmament, non-proliferation literature aims to help the Commission pinpoint the areas where it can most easily add value through its activities. According to the agreed terms of reference, the survey is limited to literature on nuclear, chemical and biological weapons as well as missile delivery systems for them.[1] The review covers three kinds of literature: publications (books and journals), web-based materials (reports and documents from specialized sites) and government documents in the public domain. The review does not aim to be either comprehensive or bibliographical and does not review or list every publication on WMD issues. The review does not itself seek to contribute new research findings, but has the following objectives:

- To identify the main findings, themes and ideas contained in recent literature.
- To take into account both the issues related to known weapon states and those raised by current and future WMD proliferation.
- To reflect literature and views that criticize—as well as support and promote—arms control, non-proliferation and disarmament as security building instruments.
- To follow a broad definition of arms control, non-proliferation and disarmament (i.e. the review is not confined to the relevant treaties and their effectiveness).
- To focus on problems of current or continuing relevance, excluding literature linked very directly and specifically to the cold war period.

The document is divided into three sections. Nuclear weapon and missile-related issues are grouped together in the first section and chemical and biological weapons are grouped together in the second section. The third section deals with a selection of cross-cutting issues and instruments, such as export controls and cooperative threat reduction measures.

The review takes into account, under each heading, the literature examining both the NBC and missile programmes of states and the applicability of existing instruments to actions by non-state actors. Non-state actors are not therefore treated in a separate section and instruments being developed to address terrorist activities in general (such as blocking of finance and general judicial or intelligence cooperation) are excluded from the review.

[1] Annex 1 to the Letter of Intent between Weapons of Mass Destruction Committee (WMDC) and Stockholm Peace Research Institute (SIPRI), 10 March 2004.

Main themes and findings

Taking a broad view of recent literature, five tendencies stand out:

- First, there has been a reduced emphasis on describing and analyzing self-restraint measures and reductions in the nuclear, biological and chemical weapons and missile delivery systems for them of the countries that accumulated stockpiles during the cold war. Conversely, the literature contains a growing emphasis on discussions of how to prevent the emergence of new possessors.
- Second, the literature related to multilateral arms control treaties has focused on the issue of how to identify violations of existing treaties and agreements and how to respond where such violations are detected. Relatively few recent studies seek to elaborate the multilateral legal framework for arms control by new treaties.
- Third, there is a growing tendency to supplement and balance the discussion of multilateral arms control treaties with literature describing and analyzing activities carried out in ad hoc groups or arrangements led by the United States.
- Fourth, there is an increasing tendency for literature to take a country-specific approach through the use of case studies and through the consideration of measures in a particular geographical context as opposed to the discussion of global phenomena.
- Fifth, while the military programmes of states remain in focus, a literature is also being developed that discusses issues and problems related to non-state actors. These issues and problems include the acquisition of NBC weapons and missiles by non-state actors as well as the contribution that such actors make to the acquisition efforts of states.

Selected areas for further consideration and possible further research

As a general statement it can be said that there is too little detailed information about nuclear, biological and chemical weapons and missile delivery systems for them. This shortcoming probably cannot be remedied with public, open source information. However, the review of recent literature suggests that there are a large number of "gaps" that need to be filled and where studies would be feasible.

In relation to *nuclear weapons* studies that might enhance the current literature include:

- A study exploring the respective role of and relationship between verification, transparency and safeguards as instruments to help achieve the objectives of multilateral nuclear arms control;
- An analysis of the implications for international security of an emerging "second nuclear age" in which nuclear weapon possessor states are greater in number and have different strategic relationships from those of the cold war.
- An analysis of the potential role of regional mechanisms, as opposed to global approaches, to ensuring stability and security.
- A study of how states have prepared to implement the Additional Protocol to their Safeguards Agreement with the International Atomic Energy Agency (IAEA).

- A study of the nuclear research establishment of countries in the Eastern Mediterranean and the wider Middle East of nuclear proliferation concern including the identification of facilities (such as institutes and research reactors) where knowledge and materials are located.

In relation to *chemical weapons* detailed studies that might enhance the current literature include:

- A comparative analysis of CWC implementation across countries and legal systems;
- A review of the OPCW's plan of action (this has been so recent that there is not yet any substantive literature on it);
- An attempt to assess the possible political impact of carrying out a challenge inspection that discovers no evidence to support the allegation that prompted it;
- Estimates of the level of resources and planning arrangements that would be needed to provide an effective OPCW response for assistance and protection against chemical attack; and
- An analysis of how to retain the OPCW "institutional memory" following the introduction of the staff tenure policy.

In relation to *biological weapons* studies that might enhance the current literature include:

- An evaluation of the advantages and disadvantages of the various biosafety and biosecurity approaches to keeping biological materials out of unauthorized hands;
- A comparative analysis of BTWC implementation across countries and legal systems;
- A compilation of elements of past proposals for verification of the BTWC that could be implemented without new international legal instruments;
- A comparative analysis of existing codes of conduct for scientists and engineers;
- An assessment of practical methods to co-ordinate international responses to a biological attack; and
- An exploration of possible measures to mark the 30th anniversary of the BTWC entry into force in 2005.

In relation to *missiles* studies that might enhance the current literature include:

- A study of the pattern of acquisition of cruise missiles and other types of unmanned air vehicle with specific reference to their potential use as delivery systems for WMD;
- An assessment of the information contained in annual declarations under the HCOC in the light of information already in the public domain. Comparing this information would help identify areas where annual declarations could be improved (e.g., developing a reporting format).
- A study of the role of incentives and security guarantees in the decision of states to give up ballistic missile programmes.

In relation to *cross-cutting issues* studies that might enhance the current literature include:

- A study of how to strengthen export control enforcement in small states.
- Case studies and analyses of export control systems in countries that have recently (or could soon) become exporters of WMD or associated sensitive items.
- An analysis and evaluation of the effectiveness of the European Union dual-use export control system.
- A study and analysis of the way in which end-use or ("catch-all") controls are implemented by states.
- An analysis of the economic impact of export controls on importing states.
- A study of the role of international non-proliferation and disarmament cooperation and assistance in Russia's security policy and of how different Russian agencies view the contribution of such programmes to enhancing Russia's security.
- A study of how international non-proliferation and disarmament cooperation and assistance projects are coordinated and implemented at the working/project level with particular emphasis on international projects.
- A study of the actual and potential role of specialized agencies (the IAEA, the OPCW and the WHO) in defining, organizing, facilitating, publicizing and implementing international non-proliferation and disarmament cooperation and assistance.
- An analysis of whether and how international non-proliferation and disarmament cooperation and assistance might be applied in locations other than the former Soviet Union, taking into account potential benefits and obstacles identified from past practice.

B. A General guide to the literature

Interest in the status of WMD programmes tends to correlate with groundbreaking events in particular states. For example, the nuclear tests carried out by India and Pakistan in May 1998 and the missile tests carried out by the Democratic People's Republic of Korea (DPRK, North Korea) in August 1998 stimulated a number of subsequent studies by researchers from the US, Russia, Europe and Asia describing the scope and details of national programmes, exploring the history of their development and discussing the drivers that made these states pursue weapons options and disincentives that might lead to the elimination of the programmes. Some researchers also speculated on the implications of these programmes for the wider policies of concerned states. It can be predicted that the declaration by Libya of its WMD programmes will stimulate similar studies. Events of this kind probably also account for the significant increase in general publications about arms control and its role in managing international security problems that can be observed in the period 2000–02.

Over time papers of this kind have accumulated for almost every country that has, had, or may have had a WMD programme. This circumstance allowed experts to issue a number of books providing an assessment of arsenals and production capabilities of weapons of mass destruction and their delivery means around the world. A number of studies have also elaborated theories that could describe the existence and development of WMD programmes. In turn, this has made it possible to create a literature for education in the area of non-proliferation and arms control. A lot of authors have provided recommendations about the settlement of contemporary nuclear and missile-related issues. Therefore, one can classify the literature describing nuclear and missile programmes and activities into the following categories.

Group 1: Descriptive literature

A sizeable number of papers collect isolated data and factual information about the programmes of a particular state and assemble it in a systematic manner. This process may include counting particular items and quantities of material, assessing the capabilities of particular facilities, investigating the origins of the programme and describing their broader strategic context. Some publications of this kind have been issued by intelligence agencies and other government authorities based on their own capabilities to gather information. For example, there were two "open reports" issued by the Russian Foreign Intelligence Service (SVR) that included rather detailed description of WMD capabilities of many countries[2].

[2] New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction. The Open Report of SVR. Moscow, 1993. (In Russian); Nuclear Non-Proliferation Treaty. Problems of Extension. The Open Report of SVR. Moscow, 1995. (In Russian). Similar publications are produced by the United States intelligence community.

It is useful to divide between online and printed open source-based publications. Printed publications are usually better structured and more thoroughly prepared, but can't easily be updated after dissemination. Computer-based technologies allow online publications to build on a greater number of individual sources, and allow for regular updating based on new sources, though sometimes at the expense of editorial quality. Provided that they apply high editorial standards, and given the descriptive nature of this group of publications, online publications have certain advantages in that they can achieve a comprehensive coverage without becoming outdated.

Included in this set of literature are the encyclopaedia-type volumes produced either by academic institutes or by commercial companies, often very well illustrated and detailed and containing photographs and technical data.

Another branch of the descriptive literature consists of books that exercise a more or less historical approach. The authors of these books not only collect factual information, organize and display it, but also reconstruct the whole story of a programme with the aim of trying to find out how, and for what purpose the activity was undertaken.[3] Given that the aim of this group of publications is to understand the specific reasons, incentives and circumstances that led to the current situation in a particular country, they tend not to become outdated quickly. Since they discuss the history of events and answer a number of predefined questions, these books tend not to need frequent updating after publication.

For the most part this literature is based on either open, published sources or contemporary recorded interviews whose contents can be shared.

The information about WMD programmes and missile programmes contained in this literature can be sorted in terms of the degree of confidence and reliability. The *first type* of information consists of statements that can safely be considered true such as the existence of military nuclear programmes in the United States, Russian Federation, United Kingdom, France and China, as well as India and Pakistan. All of these countries have developed or are in the process of developing and deploying missile delivery systems for their nuclear weapons. Conversely, it is safe to say that at the present time there is no active nuclear weapons programme in South Africa or in Iraq and that each has dismantled very active missile development programmes. In the chemical field a number of countries have declared either present or past chemical weapons programmes under the Chemical Weapons Convention, the key elements of which have to be shown to have been destroyed or converted to peaceful purposes under international verification. Countries whose armed forces have used chemical weapons in conflict, some of which are not parties to the Convention, such as Iraq and Egypt, can also safely be said to have been chemical weapons possessors.

The *second type* of information is considered to be true by the consensus of experts but without the same degree of certainty. It is widely accepted that Argentina, Australia, Brazil, Canada, Germany, Italy, Japan, Norway, South Korea, Sweden, Switzerland and Taiwan abandoned their investigations of military nuclear

[3] Examples of this type of book would be John Wilson Lewis and Xue Litai, *China Builds the Bomb*, (Stanford University Press: Stanford CA 1988) and Avner Cohen, *Israel and the Bomb*, (Columbia University Press: New York NY 1998).

programmes (some of which were rather advanced), and that Israel still has an active military nuclear programme and a nuclear weapons capability. These statements are considered safe, but not as obvious as those in the previous paragraph. For example, there is a discussion in the literature over whether Sweden eliminated its military nuclear capabilities completely, or placed them into hibernation.[4] A number of these countries could develop sophisticated missile delivery systems in a short period using existing satellite launch vehicle programmes.

The *third type* of information consists of insecure but plausible statements. There is a controversy over the purposes served by the nuclear programmes of North Korea and Iran while the true objective of nuclear programmes in certain other countries (such as Egypt, Syria and, until recently, Libya) is also periodically questioned. For example, although the assertion that there is no military nuclear programme in Iran could not be disproved using the information available in the public domain, this assertion could be severely criticized. This argument cannot be resolved on the basis of contemporary open sources. Supporting evidence can also be pointed to in respect of allegations, primarily by the United States, that North Korea and Syria have current chemical weapon programmes.

Group 2. Predictive literature

Authors of this group of publications aim to elaborate theories powerful enough to describe WMD and missile programmes around the world, partly to compensate for the shortfall in information noted above. To be more precise, there are two functions of this kind of literature: explanation and prediction. Authors seek to find a theory that would allow them to reconstruct and explain the full picture of current developments in a particular country, and to predict the future course of events, based on a limited number of available facts (for example, the presence of a nuclear facility such as a uranium enrichment or plutonium reprocessing plant that is otherwise difficult to explain). In this particular set of studies researchers usually start with the fundamental question: what incentive would this state have to pursue nuclear weapons?[5]

One group of authors assumes that the actions of the state in the international arena are defined by its own military power relative to that of other states (singly or in combination). Using such a theory, the acquisition of nuclear weapons and their delivery means would be possible to explain and predict as the natural approach for some states given their security environment. For example, in the early nineties John Mearsheimer used this approach to suggest that Ukraine should be encouraged 'to fashion its own secure nuclear deterrent'.[6] A different school of authors has put forward a contrary theory, namely that the positive incentives of participation in

[4] R. M. Timerbaev, *Russia and Nuclear Nonproliferation*, (Nauka: Moscow 1999), pp. 144–45 (in Russian).
[5] Scott Sagan, 'Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb', *International Security*, No. 3, Vol. 21, Winter 1996/97, p. 63.
[6] John Mearsheimer. 'The Case for a Ukrainian Nuclear Deterrent' *Foreign Affairs* No. 3, Vol.72, Summer 1993, pp. .50–66.

international regimes and institutions (along with the negative consequences of being seen to be behaving in a manner inconsistent with existing international standards) are sufficient to deter states that would be tempted to consider acquiring WMD if it was the case that their decisions were guided by reasons of military security alone.

A second group of authors uses theories of bureaucratic politics and organizational theory to explain and predict WMD programmes (and nuclear weapon programmes in particular) as a function of the interaction between the leaders of the state and one or more of the following: domestic political groups, the military establishment, the nuclear research establishment and the nuclear industry. Theories of this kind were applied in the case of India and Pakistan, for example, where powerful individuals and lobby groups were said to have both proved the necessity for a military nuclear programme and secured sufficient funds for it without making arguments based on military threat assessment.

Group 3: Prescriptive literature

A sizable part of the literature is intended to elaborate recommendations aimed at governments, international organizations or other decision-makers in the political or military realm. This literature seeks to promote certain ideas and views on the contemporary issues of nuclear and missile proliferation and, ultimately, to invoke actions that arise from those ideas. Publications of this type may put forward the views of the sponsoring agency or political group.

Group 4: Educational literature

The existence of the three categories of literature mentioned above has made it possible to create a fourth one, an educational literature. The idea of developing a specific set of books and materials for the purpose of education in the area of disarmament and non-proliferation can be traced to discussions in the United Nations in 1978. In 2000 the UN Secretary-General's Advisory Board on Disarmament Matters recommended a Study on Disarmament and Nonproliferation Education, which was prepared by a group of governmental experts and released in October 2002.

The idea has subsequently been promoted (in particular in Russia and in the US) that the creation of a good understanding and a non-proliferation culture among undergraduate students and young professionals in relevant fields of scientific specialization is a cost-efficient way to achieve non-proliferation objectives.[7] Nuclear and missile programmes occupy a central place in the textbooks and online resources that have been developed.

[7] For details on non-proliferation education, see Anton Khlopkov, 'Education in Disarmament and Nonproliferation: Time to Act', *Yaderny Kontrol*, No. 4, July–Aug. 2002, p. 60 (in Russian).

Select bibliography

1. Joseph Cirincione, Jon B. Wolfsthal, Miriam Rajkumar, *Deadly Arsenals: Tracking Weapons of Mass Destruction*, (Carnegie Endowment for International Peace: Washington D. C. 2002).
2. George Perkovich, *India's Nuclear Bomb: The Impact on Global Proliferation*, (University of California Press: Berkeley, CA 1999).
3. John J. Mearsheimer, *The Tragedy of Great Power Politics*, (W. W. Norton & Company: New York, N.Y. 2001).
4. Scott D. Sagan, Kenneth N. Waltz, *The Spread of Nuclear Weapons: A Debate Renewed*, (W. W. Norton & Company: New York, N.Y. 2003).
5. *Facing Nuclear Dangers: An Action Plan for the 21st Century*, The Report of the Tokyo Forum for Nuclear Non-Proliferation and Disarmament. Ministry of Foreign Affairs of Japan, 1999.
6. Michael E. O'Hanlon. 'A "Master Plan" to Deal With North Korea', Brookings Institution Policy Brief No. 114, January 2003.
7. Sarah J. Diehl, James Clay Moltz, *Nuclear Weapons and Nonproliferation: A Reference Handbook*, (ABC-CLIO: Santa Barbara, CA 2002).
8. Vladimir A. Orlov, Nikolai N. Sokov (eds.), *Nuclear Nonproliferation Textbook*, (PIR Center for Policy Studies: Moscow 2002).
9. SIPRI, *Peace, Security and Conflict Prevention: SIPRI-UNESCO Handbook*, (Oxford University Press: Oxford 1998).

C. Nuclear weapons and arms control

The status of military nuclear programmes and activities in nuclear-weapon states

In comparison to the cold war period relatively few recent studies examine the nuclear inventories of the five nuclear-weapon states recognized as such by the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

The Nuclear Posture Review conducted by the United States stimulated a number of analyses that examined the trajectory of US nuclear weapons development and discussed the relationship between US nuclear policies and plans on national and international security.

