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Research Report

Freeing the world of chemical weapons: The Chemical Weapons Convention at the ten-year-mark

SWP Research Paper, No. RP 8/2007

Provided in Cooperation with:

Stiftung Wissenschaft und Politik (SWP), German Institute for International and Security Affairs, Berlin

Suggested Citation: Thränert, Oliver; Tucker, Jonathan B. (2007) : Freeing the world of chemical weapons: The Chemical Weapons Convention at the ten-year-mark, SWP Research Paper, No. RP 8/2007, Stiftung Wissenschaft und Politik (SWP), Berlin

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SWP Research Paper

Stiftung Wissenschaft und Politik
German Institute for International
and Security Affairs

Oliver Thränert / Jonathan B. Tucker

Freeing the World of Chemical Weapons

The Chemical Weapons Convention at the
Ten-Year Mark

RP 8
July 2007
Berlin

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SWP

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ISSN 1863-1053

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Preface

On April 29, 2007, we celebrated the tenth anniversary of entry into force of the Chemical Weapons Convention (CWC). In honor of this occasion, diplomats and experts from more than forty countries gathered in Berlin on April 25–27, 2007, at the invitation of the German Federal Foreign Office and the Stiftung Wissenschaft und Politik (SWP), the German Institute for International and Security Affairs, to hold a conference on the past and future of this important arms control agreement.

The Chemical Weapons Convention is a strong treaty, not a weak one. It is unique when compared to the two other multilateral disarmament and non-proliferation treaties, the 1968 Nuclear Nonproliferation Treaty (NPT) and the 1972 Biological and Toxin Weapons Convention (BTWC), for at least three reasons.

- ▶ First, the CWC is non-discriminatory in that it treats all of its member states equally. In contrast to the NPT, which allows the five states that had tested nuclear weapons before 1967 to retain these weapons for an interim period, during which they are supposed to take concrete steps toward disarmament, the CWC requires its member states to destroy any and all stockpiles of chemical weapons within a period of no more than 15 years.
- ▶ Second, the CWC created a specialized international agency, the Organization for the Prohibition of Chemical Weapons, to oversee its implementation. In contrast, the BTWC does not have any such organization, while the members of the NPT adapted an existing agency, the International Atomic Energy Agency (IAEA), which had been created to promote the development of civilian nuclear technology. Although the IAEA negotiates bilateral safeguards agreements with NPT states parties to ensure that civilian nuclear facilities are not diverted for military purposes, verification is not its primary function.
- ▶ Third, whereas the BTWC lacks formal measures to check compliance with its basic obligations, the CWC contains some 200 pages of detailed verification procedures. These measures include on-site inspections of chemical weapons storage and destruction facilities, as well as commercial chemical plants that manufacture dual-use chemicals with peaceful as well as military applications. International teams of OPCW inspectors travel to member states throughout the world to verify their compliance with both the disarmament and the nonproliferation elements of the treaty.

This SWP Research Paper was written by Oliver Thränert, Head of SWP's Research Unit European and Atlantic Security, and Jonathan B. Tucker of the Monterey Institute's James Martin Center for Nonproliferation Studies, who spent the 2006/07 academic year at SWP as a Fulbright visiting fellow. Although the paper is not a conference report, it takes into account discussions that occurred during the Berlin seminar. It is our pleasure to present this paper, which not only carefully reviews the implementation record of the Convention but also draws some lessons for the future. The conclusions and recommendations of the authors are their own and do not necessarily reflect the views of the Federal German Government.

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**Freeing the World of Chemical Weapons.
The Chemical Weapons Convention at the
Ten-Year-Mark**

The Chemical Weapons Convention (CWC) is the first multilateral arms control treaty to prohibit an entire category of unconventional arms in a verifiable manner and the only such agreement to have a dedicated implementing body, the Organization for the Prohibition of Chemical Weapons (OPCW) in The Hague, The Netherlands. The tenth anniversary of the CWC's entry into force, which took place on 29 April 2007, provides an opportune moment to assess the treaty's implementation over the past decade and to recommend improvements. This study seeks to answer two questions: What has been accomplished since the CWC entered into force? And what are the main problems that remain to be solved?

In addition to published sources, the study draws on presentations and discussion at the conference *Freeing the World of Chemical Weapons: The Chemical Weapons Convention Ten Years After Its Entry Into Force*, which was held on 25–27 April 2007 in Berlin under the joint sponsorship of the German Federal Foreign Office and the German Institute for International and Security Affairs (SWP).

The main recommendations of this study are as follows:

Universality. Universal adherence of the CWC will be essential for its ultimate success. Unless states currently outside the treaty such as Egypt, Israel, Syria, and North Korea can be persuaded to join, it will be impossible to eliminate chemical weapons completely. Thus, the OPCW should assign a high priority to continued implementation of the Action Plan on Universality, and Germany and other European Union (EU) members should urge all of the remaining hold-out states to join the convention.

Destruction of Chemical Weapons. The two largest possessors of chemical weapons, Russia and the United States, should do everything in their power to meet the extended deadline of 29 April 2012 for destruction of their entire stockpiles. At the same time, these countries must not be allowed to cut corners by destroying their weapons in ways that increase risks to public health and the environment, violate laws and regulations, are not transparent and fully verified, or fail to eliminate toxic agents in an

irreversible manner. Germany and other EU states should continue providing financial and technical assistance to the Russian destruction program to help Moscow meet its deadlines. Should Russia and the United States fail to complete destruction by April 2012, efforts to amend the convention or its annexes would not be desirable. If, however, the cause of the delay can be attributed to technical difficulties beyond the control of either country, it may be possible to invoke a provision in Article VIII under which the Executive Council asks a noncompliant state to redress the situation. This provision, recently applied to the case of Albania, would enable the Council to set a new destruction deadline, presumably with intermediate milestones and strengthened verification procedures.

Verification of Compliance. The main problem with respect to CWC verification is the discrepancy between the comprehensive prohibitions in the treaty, which are based on the *purpose* for which toxic chemicals and their precursors are developed and used, and the limited scope of the routine verification system, which is based on three lists or “schedules” of toxic chemicals and precursors that pose a risk to the CWC. The schedules determine which chemical industry plants must be declared and inspected on a routine basis. Several steps should be taken to expand the scope and effectiveness of the industry verification regime: (a) the OPCW should conduct more inspections of “other chemical production facilities” (OCPFs) that do not currently manufacture scheduled chemicals but have the potential to do so, with particular emphasis on flexible, multipurpose production facilities that could be easily diverted to prohibited activities; (b) the inspectors should make greater use of sampling and analysis during routine inspections of chemical industry; (c) the member states should start requesting “challenge” inspections of undeclared sites to address compliance concerns; and (d) all CWC member states should adopt comprehensive implementing legislation and regulations, including laws making the prohibitions of the treaty binding on their citizens and establishing export controls on treaty-relevant chemicals.

International Cooperation and Assistance. Measures for international cooperation and assistance play an important political role in CWC implementation. Article X provides for the delivery of protective assistance to a state party that has been attacked or threatened with chemical weapons. In implementing this article, new concerns about chemical terrorism have led to an emphasis on strengthening the domestic

capabilities of member states for chemical protection and emergency response. Although this general approach makes sense, more must be done to enhance the domestic preparedness of many countries. Article XI calls for international cooperation and unhindered trade among states parties to promote the use of chemistry for peaceful purposes. Several developing countries claim that export controls other than those mandated by the CWC violate the obligation to eliminate trade barriers among states parties. In their view, Article XI requires dismantling the Australia Group (AG), an informal forum of exporting countries that harmonize their national export control regulations. AG members respond that export controls are needed to meet the obligation in Article I not to help other states to engage in prohibited activities. One way to sidestep this debate would be for CWC member states to cooperate in increasing the security of their chemical industries against natural disasters and terrorist attacks. Such efforts would create valuable synergies between the implementation of Articles X and XI.

Second Review Conference. The Second Review Conference of the CWC will take place in The Hague in April 2008. A key issue to be addressed at this meeting is the impact on the convention of recent changes in chemical science and technology. Also of concern is the growing interest of the United States, Russia, and other countries in developing so-called “non-lethal” incapacitating agents, which are not dealt with clearly in the CWC. Because the incapacitants issue is not yet ripe for discussion at the review conference, more preparatory work is needed. To that end, member states should request a respected scientific organization such as the International Union of Pure and Applied Chemistry (IUPAC) to examine the chemistry, pharmacology, and toxicology of incapacitating drugs that might be used as weapons. The EU Presidency should also consider hosting a workshop that brings together chemists, pharmacologists, toxicologists, physicians, international lawyers, and specialists in CWC implementation to examine all aspects of the topic. Once the technical and legal issues associated with incapacitants have been clarified and the main policy options identified, it would make sense to initiate discussions at the political level.

Chemical Weapons and the Chemical Weapons Convention

To assess the implementation of the CWC over the past decade, this study looks both backwards and forwards. It begins with a brief history of chemical weapons, describes the basic provisions of the CWC, examines key aspects of the treaty in greater detail, and concludes by reviewing the major issues that are likely to be addressed at the Second Review Conference in 2008.