A number of analyses noted that the US nuclear arsenal was being reduced and that advanced conventional munitions were increasingly expected to substitute for nuclear weapons in certain roles and missions. The net effect of the changes in US nuclear policy, these analysts have argued, will be to reduce (but not eliminate) reliance on nuclear weapons in US security policy. While the general tendency to de-emphasize the role of nuclear weapons is rather clear in the United States, some analysts have identified two developments in US nuclear policy as a potential cause for concern in that they might spark a new "vertical proliferation" in weapon numbers and types:[8]

First, the decision to conduct research into the development of low-yield nuclear weapons may signal that nuclear weapons are expected to play a more important role in deterring chemical, biological, and conventional attacks in future.

Second, the interest of the US in exploring new penetration aids and hardening for existing warheads (to put at risk targets in hardened shelters or targets that are deeply buried) has also been said to point to a role other than deterrence for nuclear weapons.

A number of recent studies have tried to assess the implications of nuclear weapon development in China (the only one of the five recognized nuclear-weapon states to be making an "across the board" modernization of its nuclear forces). However, assessing the scope, purpose and implications of Chinese nuclear force modernization is made more difficult by the lack of adequate information.[9]

Like the United States, Russia is making very significant cuts in the size of its deployed nuclear forces in the framework of the 2002 US–Russian Strategic Offensive Reduction Treaty (SORT) discussed below. Recent evaluations of Russian nuclear policy have examined whether or not Russia should seek rough nuclear parity with the United States or effectively de-couple its nuclear planning from scenarios

[8] The respective positions are reflected in two presentations on US Nuclear Policy at the 2002 Carnegie International Non-Proliferation Conference. Remarks of Franklin Miller, Senior Director for Defense Policy and Arms Control, National Security Council, and Christopher Paine, an analyst at the Natural Resources Defense Council, to the Carnegie Internatinal Non-Proliferation Conference, Washington DC 14 Nov. 2002.

[9] Robert A. Manning, Brad Roberts, Ronald Montaperto, *China, Nuclear Weapons, and Arms Control*, Council on Foreign Relations, 1 April 2000.

that envisage massive nuclear exchanges between former cold war adversaries. In the absence of international discussion and the development of a mutual understanding on nuclear weapons related issues the dominant view inside Russia is that nuclear weapons not subject to arms control treaties (so-called "tactical nuclear weapons") should play a greater role in Russian military doctrine in light of perceived weaknesses in Russian conventional military capabilities.

Recent articles have also suggested that the decision of the United States to withdraw from the 1972 Treaty on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty) and the decision by Russia not implement the 1993 START II treaty (that would have made further reductions in US and Russian strategic forces reciprocal and verifiable) could lead to further divergence in Russian and US nuclear policies and force structures. For example, it has been suggested that Russia may sustain or even further develop its inventory of multiple-warhead land-based missiles instead of retiring them.[10]

The choices that France and the United Kingdom face about the long-term future of their nuclear forces receive relatively little attention in the literature.

Missile defence and strategic stability

The issue of ballistic missile defence (BMD) has been at the centre of a long-running debate which has generated a voluminous literature. At the core of the debate have been disputes over three interrelated issues: (a) the nature of the threat posed by the proliferation of nuclear, biological and chemical weapons and the means to deliver them; (b) the cost and technical feasibility of BMD and its likely effectiveness in addressing these threats; and (c) the relationship between deterrence and defence in the post-cold world war, and the relevance of the ABM Treaty as the so-called cornerstone of strategic stability.

Although this last dispute has faded into the background following the demise of the ABM Treaty in 2002, the literature suggests that there are at least three general sets of issues arising from it which likely herald future challenges for arms control and disarmament efforts. The first has to do with preserving arms race and crisis management stability—two goals of 'traditional' cold war-era nuclear arms control—in regional settings into which advanced missile defence capabilities have been introduced. Some analysts warn that a destabilizing offensive-defensive arms race will intensify existing military competitions and increase incentives for pre-emptive action in periods of crisis.

A second set of issues has to do with the impact of new BMD technologies on existing arms control restraints and the strategic status quo. A particular concern has to do with the deployment of new and exotic BMD weapon systems on space-based platforms. There is a growing body of literature examining the risks that these systems, and the wider trend toward the increased military use of space, may pave the way for a destabilizing arms race in outer space. A third set of issues has to do with

[10] For example, see Rose Gottemoeller, 'Nuclear necessity in Putin's Russia', *Arms Control Today*, April 2004.

the fact that some BMD technologies (e.g., missile interceptor systems) may be applied in other missile projects, and the associated risk that their transfer might contribute, knowingly or unknowingly, to offensive programmes.

US-Russian nuclear arms reductions

Ratification and entry into force of SORT

The 2002 US–Russian Strategic Offensive Reduction Treaty (SORT) obliges the two parties to reduce the number of their operationally deployed strategic nuclear warheads so that the aggregate numbers of these warheads do not exceed 1700–2200 each by 31 December 2012. This entails a two-thirds cut in the ceiling on deployed nuclear warheads mandated by the 1991 Treaty on the Reduction and Limitation of Strategic Offensive Arms (START I Treaty). Prior to SORT's entry into force in 2003, START I was the only legally binding agreement in force that regulated the US and Russian strategic nuclear forces.

SORT marked a breakthrough in a strategic arms reduction process that had been largely deadlocked since the signing of the 1993 START II Treaty. Under its provisions, Russia and the USA will finally begin to adjust their nuclear force postures, which are arguably the most visible and enduring product of the superpower arms race, and to bring them into line with a new, non-adversarial political relationship. It also codifies the symbolically important notion of equal security for both sides, insofar as the USA is committed to sharply reducing its nuclear forces, at least on paper, to the level of Russia's. At the same time, SORT marks a fundamental change in the form and substance of the arms control process. It is not a 'traditional' US–Russian arms control treaty in the cold war sense—that is, it is not one that seeks to manage the superpower nuclear competition by setting out carefully balanced limits on strategic nuclear arms accompanied by detailed verification provisions. This type of agreement had been firmly rejected by the Bush Administration as being outdated and as inhibiting US flexibility in adapting to a new and changing security environment. In its final form, the new treaty gives the two sides unprecedented flexibility in implementing what amounted to parallel, unilateral force reductions.

SORT has been criticized for backing away from the idea of requiring the irreversible elimination of nuclear warheads to be removed from operational deployment. In the 1998, Russian and US negotiators had reached an agreement in principle to include this requirement in a prospective START III Treaty. It would entail the creation of a regime for the verifiable dismantling of surplus warheads and the secure disposal of the fissile material that they contain. Many arms control advocates stress the importance of 'locking in' reductions in strategic nuclear forces and making those cuts permanent.

Reducing inventories of non-strategic nuclear weapons

Russia and the USA continue to maintain large inventories of tactical (or non-strategic) nuclear warheads and to assign them military roles and missions. According

to estimates published in recent *SIPRI Yearbooks*, Russia possesses more than 3 000 active-duty tactical nuclear weapons (TNW), with thousands more held in reserve or awaiting dismantlement; however, there is considerable uncertainty in these estimates. The US inventory is more reliably estimated to consist of 1120 tactical nuclear weapons: *c*. 150 of these are aircraft gravity bombs deployed at US air bases in six European NATO member states, while the rest are held in central storage depots in the United States.

There are no legally-binding limitations on the numbers and deployments of TNW. In 1991, the United States and the Soviet Union issued parallel, unilateral declarations to reduce and restrict elements of their tactical nuclear weapons. They reiterated and expanded these politically-binding commitments in 1992, which currently are the only limitations in place on US and Russian tactical nuclear weapons.

There continues to be interest in proposals to create formal, legally-binding limitations on TNW inventories. However, there are at least two obstacles which must be overcome in order for progress to be made. The first is a definitional one: while other US–Russian nuclear arms reduction treaties explicitly define the types of weapon systems covered by those agreements, a working definition of tactical nuclear weapons has proven elusive. A more serious problem stems from the fact that any future agreement or treaty limiting tactical nuclear weapons will have to directly apply controls on the warheads, rather than on associated delivery vehicles (bombers, missiles and submarines). This poses daunting verification challenges that virtually all analysts agree would require the creation of a comprehensive nuclear warhead transparency regime.

The Nuclear Non-Proliferation Treaty

The 1968 Treaty on the Non-Proliferation of Nuclear Weapons (Non-Proliferation Treaty, NPT) forms the principal legal foundation of the broader regime of rules and constraints designed to prevent the spread of nuclear weapons as well as of weapon-usable fissile material and technology. It is the only global legal instrument through which a state can commit itself to non-nuclear-weapon status. The treaty mandated that five years after its entry into force a conference of the parties should be convened to review its implementation, and that at intervals of five years thereafter conferences could be held if a majority of parties agreed to do so. These review conferences have been convened every five years since 1975. At a Review and Extension Conference held in 1995, the decision was taken to make the NPT of indefinite duration.

There has been a steady increase in the number of parties to the treaty. As of January 2004, there were 188 parties to the NPT. However, the treaty has not achieved universal adherence. Three states known or widely believed to have nuclear weapons—India, Israel and Pakistan—have not joined the treaty.

Treaty provisions

The NPT parties are divided into nuclear-weapon states (NWS) and non-nuclear-

weapon states (NNWS), with a number of basic obligations following therefrom:[11]

- non-nuclear-weapon states are prohibited from undertaking to manufacture or otherwise acquire nuclear explosive devices;
- non-nuclear-weapon states are required to conclude safeguard agreements with the International Atomic Energy Agency (IAEA) designed to verify that it is not diverting nuclear materials or equipment from peaceful uses to military programmes;
- nuclear-weapon states are prohibited from transferring nuclear weapons or otherwise assisting non-nuclear-weapon states in acquiring such weapons; and
- all parties are prohibited from exporting nuclear materials or equipment to any non-nuclear-weapon state unless that material or equipment is subject to the safeguard arrangements specified in the treaty.

In order to make adherence to the NPT more attractive for non-nuclear-weapon states, two provisions were added that reflected key 'bargains' reached with the nuclear-weapon states during the treaty negotiation process. Article IV declares that nothing in the treaty should be interpreted as affecting the 'inalienable right' of all parties to participate fully in the international exchange of equipment, materials and scientific information for the development of nuclear energy for peaceful purposes. Article VI mandates that all parties must 'pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament'.

NPT challenges and controversies

Universality and regime legitimacy

The fundamental criticism of the NPT, which dates back to the earliest days of the treaty, is that it creates an inherently discriminatory system of nuclear 'haves' and 'have-nots'. This differentiation is widely perceived by many non-nuclear-weapon states as being illegitimate and has worked against building a stable and effective regime that depends on the parties' voluntary compliance with its underlying norms. It is one the main reasons cited by India for its long-standing refusal to sign the NPT.

Article VI and nuclear disarmament

There has been a long-running debate over the pace of progress made by the nuclear-weapon states in implementing their disarmament commitment codified in Article VI. The non-nuclear-weapon states have urged the NWS to make a time-bound commitment to eliminate their nuclear arsenals, or to at least to agree to established

[11] As defined in Article IX, only states that have manufactured and exploded a nuclear device prior to 1 January 1967 are recognized as nuclear-weapon states. By this definition, China, France, Russia, the UK and the USA are nuclear-weapon states (NWS). India, Israel and Pakistan (and by some assessments, North Korea) are de facto nuclear-weapon states, but they are not legally recognized as being NWS under the NPT.

criteria for assessing whether they are working in good faith toward disarmament. At the year 2000 NPT Review Conference, the nuclear-weapon states parties—at the insistence of a coalition of NNWS parties—collectively made an 'unequivocal undertaking to accomplish the total elimination of their nuclear arsenals' and committed themselves to pursuing a programme of action on arms control and disarmament containing 13 practical steps.

The results achieved to date in implementing the 13-step programme have been mixed, and the prospects for making serious progress toward nuclear disarmament are widely seen as having dimmed considerably. Several negative trends are noteworthy:

- key arms control and disarmament agreements have either stalled (e.g., the Fissile Material Cut-off Treaty, FMCT) or have been failed to gain the ratifications necessary for entry into force (the Comprehensive Test-Ban Treaty, CTBT);
- the two leading NWS—Russia and the United States-have unambiguously declared their intention to retain nuclear weapons for the indefinite future;
- with the exception of the United Kingdom, the NWS all have significant modernization programmes under way for their nuclear forces; and
- the USA is reinvigorating its nuclear weapon production complex and studying new nuclear weapon designs.

There are disagreements in the literature about how damaging these trends will be to the NPT. Many states are likely to be reluctant to call the treaty regime into question no matter how deep their anger and dismay with the failure of the NWS to meet their part of the NPT 'bargain'. However, there is general agreement that one of the cumulative effects will be to undermine efforts to delegitimize nuclear weapons as useful and usable military instruments. In this regard, non-proliferation and disarmament objectives are mutually reinforcing and cannot be pursued separately or in isolation from one another.

The Article IV 'problem'

Over the past year, a number of articles have appeared arguing that the NPT suffers from a structural weakness that is grounded in Article IV of the treaty. The specific concern is that Article IV in effect gives NNWS a right to develop a complete nuclear fuel cycle for civil nuclear energy programmes.[12] Many analysts have cited the North Korean and Iranian nuclear programmes as evidence that Article IV creates a lacuna in the NPT. This allows countries to put into place all of the fuel cycle facilities needed for producing weapon-usable fissile material—either highly enriched uranium (HEU) or plutonium—while remaining in compliance with the NPT. [13]

Concern about closing this perceived loophole has led to growing interest in the idea of restricting uranium enrichment and plutonium reprocessing activities. Several

[12] The nuclear fuel cycle is the set of chemical and physical operations needed to prepare nuclear material for use in reactors and to dispose of or recycle the material after its removal from the reactor. Existing fuel cycles begin with uranium as the natural resource and create plutonium as a by-product.
[13] Albright, D. and Hinderstein, C., 'Iran: player or rogue?', *Bulletin of the Atomic Scientists*, vol. 59, no. 5, (Sep./ Oct. 2003), 52–58.

different approaches have been proposed in articles published over the past year. Some leading US experts have advocated a 'no nascent nukes' policy that would involve the imposition by the international community of a complete ban on the production of fissile material by suspected nuclear proliferators, to be enforced by the threat of coercive sanctions or, as a final resort, the use of force.[14] Another, more widely-discussed proposal calls for limiting the processing of weapon-usable material in civil nuclear programmes, as well as the production of new material through reprocessing and enrichment, exclusively to facilities under multinational control.[15] Several variations on this proposal have been put forward, but they all envision the creation of fully transparent international facilities providing nuclear fuel services under close IAEA supervision. These facilities could be supplemented by the creation of new multinational programmes for managing and disposing of spent fuel and radioactive waste.

There are doubts about the feasibility of recent proposals to internationalize sensitive nuclear fuel cycle activities. Some analysts are sceptical whether there is any plausible set of incentives which could be offered to countries like Iran that would induce them to abandon their indigenous nuclear programmes. In these states, the proposals are seen as an effort to supplant Article IV with, in effect, a suppliers' cartel in nuclear fuel services. It is also pointed out that in order to be effective, an internationalized fuel cycle regime will have to include important nuclear technology holders (notably India, Israel and Pakistan), which are outside the existing NPT regime.

NPT withdrawal and non-compliance

In January 2003, North Korea announced its withdrawal from the NPT, after having unilaterally removed IAEA monitoring equipment from its installations and halted all verification activities by the agency. The North Korean move—and speculation that Iran may follow suit—has led to calls for a reinterpretation of Article X of the NPT. This article gives parties the right to withdraw from the treaty, with a three-month notification period, should they decide that 'extraordinary events, related to the mater of the treaty', have jeopardized their 'supreme national interests'. The main concern is that a determined proliferator currently can 'legally' to put into place all necessary capabilities to develop nuclear weapons under the pretext of developing a peaceful nuclear programme and then, when convenient, invoke Article X to withdraw from the NPT at a point when a nuclear weapon capability is within close reach.

To address this concern, some US analysts have proposed that if IAEA cannot determine that an NPT party is in compliance with its safeguards agreements, then it should not be allowed to free itself from its legally-binding obligations by announcing its withdrawal from the treaty. Rather, the state party should first have to satisfy the IAEA Director-General and Board of Governors that it is in full compliance with its obligations. It should also be required to completely dismantle all nuclear facilities it

[14] Allison, G., 'How to stop nuclear terror', *Foreign Affairs*, vol. 83, no. 1 (Jan/ Feb 2004).
[15] ElBaradei, M., 'Towards a safer world', *The Economist*, 18 Oct. 2003, pp. 43–44.

may have failed to declare to the IAEA, as mandated by its safeguards agreement with the agency.

Adequacy of safeguards arrangements

Over the last decade a large literature has emerged on the need to strengthen the comprehensive safeguards agreements[16] which non-nuclear-weapon states parties to the NPT are required to conclude with the IAEA. There is a consensus that these full-scope safeguards agreements are not sufficiently robust to detect or deter a determined cheater. Their focus—material accountancy and control—is oriented exclusively toward detecting the diversion of weapon-usable nuclear material and not its clandestine acquisition or weaponization. Following the discovery in the 1990s of the extent of Iraq's clandestine nuclear weapon programme and of South Africa's development of nuclear weapons, the IAEA developed a Strengthened Safeguards System. This programme of reinforced control and verification, which is contained in an Additional Protocol agreed with each state, has sought to remedy this shortcoming by emphasizing access to nuclear-related facilities and technologies at which nuclear materials are not necessarily present.[17] Under the Additional Protocol, the IAEA also has the authority to conduct location-specific and wide-area environmental sampling to verify the absence of activities that fall outside the scope of a state party's expanded declaration. The goal is to assess the completeness as well as the accuracy of a state party's declaration to the agency.