A Brief History of Chemical Warfare¹

The modern era of chemical warfare began on 22 April 1915, during World War I. In an effort to break the bloody stalemate of trench warfare, German forces besieging the Belgian town of Ypres released 168 metric tons of chlorine gas from pressurized canisters that had been emplaced across from the Allied trenches. Although the German attack killed hundreds and terrorized the defending forces, it was not strategically decisive. Six months later, the Allies retaliated with chlorine, triggering a chemical arms race between the two sides. In December 1915, the Germans introduced a new gas called phosgene, which was 18 times more toxic than chlorine and harder to detect. The warring parties also developed gas masks and respirators, causing the number of casualties to drop sharply. To circumvent these respiratory defenses, the Germans began to use a novel agent called mustard, an oily liquid that could penetrate the skin, causing severe chemical burns and blisters; the Allies retaliated with mustard in June 1918. By the end of World War I, gas warfare had caused about 1 million casualties, of which more than 90,000 were fatal. Although chemical weapons accounted for less than 3 percent of the 37.5 million dead and wounded, such weapons were considered particularly objectionable because they caused painful and often chronic injuries but had demonstrated little strategic utility.

After World War I, the horror evoked by chemical warfare put the issue of disarmament on the inter-

national diplomatic agenda. In June 1925, the League of Nations adopted the Protocol on the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases and of Bacteriological Methods of Warfare, better known as the “Geneva Protocol.” This treaty banned the use in war of chemical (and bacteriological) weapons but did not prevent their continued development, production, and stockpiling. Several of the contracting states also reserved the right to retaliate in kind if attacked with chemical weapons first, and to use such weapons against states that were not among the contracting parties. The Geneva Protocol was further weakened when Fascist Italy employed chemical weapons during its invasion of Abyssinia (Ethiopia) in 1935–36 but was not held to account.

In 1936, an industrial chemist working on new pesticides at the IG Farben company in Germany accidentally discovered the first nerve agent, which the German Army subsequently developed into a chemical warfare agent called tabun. It was not only much more potent than mustard but, being colorless and nearly odorless, was much harder to detect and defend against. In 1939, Hitler approved the mass production of tabun. German scientists also developed two other nerve agents called sarin and soman, although they were not manufactured during the war in significant quantities. Sarin was six times more potent than tabun, while soman was twice as toxic as sarin and was largely resistant to the effects of atropine, the only antidote then available.

During World War II, neither side resorted to chemical warfare in the European theater but Imperial Japan employed mustard gas during its invasion of Manchuria. After the war, chemical weapons became an important arena of the Cold War military competition between the United States and the Soviet Union. The Soviets captured the German nerve agent factory intact and began their own production of tabun and later sarin. Seeking to offset this Soviet advantage, the United States launched its own crash program to manufacture sarin. During the 1950s, the United States (with assistance from Great Britain) developed a persistent nerve agent called VX, which remained lethal for up to three weeks after dispersal. U.S. mass-produc-

¹ This chapter is based on Jonathan B. Tucker, *War of Nerves: Chemical Warfare from World War I to Al Qaeda* (New York: Pantheon Books, 2006).

tion of VX began in 1961, and the Soviets followed suit by manufacturing a similar agent called R-33.

Meanwhile, chemical weapons proliferated to the developing world, where they were employed occasionally on the battlefield, in most cases by technologically superior armies against less advanced forces that lacked effective chemical defenses. In the early 1960s, Egypt used phosgene and mustard against royalist rebels in Yemen during its intervention in that country's civil war (1963–1967). A few years later, other Middle Eastern countries began to acquire chemical weapons, including Iraq, Syria, and Israel. During the Iran-Iraq War (1980–1988), Iraq employed chemical weapons as a force-multiplier against the numerically superior Iranian army, which had poor chemical defenses. After Iran failed to win international support for sanctions on Baghdad, it launched its own chemical weapons program.

Several other countries also produced and stockpiled chemical weapons during the 1980s, including China, North Korea, and Yugoslavia. The United States began to modernize its chemical deterrent in 1987 by manufacturing “binary” sarin artillery shells, which were safer to transport and handle. The Soviet Union, for its part, secretly developed and tested a new generation of nerve agents called *novichoks*, after the Russian word for “newcomer.” During the Persian Gulf War, which lasted from January to March 1991, the United States-led coalition forces faced an Iraqi enemy that had previously used chemical weapons and was considered likely to do so again. But Saddam Hussein did not resort to chemical warfare for several reasons, including unfavorable weather conditions, the rapid advance of coalition forces, and Washington's deterrent threat to launch a massive retaliatory strike against the regime. After the war, the United Nations Security Council dispatched UN inspectors to Iraq to eliminate its chemical arsenal, a task that took three years.

The threat of chemical warfare during the 1991 Persian Gulf War, combined with the end of the Cold War, created a window of opportunity to conclude the CWC, which had been under negotiation in Geneva for more than a decade. By now, the United States and Russia had both lost interest in maintaining large stockpiles of chemical weapons, which lacked the strategic or political salience of nuclear arms and had the potential to proliferate widely in the developing world. These changes gave new impetus to the CWC negotiations, which were finally concluded in late 1992. The treaty was opened for signature at a formal

ceremony in Paris in January 1993, and it entered into force about four years later, on 29 April 1997.

Meanwhile, the threat of chemical terrorism emerged. In Japan, a wealthy cult called Aum Shin-rikyo plotted to seize power by carrying out chemical attacks against the Japanese government. On 20 March 1995, Aum operatives released sarin during morning rush-hour on the Tokyo subway. Because of the poor quality of the agent and the crude means of delivery, the impact of the attack was limited: twelve deaths and about a hundred seriously injured. Nevertheless, the Tokyo sarin attack had a disproportionate terrorizing effect. About 4,000 “victims” who reported to hospitals were actually suffering from anxiety and psychogenic symptoms rather than from actual exposure.

Although as of this writing 182 countries have joined the CWC, it is too early to say that chemical weapons are obsolete. The Iran-Iraq War demonstrated that chemical attacks can have military utility under conditions of static trench warfare against a poorly protected adversary, or against unprotected civilians in an ethnic conflict or counterinsurgency campaign. Terrorist groups have also shown a growing interest in chemical weapons. In 2002, CNN broadcast an al-Qaeda videotape of poison gas being tested on dogs at a crude laboratory in Afghanistan. In January 2007, Iraqi insurgents began to use truck bombs carrying tanks of liquid chlorine, generating toxic clouds that injured and terrorized scores of civilians.² Although the technical sophistication of chemical terrorism has so far been rudimentary, it could improve in the future. Thus, there are few grounds for complacency.

Basic Elements of the CWC

The CWC is unique among arms control treaties in that it combines disarmament and nonproliferation measures to ban an entire category of unconventional weapons, under strict international verification. In addition to requiring the elimination of existing chemical arsenals and the dismantling or conversion to peaceful purposes of former chemical weapons production facilities, the treaty prohibits the future development, production, stockpiling, transfer, and use of chemical weapons.³

2 Damien Cave and Ahmad Fadum, “Iraq Insurgents Employ Chlorine in Bomb Attacks,” *New York Times*, 22 February 2007.

3 The text of the CWC can be downloaded from the website of the Organization of the Prohibition of Chemical Weapons, www.opcw.org.

A major challenge facing the CWC is that many toxic chemicals and precursors are “dual-use,” meaning that they can be applied either for peaceful or hostile purposes. Because new synthetic compounds with toxic properties are continually being discovered in academic and industrial research laboratories, any list of banned chemical warfare agents and precursors would rapidly become obsolete. For this reason, Article II of the CWC defines chemical weapons in general terms as *“toxic chemicals and their precursors, except where intended for purposes not prohibited under this Convention, as long as the types and quantities are consistent with such purposes.”* A toxic chemical is also broadly defined as *“any chemical which through its chemical action on life processes can cause death, temporary incapacitation or permanent harm to humans or animals.”* These two definitions enable the CWC to prohibit all toxic chemicals intended for use as weapons, both now and in the future, regardless of their origin or method of production. Known in the arms control literature as the “General Purpose Criterion,” this comprehensive approach has enabled the treaty to stay relevant in the face of rapid changes in chemical science and technology.

As a practical matter, however, the CWC negotiators understood that it would be overly burdensome and costly for the verification system to monitor the entire universe of toxic chemicals and precursors potentially suitable for weaponization. Accordingly, the routine verification of chemical industry is based on three lists, or “schedules,” of toxic chemicals and their precursors. Treaty-relevant chemicals are assigned to one of the three schedules based on the risk that they pose to the purpose of the CWC, the extent of their legitimate commercial use, and the feasibility of monitoring. Schedule 1 lists chemical warfare agents and precursors that pose a high risk to the convention and have few if any commercial applications, Schedule 2 lists toxic chemicals and precursors that pose a moderate risk and have commercial uses in small amounts, and Schedule 3 contains toxic chemicals and precursors that pose a low risk and have commercial uses in large amounts. Along with quantitative production thresholds, the schedules provide the basis for determining which chemical industry facilities are subject to declaration and routine inspection.