There are differing assessments about how effective the Additional Protocol will be in detecting undeclared or proscribed nuclear activities, such as those alleged to have been carried out by Iran. Some analysts argue that the enhanced access granted to the IAEA under the Additional Protocol will be enough to deter would-be cheaters or to at least significantly complicate and delay any clandestine weapon programme. Others emphasize that even under the Additional Protocol the IAEA's ability to detect undeclared activities, especially taking place at undeclared sites, will remain limited if the agency does not have prior information as to the specific locations of the undeclared activities.

Monitoring compliance with safeguards agreements

In recent years the IAEA has shifted the focus of its safeguards verification efforts from evaluating information on a facility-by-facility basis to the consideration of information for the state party as a whole.[18] A number of proposals have been put forward calling for the IAEA safeguards division to fundamentally refocus its approach to verifying state parties' compliance with their NPT-mandated safeguards

[16] These agreements are known as INFCIRC/153 agreements, after the number of the IAEA Information Circular that contained the model agreement.
[17] The Model Additional Protocol upon which the individual protocol agreements between the IAEA and individual states is based was first published as INFCIRC/540. Hence, these arrangements are known as INFCIRC/540 agreements.
[18] Hooper, R., 'The changing nature of safeguards', *IAEA Bulletin*, June 2003, pp. 7–11.

agreements with the agency. In general terms, this would entail adopting an approach towards verification that retains the universality norm but that practices it in a discriminate fashion. The basis for the agency's state evaluation reports would be expanded to include considerations such as state parties' nuclear histories, the scope and size of their infrastructures, and the relative degree of transparency of these infrastructures. These considerations would in turn affect decisions about the resources to be devoted to verifying a particular party's declaration to the agency's safeguards division.

The idea that the IAEA should adopt a more selective approach to safeguards verification is a controversial one. Proponents argue that such a move would, in essence, acknowledge, that some parties to multilateral arms control agreements are more likely to cheat than others. In the view of some US analysts especially, this likelihood is, above all, a function of the nature of a particular state's regime.[19] Proponents also argue that a more selective approach is practical necessity in light of the IAEA's chronically overstretched budgets. Critics counter, however, that this shift would fatally undermine the universality norm upon which the NPT is based. It would also reinforce an emerging negative tendency to divide the international community into 'good guys' and 'bad guys'.

Regional approaches

In light of the serious shortcomings evident in the global non-proliferation regime, there has been renewed discussion of the merits of creating new or enhanced arrangements at regional level to take over, wherever possible, the application of non-proliferation and disarmament obligations and commitments. Some scholars argue that these arrangements would be more effective than global organizations in overseeing the fulfilment of the regional states' international obligations. In their view, a collection of regional states would have a much larger stake in the assurance of compliance and would be better placed to know when a member-state is in non-compliance with its obligations.

There has been an increase in interest in using regional arrangements to supplement and strengthen the global non-proliferation regime. In Europe no literature has yet emerged to evaluate the recent internal reviews and activities of the OSCE and NATO undertaken with a view to strengthening the role of those organizations in non-proliferation efforts. In other regions, virtually no literature has yet emerged to evaluate the Asian Senior Level Talks on Non-Proliferation or the non-proliferation related aspects of the first Special Conference on Security convened by the Organisation of American States.

More attention has been paid to the question of whether regional mechanisms might help to bring the three states—India, Israel and Pakistan—that exist outside the NPT

[19] Perle, R., 'Good guys, bad guys and arms control', in Anthony, I. and Rotfeld, A. D. (eds), *A Future Arms Control Agenda* (Oxford University Press: Oxford, 2001) ch. 18.

regime into some form of association with the regime.[20] Many scholars have noted that the issue of universality of the NPT is a normative one that goes to the core of the regime's legitimacy, including new efforts to strengthen compliance and implementation. One recent proposal calls for creating some form of 'associate membership' in the NPT regime for India, Israel and Pakistan. This could be accomplished by means of a freestanding separate agreement or protocol. Such a protocol could permit India, Israel and Pakistan to retain their nuclear programmes but would not recognize them as nuclear-weapon states. The protocol could contain provisions to reinforce important non-proliferation and disarmament goals, such as requiring co-operation with the international nuclear export control system, prohibiting the explosive testing of nuclear devices, calling for the phased elimination of fissile material production, and prohibiting the first use and the threat of first use of nuclear weapons.

Engaging Israel in such a protocol would seem to be excluded since it would require Israel to acknowledge its nuclear-weapon status. However, it might be possible to develop separate "tailor-made" protocols for each non-party to the NPT taking into account their specific national context and conditions.

Nuclear-weapon-free zones

In light of the serious shortcomings evident in the global non-proliferation regime, there has been renewed discussion of the merits of creating new or enhanced arrangements to take over, wherever possible, the application of non-proliferation and disarmament obligations and commitments. Some scholars argue that these arrangements would be more effective than global organizations in overseeing the fulfilment of the regional states' international obligations. In their view, a collection of regional states would have a much larger stake in the assurance of compliance and would be better placed to know when a member-state is in non-compliance with its obligations.

One 'old' idea which is receiving some attention in the recent literature is that of establishing nuclear-weapon-free (or, alternatively, WMD-free) zones. Regional arrangements establishing such zones are already important legal components of the global nuclear non-proliferation regime and supplement international efforts to prevent the emergence of new nuclear weapon states. The establishment of NWFZs has also been an instrument for regulating nuclear weapon deployments by the five NPT-defined nuclear-weapon states.

Generally speaking, the treaties establishing NWFZs share certain basic provisions. The parties undertake not to develop, manufacture or otherwise acquire, possess or have control over nuclear weapons, and not to allow any other state to develop, manufacture or otherwise acquire nuclear weapons, or station, test or use them on their territory. In some treaties they undertake to conclude safeguards agreements with the IAEA. Typically, the treaties creating NWFZs also contain protocols codifying so-

[20] Avner Cohen and Thomas Graham, 'An NPT for non-members', *Bulletin of the Atomic Scientists*, vol. 60 No. 3, May-June 2004, pp. 40–44.

called negative security assurances, under which the nuclear weapon states are to undertake not to use or threaten to use nuclear weapons against any state party to the treaty.

NWFZs have been established in Latin and the Caribbean (1967), the South Pacific (1985), South-East Asia (1995) and in Africa (1996); agreement has been reached on a draft treaty establishing a NWFZ in Central Asia. In addition, certain uninhabited areas have been formally denuclearized: Antarctica, outer space, the moon and other celestial bodies; and the seabed, the ocean floor and the subsoil thereof. There have also been renewed calls in the United Nations General Assembly for the creation a NWFZ covering the southern hemisphere.

In recent months there has been a particular interest in the idea of establishing a WMD-free zone in the Middle East. Some scholars argue that there is a potential historic change under way in the region in attitudes and perceptions toward nuclear, chemical and biological weapons. Libya's announcement in December 2003 that it had agreed to abandon, under international supervision, its non-conventional weapons programmes and ballistic missile activities, following the removal of Saddam Hussein and the disclosure of Iran's nuclear programme, is seen as creating a unique opportunity to augment momentum toward the ultimate goal of a zone free of weapons of mass destruction in the Middle East.

Ban on the production of fissile material

The idea of halting or limiting the production of fissile material for military purposes as a verifiable means to reduce, or at least cap, stockpiles of nuclear weapons was originally proposed in the 1950s. In 1995 the Conference on Disarmament (CD) in Geneva adopted a mandate to 'negotiate a non-discriminatory, multilateral and effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices'—a Fissile Material Cut-off Treaty (FMCT).

The main stumbling block to opening negotiations on a FMCT is the dispute over the scope of the treaty. Egypt, Pakistan and other states have argued that the ban should go beyond mandating a cut-off of fissile material production and include placement of existing stockpiles of fissile material under international safeguards. This proposal has generated strong opposition from the P5 states (i.e., the five permanent members of the UN Security Council, which are also the NPT-defined nuclear-weapon states), which have large inventories of fissile material for military purposes, and, among others, India. These states argued that the mandate should apply only to future fissile material production.

The issue of what to do about existing fissile material stocks remains unresolved and will not be taken up until the negotiations are under way. The P5 states and India have reiterated their views that under the 1995 mandate existing stockpiles fall outside the purview of the ban. By contrast, delegations from the many non-aligned states argue that the treaty regime will be a meaningful disarmament measure only if it applies to current stockpiles as well as to future production. In the Middle East, where

Israel's ambiguous nuclear-weapon status has complicated nuclear non-proliferation and disarmament measures, Egypt and other Arab states insist that all stocks of weapon-usable fissile materials will have to be declared and be subject to inspection and inventory under international supervision and control.

As of April 2004, the CD had yet to open negotiations on a FMCT. The central issue blocking formal talks has stemmed from member differences, primarily between the United States and China, over whether the CD should draft a treaty on the prevention of an arms race in outer space (PAROS). China had linked beginning any negotiations at the 66-member CD, which operates by consensus, to beginning parallel negotiations on a space treaty. The prospects for opening negotiations on an FMCT brightened in the summer of 2003, when China dropped its insistence on this linkage. There were also indications in early 2004 that the Bush Administration was seriously interested in concluding a convention banning the production of material.

Comprehensive Nuclear Test-Ban Treaty (CTBT)

The opening for signature in 1996 of the Comprehensive Nuclear Test-Ban Treaty (CTBT) represented the culmination of a three decade-long effort to ban nuclear explosive testing.[21] The provisions of the CTBT and associated Protocol include:

- prohibiting the parties from carrying out 'any nuclear weapon test explosion or any other nuclear explosion'.
- prohibiting the parties from 'causing, encouraging or in any way participating in the carrying out' of any nuclear explosion.[22]
- providing for the establishment of a comprehensive verification regime consisting of an International Monitoring System (IMS), on-site inspections, confidence-building measures and mechanisms for consultation and clarification of treaty compliance issues.

Entry into force

The CTBT will enter into force 180 days after it has been ratified by the 44 states members of the CD with nuclear power or research reactors on their territories, as listed in Annexe 2 of the treaty. This requirement, which was the source of considerable controversy during the closing stages of the CTBT negotiations, reflected the view that the treaty must capture a certain minimum set of nuclear-

[21] As earlier steps in this effort, in 1963 the Soviet Union and the USA, along with the UK, signed the Partial Test Ban Treaty (PTBT), prohibiting nuclear explosions in the atmosphere, in outer space and under water. In 1974 the USA and the Soviet Union reached agreement on the Threshold Test Ban (TTBT), which bans any underground nuclear weapon explosion test having a yield greater than 150 kilotons (kt).

[22] The CTBT does not prohibit so-called sub-critical tests, in experiments, in which the configuration and quantities of explosives and nuclear materials used do not produce a critical mass (i.e., a self-sustaining nuclear fission chain reaction). Critics complain that such tests contravene the spirit of the accord by enabling states to maintain existing nuclear warheads *in perpetuum* or to carry out modernization programmes based on new warhead designs.

weapon-capable states to be effective in promoting non-proliferation objectives. It has proved to be problematic because several of these 44 states have been unwilling to sign and ratify the treaty. In many countries the CTBT is seen as a litmus test of the willingness of the nuclear-weapon states to fulfil their obligations under Article VI of the NPT to end the nuclear arms race.

As of 1 January 2004, the CTBT had been ratified by 108 states and signed by a further 62 states. Of the 44 states whose ratification is required for the treaty to enter into force, 32 had ratified the treaty and an additional 9 states had signed but not ratified the treaty. The USA signed the treaty in 1996 but later voted not to ratify it. There are three states among the 44—India, North Korea and Pakistan—which have not signed the accord.

Although no nuclear tests have been carried out since 1998, most observers judge that the prospects for the CTBT's entry into force in the foreseeable future are poor. In the *USA*, opposition to the CTBT centres largely on two issues. The first is whether compliance with the treaty's 'zero-yield' test ban can be adequately verified. Treaty opponents argue that the IMS will not be able to detect with high confidence low-yield nuclear explosive tests, particularly those conducted using evasive techniques such as cavity 'decoupling' (i.e., conducting a nuclear explosion in an underground cavern so as to attenuate the seismic signals produced by the blast). The second issue has to with concern about the potentially negative long-term impact of a permanent halt to nuclear testing on the safety and reliability of the US nuclear arsenal. In *India*, opponents of the CTBT portray it as placing an unacceptable constraint on the country's options for developing and modernizing it nuclear deterrence posture. *North Korea* has stated that it will not consider signing the treaty before the USA first drops its 'hostile policy' toward the country. North Korean officials reportedly told their US counterparts in the spring of 2003 that Pyongyang might conduct a nuclear test explosion in order to demonstrate its nuclear-weapon capability.

Enhancing transparency in nuclear warhead and fissile material inventories

There have been some studies done examining the possibilities and limits of various technical approaches to building a comprehensive nuclear warhead transparency and dismantling regime. Such a regime could, at least conceptually, envisage full accounting of warheads, verifying their dismantling and monitoring of their production facilities, broadly comprising the following main elements: first, establishing declarations of warhead inventories and verifying their accuracy and, more importantly, their completeness; second, providing assurances that warheads earmarked for elimination are what they are claimed to be and ensuring that those warheads designated for dismantling are in fact destroyed and not otherwise diverted or replaced by decoys; third, guaranteeing that no new warheads are manufactured; and fourth, disposing of fissile material from dismantled warheads in an irreversible way. One conclusion which emerges from these studies is that there are formidable technical and political challenges to making even limited progress towards establishing a warhead transparency regime.

These difficulties were highlighted by efforts made in the framework of US–Russian arms control discussions to establish the initial basis for a nuclear warhead transparency regime: namely, the exchange of classified declarations of warhead numbers, locations and dispositions. The Russian and US presidents agreed in 1994 to develop a process for sharing classified stockpile data on regular intervals. However, negotiations to implement the agreement were abruptly abandoned the following year and were never resumed. In the view of many analysts, the current prospects for negotiating a similar measure are remote, as US and Russian nuclear warhead production complexes have become increasingly opaque, especially in light of recent concerns about terrorism.

Transparency in fissile material holdings

By contrast, there has been some progress made in increasing the transparency of fissile material holdings in the USA and Russia. This has come through the implementation of several agreements related to the storage and disposition of excess fissile material, including: the 1993 US–Russian Highly Enriched Uranium (HEU) Agreement, the 1996 US–Russian–IAEA Trilateral Initiative, and the 2000 Plutonium Management and Disposition Agreement (PMDA). Progress has also been achieved in increasing transparency in the US and Russian nuclear weapon production complexes through various Materials Protection, Control and Accountancy (MPC&A) programmes undertaken as part of co-operative threat reduction activities.

Growing international concern about the danger of fissile material into the hands of terrorist groups has led to renewed interest in the idea of developing a comprehensive approach for achieving transparency in military and civilian stocks of fissile materials. This could be accomplished within the framework of a FMCT. There has been some work done assessing the practices and procedures required for implementing and monitoring a global ban on the production of fissile material. Most of this work has focused on monitoring activities at fuel cycle facilities and other sensitive sites, as well as on the storage and disposition of existing fissile materials. There has been relatively little work published on assessing the potential for countries to maintain undeclared holdings of nuclear explosive material capabilities through the retention of undeclared stocks or clandestine production of new inventories, or covert transfer of these materials from other countries.

IAEA initiatives to secure nuclear materials and facilities

International concern about the dangers of nuclear material falling into the hands of terrorists has been accompanied by a growing awareness that national measures for protecting nuclear material and facilities are uneven in their substance and application. As a result, a number of new initiatives have been launched under the auspices of the IAEA to promote consistent standards for enhancing the safe transport and physical protection of nuclear materials. These efforts include:

• *Convention on the Physical Protection of Nuclear Material (CPPNM)* The 1979 CPPNM is the only multilateral treaty in force that deals with physical protection

issues. It obliges the parties to make specific arrangements for the protection of nuclear material. Discussions are under way on amending the convention to apply some of its provisions which currently apply only to international transport of nuclear materials to cover domestic transport as well.

• *Action Plan for Protection Against Nuclear Terrorism* Approved by the IAEA Board of Governors approved in 2002, the Action Plan is designed to upgrade worldwide protection against acts of terrorism involving nuclear and other radioactive materials. The plan supplements efforts by countries working at the national level to upgrade physical protection of their nuclear material and nuclear facilities, detect illicit nuclear trafficking across borders and improve control of radioactive sources.

• *IAEA–Russia–US Tripartite Initiative* The Tripartite Initiative is a cooperative international effort to reduce, and if possible eliminate, the use and storage of highly enriched uranium in civil nuclear activities. The purpose is to facilitate the return of both fresh and spent fuel from Russian-supplied HEU research reactor fuel for long-term management and disposition. There are currently about 80 research reactors around the world that still use HEU.

The Nuclear Suppliers Group

As can be seen from the sections above, the international legal framework for nuclear arms control is incomplete in a number of respects. In a number of important areas there are no agreements in place. In cases where agreements do exist participation in them is not universal and there is clear evidence that not all states have complied with their obligations under those agreements. In these circumstances the Nuclear Suppliers Group (NSG) has been seen by participating states as necessary to help fill identified gaps. The NSG is an informal arrangement of nuclear supplier states that seek to prevent the acquisition of nuclear weapons by states other than those recognized as nuclear-weapon states in the framework of the NPT. Within recent literature about the NSG a number of issues and challenges emerge with particular regularity.[23]

The first is the implications for export control of the commercial incentives for many NSG members to engage in the nuclear trade with countries that do not apply "full-scope" IAEA safeguards on their nuclear activities and have not joined the NPT. These commercial reasons are reinforced by the argument made by some experts that it would be safer to bring these countries (that have already developed their military nuclear programmes) into the NSG to reduce any risk of further proliferation. One could mention India as an example. Other authors enumerate the difficulties with such a policy of engagement, including the tensions it would introduce among NPT parties.