The Organization for the Prohibition of Chemical Weapons (OPCW) is dedicated to the verification and implementation of the CWC. It has a 2007 annual budget of € 75,025,751 and is financed by contributions from member states, based on a modified United

Nations assessment scale. The Organization consists of three subsidiary organs. The main decision-making body is the Conference of the States Parties, which includes all member states and meets once a year or in special session. Substantive decisions are taken by consensus, if possible. When consensus cannot be reached, the chairman calls a 24-hour period of deferment and tries to facilitate agreement. If this procedure is not successful, the Conference may in principle take a decision by a two-thirds majority of members present and voting, although it has not yet done so.

The Executive Council is the executive organ of the OPCW and reports to the Conference. Its primary responsibilities are supervising the activities of the Technical Secretariat, proposing measures in cases of non-compliance, considering the draft OPCW program and budget prior to its submission to the Conference, and facilitating consultations and cooperation among states parties at their request. The Council has 41 rotating members who are elected by the Conference for a term of two years. Every state party has a right to serve on the Council, which is constituted according to the principle of equitable geographical distribution, as well as industrial, political, and security interests. The Council holds four to six regular sessions per year and may convene special meetings as required. Decisions are taken by a two-thirds majority vote on matters of substance and by a simple majority on procedural questions.

The Technical Secretariat employs about 500 international civil servants, including about 180 inspectors. Its main tasks are verifying the CWC and overseeing its national implementation, negotiating agreements with states parties regarding verification and the provision of emergency assistance, preparing the OPCW annual program and budget, and submitting reports to the Executive Council and the Conference of the States Parties. The complexity of CWC implementation is reflected in the nearly 200 pages of treaty text, most of which are devoted to verification. OPCW inspectors monitor the destruction of chemical weapons, the dismantling or conversion of former chemical weapons production facilities, the limited production of Schedule 1 chemicals for peaceful or protective purposes, and the nonproduction of chemical weapons by commercial chemical plants.

The following sections describe the major provisions of the CWC and assess the current status of their implementation.

Achieving Universal Adherence to the CWC

When the CWC celebrated its tenth anniversary in April 2007, it had 182 member states corresponding to 98 percent of the global population, a remarkable achievement in such a short time. Only 13 countries remain outside the treaty: six that have signed but not ratified, and seven that have not even signed.⁴ Of the hold-out countries, four are believed to have chemical weapons (Egypt, Israel, Syria, and North Korea), while two others are sometimes mentioned as possible possessors (Myanmar and Angola). As long as these states refuse to join the CWC, the goal of eliminating chemical weapons from the world cannot be achieved.

In addition to the “hard cases” mentioned above, several small countries remain outside the treaty, including the Bahamas, the Congo, the Dominican Republic, Guinea-Bissau, and Somalia. Although these states do not possess chemical weapons or have significant chemical industry, their participation in the CWC is still important because such countries can provide safe havens and transshipment points for “proliferation entrepreneurs,” such as non-state actors and smuggling networks.⁵

Given these concerns, the First Review Conference of the CWC in 2003 approved the creation of an Action Plan on Universality to promote the goal of global adherence to the treaty. Universality-related activities by the Technical Secretariat include bilateral meetings with non-member states, assistance to states preparing to join the CWC, regional and sub-regional seminars and workshops, and other measures to increase aware-

ness. The OPCW has positively influenced governmental decisions to join the treaty in a number of cases, including Sudan, Serbia and Montenegro, Afghanistan, Libya, and several of the former Soviet republics, particularly in Central Asia.⁶

North Korea and a few countries in the Middle East remain the main obstacles to achieving universal adherence to the CWC. North Korea reportedly began developing chemical weapons in the 1960s with technical assistance from the Soviet Union and later China; it is now believed to possess about 5,000 tons of blister and nerve agents, filled into artillery shells and missile warheads. These weapons, deployed close to the border to South Korea, pose a serious threat to the densely populated city of Seoul. Efforts by the OPCW to engage North Korea have so far been rebuffed by the authorities in Pyongyang. North Korea has also defied UN Security Council Resolution 1718 of 14 October 2006, which ordered it to eliminate all of its stockpiled weapons of mass destruction and ballistic missile delivery systems in a complete, verifiable, and irreversible manner. If and when the status of the North Korean nuclear program is resolved, progress may be possible on the chemical weapons front.

In the Middle East, the main obstacle to universality is the political linkage between chemical and nuclear weapons. After the CWC was concluded in 1992, the League of Arab States called on its members to boycott the treaty until Israel became a non-nuclear state party to the Nuclear Nonproliferation Treaty (NPT). Arab solidarity on this issue did not last long, however, and most of the countries in North Africa and the Middle East have since joined the CWC. Libya, a long-time hold-out, acceded to the treaty in 2004, and Iraq and Lebanon have made known their intention to join in the near future. Nevertheless, Egypt continues to condition its accession to the CWC on the negotiation of a Mideast zone free of all weapons of mass destruction. Given Israel’s reliance on nuclear deterrence as the guarantor of its national survival, however, Cairo’s insistence on linking chemical and

⁴ The Republic of China (Taiwan) has a large chemical industry and has sought for several years to join the CWC because it could be adversely affected by the ban on trade in Schedule 2 chemicals with non-states parties. Because the international community does not recognize Taiwan as an independent state but rather as part of the People’s Republic of China, the problem can only be solved with the active cooperation of Beijing.

⁵ These concerns have been diminished but not eliminated by the adoption in April 2004 of United Nations Security Council Resolution 1540, which requires all states—whether or not they are parties to the CWC—to pass domestic legislation making it more difficult for terrorists to acquire chemical weapons and related materials and equipment. However, Resolution 1540 does not require states that currently possess chemical weapons to disarm in a verifiable manner.

⁶ Sergey Batsanov, “Approaching the 10th Anniversary of the Chemical Weapons Convention. A Plan for Future Progress,” *Nonproliferation Review*, 13, no. 2 (July 2006), p. 341.

nuclear disarmament is a recipe for deadlock. Syria, for its part, appears to view its chemical arsenal as a strategic counterweight to Israel's nuclear capability.

Israel was among the initial signatories to the CWC in January 1993 and seriously considered ratifying the treaty during the brief period of optimism that followed the signing of the Oslo Accords later that year. Israel also played an active role during the four-year Preparatory Commission that paved the way for the CWC's entry into force in April 1997. Unfortunately, the outbreak of the Palestinian intifada in 2000 and the ensuing deterioration in regional security led to a change of heart. Since then, a combination of strategic, political, and economic considerations have prevented Israel from ratifying the CWC.⁷ At the strategic level, Israeli military planners believe that relying exclusively on nuclear weapons to deter Syrian use of chemical weapons would not be credible and that an in-kind deterrent is needed. At the political level, Israel fears that becoming a party to the CWC—or any global arms-control treaty—would increase pressures on it to join the NPT. Israeli policymakers also worry that a CWC challenge inspection at the Dimona nuclear facility might reveal sensitive information, and that the government would be put on the political defensive if it tried to limit inspectors' access to the site.⁸ Finally, with respect to economic considerations, Israel has large chemical and pharmaceutical industries that would be adversely affected by a decision by CWC member states to expand the restrictions on chemical trade with non-states parties. The trade restrictions are currently limited to Schedules 1 and 2, and there is no consensus to extend the ban to cover Schedule 3, which includes dual-use chemicals that are consumed in large quantities for industrial purposes. Accordingly, Israel has been able to adjust to the CWC's trade restrictions on non-states parties without suffering unacceptable economic damage.

At least for the near-term, there is no obvious formula to break the Mideast deadlock over the CWC. Although the likely accession of Iraq and Lebanon will further isolate Egypt and Syria within the Arab world, these pressures are unlikely to prove decisive. For Israeli policymakers, the emerging nuclear threat from Iran will reinforce the argument that because of

Israel's geostrategic situation, only regional agreements linked to an overall solution to the Mideast crisis can meet its security needs. Of course, the political reality is that any Israeli use of chemical weapons, even in retaliation, would elicit severe condemnation from the international community. Given that the Israel Defense Forces are well-equipped with chemical protective gear and that the entire Israeli civilian population was supplied with gas masks and nerve-agent antidotes during the 1991 Persian Gulf War, Israel should consider replacing its current strategy of deterrence by threat of retaliation with a policy of deterrence by denial of the enemy's military objectives. This shift to a defense-dominant strategy would enable Israel to seize the moral and diplomatic high ground by ratifying the CWC, thereby shifting the political onus onto Cairo and Damascus.

Despite the major obstacles facing the OPCW's efforts to persuade the hold-out states to join the CWC, the Technical Secretariat should continue to implement the various elements of the Action Plan on Universality, including regional workshops, consultations with non-states parties, and cooperation with non-governmental organizations (NGOs). These efforts should be supplemented with bilateral contacts by individual member states, such as Germany and other EU members, to convince Egypt, Israel, and Syria of the merits of joining the CWC. In addition, universality refers not just to the number of states parties but to the quality of national implementation. Joining the treaty requires not only a political commitment to chemical disarmament but the willingness and the ability to implement all of its provisions fully, a demanding and time-consuming task. For this reason, the OPCW has devoted an increasing amount of effort to assisting states with national implementation.