A second prominent issue is that the need for consensus and the voluntary nature of the NSG limits effective action. For example, it is difficult to reach consensus on targets of the regime—which contributed to the decision of the NSG in 1992 to

[23] Literature that examines and analyses export control issues and problems more broadly is discussed in the section called 'cross-cutting measures'. This section focuses on recent literature related to nuclear export controls and nuclear-related dual-use export controls.

establish different conditions for supply for nuclear and nuclear-related dual-use items.

Some experts argue that the NSG lacks the means to enforce compliance by its members with their commitments. Due to its informal nature the NSG has to rely on diplomatic pressure and enhanced transparency among participants and many experts doubt that effective enforcement is possible under the current NSG structure.

Selected areas for further consideration and possible research

In relation to *nuclear weapons* studies that might enhance the current literature include:

- A study exploring the respective role of and relationship between verification, transparency and safeguards as instruments to strengthen multilateral nuclear arms control;
- A study of the implications for international security of an emerging "second nuclear age" in which nuclear weapon possessor states are greater in number and have different strategic relationships from those of the cold war.
- An analysis of the potential role of regional mechanisms, as opposed to global approaches, to ensuring stability and security.

Select bibliography

1. Rebecca Johnson 'The NPT in 2004: Testing the Limits' *Disarmament Diplomacy*, No. 76, March/April 2004.
2. Lawrence Scheinman, 'The Nuclear Fuel Cycle: A Challenge for Nonproliferation' *Disarmament Diplomacy*, No. 76, March/April 2004.
3. Joseph Cirincione and Jon B. Wolfsthal 'North Korea and Iran: Test Cases for an Improved Nonproliferation Regime?' *Arms Control Today*, December 2003.
4. Proceedings of the Conference on *Atoms for Peace After 50 Years*, Lawrence Livermore National Laboratory, CGSR, April 2003.
5. Ariel E. Levite, *Brief Reflections on the Nuclear Non-proliferation Regime*, Presentation at the Second Moscow International Non-Proliferation Conference, Moscow, 18–20 Sept. 2003.
6. Nicholas Zarimpas (ed.), *Transparency in Nuclear Warheads and Materials: The Political and Technical Dimensions*, (Oxford University Press: Oxford 2003).
7. David Albright and Kevin O'Neill (eds.), *The Challenges of Fissile Material Control*, (Institute for Science and International Security Press: Washington, D. C. 1999).
8. Roland Timerbaev, *The Nuclear Suppliers Group: Why and How It Was Created. (1974-1978)*, PIR Center, October 2000.
9. Alec Baer, 'The Nuclear Suppliers Group and Its Time', 2nd NSG International Seminar on the Role of Export Controls in Nuclear Non-Proliferation, IAEA, 1999.
10. Carlton E. Thorne, *A Guide to Nuclear Export Controls*, 1997.

11. Weixing Hu. ‘China’s Nuclear Export Controls: Policy And Regulations’ *Nonproliferation Review*, Winter 1994.
12. Vitaly Fedchenko. ‘Russian-Indian Nuclear Relations and Export Control Issues’ in: Roland Timerbaev, Alexander Shilin, Vitaly Fedchenko. *Problem of Proliferation and Nonproliferation in South Asia: Current Situation and Prespectives*, PIR Study Papers No. 17, 2002 (In Russian).

D. Chemical Weapons

A chemical weapon is a weapon intended to work through its toxic effects. Many chemicals are toxic and any toxic chemical could potentially be used as a chemical weapon.[24] This has led to considerable debate as to how a chemical weapon might be more precisely defined.

Most military forces define chemical weapons as munitions filled with toxic agents ready to be fired. This definition is too narrow to be able to catch within it the key components of such a weapon and activities that might be carried out to develop and manufacture it. Therefore, under the 1993 Chemical Weapons Convention (CWC)—the main international legal instrument in this field (and which is discussed further below)—the definition of a chemical weapon is much wider than this. The Convention embodies a concept known as the 'general purpose criterion', which effectively specifies that any toxic chemicals—and any other chemicals from which they can be made ('precursors')—are considered to be chemical weapons unless they are for purposes not prohibited by the Convention.

Toxic chemicals form one of three categories defined by CWC as falling within the scope of the term 'chemical weapon'—the other two are munitions and devices specifically designed to cause death or harm through the use of such toxic chemicals; and any equipment specifically designed to be used directly in connection with such chemicals, munitions and devices.

Chemical Weapons Programmes

There are essentially three types of literature describing past and present chemical weapons programmes: official declarations under the terms of the CWC, literature describing substantiated use of chemical weapons, and literature describing claims and allegations of programmes without proof.

Declared Programmes

Under the terms of the Chemical Weapons Convention the following countries declared that they held stocks of chemical weapons at entry into force of the Convention for them: Albania, India, Libya, Republic of Korea, Russia, USA. All of these countries are under a legal obligation to destroy these stocks under international verification measures.

The Convention also requires its member states to declare certain relevant activities carried out since 1 January 1946. The following countries declared that they had had past chemical weapons production programmes, but no current stocks: Bosnia and Herzegovina, China, France, Iran, Serbia and Montenegro, and the UK.

[24] It should be noted that the toxic effect of any chemical can only be exploited as a weapon if it is able to be distributed in such a way as to cause adverse effects where it is targeted. This simple constraint limits the number of chemicals that could be used as weapons.

Substantiated Use of Chemical Weapons

Another guide to the extent of chemical weapons programmes is to look at those cases in which there is a general consensus by experts in the literature that chemical weapons have been used.

In almost all major wars in the twentieth century, allegations have been made that one side or another has used chemical weapons. Most of these allegations are baseless and are brought forward by one side as a propaganda tool against the other.

The First World War saw substantial use of chemical weapons. There have been nine conflicts since the end of World War I in which the use of lethal chemical weapons has been substantiated.[25] The instances were: British forces in Russia (1919); Spanish forces in Morocco (1923–26); Italian forces in Libya (1930); Soviet forces in Sinkiang (1934); Italian forces in Ethiopia (1935–40); Japanese forces in China (1937–45); Egyptian forces in Yemen (1963–67);[26] Iraqi forces fighting Iran (1983–88); and Iraqi forces in Iraqi Kurdistan (1987–88).[27]

So-called 'non-lethal' agents[28] have also been used as a method of warfare, for example, British forces in Iraq in the 1920s and US forces in Vietnam in the 1960s and 1970s. Strong evidence suggests that such agents were used by Serbian forces during the wars in Yugoslavia in the 1990s. Such use is now included in the prohibitions under the Chemical Weapons Convention.

In addition to the use of chemical weapons in conflicts there has been confirmed use of lethal chemical weapons by the Aum Shinrikyo religious group in Matsumoto (1994) and Tokyo (1995) in Japan.

Other alleged chemical weapons programmes

Allegations have been made, primarily by the United States,[29] that the Democratic People's Republic of Korea, Sudan and Syria have current chemical weapons programmes. The USA also alleges that the past Iranian programme may be continuing. Of these allegations, the one with the strongest supporting evidence from

---

[25] Julian Perry Robinson. 'Chemical-weapons proliferation in the Middle East', in: E Karsh, MS Navias and P Sabin (eds). *Non-conventional-weapons proliferation in the Middle East,* Oxford, Clarendon Press, 1993, pp. 69–98.

[26] During the Yemeni civil war, Egypt intervened on the side of the republican forces. A large number of instances of aerial bombardment with chemical weapons have been documented. It is not clear what the source of the weapons was or whether Egypt had any indigenous production capability.

[27] While details of the Iraqi chemical weapons programme are the subject of much international controversy at present, during the Iran–Iraq war many instances of use of chemical weapons were proven by investigators acting under the authority of the UN Secretary-General. Nearly 20 instances of attacks with chemical weapons on settlements within Kurdish areas of northern Iraq during 1987 and 1988 have been well documented. The best known of these was the attack on Halabja on 16–17 March 1988.

[28] While the agents themselves may not cause lethal effects in the majority of those exposed, they have most often been used in association with lethal weaponry to which the exposed individuals are more likely to become vulnerable to.

[29] The United States Government regularly publishes the views of its intelligence services more extensively than other countries do.

other sources in the literature is that against Syria. However, that country is not a party to the Chemical Weapons Convention. At other times suggestions of total numbers of states with chemical weapons capabilities have been cited by the US, normally in the range of 10-16 states, although no details are given of which states are supposedly included in this total, nor what 'weapons capability' is meant to indicate.

In addition to the countries referred to in the sections above, NGO assessments have mentioned allegations of current or past programmes in Israel, Pakistan, Saudi Arabia and Taiwan, although it is not clear that any of these countries have carried out activities in this field.

The control of chemical weapons

Controls on chemical weapons take many forms such as formal international measures, informal co-operative arrangements between states, and national regulations. There is also an active scientific community concerned about the potential for misuse of technologies in this field.

Until the end of the twentieth century, the major international legal instrument in this field was the 1925 Geneva Protocol. This was a widely supported (but sometimes flouted) treaty that prohibited use, but not the development or possession of chemical weapons. At the end of the century, a new convention was agreed and implemented.

The Chemical Weapons Convention

After some 25 years of sometimes controversial negotiations agreement was reached in the late 1990s on the Chemical Weapons Convention.[30]

Under the CWC, 12 parties have declared 64 chemical weapon production facilities or sites: Bosnia and Herzegovina, China, France, India, Iran, Japan, Libya, South Korea, Russia, the UK, the USA and the former Yugoslavia (now Serbia and Montenegro). Ten parties have declared the possession of old chemical weapons (dating from before 1925): Australia, Belgium, Canada, France, Germany, Italy, Japan, Slovenia, the UK and the USA. Three parties have declared that abandoned chemical weapons were present on their territory: China, Italy, and Panama. Six countries have declared the possession of chemical weapon stockpiles: Albania, India, Libya, Russia, South Korea and the United States.[31]

The CWC bans the production, development, stockpiling and use of all toxic chemicals and their precursors except for peaceful purposes — the 'general purpose criterion'. This is the key to ensuring that all toxic chemicals are covered by the treaty's prohibitions and is the principal mechanism through which future

[30] The CWC was opened for signature on 13 January 1993 and entered into force on 29 April 1997. As of 31 March 2004, 162 states had ratified or acceded to the convention. As of the same date, 20 countries had signed, but not ratified, the treaty, while 12 countries had neither signed nor acceded to the convention.

[31] The information in this paragraph is current as of 31 March 2004.

technological and scientific developments can be taken into account when implementing the convention.

The CWC is implemented by the Organisation for the Prohibition of Chemical Weapons (OPCW), based in The Hague, Netherlands. The OPCW consists of three parts: the Conference of the States Parties (CSP), the Executive Council (EC) and the Technical Secretariat (TS). The CSP is the highest decision-making body, meeting in regular session once per year. The EC is a representative body, composed of 41 member states representing the five regional groupings, which oversees operational aspects of treaty implementation, meeting in regular session about 3-4 times per year. The TS is responsible for the day-to-day implementation of the OPCW, including the processing of declarations submitted to the OPCW by the parties and the carrying out of on-site inspections.

CWC implementation issues

There is a range of treaty implementation issues that have not been fully resolved. All are long-standing and relate to the cost, scope and level of intrusiveness required to implement the convention effectively. These issues include: measures to ensure universal membership of the CWC; verification; destruction methods; national implementation measures; consultation, cooperation and fact-finding; assistance and protection against chemical weapons; economic and technological development; scientific and technological developments; and the institutional basis of the Convention.

Measures to ensure universal membership of the CWC

With 182 states having made CWC commitments,[32] the OPCW is continuing efforts to encourage non-member states to join the convention. For example, the decision by the former Yugoslavia to accede to the convention was facilitated through a diplomatic initiative that was pursued partly within the framework of the OPCW. The holding of annual regional meetings have also been used as a mechanism to encourage non-member states to join the CWC.

There is little said in the literature against universality efforts, as it is seen as a generally worthwhile objective. However, there is an emerging debate in the literature about whether it is more productive to target states that are outside of the Convention simply through lack of political momentum, and which have no likelihood or potential to proliferate chemical weapons, or to put effort into drawing into the regime those states whose possible capabilities and intentions may cause concern. The former approach creates headline figures that sound good but produces little direct impact on proliferation potentials. The latter takes much more time and effort (and can be very frustrating) but the bringing within the regime of key states, such as Libya, can mean a significant reduction in proliferation potentials.

[32] 162 states parties plus 20 signatory states.

Verification

Since the CWC's entry into force most of the OPCW's resources have been devoted to chemical weapon-related facilities — such as verifying the destruction or conversion of former chemical weapons production facilities, verifying the destruction of chemical weapons stockpiles,[33] and verifying that facilities doing defensive research are not carrying out prohibited activities. For example, approximately two-thirds of inspector man-hours have so far been spent at such facilities. While this has presented a number of challenges to the OPCW, the more significant challenges over the long term are those connected with the verification of non-production of chemical weapons by the chemical industry or in undeclared facilities.

Major chemical industry verification issues that are currently the subject of debate in the literature include (a) deciding how much of the chemical industry should be declared and subject to routine inspections, (b) how inspection resources should be directed towards the various types of facilities and plant sites (inspection regimes vary in terms of degree of intrusiveness and scope according to type of facility or plant site), (c) harmonizing the collection and reporting of chemical industry data (especially with regard to declarations of chemical transfers between states), and (d) ensuring that the verification regime takes into proper consideration scientific and technological developments, including, for example, through the application of the general purpose criterion.

Application of the GPC is also key to ensuring that undeclared facilities and activities are covered by the convention, including, for example, through the use of the challenge inspection mechanism or by adjusting CWC implementation to ensure that certain types of facilities are declarable and subject to routine inspection.

The other major elements of CWC verification are challenge inspections and investigations of alleged use of chemical weapons, neither of which have yet been invoked. There is only a small literature on what the impact on the CWC might be if a challenge inspection uncovered evidence to support the allegation that prompted it, but even less has been written about what the impact might be if no evidence was found.

Chemical weapon destruction methods

There has been an extensive scientific literature about the advantages and disadvantages of a variety of technological methods for destroying chemical weapons. Concerns in the regions where facilities for destruction of chemical weapons are located have prompted many writings on the possible environmental impact of the various processes that could be used. Much of the debate between experts in the USA

[33] Chemical weapon stockpiles of approximately 70 000 agent tonnes have been declared since the CWC entered into force. Although chemical weapon possessors are required to destroy their stockpiles no later than 29 April 2012, both Russia and the USA will be unable to meet their deadlines for political and technical reasons. As old and abandoned chemical weapons continue to be periodically recovered, their destruction will continue for at least several more decades.

is now focused on the trade-offs in the additional costs required to reduce environmental impact. Elsewhere, much of the debate is on the difficulties the Russians have in finding the resources to complete their destruction requirements including provisions relating to health and safety and protecting the environment.

National implementation measures

The OPCW is currently placing great emphasis on ensuring that all of the parties effectively implement their obligations for national implementation measures, including by passing penal legislation that prohibits individuals and groups under a party's jurisdiction from carrying out activities that are banned by the CWC. As the constitutional frameworks of member states vary substantially, there is considerable debate about the best methods of implementing provisions within the various legal systems. Most literature in this area deals with legal implementation in individual states and there is little comparing measures across a sample of states.

The OPCW now has a 'plan of action', agreed by the Conference of the States Parties to encourage states, not only to implement their own legislation, but to co-operate and share information between them on legal measures. As of 14 March 2004, 95 parties (or 59 per cent) had informed the OPCW of their implementing measures. Of these states, only 52 (or 32 per cent) had legislation that covered areas determined by the OPCW to be 'key' to the CWC's enforcement. The current OPCW efforts enjoy a high level of active political engagement. This is mainly due to renewed concerns over the possible threat posed by non-state actors, such as terrorists, using toxic chemicals.

Consultation, cooperation and fact-finding

If one or more parties has a question or concern regarding implementation of the convention by another party, provisions in Article IX of the CWC regarding consultation, clarification and fact-finding can be invoked. This includes the possibility that parties may contact each other directly. In addition, a party may request the Executive Council to assist in clarifying 'any situation which may be considered ambiguous or which gives rise to a concern about the possible non-compliance of another State Party'.

It should also be noted that requests for clarification have been frequently and routinely requested and addressed under the provisions of Article IX. Some of these informal discussions have taken place within the framework of EC meetings, while others have taken place directly between interested states. The overwhelming majority of requests for clarification have been responded to in a way that has satisfied those requesting clarification.

Assistance and protection against chemical weapons

Article X of the CWC contains provisions to assist states that are threatened with chemical weapons or are the victims of their use. The parties may elect to, inter alia, contribute to a voluntary assistance fund, conclude an agreement with the OPCW on

the procurement of assistance, and declare the kind of assistance the party might provide in response to an appeal from the OPCW.

While assistance and protection workshops have been periodically held since the CWC's entry into force, such activities have been given greater emphasis since the 11 September 2001 attacks in the USA. However, implementation of this article has been uneven and is the subject of some debate. A failure by the OPCW to provide a credible response to an appeal for assistance or protection could fundamentally undermine the treaty regime. This could happen in a case where the general public felt the OPCW lacked credibility as a viable, effective organization. However, there is no consensus as to the level of resources and planning arrangements that would be needed to provide an effective response.

There are also unresolved issues on how OPCW resources should be interwoven into states' national emergency response plans. Although the OPCW has good relations with the foreign relations and trade ministries in the governments of member states, there has, so far, been comparatively little contact with emergency planning departments and there is no common expert comment on how this should be best carried out.

Economic and technological development

The developing countries, in particular, place great emphasis on the convention's economic and technological development provisions (Article XI). This is largely because most countries do not see themselves as being directly threatened with chemical weapons. For such countries, the CWC's economic and technological development provisions are, aside from more general political and ethical considerations, a major attraction for joining the CWC and participating in the regime. Current OPCW programmes that are at least partly designed to fulfil these provisions include: the Associate Programme, the Conference Support Programme, the Equipment Transfer Programme, the Internship Support Programme, the Laboratory Assistance Programme, and various research projects.

Scientific and technological developments

Issues that need to be taken into account to ensure that the scientific and technological developments are properly taken into account include: (a) periodic consideration of how the GPC can or should be implemented, (b) ensuring that the verification regime that is applied to the chemical industry reflect current and future scientific and technological developments (e.g., through the adjustment of quantitative risk factors and frequency of inspection algorithms), (c) ensuring that the validated data for inclusion in the OPCW's Central Analytical Database reflect current and future scientific developments, and (d) ensuring that the OPCW's list of approved inspection equipment is periodically updated and that existing inspection equipment is used and properly maintained.

The principal body responsible for ensuring that scientific and technological developments are taken into account is the OPCW's Scientific Advisory Board

(SAB). It is clear from debate in non-governmental scientific circles that there is some frustration that the SAB takes considerable time to reach conclusions on technological developments. The EC and CSP need to act on SAB recommendations in a timely manner. A number of key SAB recommendations have not been acted on by the EC or CSP. In general, technical experts tend to share the same views. Complications have more often arisen once implementation issues are taken up at a political level.

A related concern is that CWC implementation will, on some issues, be driven by implementation practice rather than explicit policy decisions. This is especially true with regard to whether and how the CWC should be interpreted in relation to programmes for the development of non-lethal weapons and incapacitants.

Institutional basis of the Convention

There has been considerable debate about the institutional basis of the CWC. An example of this debate has been the discussions about introduction of a tenure policy for OPCW staff. This will mean that with the exception of locally-recruited support staff and translators, OPCW staff will serve a maximum of seven years with the organization. From one perspective, some members states want to ensure that the OPCW does not become an organization that people spend their entire careers within; from another, other states have been concerned that this policy will severely weaken the OPCW through the loss of staff continuity.

Supplier controls

Article I of the CWC places a legal obligation on states parties to ensure they do not assist anyone to make or develop chemical weapons. Most states fulfil this legal obligation by implementing a system of national export controls. The experience of the efforts by Iraq during the 1990s to acquire materials and technologies for chemical weapons for use in the Iran-Iraq War led to calls for co-ordination of information between suppliers. Iraq had a deliberate policy of purchasing different components for projects from various suppliers in separate countries. This made it very difficult for any one system of control in any one country to have a clear idea of the final use components might be put to.

During the 1980s a number of states started to co-ordinate their supply controls through an informal arrangement which became known as the Australia Group. The issues of export controls are dealt with in a separate section of this document.

Selected areas for further consideration and possible research

Those involved with OPCW matters in national governments and elsewhere are sometimes unfamiliar with the basic provisions of the CWC or their background. This is partly because members of national delegations assigned to the OPCW are periodically rotated to other areas every three years or so. While the OPCW and national governments do provide some excellent training, there is a need for better

provision of training materials and background information for officials entering this field.

More detailed studies that might enhance the current literature include:

- comparative analyses of CWC implementation across countries and legal systems;
- reviews of the OPCW's plan of action (this has been so recent that there is limited literature on it);
- assessments of the political impact of carrying out a challenge inspection that discovers no evidence to support the allegation that prompted it;
- estimations of the level of resources and planning arrangements that would be needed to provide an effective OPCW response for assistance and protection against chemical attack; and
- methods to retain the OPCW "institutional memory" following the introduction of the staff tenure policy?

Select bibliography

1. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare*, 6 vols. (Almqvist & Wiksell: Stockholm, 1971-75).
2. World Health Organization, 'Public health response to biological and chemical weapons: WHO guidance', 2004.
3. 'Impact of scientific developments on the Chemical Weapons Convention', Proceedings of IUPAC Workshop, Bergen, Norway, 30 June-3 July 2002, *Pure and Applied Chemistry*, vol. 74, no. 12 (12 Dec. 2002).
4. Jonathan Tucker (ed.), 'The conduct of challenge inspections under the Chemical Weapons Convention: proceedings of an expert workshop held on May 29-31 2002 in Washington DC', Center for Nonproliferation Studies, 2002.
5. John Hart and Cynthia Miller (eds.), 'Chemical Weapon Destruction in Russia: Political, Legal and Technical Aspects', *SIPRI Chemical & Biological Warfare Studies*, no 17, Stockholm International Peace Research Institute, 1998.
6. Walter Krutzsch and Ralf Trapp, *A Commentary on the Chemical Weapons Convention* (Martinus Nijhoff Publishers: Dordrecht, 1994).
7. Jean Pascal Zanders, John Hart, Frida Kuhlau and Richard Guthrie, 'Non-Compliance with the Chemical Weapons Convention: Lessons from and for Iraq', SIPRI Policy Paper no. 5, October 2003, available at URL <http://projects.sipri.se/cbw/cbw-pol-pap05.pdf>.

E. Biological weapons

A biological weapon is one that works through the pathogenic effects of micro-organisms.[34] This includes toxins and viruses. It should be noted that toxins, being chemicals produced by organisms, may also be counted as chemical weapons.

Biological warfare stems from the attempt by warring parties to induce diseases and ill-effects in their enemies. It has a history that goes back even before the discovery of micro-organisms, when diseased carcasses of animals would be catapulted into beseiged cities and castles with the hope of spreading the affliction. In summary, biological warfare is the deliberate creation of disease for hostile purposes.

This manipulation of health makes the biological weapons field the most difficult to deal with from the 'dual-use' perspective, as knowledge to counter biological warfare is the same as is needed to counter naturally occurring outbreaks of diseases. Moreover, the knowledge of mechanisms of disease is critical for the ability to develop biological weapons.

The creation of disease for hostile purposes may not only have humans as the target, as the impact on societies (and the societies' ability to generate military forces) of the loss of livestock and crops has made these targets for past biological weapons programmes. As most diseases that have been examined for the potential to be used as agents of biological warfare exist in a naturally-occurring form, it may be difficult in the early stages of an outbreak to understand whether an illness has been deliberately induced or has happened naturally.

As the knowledge required to develop protection against biological attacks is very similar to that needed to make weapons to carry out such attacks it can be very difficult to distinguish between research carried out for defensive purposes (which is permitted under international controls) and that carried out for offensive purposes (which is not).

Historically, there has a general lack of perceived military and economic gains to be obtained by the acquisition or use of biological weapons. Not being able to regard biological weapons as reliable and effective strategic deterrents was a major reason for a number of states to unilaterally abandon their offensive programmes. While this held true for major powers during the Cold War, there is a perception that this may not apply to some smaller powers in the modern multi-polar world.

Biological weapons programmes

Unlike the Chemical Weapons Convention,[35] the terms of the Biological and Toxin Weapons Convention did not require declarations of existing or past programmes

[34] For a number of decades the term 'bacteriological warfare' was used as bacteria were the only clearly identified class of microbes. When the science had become clearer, the usage 'bacteriological (biological) warfare' became common to ensure that there was no ambiguity that this included other microbes such as viruses and fungi. Over time, this has simply become 'biological warfare'.

[35] For more details of the CWC see the section on chemical disarmament in this document.

when that Convention entered into force. A later system of declarations was introduced as 'Confidence-Building Measures' but this system is not legally binding and has not been universally acted upon.

This means that the literature in this field is much scarcer than in the chemical field. A first group consists of information based on rare unilateral statements by states of possession or non-possession, whether relating to the past or the present. A second group consists of allegations made by one state against another and a wider analytical exploration of these allegations.

Declared programmes

States which have acknowledged past biological weapons programmes include Russia, the UK, and the USA. Iraq acknowledged in 1995 that it had carried out research to develop biological weapons. During the Second World War, Japan used biological weapons in a number of military actions in China.

Suspected programmes

Allegations have been made, primarily by the United States,[36] that the Democratic People's Republic of Korea and Syria have current biological weapons programmes. The DPRK is a party to the BTWC while Syria has signed but not ratified the Convention. At other times suggestions of total numbers of states with biological weapons capabilities have been cited by the US, normally in the realm of 10-13 states, although no details are given of which states are supposedly included in this total, nor what "weapons capability" is meant to indicate.

In addition to the countries mentioned in the sections above, NGO assessments have mentioned allegations of current or past programmes in India, Israel, Pakistan, Saudi Arabia and Taiwan, although it is not clear that any of these countries have carried out activities in this field.

Control of biological weapons

Controls on biological weapons take many forms such as formal international measures, informal collaborative arrangements between states and national regulations. There is also an active scientific community concerned about the potential for misuse of technologies in this field. The debate in the scientific community is much more intense in this field than in the chemical or nuclear fields.

The two main international treaties in this field are the 1925 Geneva Protocol and the 1972 Biological and Toxin Weapons Convention. The Geneva Protocol is essentially a prohibition on use of the weapons it controls, not on their possession. The BTWC contains much broader prohibitions.

[36] The United States Government regularly publishes the views of its intelligence services more extensively than other countries do.

There is a clear consensus that the controls on materials and technologies that could be used to make biological weapons need to be strengthened. However, there is an ongoing debate about what are the best means to do this.

The Biological and Toxin Weapons Convention (BTWC)

The BTWC prohibits the development, production and stockpiling of biological and toxin weapons.[37] While it is common for people to draw direct comparisons between the BTWC and CWC there are a number of fundamental differences. Perhaps the most significant two are that the BTWC has no formal verification mechanisms and that it has no standing institution overseeing treaty implementation.

Concerns about the lack of verification measures were raised during the negotiations and at each of the formal Review Conferences to the Convention.[38] In order to explore possibilities for strengthening the Convention itself, an Ad Hoc Group of Governmental Experts to Identify and Examine Potential Verification Measures from a Scientific and Technical Standpoint (VEREX) was convened in 1991 to explore the possibility to provide technical and scientific measures of verification. The VEREX process led to a substantial debate with many states providing working papers analysing options. A final report was produced which presented a number of recommendations to a Special Conference of BTWC states parties in September 1994. This conference agreed a mandate establishing an Ad Hoc Group to develop a legally binding protocol to the Convention (often referred to as the 'verification protocol'). Negotiations began in 1995 and a first 'rolling text' was put together in 1998. The negotiating process was brought to a standstill with the withdrawal of support by the USA in 2001.

Issues of concern to the USA included the burden of verification on the large industrial base of the country (and the risk that commercially sensitive information may not be sufficiently controlled), the burden on government of compiling declarations investigations, and other impacts stronger export controls would impose on a state party and its bio–pharmaceutical industry. In addition there was a concern that the proposed verification regime could not guarantee compliance and that it would bring forth a false sense of security.

Current issues of concern

A new programme of meetings of BTWC states parties provides a useful structure for consideration of the current main issues of concern and debate. After the negotiations for a protocol had come to a standstill in 2001 a programme for a series of meetings

[37] The BTWC was opened for signature on 10 April 1972 and entered into force on 26 March 1975. As of 30 April 2004, 152 states had ratified or acceded to the convention. As of the same date, 16 countries had signed, but not ratified, the treaty, while 27 countries had neither signed nor acceded to the convention.

[38] Five Review Conferences have been held — 1980, 1986, 1991, 1996 and 2001-02 (the fifth was convened and suspended in 2001 and reconvened for a short session in 2002).

was adopted by consensus at the reconvened Fifth Review Conference in 2002. This called for the parties to hold three annual meetings before the Sixth Review Conference (to be held no later than 2006). The mandate of each meeting is to discuss and work towards a common understanding and effective action on five issues:

- national implementation measures to implement the prohibitions set forth in the convention, including penal legislation;
- security and oversight of pathogenic micro-organisms and toxins;
- international capabilities to respond to, investigate and mitigate the effects of alleged use of biological or toxin weapons or suspicious outbreaks of disease;
- national and international institutional efforts related to the surveillance, detection, diagnosis and combating of infectious diseases affecting humans, animals and plants; and
- the design and promulgation of international codes of conduct for scientists.[39]

National implementation and penal legislation

Article IV of the BTWC formulates the legal obligation for each state party 'in accordance with its constitutional processes' 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' in circumstances prohibited by the Convention.

As this article does not specify the introduction of legislation, a number of states have relied on other, often more general, laws to implement their Convention obligations. With advances in technologies, and the introduction of biological sciences into new areas of industry, there is a growing consensus that specifically drafted, detailed legislation is needed to fulfill all Convention requirements, and that such legislation should include penal provisions.

However, national implementation of detailed legislation has been far short of comprehensive. A Confidence-Building Measure (CBM) agreed in 1991 allows for declarations by states on legislation, regulations or other measures taken to implement the BTWC but few states have provided declarations. A recent NGO survey indicated that less than half of states parties could provide details of their legislation.[40]

There is no indication in the literature that delays in introduction of detailed legislation have been caused for any reason other than the existence of other priorities in national legislatures. Another indicator of a lack of priority for BTWC implementation is that only 11 states parties are known to have established a national focal point for BTWC implementation. While this is not a requirement under the Convention, it is a recognized means of co-ordinating policy and for creating ease of

[39] The first two of these issues were discussed at the 2003 meetings, the third and fourth will be discussed at the 2004 meetings and the fifth at the 2005 meetings.

[40] In a study carried out by VERTIC in 2003, 95 (out of the then 151) delegations or embassies of states parties were surveyed in an effort to assess the current status of national implementation legislation. The results show that 47% of the surveyed states have national implementation legislation in force, 7% are in the drafting process, 15% have an uncertain status and 37% have no information.

consultation between states parties. There is a need to increase the awareness among parties to prioritize BTWC activities.

Security and oversight of pathogenic micro-organisms and toxins

There is growing recognition of the need for effective security measures to reduce biological warfare threats and the threat of bioterrorism. The 2001 incidents in which letters containing anthrax spores were sent through the US postal system triggered a renewed interest in the security methods to prevent micro-organisms and toxins being available to people with malicious intent.

A key debate has ensued over how to define the terms 'biosafety' and 'biosecurity' in the absence of an agreed definition of these terms. Some governments consider that their existing measures for 'bio-safety'—that is, measures intended to prevent the release of biological material that could lead to disease in humans, animals or plants—contain substantial provisions to stop such material from falling into the possession of unauthorized persons and thus include 'biosecurity' measures. Other governments wish to define biosecurity separately, such as the US definition as 'effective measures to protect dangerous pathogens and toxins from illicit or malicious diversion'. A comparable divergence of opinion appears in academic literature. Nonetheless, there is a general recognition that there are many circumstances in which measures could be strengthened to help prevent unauthorized access to relevant materials of concern.

There is a further debate as to whether biosafety/security standards should be established on a national basis with the hopes that eventually an international harmonization of measures will evolve or whether an international set of standards should be agreed upon which can then be adopted on a national basis. The involvement of industrial and scientific expertise in the setting of standards is widely recognized as important in establishing practical arrangements.

Responses to outbreaks of disease

The economic and security consequences of outbreaks of diseases were highlighted in 2003 with the outbreak of severe acute respiratory syndrome (SARS). The international spread of SARS revealed weaknesses in early detection and global public health responses, and in coordination and sharing of information. There has been much advocacy of the concept that in order to detect and effectively respond to an unusual outbreak of a disease it is important to have existing international agreements for co-operative procedures. The lessons learned from outbreaks of naturally occurring diseases should be used to raise preparedness (and increase deterrence capabilities) in the case of a disease that has been induced deliberately.

Specific measures for fighting infectious diseases such as the 'Vaccines for Peace Programme' and the establishment of a global disease surveillance programme have been suggested. That both proposals would bring benefits for the control of diseases, whether naturally or deliberately occurring, is no longer subject to debate. The key

issue on these sorts of proposals is where the resources needed to implement them would come from and whether the benefits are worth the costs.

Although Article X of the BTWC calls for 'the fullest possible exchange of equipment, materials and scientific and technological information for the use of bacteriological (biological) agents and toxins for peaceful purposes', BTWC implementation has concentrated on biological warfare and not on naturally occurring diseases. A strengthened treaty could build an international response capability against infectious diseases as a general threat to humans which would be a useful tool in the case of a deliberate release of pathogenic microbes.

Codes of conduct or other controls for scientists

There has been a long-standing, broadly held, taboo against the use of biological methods of warfare. Ensuring that this taboo is universally maintained requires the involvement of the scientific community. The role of scientists and researchers in the proliferation process has often been overlooked in the literature.

The process of scientific study involves communication between scientists and relies on the free exchange of information between individuals and between institutions. It has been suggested that these activities should be carried out within a framework that includes an ethical code containing a pledge to not conduct any activities that promote the hostile uses of biological sciences. While the guidance in ethics codes might not prevent an individual with the intent to cause problems, it would strengthen the norm and make it easier for scientists to alert others if someone is undertaking questionable activities.

Some comparisons have been made with the Hippocratic Oath traditionally taken by doctors when qualifying. In reality, few medical schools use the original Oath and there have been a number of modern variations brought into use and some attempts have been made to unify these newer versions.[41] Only a small proportion of professional scientific associations have a code of ethics for their members.[42]

One subject of debate is whether ethical standards should be established on a national basis, with the hope that eventually international standards will develop, or whether an international set of codes should be agreed upon which can then be adopted on a national basis. A further topic of debate is whether codes should be promulgated by governments, by professional scientific associations, or by both.