⁷ Eitan Barak, "Israel, the CWC and the Universality Objective: The View from Jerusalem," *CBW Conventions Bulletin*, No. 68 (June 2005), pp. 1–6.

⁸ Of course, the United States would probably try to persuade the OPCW Executive Council to block any request for a challenge inspection of Dimona as "frivolous and abusive."

Destruction of Chemical Weapons Stockpiles and Former Production Facilities

A key element of the CWC is the requirement that all states parties destroy their entire chemical arsenals within ten years after the entry into force of the convention, with the possibility of a one-time extension of up to five years. Six member states declared a total of nearly 8.7 million chemical munitions and containers weighing about 71,000 metric tons: Russia (41,000 mt), the United States (28,000 mt), India (1,044 mt), South Korea⁹ (602 mt), Libya (24 mt), and Albania (16 mt). The arsenals of Albania, India, and South Korea were previously unknown and were only declared after these countries joined the CWC. Destruction of the declared stockpiles is continuing, and so far about a third has been safely eliminated.

In addition to the disposal of chemical weapons, the convention requires the dismantling of chemical weapons production facilities (CWPFs) or their conversion for peaceful purposes. Twelve countries have declared a total of 65 CWPFs, of which 42 have been certified as destroyed and 19 as converted (see table 1).¹⁰ (Many of these facilities were historical sites, some of which had ceased operation in the early 1950s.) All of the remaining CWPFs will either be destroyed or converted by the end of 2008, and the OPCW will continue to monitor the converted facilities for several years.

Finally, the CWC requires the destruction of old and abandoned chemical weapons. According to the treaty definition, “old” chemical weapons were either (a) produced before 1925 or (b) produced between 1925

Table 1
Chemical Agent and Munitions/Containers Declared and Destroyed. CWPFs Declared, Destroyed and Converted as of 30 June 2007

	<i>Chemical agent (metric tonnes)</i>	<i>Munitions/ containers (million items)</i>	<i>Chemical Weapons Pro- duction Facil- ities (CWPFs)</i>
Declared	71,330	8.67	65
Destroyed	23,688	2.77	42
Converted	n.a.	n.a.	19

Source: OPCW website, accessed 16 July 2007

and 1946 but have deteriorated to such an extent that they can no longer be used as chemical weapons. Thirteen countries have declared stockpiles of old chemical weapons.¹¹ “Abandoned” chemical weapons are munitions (including “old” chemical weapons) that were abandoned by a state party after 1 January 1925 on the territory of another state party without the consent of the latter. China, Italy, and Panama have declared abandoned chemical weapons on their territory.

The destruction of chemical weapons stockpiles has become a major challenge for CWC implementation. Eliminating these highly toxic materials in a safe and environmentally responsible manner has turned out to be far more politically contentious, technically complex, and expensive than had been anticipated. As a result, none of the six declared possessor states was able to meet the original ten-year destruction deadline of April 2007. Although the CWC negotiators foresaw the possibility of delays and granted member states the right to request an extension of up to five years to complete destruction, the treaty does not provide for an additional grace period. Thus, if the Russian Federation and the United States do not complete destruction of their respective stockpiles by 29 April 2012, the CWC will enter into uncharted waters. The failure of

⁹ Official OPCW documents refer to the Republic of Korea (South Korea) as “a State Party” because it has claimed confidentiality under the CWC.

¹⁰ States that have declared former chemical weapons production facilities are Russia, the United States, China, France, the United Kingdom, India, Iran, Japan (the sarin production facility built by the Aum Shinrikyo cult), Libya, Bosnia-Herzegovina and Serbia (the production site formerly owned by Yugoslavia), and South Korea. While it was expected that the six states with declared stockpiles of chemical weapons would declare former production facilities, in the other six cases it is not always clear why a production capacity was declared but no actual weapons. The U.S. government has alleged that Iran and China possess undeclared stockpiles, but it is possible that some or all of the six countries destroyed their chemical weapons before joining the CWC.

¹¹ Member states that have declared stocks of old chemical weapons are Australia, Belgium, Canada, France, Germany, Italy, Japan, Russia, Slovenia, the United Kingdom, the United States, and two countries that do not wish to be named in open sources.

one or both countries to comply with one of the treaty's most important obligations could weaken the credibility of the chemical disarmament regime.

The Russian Chemical Weapons Destruction Program

For technical, financial, and bureaucratic reasons, Russia was late in starting its chemical weapons destruction program. The first Russian destruction facility, at Gorny in the Saratov region, did not begin operation until December 2002, more than five years after the CWC's entry into force. Significant international assistance, including a German contribution of € 50 million, was required to build this facility.¹² After 1,250 tons of the blister agents lewisite and mustard (and mixtures of the two) had been neutralized, the Gorny facility shut down at the end of 2005. In March 2006, the second Russian destruction facility opened at Kambarka in the Republic of Udmurtia. Again, international financial and technical assistance, mainly from Germany, was needed to construct this facility.¹³ The roughly 6,300 tons of lewisite stored at Kambarka are scheduled to be neutralized by the end of 2008. At both Gorny and Kambarka, second-stage processing of the neutralized liquid "reaction mass" remains an open question.

The third Russian destruction facility, at Maradykovsky in the Kirov region, opened in September 2006 and will destroy a total of 7,000 tons of nerve agents and mustard-lewisite mixture filled into aerial bombs. Maradykovsky is the first site to be financed entirely by the Russian government and is expected to reach full capacity in December 2008. In the first destruction step, the agents are being neutralized chemically inside the bomb casings. Because the reaction mass could theoretically be converted back into the toxic agent, a second neutralization step will be needed to render the process irreversible. One or more incinerators will also be built at Maradykovsky to burn the neutralized liquid and decontaminate the metal parts. All of these steps will be monitored by OPCW inspectors according to a recent verification agreement between the OPCW and Russia.

¹² Other contributors included the European Union, Finland, the Netherlands, and Poland.

¹³ Assistance was also provided by the European Union, Finland, the Netherlands, Sweden, and Switzerland.

Four additional Russian chemical weapons destruction facilities are due to come on line in the next few years. With support primarily from the United States, a destruction facility is being built at Shchuch'ye in the Kurgan region, where about 5,400 tons of nerve agents are stored.¹⁴ Washington decided to focus on this site because it holds the most modern portion of the Russian stockpile, consisting mainly of portable artillery shells, and is close to the border with Kazakhstan. Although the U.S. government has allocated more than \$1 billion to the Shchuch'ye project, completion of the destruction facility has been repeatedly delayed. First, the U.S. Congress imposed several conditions on the release of the funds that Moscow did not meet, leading to efforts to cut off funding in 2000 and 2001 and to delay it for nine months in 2002. Finally Congress authorized President George W. Bush to waive the conditions on grounds of national security.

Since then, however, other problems have slowed progress at Shchuch'ye. In 2005, construction came to a halt when all of the bids submitted by Russian subcontractors were much higher than expected. Only in April 2007 did the United States and Russia sign an agreement to complete the facility by turning over the subcontracting to Moscow.¹⁵ Although the Shchuch'ye destruction facility was supposed to become operational in 2005, the start date has now been pushed back until 2009 and could slip further. Even if the facility achieves the maximum destruction rate of 1,700 metric tons of agent per year, it will still take more than three years to eliminate the stockpiled weapons.¹⁶

The next Russian chemical weapons destruction facility, at Leonidovka in the Penza region, is scheduled to start operation in mid-2008. This site holds about 6,900 tons of aerial bombs containing nerve agents. The last two destruction facilities are planned to open in 2009 at Kizner in the Republic of Udmurtia (about 5,700 tons of nerve agent in rockets and artillery shells) and Pochep in the Bryansk region (about 7,500 tons of nerve agents in aerial bombs). Germany recently signed an agreement with Russia to help finance the Pochep facility.

¹⁴ Other contributors include Belgium, Canada, Czech Republic, the European Union, France, Ireland, Italy, the Netherlands, New Zealand, Norway, Sweden, Switzerland, and the United Kingdom.

¹⁵ Daniel Arnaudo, "Progress or Problems at CW Destruction Site?" *Arms Control Today*, 37, no. 4 (May 2007).

¹⁶ Paul Walker, "Destruction of Chemical Weapons," presentation at the conference *Freeing the World of Chemical Weapons*, SWP, Berlin, 26 April 2007.

At the end of April 2007, Russia claimed that it had destroyed 20 percent of its entire chemical weapons stockpile. According to a revised timetable submitted to the OPCW, Moscow expects to eliminate 45 percent by 31 December 2009 and 100 percent by 29 April 2012, at an estimated total cost of about \$7 billion. Russian officials are confident they can meet the 2012 deadline, noting that it took eight years to destroy the first 10 percent of the Russian stockpile but only eight months to eliminate the second 10 percent.¹⁷ Nevertheless, the fact remains that a daunting 80 percent of the stockpile must be eliminated in only five years. Given the significant delays experienced at all Russian destruction sites, it appears unlikely that Moscow will make the 2012 deadline.