There is a broad consensus that scientists should receive more information in their training to help them examine the wider consequences of their research and how it might be misused by others. The literature also recognizes that codes formulated with the co-operation of scientists would be better than codes imposed by governments which may be overly restrictive and have the effect of both hampering legitimate research and discouraging scientists from pursuing certain legitimate research areas.

[41] For example, a proposed 'Revised Hippocratic Oath' was presented to the World Medical Association by the British Medical Association in 1997.

[42] In 2002 SIPRI conducted an online survey of how many professional scientific organizations worldwide had a code of ethics and the result was that 11% of 71 international scientific organizations and 12% of 267 national or regional scientific organizations had a code of ethics

Supplier controls

Article III of the BTWC places a legal obligation on states parties to ensure they do not assist any other state to make or develop biological weapons. Most states fulfil this legal obligation by implementing a system of national export controls

During the 1980s a number of states started to co-ordinate their supply controls through an informal arrangement which became known as the Australia Group. The issues of export controls are dealt with in a separate section of this document.

Selected areas for further consideration and possible research

As in the field of chemical weapons (see above), there is a need for better provision of training materials and background information for officials dealing with biological weapons control issues.
More detailed studies that might enhance the current literature include:

- An evaluation of the advantages and disadvantages of the various biosafety and biosecurity approaches to keeping biological materials out of unauthorized hands;
- A comparative analysis of BTWC implementation across countries and legal systems;
- A compilation of elements of past proposals for verification of the BTWC that could be implemented without new international legal instruments;
- A comparative analysis of existing codes of conduct for scientists and engineers;
- An assessment of practical methods to co-ordinate international responses to a biological attack; and
- An exploration of possible measures to mark the 30th anniversary of the BTWC entry into force in 2005.

Select bibliography

1. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare*, 6 vols. (Almqvist & Wiksell: Stockholm, 1971-75).
2. World Health Organization, 'Public health response to biological and chemical weapons: WHO guidance', 2004.
3. Malcolm Dando, *The New Biological Weapons: Threat, Proliferation, and Control* (Lynne Rienner Publishers: Boulder, Colorado, 2001).
4. Michael Moodie, *Reducing the Biological Threat: New Thinking, New Approaches*, CBACI Special Report no 5, January 2003, 57 pp.
5. Nicholas A Sims, 'The Evolution of Biological Disarmament', *SIPRI Chemical & Biological Warfare Studies*, no 19, Stockholm International Peace Research Institute, 2001.
6. P Williams and D Wallace, *Unit 731: the Japanese Army's secret of secrets*, (London, Hodder & Stoughton, 1989).

F. Missiles

Missile programme developments

During the cold war missiles became the centrepiece of a global military balance between ideologically opposed blocs. As the large numbers of inter-continental missiles are being reduced after the end of the cold war, the size and shape of the arsenals of the major powers are diverging. However, while the cold war strategic environment was characterized by a relatively high degree of symmetry and a fairly static strategic balance between the main possessors of missiles, the present environment is more dynamic, more complicated and more difficult to predict over the next decades.

Missiles of different types have now become a central element in the armed forces of many states. Moreover, missiles of different types armed with conventional explosive warheads have been used with increasing frequency in conflicts.

At least 46 states possess missile systems capable of delivering weapon of mass destruction. However, the emergence of ballistic missiles as the primary delivery system of choice for nuclear weapons has heavily conditioned the general literature on missiles—which predominantly describes and analyzes the ballistic missile programmes of a small number of states.

A number of studies focus on the ballistic missile programmes of China, France, Russia, the UK and the USA. A sizable literature is also devoted to the ballistic missile programmes of India, Iran, Iraq, Israel, North Korea and Pakistan. Studies have also been made of ballistic missile programmes that previously existed in Argentina, Brazil, Egypt, Iraq, Libya and South Africa—all countries of actual or considered to be of potential nuclear weapons-related concern. In comparison to the clear link drawn in the literature between nuclear weapons and ballistic missiles, the number of studies and analyses of cruise missiles as delivery systems for nuclear weapons is limited. Relatively few studies address the use of missiles to deliver chemical and biological weapons.

The strategic relationship between the countries that either have or are developing significant missile forces have a very different character from the cold war and a number of these countries do not have and have never had much by way of strategic interaction with one another. The literature on missiles does put forward a number of factors that seem to be driving missile programmes, including: unresolved local conflicts; regional competition between rival states; efforts to deter intervention by outside powers (primarily the United States); efforts to respond to changes in the way that military operations are conducted in the light of technology development, as well as by an effort to compensate for the difficulty of keeping pace with the cost and complexity of developing advanced conventional weapon technology. However, looking at the literature as a whole it can be concluded that at present there is no

conceptual framework that can adequately capture this changed environment or that can help to put the new issues, problems and patterns into a perspective.[43]

A number of countries (Brazil, China, India, Israel, Japan, Russia, the United States) have developed the capacity to develop space launch vehicles (SLVs) with characteristics similar to long-range ballistic missiles. There are also a number of international (in particular European) as well as bilateral cooperation programmes to develop and produce SLVs. The existence of a legitimate commercial market for launching satellites (as well as military programmes to launch satellites) expands the number of sources of missile technology, including technologies that would be needed for advanced long-range ballistic missile programmes. The growing number of commercial markets being identified for unmanned air vehicles of different kinds has been pointed to in recent literature as another factor that makes the global missile inventory more difficult to describe and analyse.

Missile control arrangements and discussions

Establishing negotiated limits on ballistic and cruise missiles were a central element of bilateral nuclear arms control during the cold war. However, there is no multilateral treaty that establishes the parameters of legal and legitimate missile inventories.

The Missile Technology Control Regime (MTCR)

The MTCR, an informal arrangement in which countries that share the goal of non-proliferation of unmanned delivery systems for NBC weapons cooperate to exchange information and coordinate their national export licensing processes, is currently the primary arrangement that seeks to control missile proliferation. The literature related to MTCR underlines that the regime has largely succeeded in its original objective in that the multiple sources of supply available to states seeking a complete, functional long-range missile delivery system in 1987 (when the MTCR was formed) has been reduced to one in 2004 (North Korea).[44] From the literature it is also clear that this success of MTCR has not by itself resolved all of the issues and problems related to missile proliferation. A number of states continue to pursue dedicated programmes to acquire long-range missiles intended for or capable of NBC weapon delivery.

Recent literature has identified a number of challenges to the effectiveness of the MTCR of which the following are probably the most important:

- Trade and technology exchange between states that neither participate in MTCR nor apply its guidelines.
- The acquisition of items not listed in the MTCR Equipment and Technology Annex and the use of these items in missile programmes.

[43] It should be noted that SIPRI is in the process of trying to develop a global inventory of missile related issues and problems in the hope of contributing a broader perspective on these matters.
[44] In 1987 Argentina, Brazil, China, the Soviet Union and the United States were all active suppliers of long-range ballistic missile systems.

- The potential for adapting missiles acquired for other military purposes for NBC weapon delivery. This might include adapting anti-ship or land attack cruise missiles that have been and continue to be traded extensively or transferring technology from surface-to-air missiles acquired for defence against enemy aircraft or missiles.
- The potential adaptation and use of unmanned air vehicles other than missiles for NBC weapon delivery.
- The potential adaptation of satellite launch vehicles for use as missiles or the diversion of technology provided to SLV programmes into missile programmes.

In addressing these problems the principal recommendation in the literature has been the more extensive application of end-use or "catch-all" controls by MTCR participating states (a step that the regime agreed to take in 2003).[45] The literature also makes clear that the adoption of catch-all controls has important implications for the design and implementation of national export controls. The effective implementation of catch-all controls requires exporters to develop a greater knowledge and understanding of the activities of their customers. National authorities have a responsibility to work closely with industry to ensure that relevant and detailed information about countries and programmes of concern is provided in a timely manner. According to this literature, to be effective in future MTCR will have to strengthen its arrangements for information sharing between national authorities, few of which can gather detailed information in a timely manner on a national basis. Some authors question whether such cooperation can be accomplished in an informal regime or whether MTCR will have to consider a new legal basis for its activities.

The Hague Code of Conduct Against Ballistic Missile Proliferation

Several other supporting measures have been developed in the area of missile-related arms control and non-proliferation. The Hague Code of Conduct Against Ballistic Missile Proliferation (HCOC) was adopted by an international conference in The Hague (Netherlands) in November 2002. The HCOC sets norms and specifies transparency measures as tools to increase confidence in the peaceful nature of satellite launch vehicle programmes and to promote the non-proliferation of ballistic missiles. With regard to ballistic missiles, the HCOC states that the subscribing states should make an annual declaration providing an outline of their ballistic missile policies, such as relevant information on ballistic missile systems and land test-launch sites.

The current literature on HCOC is largely critical of its coverage (in particular the failure to extend the measures to cover cruise missiles) and its lack of specificity about what information participating states are required to submit. Other authors have pointed out that some states that participated in the process of multilateralising the HCOC (the draft of which was developed within the MTCR) decided against

[45] End-use or "catch-all" controls require exporters to submit any export transaction to national authorities for assessment prior to export, whether or not the item concerned is on an export control list, if there is reason to know that the item is or could be used in an NBC weapon programme.

subscribing to the Code because transparency measures were considered too intrusive. These authors suggest that greater specificity could have reduced (rather than encouraged) participation.

Other missile control proposals

Recent literature pays little attention to two other processes intended to support missile-related arms control. A group of government experts produced a report in July 2002 on the subject of missiles in the framework of the United Nations. This report was heavily criticized for its lack of actionable proposals.

In 1999 the Russian government proposed a Global Control System (GCS) for missiles that would include the following elements: a missile launch transparency regime; positive incentives for states that agree to give up existing missile delivery systems and programmes; a security guarantee to be provided to states that agree to give up existing missile delivery systems; and a consultation mechanism to oversee the GCS and discuss its further development. A GCS of this type would be compatible with and supportive of the HCOC in theory and the Russian government organized a number of seminars to discuss the idea. As no specific draft of the GCS was prepared further literature examining GCS is probably unlikely. However, further study of two of the ideas central to the GCS (positive incentives for states that agree to give up existing missile delivery systems and programmes as well as a security guarantee to be provided to states that agree to give up existing missile delivery systems) would be worthwhile.

Selected areas for further consideration and possible research

In relation to *missiles* studies that might enhance the current literature include:

- A study of the pattern of acquisition of cruise missiles with regard to their potential use as delivery systems for WMD;
- An assessment of the information contained in annual declarations under the HCOC in the light of information already in the public domain. Comparing this information would help identify areas where annual declarations could be improved (e.g., developing a reporting format).
- A study of the role of incentives and security guarantees in the decision of states to give up ballistic missile programmes.

Selected bibliography

The Center for Nonproliferation Studies at the Monterey Institute for International Studies maintains a substantial internet-based database of missile programmes. This resource can be found at URL http://cns.miis.edu/research/missile.htm.

1. Pavel Podvig, ed. *Russian Strategic Nuclear Forces*, (MIT Press: Cambridge MA 2001).

2. Mark Smith, ‘Assessing missile proliferation’ in Gustav Lindstrom and Burkhard Schmitt eds. *Fighting Proliferation—European perspectives*, Chaillot Paper no. 66, EU Institute for Security Studies, Paris December 2003.
3. Mark Smith, ‘The MTCR and the Future of Ballistic Missile Non-Proliferation’ *Disarmament Diplomacy*, Issue No. 54, February 2001.
4. Dinshaw Mistry, ‘The MTCR: A Ten-Year Review’, *Comparative Security Policy*, Vol. 18 No. 3 December 1997.
5. Dinshaw Mistry, ‘Beyond the MTCR’, *International Security*, Vol. 27 No. 4 Spring 2003.
6. Dennis Gormley and Richard Speier, *Controlling Unmanned Air Vehicles: New Challenges*, Non-Proliferation Education Center, 19 March 2003.
7. Victor Zaborsky, ‘Missile proliferation risks of international space cooperation’, *World Affairs*, Spring 2003.

G. Cross-cutting measures

A tendency in the recent literature on arms control has been the discussion of how to organize a more coherent and comprehensive approach to non-proliferation in the face of identified weaknesses in existing arrangements.

Recent literature has highlighted the failure to universalize multilateral treaties, identified cases of non-compliance with treaties and treaty violations and the difficulty of developing a common response in the face of these challenges (including the failure to implement UN Security Council resolutions). Moreover, while there is a consensus that WMD regimes need to adapt to new circumstances and take into account new threats, in practice the process of adaptation has not kept pace with changing threat perceptions.

The failure to adapt treaty-based instruments has raised a number of institutional and organizational issues and challenges. Some authors have identified a need to establish a permanent verification mechanism within the United Nations to allow the UN to play a more central role in assessing compliance with existing treaties and to inform UN responses to identified cases of non-compliance.[46]

Other authors have suggested that an approach based on combining the standards set in multilateral treaties with monitoring and enforcement mechanisms that draw on practical cooperation through informal and ad hoc arrangements would be more likely to produce tangible results in the short term under present political conditions.[47]

The revived interest in practical cooperation through informal and ad hoc arrangements has translated into significant changes in informal export cooperation regimes as well as a strengthening and expansion of international non-proliferation and disarmament cooperation and assistance programmes.

The dual-use nature of WMD technologies

The pattern of industrial and technological innovation has meant that a growing number of advances relevant to security are driven by commercial investment while a shrinking number have been specially developed exclusively (or even primarily) for military use. This is especially true of the IT and biomedical sectors.

The pattern of innovation, product development and production in the field of security has reflected the wider tendency towards international cooperation with a corresponding move away from traditional tendency to encourage the greatest possible degree of national self-reliance in the military field.

In past times, many countries would not have been able to make use of some of the advanced technologies as they did not have the local skills to use what they might have required. In recent years the capabilities of countries and organizations to take

[46] Trevor Findlay, 'Preserving UNMOVIC: The Institutional Possibilities', *Disarmament Diplomacy*, No. 76 March-April 2004.

[47] *The Stockholm Agenda for Arms Control*, Report based on the Rapporteur's Statement at the Nobel Symposium on A Future Arms Control Agenda, 1–2 Oct. 1999.

up new technologies and innovations and to be able to use them (their "absorptive capacity") has increased substantially.

Controls on dual-use technologies

As dual-use technologies have legitimate as well as prohibited uses, the difficulties of discriminating between legitimate and non-legitimate uses are severe and there is a growing literature on this problem.[48]

The problem of control is magnified with regard to "intangible technologies". The definition of "intangible technologies" is the subject of some debate within the literature. Some define the term narrowly as only the sorts of knowledge that are difficult to codify (i.e., those skills and knowledge that cannot be written down – this is also known as "tacit knowledge"). Others define it more broadly as including codified information such as books, designs and algorithms.

Three approaches can be identified in the literature for reducing the potential for the misapplication or unauthorized transfer of intangible technologies.

The first is to quarantine those in possession of sensitive information and skills and control their movements and contacts. For example, a significant body of literature has examined the controls that continue on the physical movement and foreign contacts of scientists working and training in Russia's "nuclear cities" where the most sensitive nuclear weapons related knowledge resides.[49]

The reverse to this "inside-out" approach are "outside-in" measures in which the inward movement of scientists and technicians as well as the identity of overseas students and trainees is scrutinized and assessed before such activities take place. There are very few studies or analyses of this form of control, though a number of papers have sought to clarify the implications of such controls for the conduct of basic or applied research in science and/or engineering at institutions of higher education in the West, and the USA in particular.[50] The limited literature in this field has been almost exclusively focused on the impact of such controls on the West with very little said about the impact on economic development of reductions in the numbers of scientists and engineers from less developed countries being trained in the West.

A third approach to controls—the development of codes of conduct for scientists to raise awareness about the need to treat sensitive information in a responsible manner—is discussed in the section on biological weapons above.

In light of the potential economic benefits to be gained from international cooperation in fields such as microbiology, further literature examining the potential impact of security-related controls on biological research.

---

[48] See the following section on export controls.

[49] For example, Maurizio Martinelli, Secretary General Landau Network-Centro Volta (LNCV), *An Assessment of Russian Nuclear Cities, International Efforts, Strategies and the European Nuclear Cities Initiative*, paper delivered to the LNCV Forum on the European Nuclear Cities Initiative, Rome 13–14 Dec. 1999.

[50] Robert A. Brown, Provost, and Julie T. Norris, Director, Sponsored Programmes, 'Export Control Laws and Regulations', Memorandum to Deans, Department Chairs, Laboratory and Center Directors, Massachussetts Institute of Technology, 25 Jan. 2002.

Criminalization

One new set of proposals to deal with the changed proliferation threat that results from advances in dual-use technologies (as well as to strengthen WMD regimes as a whole) has been to suggest that new legal provisions are brought forth to criminalize the actions of individuals involved in preparations for chemical and biological warfare. Blanket provisions that would prohibit preparations for nuclear warfare would be more difficult, owing to the status of nuclear-weapon states.

Both the BTWC and the CWC require each state party to prohibit activities on its territory that are prohibited to a state party. Neither convention requires a state party to establish criminal jurisdiction over foreign nationals on its territory who commit (or have previously committed) offences relating to biological or chemical weapons elsewhere nor does either contain provisions dealing with extradition issues.

The Rome Statute of the International Criminal Court (ICC), which entered into force on 1 July 2002, includes as war crimes the following acts: 'Employing poison or poisoned weapons' and 'Employing asphyxiating, poisonous or other gases, and all analogous liquids, materials or devices'. This means that individuals can be liable if they carry out these acts in wartime, but not for development and production of the weapons or for using such weapons in operations other than war.