The U.S. Chemical Weapons Destruction Program

The U.S. chemical weapons destruction program is also behind schedule. As of mid-2007, the United States had eliminated 45 percent of its chemical weapons stockpile. Two U.S. destruction facilities have completed their work, five remain in operation, and two are in pre-construction. Largely because of delays in financing and building the last two facilities, however, the United States currently projects that it will have destroyed only about 66 percent of its stockpile by the April 2012 deadline.

Given public opposition to transporting chemical weapons across state lines, it was decided early on to destroy them *in situ* at each of the nine U.S. Army depots where they were stored. The first U.S. destruction facility, located on Johnston Atoll in the Pacific, operated between 1990 and 2000 and used high-temperature incineration to dispose of more than 2,000 short tons of nerve and blister agents transferred from U.S. Army depots in Germany and Japan. A second destruction site in Aberdeen, Maryland, neutralized 1,600 short tons of bulk mustard from 2003 to 2006. The Johnston and Aberdeen facilities have since closed. Four U.S. destruction facilities using high-temperature incineration technology are currently operational: Tooele, Utah (began operation in August 1996, more than 13,600 short tons of chemical agents); Anniston, Alabama (August 2003, more than 2,200 short tons); Umatilla, Oregon (September 2004, about 3,700 short

tons); and Pine Bluff, Arkansas (March 2005, about 3,800 short tons). Although more than half of the weapons have been destroyed at Tooele, the largest storage depot, the other facilities are less than half-way through.

A fifth chemical weapons destruction facility at Newport, Indiana, started operation in May 2005 and is employing neutralization rather than incineration to destroy about 1,270 short tons of bulk VX nerve agent. Although the Army originally planned to treat the neutralized product with a second-stage process called supercritical water oxidation to eliminate residual toxicity, Army officials decided that this technology was too expensive. Instead, the Army chose to ship the neutralized product off-site for treatment as hazardous waste. After local opposition blocked the proposed use of treatment plants in Ohio and New Jersey, the Army secretly shipped the neutralized product from Newport through eight states to an incinerator in Port Arthur, Texas, for final disposal.¹⁸ Due to local protests and a lawsuit by environmental groups and citizens, the shipments were halted after two months, and it is unclear whether they will be allowed to continue.

The U.S. chemical weapons destruction facilities at Tooele, Anniston, Umatilla, and Pine Bluff are currently expected to operate past the 2012 deadline. In addition, the last two destruction facilities planned at the Army depots in Pueblo, Colorado (about 2,600 short tons) and Blue Grass, Kentucky (about 500 short tons) are still in the pre-construction phase. One reason for the delay is that incineration, the Army's preferred destruction technology, is no longer considered politically acceptable. As already occurred in Maryland and Indiana, public pressure and congressional action have forced the Army to develop alternative destruction technologies based on chemical neutralization.

For various technical and political reasons, the total cost of the U.S. chemical demilitarization program has soared over the past 20 years from about \$1.8 billion in 1985 to more than \$35 billion today. This huge increase, combined with the heavy financial burden of the wars in Afghanistan and Iraq, has made the Department of Defense unwilling to fund the accelerated destruction program planned after 11 September 2001, stretching out the schedules for construction and operations. At the current rate of spending, the Pueblo and Blue Grass facilities will not be operational

¹⁷ Jon Fox, "Russia Confident CW Stockpile Will Be Gone by 2012," Global Security Newswire, November 3, 2006.

¹⁸ Paul Walker, "Destruction of Chemical Weapons" (see note 16).

before January 2015 and January 2017, respectively. Moreover, unless the budget cuts are restored, destruction at Pueblo will not be completed until November 2020 and at Blue Grass in October 2023—more than a decade beyond the 2012 deadline in the CWC.¹⁹

Other Chemical Weapons Destruction Programs

The other four CWC member states with declared stockpiles of chemical weapons have also experienced delays in their destruction programs. In December 2006, the OPCW Conference of the States Parties approved requests by five of the six possessor states to extend their destruction deadlines for periods of up to five years, as permitted by the convention.²⁰ India, which has the third largest declared stockpile, had eliminated nearly 75 percent of its stockpile by the end of 2006 and plans to finish by 29 April 2009. South Korea is further along and expects to eliminate its stockpile by 31 December 2008. Libya plans to destroy its 23 tons of bulk mustard agent and 1,300 tons of nerve-agent precursors by 31 December 2010. The OPCW has also granted Libya permission to convert its former chemical weapons production facility at Rabta into a pharmaceutical plant. In May 2007, Tripoli cancelled an assistance agreement with the United States because of dissatisfaction with the provisions on liability, financing, and facility ownership. Instead, Libya has vowed to take sole responsibility for its destruction program.²¹

Albania, whose stockpile consisted of 16 tons of bulk mustard, lewisite, and adamsite, was the only declared possessor state that did not request an extension to the original April 2007 deadline. The United States committed \$20 million over two years to build an incinerator, supplied by a German contractor, next to the building where the agents were stored.²² Due to unforeseen technical and weather problems, how-

ever, Albania managed to destroy only 38 percent of its stockpile by 29 April 2007. After the OPCW Executive Council determined that Albania's failure to meet the deadline had resulted from factors beyond its control, Tirana was asked to redress the situation and complete the destruction process as soon as possible. The OPCW confirmed the elimination of the last weapons on 11 July 2007.²³

What If the 2012 Deadline Cannot Be Met?

What will happen if Russia and/or the United States, the two largest possessors of chemical weapons, fail to complete destruction by the extended deadline of April 2012? OPCW Director-General Rogelio Pfrter has argued that it is premature to open a debate on this issue, which will depend on the political conditions prevailing at the time and how many weapons remain to be destroyed. Instead, Pfrter has urged both countries to spare no effort in completing destruction by the 2012 deadline, without cutting corners on public health, safety, environmental protection, and transparency.

Because the 2012 destruction deadline is a solemn treaty obligation, a failure of either Russia or the United States to finish the task on time would have serious legal and political ramifications. One possible consequence relates to the fact that the CWC is a complex treaty that demands extensive implementation efforts at the national level, including the preparation of initial and annual declarations, the adoption of domestic legislation and subsidiary regulations, the establishment of a National Authority, and the hosting of routine inspections at chemical industry sites. It has not been easy to persuade states parties to accept these burdens so that the CWC can function smoothly and effectively. If the two largest possessors of chemical weapons were to fail to destroy their stockpiles on schedule, then other member countries may ask themselves why, having never possessed such arms, they should invest considerable time and money in national implementation. In view of the corrosive effects that such an attitude would have, a possible failure by Russia and the United States to meet the

¹⁹ Ibid.

²⁰ OPCW, "Annual Chemical Weapons Convention Conference Concludes; Final Stockpile Destruction Deadlines Extended to 2012," Press Release, The Hague, 11 December 2006.

²¹ Alex Bollfrass, "Libya Backs Out of CW Destruction Agreement," *Arms Control Today*, 37, no. 6 (July–August 2007).

²² Joby Warrick, "Albania's Chemical Cache Raises Fears About Others," *Washington Post*, 10 January 2005, p. A01. See also, Lt. Col. Fadil Vucaj, "Republic of Albania: World Leader in Chemical Disarmament," *Chemical Disarmament Quarterly*, May 2007, pp. 6–10.

²³ Chris Schneidmiller, "Chemical Weapons Pact Hits 10 With Challenges Ahead," *Global Security Newswire*, 27 April 2007; OPCW, "Albania – First Country to Destroy All of Its Chemical Weapons", Press Release, The Hague, 12 July 2007.

2012 deadline must be taken seriously and a practical solution worked out in advance.

In thinking about the problem, it is important to keep in mind that neither Moscow nor Washington intends to retain parts of its chemical arsenal for military purposes, and that the sole reason for the delays in destroying the weapons has been a series of unanticipated problems of a technical, environmental, financial, and political nature. It is also clear that the OPCW inspectorate will continue to monitor the storage and destruction facilities in both countries. For these reasons, CWC member states should view any delay beyond April 2012 with a degree of equanimity. It is also essential to make sure that the weapons are destroyed in a manner that fully protects the environment and the health of plant workers, OPCW inspectors, and nearby communities. Accordingly, Russia and the United States must not be allowed to accelerate their destruction programs by using short-cut neutralization or incineration techniques that fail to destroy chemical warfare agents in a safe, complete, and irreversible manner. Instead, they must continue to comply with stringent pollution controls, safety precautions (including emergency preparedness and evacuation planning), and expectations of transparency (including stakeholder involvement and public outreach).

One option for extending the destruction deadline would be to convene an Amendment Conference, as is provided for in Article XV of the CWC. In theory, the member states could amend the treaty to grant the possessor states more time to destroy their arsenals. Opening up the CWC to amendment would be a risky undertaking, however, because any new deadline would have to be approved by a majority of states parties, with none casting a “no” vote. A failure of the Amendment Conference would deal a serious blow to the CWC. Moreover, any new destruction deadline would have to be ratified by all states parties that cast a positive vote and hence would not enter into force for an indefinite period. For these reasons, an Amendment Conference should be avoided. A second approach would be to make a technical amendment to the part of the CWC Verification Annex that deals with chemical weapons destruction. Although the technical amendment process is somewhat easier procedurally, any new destruction deadline would still have to be approved by consensus. Given that a lack of unanimity would create a crisis for the CWC, this option appears overly risky as well.