The proposals are to create a new international treaty that defines specific acts involving biological or chemical weapons as international crimes with universal jurisdiction, like aircraft hijacking or torture. The criminalization of hostile uses of biotechnology creates a new legal framework in which prosecuting authorities and courts would have a chance to define whether particular activities with dual-use technologies were legitimate or not.

In a variant of this approach authors have proposed that acts with regard to the preparation development, production, and weaponization of biological agents for deadly purposes should be made an international crime without negotiating a new international treaty by adapting existing multilateral treaties to extend the prohibitions that now apply to states parties to private individuals.

A second step in either process is that each nation should enact domestic measures to prevent the wrongful use of biotechnology. The decision of the United Nations Security Council in April 2004 that all states, in accordance with their national procedures, shall adopt and enforce appropriate effective laws which prohibit any non-State actor to manufacture, acquire, possess, develop, transport, transfer or use nuclear, chemical or biological weapons and their means of delivery seems certain to stimulate further research into the use of the criminal law to prevent WMD acquisition and use.

Select bibliogaphy

1. V Moses and RE Cape (eds), *Biotechnology: The Science and the Business* (Harwood Academic Publishers: 1991)
2. Malcolm Dando, 'Benefits and threats of developments in biotechnology and genetic engineering', *SIPRI Yearbook 1999*, pp. 596–611.

3. Harvard Sussex Program, 'A Draft Convention to Prohibit Biological and Chemical Weapons Under International Criminal Law', *CBW Conventions Bulletin*, 42, December 1998.
4. 'Preventing the Misuse of Biotechnology' Remarks by Barry Kellman, Director, International Weapons Control Center, DePaul University International Human Rights Law Institute, Carnegie International Non-Proliferation Conference, Washington, DC 15 November 2002.

Informal export control cooperation

International trade and cooperation should not undermine security, and export controls allow a choice to be made whether or not to allow a particular export to take place. An export control system is not an embargo and the fact that data is gathered on exports and permission required before certain items can be exported does not imply that governments are attempting to deny any specific item to any specific end-user. No multilateral regimes have the authority to decide on specific exports, but there are forums in which participating governments discuss current issues and problems, exchange information and seek to harmonize their national export controls. The forums are the Australia Group, the Missile Technology Control Regime, the Nuclear Suppliers Group, the Wassenaar Arrangement on Export Controls of Conventional Arms and Dual-Use Items and the Zangger Committee.

A number of institutes now track export control developments and report on them regularly.[51] In addition to this reporting of specific events and decisions, there is a small but growing literature that seeks to describe and analyse export control issues and problems in a more comprehensive manner. Moreover, as preventive measures export controls have certain features that are likely to attract greater interest in the future in the context of the need to develop effective instruments to deny non-state actors and terrorist groups access to WMD and delivery means for them. Firstly, export control cooperation arrangements organize the specialist expertise of participating states to discuss and decide which items (materials, equipment and technologies) are sensitive and need to be controlled. These technical expert groups have already begun to include in their discussions the need to adapt control lists to take into account potential terrorist use of items not currently controlled. Secondly, whereas arms control agreements traditionally produce rules that are binding on states, export control laws and regulations already apply to non-state end-users of controlled items. Thirdly, export control authorities have developed mechanisms for conducting a dialogue with industry and these mechanisms could be exploited to discuss measures to ensure an unbroken chain of custody over sensitive items and to prevent unauthorized access to or end-use of such items.

[51] The Center for International Trade and Security (CITS) produces a monthly *Export Control News Update* that covers developments on a global basis while the Center for Nonproliferation Studies at the Monterey Institute for International Studies produces the *NIS Export Control Observer*, also on a monthly basis, with a main focus on Russia and the successor states to the Soviet Union.

In the main, however, the existing literature addresses itself to the traditional question: how to prevent the acquisition of militarily significant quantities of WMD by states. Surveys and analyses of international export control cooperation often focus on the issues of fairness and effectiveness.

Criticisms of the effectiveness of export controls take as their point of departure the assertion that they cannot prevent a strongly motivated state from acquiring weapons of mass destruction. The documented cases of proliferation all involved the acquisition of critical items (materials, equipment and technology) from foreign suppliers. A state that is denied access to one class of items (such as weapons or critical components) will invest the time and resources to acquire the materials, equipment and technology needed at an earlier stage of the acquisition process (such as production) and, if these are in turn denied, will seek even more basic materials and know-how. A control system could only succeed if it became so comprehensive that the cost and feasibility of its management and implementation became questionable.

A countervailing literature argues that export controls are not and should not be asked to carry the full responsibility for preventing proliferation. They can be an effective element containing proliferation if used as part of a wider set of measures—a point made in a number of case studies that illustrate the role of export control in non-proliferation and de-proliferation successes. These studies recommend that export controls need to be strengthened, adjusted and reformed continuously in the light of technology change and changes in the types of actor and the types of transaction taking place in the market.

Some of the studies criticizing export controls assert the primacy of commitments in treaties to share technology for peaceful purposes over national law and (in particular) over what is considered to be the politically-motivated form of export control cooperation organized in informal regimes. According to this argument full compliance with treaties would make export controls redundant. Other studies—in an increasing majority—point to the necessity of national export controls to implement treaty commitments in conditions where not all states participate in the treaties, not all sensitive items are subject to control under treaties and where compliance is known to be less than complete. These studies also tend to underline that assessment of an export does not contain a presumption of denial except in regard to particularly sensitive technologies or where there are doubts about end-use.

A number of studies criticize export controls on the basis that they deny legitimate commercial opportunities. Of the few economic impact studies (other than industry-sponsored studies) in existence those arguing that the negative commercial impact is disproportionate to the non-proliferation effectiveness of export controls appear to be outnumbered by those that point to the very low proportion of trade subject to assessment (and the very high proportion of assessed transactions that are approved for export). There appear to be very few (and no comprehensive) studies addressing the economic impact of export controls on importing states.

There is consensus within the literature that the effectiveness of existing export controls needs to be improved in the light of demonstrated failures.[52]

An issue taken up in a number of the studies that focus on generic export control issues is the legal form of control: in particular the relative merits of list-based systems requiring authorization of any export of an item with identified technical characteristics, and an end-use (or "catch-all") based system that requires authorization of any item that is to be used for a particular purpose or that is destined for a particular end-user (such as a named facility or to any military establishment). The fact that a growing number of states apply end-use or "catch-all" controls suggests that this approach (which was very controversial ten years ago) has gained acceptance.

The type of event to which export controls should apply is another subject taken up in the literature. Controls have traditionally been applied to exports of physical items and technologies. Recent analyses have pointed to the need to extend controls to so-called "intangible" items (such as information passed through electronic communications or orally in meetings) and to services.

The issue of whether the current form of inter-governmental cooperation is optimal and if not how it might be improved is a subject taken up in a number of analyses. The main issues discussed are: whether a different legal basis for the regimes would help to make cooperation more effective; whether the work of the current regimes could be combined into a single forum for export control cooperation; whether the participating states should open their forums to new participating states and (if yes) which ones and on what basis.

While states are responsible for assessing exports and issuing licences, the question of how to develop a shared normative framework for these decisions is discussed in a number of studies. The codification of prohibitions, guidelines or conditions of supply attached to export control assessments has been examined in several studies. The issue of whether export controls should be linked exclusively to non-proliferation objectives or used in pursuit of other foreign policy goals (for example, to bring about improved human rights behaviour in states importing controlled items or as part of a policy to strengthen democracy in such states) has been discussed both nationally in the United States and also within the European Union. In the United States foreign policy export controls are a subject of regular criticism and are currently under review. EU states agreed to apply the elements contained in their shared Code of Conduct on arms exports (which include considering factors such as the human rights practices in the importing state) in assessments of dual-use exports in 2000.

Any position or rule agreed to in one of these arrangements is put into effect through national law or (for European Union Member States) EU law. Although the constitutional arrangements, legal systems, systems for administration and industrial organization in different countries vary extensively (and there is no blueprint of a national export control system), studies have established certain features that any

[52] All of the military nuclear programmes identified after the signing of the NPT and all recent missile programmes have depended on items (materials, equipment and technologies) obtained from foreign suppliers.

export control system needs to have if it is to be successful. A number of surveys examine the national export control systems in different countries and compare them either against one another or against a model system. A number of these surveys address the particular question of how countries with an authoritarian or one-party political system and a command economy have adapted their export control system as part of the transition to a democratic political system and a market economy.

A number of studies have focused on the implementation of export controls. These studies have clearly established the basic elements needed to judge an export application, namely: an understanding of how the particular item can contribute to a weapon of mass destruction, the nature of the end-user that will receive the item and the true end-use to which the item will be put. No single agency is likely to hold all of the information needed to make an assessment of these things and existing studies have not identified a 'best practice' regarding how to organize a system that brings the most relevant information to bear on an assessment in the most timely manner. However, studies have revealed that few countries have access to all of the information they need from national means. Therefore, how to share information and technical advice among national authorities is a critical issue for export control effectiveness.

A number of recent studies have paid attention to the need for more effective enforcement of export controls. As export controls are a preventive measure, raising the effectiveness of pre-shipment enforcement through greater cooperation with industry to raise awareness and put company compliance procedures in place has been emphasized in these studies.

Selected areas for further consideration and future research

In relation to *export controls* studies that might enhance the current literature include:

- A study of how to strengthen export control enforcement in small states.
- Case studies and analyses of export control systems in countries that have recently (or could soon) become exporters of WMD or associated sensitive items.
- An analysis and evaluation of the effectiveness of the European Union dual-use export control system.
- A study and analysis of the way in which end-use or ("catch-all") controls are implemented by states.
- An analysis of the economic impact of export controls on importing states.

Select bibliography

The most comprehensive internet resources on export controls can be found at:

http://www.uga.edu/cits/home/index.htm
http://projects.sipri.se/expcon/expcon.htm
http://www.nti.org

1. Michael Beck, Cassady Craft, Seema Gahlaut, Scott Jones. Strengthening Multilateral Export Controls. Center for International Trade and Security, University of Georgia. 2002.
2. Nonproliferation: Strategy Needed to Strengthen Multilateral Export Control Regimes. General Accounting Office Report. GAO-03-43, October 25, 2002.
3. Global Evaluation of Nonproliferation Export Controls. 1999 Report. The University of Georgia, 1999.
4. Final Report of the Study Group on Enhancing Multilateral Export Controls For US National Security, April 2001
5. Harald Müller, Matthias Dembinski, Alexander Kelle, Annette Schaper, From Black Sheep to White Angel? The New German Export Control Policy, PRIF Reports No. 32, Frankfurt/M. (PRIF) January 1994.
6. Claus Hofhansel, Commercial Competition and National Security: Comparing U.S. and German Export Control Policies, Praeger/Westview Press 1996.
7. Ian Davis, The Regulation of Arms and Dual-Use Exports: Germany, Sweden and the UK, Oxford University Press 2002.

Active measures against the WMD and missile programmes

In recent years, the efficacy and future viability of the existing framework of arms control and disarmament agreements has been called into question, especially in the USA, as a result of allegations, or clear-cut cases, of states violating their legal commitments. The Bush Administration came to the White House with a philosophical conviction that formal arms control is neither a necessary nor desirable element in the post-cold war international security system; underlying this conviction is a deep-rooted scepticism about the efficacy of the existing framework of restraint agreements and multilateral supplier arrangements designed to prevent the spread of weapons of mass destruction and the means to deliver them. The Administration has articulated a clear and outspoken view of how to deal with the possibility—the near-certainty, in the view of some Administration officials—that hostile proliferators will succeed in acquiring WMD. The National Security Strategy of the United States released in September 2002 stated that to forestall or prevent hostile acts by adversaries, the United States would, if necessary, act preemptively.[53] In broad outline, this view resembles the Clinton Administration's notion that non-proliferation is preferable but counter-proliferation (that is, the creation of military responses to hostile proliferation) may be necessary if non-proliferation fails. However, there are substantial differences in tone and substance between the current and former administrations: US policy under the Bush Administration is much more oriented toward the pursuit of active—if necessary, unilateral—measures in response to hostile proliferators, as the best approach to guaranteeing that US interests are preserved.

The Bush Administration's approach to the use of coercive measures, which may or may not meet with universal favour or cooperation outside the United States, is rooted

[53] *The National Security Strategy of the United States*, The White House Sept. 2002, p. 15.

in a belief that any so-called rogue regime seeking to acquire WMD must be made to pay a price. There is strong aversion to bargaining with or otherwise 'rewarding' cheaters. Instead, the focus of current US policy is on refraining from engagement with such regimes and working to isolate them in the international community. Instead the United States has emphasized the need for direct and continuous action using all the elements of national and international power against 'terrorist organizations of global reach and any terrorist or state sponsor of terrorism which attempts to gain or use weapons of mass destruction (WMD) or their precursors.'[54]

The United States also places stronger emphasis on finding and exploiting political and economic vulnerabilities as a part of an aggressive diplomatic strategy of dissuasion and punishment. In the United States the Congress has incorporated this approach into national legislation that mandates the imposition of economic sanctions on foreign entities (exporters and importers) located outside the United States that engage in activities that would be inconsistent with US laws and agreements to which the United States is party. A number of studies examine the effectiveness of those sanctions as well as the fairness and legality of their extra-territorial provisions. The administration's preference for active measures has also led it to adopt a robust approach to interdicting flows of WMD-usable materiel into or out of rogue regimes.

The Proliferation Security Initiative

In May 2003 President Bush announced the creation of a heightened interdiction effort known as the Proliferation Security Initiative (PSI). The purpose of the new initiative is to interdict ships, aircraft and vehicles suspected of carrying nuclear and other weapons of mass destruction (WMD), ballistic missiles and related technologies to or from 'countries of proliferation concern'. It allows participating states to detain and search suspect shipments as soon as they enter into their territory, territorial waters or airspace. Bush's announcement was quickly followed by the formation of a core group of eleven nations (Australia, France, Germany, Italy, Japan, the Netherlands, Poland, Portugal, Spain, the United Kingdom and the USA) that has begun pooling intelligence and organizing military interdiction exercises.

The legal basis for the intensified interdiction campaign is the subject of controversy. US officials emphasize that current national and international laws provide a sufficient basis for most of what the PSI envisions. In their view, what is required is closer international coordination and stricter enforcement of existing export control laws and other relevant national legislation.

Others question how much legal authority exists for such intensified interdiction. Authors have questioned the compatibility of PSI with international maritime law. While vessels carrying illicit cargo can be seized, as can ships carrying materials between countries that are violating their obligations under international conventions, there is no general international ban against trading in weapons of mass destruction. Critics of PSI concede that in extreme situations, such as the sale by North Korea of a nuclear device, a strong argument can be made for justifying action under the UN

[54] *The National Security Strategy of the United States*, The White House Sept. 2002, p. 6.

Charter's right of self-defence. However, in the case of shipment of dual-use items that have civilian applications as well as roles in constituting WMD, international law is silent. There is a risk that certain PSI activities could lead to a legal challenge and compensation claim by an entity whose goods had been seized and that this challenge would be difficult to defend on the basis of existing law. This has led legal experts to conclude that the Bush Administration must get the approval of the UN Security Council for action, on a case-by-case basis.

Select bibliography

1. Baker Spring, 'Harnessing the Power of Nations for Arms Control: The Proliferation Security Initiative and Coalitions of the Willing', The Heritage Foundation Backgrounder, 18 March 2004.
2. Rebecca Weiner, *Proliferation Security Initiative to Stem Flow of WMD Matériel*, Center for Nonproliferation Studies, Monterey Institute for International Studies, 16 July 2003.
3. *The Proliferation Security Initiative: The Legal Challenge*, Global Security Institute Bipartisan Security Group Policy Brief, Sept. 2003.
4. Wade Boese 'The Proliferation Security Initiative: An Interview With John Bolton', *Arms Control Today*, December 2003
5. Richard H. Speier, Brian G. Chow, S. Rae Starr, *Nonproliferation Sanctions*, National Security Research and Analysis Division, RAND Corporation 2001.

International Non-proliferation and Disarmament Cooperation and Assistance

The expression Cooperative Threat Reduction (CTR) originated in the legislation passed in the United States in 1993 designed to help the countries of the former Soviet Union destroy nuclear, chemical and biological weapons of mass destruction and associated infrastructure, and establish verifiable safeguards against the proliferation of those weapons. The name was chosen when the US legislation was revised (the earlier law was called the Soviet Nuclear Threat Reduction Act of 1991) to reflect a widening scope of activities. While its origins are specific, in academic literature the expression CTR has often been applied much more widely to describe programmes and projects with characteristics similar to those carried out under the 1993 Act.

Over time, as more projects have been undertaken and as the activities of countries other than the United States have been included, the acronym CTR has been supplemented with the expressions 'non-proliferation and disarmament assistance' and 'non-proliferation and disarmament cooperation'. The literature on cooperative threat reduction can be divided into categories as follows:

A small number of studies focus on the *generic activity* of non-proliferation and disarmament assistance, without exclusive reference to any one programme or project or to any particular weapon type. These studies take as their point of departure the need to reconsider the rationale for cooperative threat reduction programmes, as well

as their organization, as so much has changed in the international security environment and in Russia since the programmes were initiated in the early 1990s.

A number of studies focus on particular *programmes.* Most often these are the bilateral programmes carried out by the United States together with partners in the former Soviet Union, and most of these studies focus on cooperation with Russia. In the first half of the 1990s a large number of publications were produced in the United States describing and analyzing the Cooperative Threat Reduction programme and other bilateral US–Russian assistance programmes. Recently, these studies have been supplemented by descriptions and analyses of programmes carried out by countries other than the United States as well as studies of programmes carried out by the EU. However, this literature remains small relative to the number of studies of bilateral US–Russia programmes.

A number of studies focus on particular *projects* (such as chemical weapon destruction or submarine dismantlement) or clusters of projects that share a common characteristic (such as projects aimed to reduce nuclear risks and enhance nuclear safety and security).

The revival of interest in the academic community in the issue of cooperative threat reduction has been stimulated by a number of developments.

First, the objectives, coherence, effectiveness and direction of assistance were increasingly questioned in the United States. These questions stimulated a debate between advocates of reforming assistance on the one hand and on the other those who thought that while assistance had served a purpose in its early stages, it had accomplished what could reasonably have been expected and should now be scaled back if not phased out entirely.

The main arguments of critics of assistance programmes can be summarized as the following.

- The objective of facilitating strategic nuclear arms reduction has largely been met with the implementation of START-I. While this process should be followed to its conclusion, no new programmes should be launched unless and until Russia requests further assistance.
- Some CTR objectives, while desirable, can’t be met, particularly in the fields of biological weapons and disposal of plutonium, because of a lack of serious engagement on the Russian side.
- Some CTR programmes have been made redundant by changes in the security environment or occupy a much lower priority in revised threat assessments. Specifically, few current CTR programmes could be expected to make a contribution to non-proliferation or counter-terrorism that justifies the investment required (see below).
- The credibility of CTR has been undermined by a lack of coherence in the organization and execution of programmes and by implementation failures on the Russian side (particular attention is drawn to the waste of US financial resources arising out of implementation failures). Declaratory policy notwithstanding, these failures are symptoms of a lack of interest in the success of CTR in key agencies on the Russian side.

Main arguments of reformers are:

- Russia in particular retains major real or latent capacities in the field of NBC weapon development and production and, if misdirected, these capacities would destroy any prospects for non-proliferation and disarmament.
- Past experience allows the conditions for programme success to be identified and in this way efficiency can be improved in future. One critical pre-condition for success has been identified: a structure (and not least a mindset) based on partnership (discussed below).
- CTR is one of very few instruments that are available to address some problems, such as preventing the 'brain drain' of scientific knowledge about NBC weapons. Therefore, the approach adopted in such valuable and innovative organizations as the International Science and Technology Center (ISTC) in Moscow and the Science and Technology Centre in Ukraine (STCU) in Kyiv should be built upon and extended.[55]

Second, at a time when confidence in arms control and disarmament treaties was being undermined by public information about weapon programmes and other activities of concern, a number of academic studies began to look for non-military crisis management and security building tools that might obviate the need to develop counter-proliferation and missile defence options. Some of these academic studies examined how threat reduction assistance might strengthen treaties or prevent their failure. Others argued that threat reduction assistance might represent an alternative to traditional forms of arms control in regard of certain nuclear and biological weapons and capabilities for which treaties have not proved to be negotiable.

The main synergies identified between CTR and arms control are:

- By helping Russia to meet its obligations under existing treaties, CTR strengthens the overall treaty regime (e.g. the CWC).
- By providing clear objectives, detailed inventory declarations, transparency and a legal basis for access to facilities by foreign personnel, a treaty or convention can facilitate CTR project implementation.

The main ways in which CTR differs from (and might substitute for) arms control are:

- CTR projects can be developed by interested parties and applied directly at facilities and agencies in specific countries without the need to engage many governments in negotiations.
- Since they are not symmetrical and do not involve reciprocal obligations and procedures, individual CTR programmes can be specifically tailored to safeguard

[55] Although the context is very different from that prevailing in US–Russia relations, the plans by the United States to establish an Iraqi International Center for Science and Industry in Baghdad to attract former weapon scientists into programmes that contribute to the economic and scientific development of Iraq is an example of such an extension. In another example, the US State Department is preparing a programme for bilateral "twinning" of US scientific and engineering institutes with Iraqi partners.

or eliminate weapons and infrastructure without being concerned about how to define military strategic stability or balance.

- Where treaties lack provisions for intrusive verification (such as the Moscow Treaty) CTR programmes to assist with delivery system destruction, provide adequate facilities for fissile material storage and to improve nuclear material accountancy might provide transparency and some reassurance as regards implementation.

Third, growing concern about the threat that "rogue states" or non-state actors would use NBC weapons has stimulated academic thinking about what kinds of preventive approaches could be applied to reduce those threats. While this thinking can be traced back to the period before 11 September 2001, the attacks on the United States on that day and the spreading of anthrax spores via the US mail led to an increased interest in approaches that might reduce the risk of non-state actors acquiring NBC weapons.

Although enhanced capacities to withstand and respond to NBC weapon use (whether by states or non-state actors) are needed, recent papers and reports have pointed out that the main requirement is prevention. The main potential benefit of CTR to counter-terrorism is the denial of access to weapons and/or materials that can be used to make weapons.

A number of reports have questioned whether CTR programmes as currently configured are making the most effective contribution that they could to counter-terrorism. Questions surround the location of programmes (and in particular the heavy emphasis on Russia) and the technical coverage of programmes (which include a heavy focus on chemical weapon destruction and general-purpose nuclear submarine dismantlement).

Fourth, decisions by governments raised the profile of non-proliferation and disarmament assistance, including threat reduction programmes. The group of eight industrialized countries (G8) has developed a Global Partnership Against the Spread of Weapons and Materials of Weapons of Mass Destruction. The EU has developed a bilateral assistance programme with Russia and elaborated a strategy against weapons of mass destruction that emphasizes the potential contribution of CTR among other measures. In coordinating transatlantic policies the EU–US dialogue as well as the Enhanced Threat Reduction Initiative (ETRI) and its successor the Non-proliferation and Disarmament Cooperation Initiative (NDCI) have given some prominence to CTR. Through these decisions, a new part of the academic community is becoming aware of the issue for the first time and beginning to examine CTR as one part of the wider management of international security.

Governmental processes that appear to be interesting and new will always attract academic interest. At a time when the United States and Russia are pressing for a partnership approach within the G8, a number of their most important bilateral CTR programmes are stalled because of lack of agreement. This kind of unexplained paradox is particularly likely to stimulate academic interest and investigation. It is predictable that new literature will appear in the next years focused on the G8 and the EU in particular.

The G8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction

At their 2002 summit in Kananaskis, Canada the leaders of the group of industrialized states (the G8) agreed on a Global Partnership Against the Spread of Weapons and Materials of Mass Destruction to supplement existing non-proliferation and disarmament assistance programmes to Russia and other states, and to reinforce them with new funding. This would be provided primarily by European countries and, potentially, by the European Union. The Global Partnership was designed to work in the area where the Nunn-Lugar programme and other similar undertakings were already underway (as described above) and authors rarely focus exclusively on Global Partnership without discussing other cooperative threat reduction issues. However there are some publications that have the Global Partnership as their primary focus. This literature can be categorized as follows.

The first category describes existing programmes, including calculations of the funds allocated to the Global Partnership. During the two years of the Global Partnership development, rather comprehensive descriptions of Russia's current and projected bilateral projects with other states (including those that are not G8 members) have been produced. For example, factsheets describe in detail the funding commitments of all involved states broken down into itemized financial pledges and general sums committed for the future but not allocated to particular projects.

The second category focuses on the discussion of options that might improve the scope, pace and effectiveness of the Global Partnership. This includes papers that identify and research specific implementation problems (such as exemptions from taxation or the lack of adequate liability protections)[56] and papers searching for gaps in the coverage of existing programmes in order to find new areas for cooperation.

A third category of papers seeks to define the place of the Global Partnership in a political and strategic context. It could include an analysis of an evolution of donors' or recipients' policy in this area, or a study of the role of Global Partnership in the security strategy of involved states. For example, the European Union's policy towards non-proliferation and disarmament assistance to Russia has been described, including the role of Global Partnership as one mechanism available to the EU.

These publications, while very useful, leave a number of important issues to be researched. First, very little attention is paid in the literature to the role of the recipients of assistance. The importance of this topic was emphasized by recent changes in the Russian governmental structure. Second, Global Partnership is different from the Nunn-Lugar programme because it explicitly includes multiple donors and anticipates multiple recipients of non-proliferation and disarmament assistance. The Global Partnership that was designed to encourage participation by as many states as possible, and recipients of assistance could also become donors. For example, President of the Russian Federation Vladimir Putin stated in 2002 that

[56] Such as the paper by R. Douglas Brubaker and Leonard S. Spector analysing the controversy surrounding the liability and compensation arrangements in Russia's assistance agreements with donor states, which came up with two new approaches towards resolving the identified problems.

Russia is ready to take part in weapons elimination and dismantlement not only on its territory, but also in other countries where weapons and WMD relevant materials exist. The consequences of this difference in approach should be studied with a view to identifying the comparative advantages of different donors and to identify the countries that might receive assistance and the projects that these countries would need to put in place.

A third gap that has become evident is the need to clarify and assess the boundaries of Global Partnership project coverage by examining the advantages and disadvantages of different alternatives. While the core activity of Global Partnership has been identified as non-proliferation, projects that emphasize environmental protection and nuclear safety also fall under its umbrella at present. Should these projects be phased out of the Global Partnership or might the Partnership be widened further to incorporate other very difficult nuclear security problems (such as the very difficult problem of securing radioactive materials, such as commercial radioactive sources used in medicine, in industry and scientific research): or would it be better, cheaper and easier to address such problems using another mechanism? Can a special project under the umbrella of Global Partnership supplement the work of the IAEA, or would it be better to manage this exclusively through the Agency?

Each of the states that are already involved in the Global Partnership no doubt has an understanding of activities that should be carried out in its framework. Whether the political priorities of partners are compatible should be researched. Another area to which little attention has been paid has been the technical feasibility and cost of implementing some projects in the framework of Global Partnership.

Selected areas for further consideration and possible research

There is no need for additional descriptive studies of US–Russia CTR programmes and projects, about which a wealth of detailed information is already available. Recent literature also describes the activities of the European Union in detail. Studies that might enhance the current literature include:

- A study of the role international non-proliferation and disarmament cooperation and assistance plays in Russia's security policy and of how different Russian agencies view the contribution of such programmes.
- A study of how international non-proliferation and disarmament cooperation and assistance projects are coordinated and implemented at the working/project level with particular emphasis on international projects.
- A study of actual and potential role of specialized agencies (the IAEA, the OPCW and the WHO) in defining, organizing, facilitating, publicizing and implementing international non-proliferation and disarmament cooperation and assistance.
- An analysis of whether and how international non-proliferation and disarmament cooperation and assistance might be applied in locations other than the former Soviet Union, taking into account potential benefits and obstacles identified from past practice.

Select bibliography

The most comprehensive internet resources on cooperative threat reduction can be found at:

http://www.ransac.org
http://www.nti.org
Global Partnership Resource Page, Center for Nonproliferation Studies (CNS), Monterey Institute of International Studies (MIIS), (http://cns.miis.edu/research/globpart/index.htm).

1. Matthew Bunn, *The Next Wave: Urgently Needed New Steps to Control Warheads and Fissile Material* (Washington D.C.: Carnegie Endowment for International Peace and Harvard Project on Managing the Atom, 2000).
2. Center for Strategic and International Studies, *Managing the Global Nuclear Materials Threat* (Washington, D.C.: Center for Strategic and International Studies, 2000).
3. Howard Baker and Lloyd Cutler, *A Report Card on the Department of Energy's Nonproliferation Programs with Russia* (Washington, D.C.: Russia Task Force, The Secretary of Energy Advisory Board, U.S. Department of Energy, January 2001).
4. John B. Wolfsthal, Christina A. Chuen, and Emily E. Daughtry (eds.), *Nuclear Status Report: Nuclear Weapons, Fissile Material, and Export Controls in the Former Soviet Union*, Number 6 (Washington D.C.: Carnegie Endowment for International Peace and Monterey Institute of International Studies, 2001).
5. Robert J. Einhorn, Michèle A. Flournoy (eds.). *Protecting against the spread of nuclear, biological, and chemical weapons: An action agenda for the global partnership*, (four volumes) (CSIS: Washington D.C., 2003).
6. Matthew Bunn, Anthony Wier, John P. Holdren, *Controlling Nuclear Warheads and Materials: A Report Card and Action Plan*, (Cambridge MA: Belfer Center for Science and International Affairs, Harvard University, March 2003).
7. Ian Anthony, *Reducing Threats at the Source: A European Perspective on Cooperative Threat Reduction*, (Oxford University Press: Oxford 2004).
8. Michael Krepon, *Cooperative Threat Reduction, Missile Defense, and the Nuclear Future*, (London: Palgrave, MacMillan 2002).
9. R. Douglas Brubaker and Leonard S. Spector, 'Liability and Western Nonproliferation Assistance to Russia: Time for a Fresh Look?' *Nonproliferation Review*, Vol. 10, No. 1, Spring 2003.
10. Kathrin Höhl, Harald Müller and Annette Schaper, edited by Burkard Schmitt, *EU Cooperative Threat Reduction Activities in Russia*, EU Institute for Security Studies, Paris Chaillot Paper No. 61, June 2003.
11. Richard G. Lugar, 'The Next Steps in U.S. Nonproliferation Policy' *Arms Control Today*, Vol. 32, No. 10, December 2002.

The European Union Strategy Against Proliferation of Weapons of Mass Destruction

On 12 December 2003, the EU Strategy Against Proliferation of Weapons of Mass Destruction was agreed at the European Council. The strategy included operational elements (such as the establishment of a unit to function as a monitoring centre to collect information and intelligence relevant to the implementation of the strategy as well as a review of implementation every six months by the External Relations Council) that should ensure that the EU continues to pay high-level attention to the issue of WMD proliferation.

The Strategy built on earlier documents, notably Basic Principles for an EU Strategy against Proliferation of Weapons of Mass Destruction and an Action Plan for the implementation of the Basic Principles, both agreed on 10 June 2003.

These developments have been described and analysed by a small body of literature. While it is not possible to reach any judgement on the impact and effectiveness of such a new EU initiative, there are certain common features of the texts that have emerged about it.

The analyses agree that this initiative is qualitatively different from earlier EU actions on WMD for two reasons. Firstly, although individual statements have been made and actions taken in the past, EU states have never before taken such an comprehensive, coherent and integrated approach to the issue. Moreover, the strategy against proliferation of WMD is located in the wider context of the first document setting out a general EU security strategy (‘*A Safer Europe in a Better World*’) agreed collectively by EU Member States in December 2003.

The second reason for regarding the WMD strategy in a different light from earlier efforts has been the determination of Member States and EU institutions to ensure implementation by allocating the necessary resources and setting up oversight and monitoring procedures. The Action Plan grouped measures to be undertaken by the EU into two categories: measures for immediate action and measures to be implemented over a longer time frame. A timetable was established for the short-term actions and the sources of financing needed to implement them were identified.

It is a common observation within the literature on this topic that the EU WMD strategy has many elements in common with the policy and approach of the Strategy Against Weapons of Mass Destruction published by the United States in December 2002. In the post-Iraq political environment the EU and US strategy documents provided a platform on which the EU and US could build a common approach to tackling shared concerns about WMD proliferation.

At the same time, the publications also point to the main difference between the EU and US approaches, namely that the EU pays greater attention to the need for strengthening the international legal framework for disarmament and arms control as well as enhancing the effectiveness of multilateral efforts against proliferation.

The literature makes clear that it is as yet unknown whether the WMD strategy will be embedded into the Common Foreign and Security Policy and become a permanent feature of the external relations of the EU. Should this occur the EU would become an important new contributor to international efforts to combat proliferation. The

implementation of the EU WMD strategy is a development to which the Commission should pay close attention in its subsequent work. A document drawing together different European perspectives on what can and should be done to implement the WMD strategy could form the basis for a Commission report or recommendation.

Select bibliography

1. Ian Anthony, 'Addressing the Threat of Weapons of Mass Destruction: A moment of opportunity for the EU?' EWI NEAR Working Paper/EPC Policy Paper No. 18, 15 April 2003.
2. Joanna Spear 'The Emergence of a European 'Strategic Personality' *Arms Control Today*, November 2003.
3. Stephen Pullinger and Gerrard Quille, 'The European Union: Seeking Common Ground for Tackling Weapons of Mass Destruction', *Disarmament Diplomacy*, Dec. 2003.

List of published studies and papers
All papers and studies are available as pdf-files at the Commission's website: www.wmdcommission.org

No 1 "Review of Recent Literature on WMD Arms Control, Disarmament and Non-Proliferation" by Stockholm International Peace Research Institute

No 2 "Improvised Nuclear Devices and Nuclear Terrorism" by Charles D. Ferguson and William C. Potter

No 3 "The Nuclear Landscape in 2004: Past Present and Future" by John Simpson

No 4 "Reviving the Non-Proliferation Regime" by Jonathan Dean

No 5 "Article IV of the NPT: Background, Problems, Some Prospects" by Lawrence Scheinman

No 6 "Nuclear-Weapon-Free Zones: Still a Useful Disarmament and Non-Proliferation Tool?" by Scott Parrish and Jean du Preez

No 7 "Making the Non-Proliferation Regime Universal" by Sverre Lodgaard

No 8 "Practical Measures to Reduce the Risks Presented By Non-Strategic Nuclear Weapons" by William C. Potter and Nikolai Sokov

No 9 "The Future of a Treaty Banning Fissile Material for Weapons Purposes: Is It Still Relevant?" by Jean du Preez

No 10 "A Global Assessment of Nuclear Proliferation Threats" by Joseph Cirincione

No 11 "Assessing Proposals on the International Nuclear Fuel Cycle" by Jon B. Wolfsthal

No 12 "The New Proliferation Game" by William C Potter

No 13 "Needed: a Comprehensive Framework for Eliminating WMD" by Michael Krepon

WMDC

THE WEAPONS OF
MASS DESTRUCTION
COMMISSION

www.wmdcommission.org