There is another possible solution, however. Albania’s recent failure to meet the 29 April 2007 deadline for destroying its small chemical weapons stockpile may have set a useful precedent. Because the reason for Albania’s noncompliance was not a lack of political will but rather technical and weather problems beyond its control, the OPCW Executive Council evoked Article VIII, paragraph 36 of the CWC, which empowers the council to “consult with the States Parties involved and, as appropriate, request the State Party to take measures to redress the situation within a specified time.” The Albanian decision could provide a way of dealing with the likely inability of the United States and/or Russia to meet the 2012 deadline. Since both countries appear committed to the total destruction of their stockpiles but face major challenges in doing so, it would be in the interest of all states parties to avoid finding them in noncompliance under Article XII and thus spare the CWC a crippling loss of legitimacy. If the Executive Council concludes that the failure of the United States and/or Russia to comply with the deadline was due to factors beyond their control, it may again invoke Article VIII, paragraph 36, and ask the affected parties to redress the situation and set a new destruction deadline, presumably with intermediate milestones and strengthened verification procedures. The Executive Council has already decided that starting in early 2008, it will send an annual delegation to visit chemical weapons destruction sites and national capitals in both the United States and Russia to seek political assurances that everything possible is being done to meet the 2012 deadline. These visits should help the Council to obtain a clear picture of progress in the two countries and the reasons why the final deadline may not be met, and will provide a factual basis for an eventual decision on how to respond.

As noted earlier, between four and six suspected chemical weapons possessor states have yet to join the CWC. If some or all of these countries accede to the convention, it will be necessary for them to destroy their stockpiles under OPCW supervision. To this end, Article IV, paragraph 8 provides for the following process: “If a State ratifies or accedes to this Convention after the 10-year period for destruction [...], it shall destroy [its] chemical weapons [...] as soon as possible. The order of destruction and procedures for stringent verification for such a State Party shall be determined by the Executive Council.”

Verification of the CWC

Verification of the CWC involves three main tasks: monitoring the destruction of declared chemical weapons, inspecting declared facilities that produce small amounts of Schedule 1 chemicals for peaceful or protective purposes, and inspecting commercial chemical plants to make sure that no production of chemical warfare agents or precursors occurs in the guise of manufacturing for peaceful purposes. Each of these tasks is discussed below.

Verifying the Destruction of Chemical Weapons

To date, the lion's share of verification resources has been allocated to monitoring chemical weapons destruction. According to OPCW data, in 2005 the organization devoted 15,519 inspector-days to verifying destruction but only 2,651 inspector-days to inspecting chemical industry sites.²⁴ Although several more destruction facilities are planned, few if any additional inspection resources will be available to monitor them. Accordingly, the OPCW Technical Secretariat has sought to "optimize" the verification process to save money and avoid increasing the number of inspectors. Both Russia and the United States have supported such efforts because the states that possess chemical weapons are responsible for the costs of verifying their destruction. Examples of optimization measures taken by the OPCW include conducting sequential inspections, reducing the size of inspection teams from 11 members to five, streamlining report-writing and other procedures, making use of remote recording devices at destruction facilities, and hiring "on-call" inspectors to work under temporary contract. These efforts have yielded a time savings equivalent to more than 40 additional inspector positions.

As the declared stockpiles of chemical weapons are gradually eliminated over the next several years, the primary mission of the OPCW will transition from chemical disarmament to preventing covert rearmament. From then on, the focus of CWC verification

will be to monitor the commercial production of dual-use chemicals. Even so, if additional possessor-states accede to the CWC, a special destruction schedule will have to be developed for each country and approved by the executive organs of the OPCW. The Technical Secretariat must therefore maintain the capacity to monitor the destruction of chemical weapons owned by future states parties—and possibly for monitoring U.S. and/or Russian chemical weapons destruction if one or both countries fail to meet the April 2012 deadline, which now seems likely.

Verifying the Production of Schedule 1 Chemicals

Under the CWC, states parties may not produce, acquire, retain, transfer, or use the chemical warfare agents and precursors listed on Schedule 1 except in limited quantities for research, medical, pharmaceutical, or protective purposes. The types and quantities produced must be consistent with the permitted purposes, and the total amount possessed by a member state at any time may not exceed 1 metric ton. States parties may manufacture Schedule 1 chemicals for non-prohibited purposes at a Single Small-Scale Facility (SSSF). In addition, they may produce up to 10 kilograms of Schedule 1 chemicals per year for protective purposes at one additional facility, and in total amounts of less than 100 grams per year at other locations for research, medical, or pharmaceutical (but not protective) purposes.

All facilities that produce Schedule 1 chemicals must submit detailed annual declarations and are subject to on-site inspection. The aim of inspections at the SSSF is to verify that the quantities of Schedule 1 chemicals produced have been declared correctly and that the aggregate amount does not exceed 1 metric ton. Inspections at the other sites are designed to ensure that the facility is not used to produce undeclared Schedule 1 chemicals, that the declared quantities are accurate, and that Schedule 1 chemicals are not diverted or used for prohibited purposes. As of mid-2007, 21 countries had declared a total of

²⁴ OPCW Executive Council, *Report of the OPCW for 2005* (C-11/4), 6 December 2006, p. 7.

Table 2
Declarations and Inspections

	<i>States Parties which have declared Facilities</i>	<i>Declared Sites or Facilities</i>	<i>Inspections Conducted</i>	<i>Sites Inspected</i>
Chemical Demilitarisation				
Chemical Weapons Production Facilities (CWPFs)	12	65	384	67
Chemical Weapon Destruction Facilities (CWDFs)	6	37	875	35
Chemical Weapons Storage Facilities (CWSFs)	6	36	354	36
Abandoned Chemical Weapons (ACW)	3	19	37	26
Old Chemical Weapons (OCW)	13	47	73	29
Industry Verification				
Schedule 1	21	27	177	35
Schedule 2	37	469	385	231
Schedule 3	34	513	204	189
Other Chemicals Production Facilities, including DOC/PSF	78	4,767	462	404
Totals	n/a	5,980	2,951	1,052

DOC = Discrete Organic Chemicals

PSF = (Chemicals containing) Phosphorus, Sulfur or Fluorine

Source: OPCW website, accessed 16 July 2007

27 Schedule 1 facilities, and the OPCW had conducted 177 inspections at them.

Verifying the Nonproduction of Chemical Weapons

The industry verification regime contained in Article VI and the relevant parts of the Verification Annex calls for “routine” on-site inspections of declared commercial chemical plants that produce scheduled chemicals. The purpose of these inspections is to ensure that the activities at the declared sites are consistent with those reported to the OPCW and, in particular, that no production of undeclared scheduled chemicals occurs. Although the system of routine inspections has operated fairly smoothly over the past

decade, it contains a number of gaps and limitations that, if not corrected, could impede the ability of the CWC to detect and deter violations.²⁵ One problem is that the member states have watered down important elements of the verification process in ways not intended by the treaty negotiators. For example, the Conference of the States Parties has authorized inspected facilities to make copies of the inspectors’ notebooks to help prevent the compromise of proprietary business information. This decision runs counter to the immunity of inspection records guaranteed by

²⁵ For a more detailed discussion of these issues, see Jonathan B. Tucker, “Verifying the Chemical Weapons Ban: Missing Elements,” *Arms Control Today*, 37, no. 1 (January/February 2007), pp. 6–13.

the CWC and could have a chilling effect on the willingness of inspectors to report treaty violations.²⁶

Another factor limiting the scope and effectiveness of the industry verification regime is an overly narrow focus on scheduled chemicals. In compiling Schedule 1, the negotiators of the CWC decided to include only those chemical warfare agents and precursors for which past weaponization was a known fact. As a result, most of the listed agents (such as mustard, sarin, and VX) were already more than 20 years old when the convention entered into force. The negotiators also excluded chlorine, which was used as a chemical weapon in World War I but has numerous peaceful applications such as water purification and the manufacture of products ranging from pesticides to paper. Although chlorine is too ubiquitous to serve as a useful trigger for routine inspections, it is clearly covered by the General Purpose Criterion.

Because the CWC schedules are essentially a snapshot of the chemical weapons threat that existed at the time they were compiled, they have become increasingly obsolescent as chemical technology has moved forward at an accelerating pace. Toxic chemicals of chemical warfare concern that are not included in the schedules include most of the *novichoks*, a family of nerve agents that Soviet military scientists developed during the 1970s and 1980s; several chemicals designed to penetrate gas masks; incapacitating drugs such as the anesthetic fentanyl and related compounds; and numerous toxins (nonliving poisons produced by living organisms). At the same time, it is important to keep in mind that only a small fraction of highly toxic chemicals have the physiochemical properties that would make them suitable for weaponization, such as stability, persistence, and volatility. In addition, it must be possible to manufacture a chemical warfare agent economically in large quantities.

The fact that the CWC schedules are increasingly out of date impairs the ability of the OPCW inspectorate to address the risks posed by novel chemical agents and production technologies. Despite the fact that the treaty contains an expedited procedure for making technical amendments to the schedules to add novel toxic chemicals and precursors, the member states have shown little interest in doing so. One reason for this reluctance is that listing novel chemical warfare agents and their precursors could call attention to

their suitability for offensive use and thereby facilitate their acquisition by proliferators and terrorist groups. In addition, it would be impractical to keep adding new compounds to the schedules in an effort to keep up with rapid innovations in chemical science and technology. Although the technical amendment process is less complex than the regular amendment process, it is still lengthy and difficult. Amending the schedules would also create the risk that some countries might seek to remove listed chemicals as well as add new ones.

Because only industry facilities that produce treaty-relevant chemicals above specified quantitative thresholds are subject to routine inspection, the narrow scope of the verification system risks creating false confidence in compliance. The following sections discuss these concerns and suggest how they might be remedied.

Inspections of “Other Chemical Production Facilities”

One major gap in the industry verification system concerns “other chemical production facilities” (OCPFs), defined as plant sites that produce by synthesis more than 200 metric tons per year of organic (carbon-based) chemicals not listed in the schedules, or 30 metric tons of unscheduled organic chemicals containing the elements phosphorus, sulfur, or fluorine, which are often present in chemical warfare agents. As of July 2007, 78 member states had declared a total of 4,767 OCPFs, or nearly five times the number of declared facilities that produce scheduled chemicals. Since many OCPFs in large countries like China have yet to be identified, the total number of such facilities worldwide may be considerably larger.

Some 10 to 15 percent of the declared OCPFs are believed to be flexible, multipurpose batch production facilities that have the ability to switch rapidly from the manufacture of one chemical to another in response to shifts in market demand. Although these facilities do not currently manufacture scheduled chemicals, they could easily be converted to do so, giving them a “breakout” potential for clandestine chemical weapons production. To date, the level of attention given to multipurpose OCPFs has not been sufficient to provide a high level of confidence in compliance. Of the estimated 500 “other” production facilities that are considered high-risk, only a small fraction are inspected each year. Although the total

²⁶ Walter Krutsch, “‘Never Under Any Circumstances’: The CWC in the Third Year After its First Review Conference,” *CBW Conventions Bulletin*, No. 68 (June 2005), pp. 1–3.

number of OCPF inspections increased from 90 in 2006 to 118 planned in 2007, only some of these inspections are at high-risk sites. In addition, proposals to expand the total number of OCPF inspections further have met with resistance.

The selection of OCPFs for inspection has also been problematic. According to the provisions on OCPF inspections in Part IX of the CWC Verification Annex, *“the Technical Secretariat shall randomly select plant sites for inspection through appropriate mechanisms, such as the use of specially designed computer software, on the basis of the following weighting factors: (a) equitable geographical distribution of inspections; (b) the information on the listed plant sites available to the Technical Secretariat, related to the characteristics of the plant site and the activities carried out there; and (c) proposals by States Parties on a basis to be agreed upon...”* The current selection algorithm treats all CWC member states the same, regardless of how many OCPFs they have on their territory. As a result, a country with only a few relevant facilities may be required to host as many inspections per year as a country with hundreds of OCPFs, which is manifestly unfair.

With respect to facility characteristics, OCPF inspections should be better targeted on the flexible, multipurpose chemical plants that pose the greatest risk of diversion for illicit production. According to a recommendation by the OPCW Scientific Advisory Board, *“it may be helpful to devise criteria and risk assessment methodology for prioritizing and better targeting OCPF inspections to those facilities that pose a particularly high risk to the Convention, rather than to go for an all-out, non-targeted increase in the frequency of inspections at OCPF plant sites. The selection methodology for OCPF plant sites should then be applied in such a way that these criteria and methodologies can be effectively used.”*²⁷

Unfortunately, the detailed information needed to perform this type of risk-based weighting is not available to the Technical Secretariat. Compared to plants that manufacture scheduled chemicals, the OCPF regime requires states parties to declare only a minimal amount of data: the name of the plant site, its operator, location, and main activities. There is no obligation to identify the chemicals being manufactured or the production technologies in use. As a result, many OCPF inspections have been “wasted” on

facilities that turned out to produce harmless organic chemicals such as urea or methanol. Furthermore, the Technical Secretariat has not been allowed to target OCPF inspections by drawing on “open-source” information such as company databases and websites, although such sources may be used to help prepare for the inspections themselves. The rationale for ruling out the use of open-source information as a weighting factor is that it is available primarily for developed countries and hence would bias the selection process.

The third weighting factor provided for in the CWC, known as “national nominations,” refers to proposals by member states to inspect individual OCPFs of particular concern. Three years after the CWC entered into force, the Conference of the States Parties was supposed to decide how national nominations would be incorporated into the OCPF selection process, but the states parties failed to reach consensus on a suitable mechanism. As a result, this weighting factor has not been included in the OCPF selection process.

In response to a request from the OPCW Director-General to make the selection algorithm more equitable and effective, the Technical Secretariat revised the first two weighting factors (geographical distribution and facility risk assessment), while continuing to exclude national nominations. Under the new formula, which is expected to go into effect on 1 January 2008, the member states with the greatest number of OCPFs will have to accept a proportionately larger share of inspections. Even so, the dilemma remains that the information contained in national declarations is not sufficient to identify multipurpose OCPFs that pose the greatest risk to the convention. One way to improve the accuracy of risk assessments would be for states parties to provide relevant information about their facilities on a voluntary basis, enabling the Technical Secretariat to target OCPF inspections more effectively.

Use of Sampling and Analysis in Industry Inspections

The second major gap in the CWC verification regime has been the lack of sampling and analysis during on-site inspections of industry sites. According to Part VII of the Verification Annex, sampling and analysis—usually conducted with a portable instrument called a gas chromatograph-mass spectrometer (GC-MS)—is mandatory during routine inspections of Schedule 2 plants to confirm the nonproduction of undeclared

²⁷ OPCW Technical Secretariat, “Note by the Director-General: Report of the Scientific Advisory Board on Developments in Science and Technology,” RC-1/DG.2 (Annex), 23 April 2003, p. 18.

scheduled chemicals. It may also be performed on a voluntary basis at Schedule 3 plants and OCPFs. For the first several years of CWC implementation, however, sampling and analysis occurred only rarely during industry inspections because of resistance from states parties. Objections included high costs and complex logistics, as well as concerns over the possible compromise of commercial trade secrets.

In July 2006, the OPCW launched an 18-month trial program to increase the use of on-site sampling and analysis during routine inspections of Schedule 2 facilities. By the end of June 2007, six inspections involving sampling and analysis had been carried out, including at plants in China, Switzerland, and the United Kingdom. The Technical Secretariat currently views sampling and analysis as an important tool and plans to utilize it during about 10 inspections of Schedule 2 facilities each year, with the total number limited by budget and personnel. As industry becomes more comfortable with the technique, it would be desirable to extend its routine use to high-risk OCPFs, where it could make an important contribution to building confidence in CWC compliance.

To protect proprietary information, OPCW inspectors currently perform GC-MS analysis at Schedule 2 facilities with a software package called AMDIS that, when run in “blinded” mode, prevents the operator from seeing and recording the raw data generated by the machine. Instead, the software displays the names of any scheduled chemicals in the sample that match reference spectra stored in the OPCW Central Analytical Database. Although the use of blinded software does not matter a great deal during routine inspections of Schedule 2 sites, where the main objective is to confirm the absence of undeclared scheduled chemicals, blinded analysis would be problematic during challenge inspections of suspect chemical production facilities or during field investigations of alleged chemical weapons use. In such cases, it would be important to analyze for a wide range of toxic chemicals and precursors, including unscheduled compounds that might be developed and used for prohibited purposes.

For such cases, the OPCW Scientific Advisory Board (SAB) has recommended expanding the analytical database for GC/MS to include unscheduled chemicals that have the potential to be used for warfare or terrorism or that might be confused with scheduled chemicals and thus generate false-positive results. Compounds and spectra considered proliferation-sensitive could be classified as confidential and handled as

such. The SAB has also recommended the development of sampling and analysis techniques for toxins of biological origin—particularly the two toxins (saxitoxin and ricin) listed on Schedule 1—as well as biomedical samples collected from victims during investigations of alleged chemical weapons use.²⁸ A difficulty of identifying some toxins (such as botulinum) is that they consist of several related proteins and do not have a single chemical formula, making it problematic to integrate them into the CWC verification regime.

Challenge Inspections

Article IX of the CWC enables a state party to request a “challenge” inspection of any facility, declared or undeclared, on the territory of another state party “for the sole purpose of clarifying and resolving any questions concerning possible non-compliance....” The treaty negotiators intended that challenge inspections would serve as a “safety net” to capture clandestine chemical weapons stockpiles and production facilities that a cheater has deliberately not declared and hence are not inspected on a routine basis. To prevent frivolous or abusive challenge inspections, the requesting state must accompany its request with “all appropriate information on the basis of which a concern has arisen regarding possible non-compliance.” Provided that the Executive Council does not block the challenge request by a three-quarters majority vote, the OPCW inspectorate will carry out the inspection on fairly short notice. The Verification Annex also contains detailed procedures for conducting field investigations of the alleged use of chemical weapons. Despite the intrusiveness of the challenge provisions, numerous trial inspections have demonstrated that it is possible to safeguard proprietary data and national-security information unrelated to the CWC by means of careful preparation, good organization, and “managed access” techniques, such as turning off computers and shrouding sensitive equipment.

Recent advances in chemical science and technology have exacerbated the problem of dual-use production facilities and increased the relevance of challenge inspection for addressing it. Yet ever since the CWC entered into force in April 1997, no state party has requested the use of this key verification tool. Instead, challenge inspection has become the political “third rail” of the convention, considered too hot to touch.

²⁸ Ibid., p. 21.

Although the United States has publicly accused China, Iran, Russia, and Sudan of violating the CWC, Washington has not sought to address these allegations within the treaty framework by requesting challenge inspections.²⁹ The fact that serious charges of noncompliance have not been resolved has had a corrosive effect on the credibility of the regime.

Disincentives to the use of the challenge mechanism include the possible need to disclose sensitive intelligence information to justify a request; the concern that the inspection will fail to uncover definitive evidence of a violation; the risk that the challenged state may request a “retaliatory” inspection at a sensitive facility in the initiating country; and the perception that a challenge inspection request may be politically too confrontational. For these reasons, states parties have preferred to address compliance concerns through bilateral consultation measures in the CWC, which can be kept confidential. Another obstacle to the use of challenge inspections is the fact that the U.S. implementing legislation empowers the president to block an inspection (routine or challenge) on grounds of national security. Because this unilateral exemption creates a precedent for other CWC member states to demand the same prerogative, it has weakened the challenge inspection mechanism.

Despite these drawbacks and limitations, however, challenge inspection remains a key verification tool for exposing CWC violations at undeclared facilities. Another benefit of the challenge mechanism is its deterrent effect. The prospect of an international inspection team arriving at a suspect site on short-notice, asking probing questions, taking samples, and examining buildings would create serious problems for a would-be cheater.³⁰ To function as a credible deterrent, however, challenge inspections must be seen as a usable tactic. Otherwise the political threshold will remain too high for even serious concerns about noncompliance to trigger a challenge request. Furthermore, the longer the challenge mechanism remains unused, the higher the political hurdle to using it will become. One way to lower the political bar for challenge inspections would be to employ them for clarification purposes in cases where voluntary

cooperation is not forthcoming. For example, a state party might request a challenge inspection to clarify whether or not a particular facility on the territory of another member-state should have been declared.

In the meantime, it is important for the OPCW Technical Secretariat to maintain the capability to carry out a challenge inspection effectively whenever one is requested. Additional trial inspections are therefore needed to hone the skills of the OPCW inspectorate and practice interactions among the inspection team, the host country, and the inspected facility. By demonstrating that the OPCW is capable of carrying out a challenge inspection effectively, such exercises can help to deter potential violators even in the absence of an actual inspection request.

Role of the National Authorities

The final gap in the industry verification regime relates to the role played by the states-parties themselves. Because the Technical Secretariat cannot monitor compliance with all of the obligations in the CWC, the treaty establishes a division of labor between the verification activities of the OPCW at the international level and those of the member states at the national level. According to Article VII, all states parties must adopt “the necessary measures to ensure that toxic chemicals and their precursors are only developed, produced, otherwise acquired, retained, transferred, or used [...] for purposes not prohibited under this convention.” To fulfill this requirement, each member state must establish a National Authority to monitor its chemical industry and serve as a focal point for liaison with the OPCW. States parties must also enact domestic legislation that criminalizes the acquisition and use of chemical weapons by their citizens and imposes penal sanctions for violations, and that creates licensing and reporting rules for the import, export, and transshipment of scheduled chemicals. These national laws and regulations play a vital role in preventing proliferators and terrorists from acquiring chemical weapons precursors and dual-use production equipment.

Unfortunately, less than 50 percent of CWC member states have adopted the full set of implementing legislation required under Article VII, including penal legislation and export controls. These laws must also be translated into subsidiary regulations before they can be effective. Although the OPCW Technical Secre-

²⁹ U.S. Department of State, Bureau of Verification and Compliance, *Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments*, 30 August 2005, pp. 55–56.

³⁰ John R. Walker, “Verification: Challenge Inspection,” Paper presented at the conference *Freeing the World of Chemical Weapons*, SWP, Berlin, 26 April 2007.

tariat helps countries to draft the necessary legislation, it often has difficulty persuading parliamentarians from developing countries to make CWC implementation a priority. At present, the OPCW is focusing on the roughly 25 states parties that have declared treaty-relevant facilities but do not yet have comprehensive implementing legislation in place.³¹

On 28 April 2004, the United Nations Security Council adopted Resolution 1540 under Chapter VII of the UN Charter (“Action with Respect to Threats to Peace, Breaches of the Peace and Acts of Aggression”). The resolution aims to prevent non-state actors from manufacturing, acquiring, or trafficking in nuclear, biological, or chemical weapons, materials, or delivery systems. To this end, all states—whether or not they are parties to the CWC—must establish a national system of export controls on dual-use chemicals and other items of proliferation concern. Because many verification measures apply only to the CWC, however, it can be difficult to integrate the legal provisions for chemical weapons with those for nuclear and biological weapons. Moreover, some countries assume erroneously that because they have fulfilled the requirements of Resolution 1540, there is no need to pass comprehensive implementing legislation for the CWC.

³¹ Santiago Oñate Laborde, Legal Advisor to the OPCW, presentation at the conference *Freeing the World of Chemical Weapons*, SWP, Berlin, 26 April 2007.

International Cooperation and Assistance

An important but often overlooked aspect of the CWC is the role of international cooperation and assistance. Article X provides for the delivery of protective equipment and medical aid to a state party that has been attacked or threatened with chemical weapons, while Article XI allows for international cooperation in the peaceful uses of chemical technology. These two articles were included to provide incentives for developing countries to join the CWC, either because they might be the victim of a chemical attack or because they seek access to chemical technology and materials for their economic and social development.

Protective Assistance under Article X

Protective assistance against chemical attack is particularly important for developing countries that lack an effective chemical defense capability. The CWC provides three different options by which member states can supply such assistance: (1) by making a contribution to a Voluntary Fund for this purpose; (2) by concluding an agreement with the OPCW regarding the provision of assistance to a state party upon request; or (3) by declaring the type of assistance it would provide in response to an appeal from the OPCW to support a state party that has been attacked or threatened with chemical weapons.³² Once a CWC member state has requested assistance under Article X, the Technical Secretariat must promptly investigate the incident and arrange for the delivery of aid by the OPCW and individual member-states. An Assistance Cooperation and Assessment Team (ACAT) has been established for this purpose.

In recent years, CWC member states have become increasingly concerned about chemical terrorism, including the deliberate release of toxic industrial chemicals such as chlorine, phosgene, and hydrogen cyanide.³³ Since January 2007, insurgents in Iraq have

detonated a series of truck bombs incorporating tanks filled with liquid chlorine. Concerns also exist about the safety and security of chemical industry, including the potential sabotage of chemical plants that work with highly toxic chemicals and attacks on various modes of chemical transport, such as tanker-trucks and railroad tank cars.³⁴ Because the time available to manage the consequences of a chemical attack would be measured in hours rather than days, international assistance would probably arrive too late to be of much benefit. For this reason, the OPCW has de-emphasized planning for the delivery of assistance after a chemical attack and instead worked to improve the capabilities of member states for self-protection and emergency response, for example, by training government officials and emergency responders. Although the current focus on domestic preparedness makes sense, more resources are needed to implement this strategy effectively.

International Cooperation under Article XI

The promise of international cooperation in the use of chemistry for peaceful purposes is an important component of the overall balance of objectives in the CWC. According to Article XI, states parties “shall not maintain among themselves any restrictions [...] incompatible with the obligations taken under this Convention, which would restrict or impede trade and the development or promotion of scientific and technological knowledge in the field of chemistry for industrial, agricultural, research, medical, pharmaceutical or other peaceful purposes.” The provisions of Article XI aim to facilitate legitimate exchanges among states parties of chemicals, equipment, and scientific and technical information. Indeed, many countries were persuaded to join the CWC with the promise that economic and industrial benefits would flow from membership, including technical assistance and technology transfer. Whereas the developed countries tend to emphasize

³² These options do not prevent CWC states parties from entering into independent agreements for the provision of emergency assistance.

³³ Mimi Hall, “Chlorine Bombs Pose New Terror Risk,” *USA Today*, 23 April 2007; Bradley Hope, “Police on Alert as Chlorine Hits Iraq,” *New York Sun*, 1 May 2007.

³⁴ Paul Orum, *Toxic Trains and the Terrorist Threat: How Water Utilities Can Get Chlorine Gas Off the Rails and Out of American Communities* (Washington, DC: Center for American Progress, April 2007), available online at: www.americanprogress.org/issues/2007/04/chemical_security_report.html.

exchanges of information, including assistance with national implementation, the developing countries are more concerned with removing barriers to chemical trade, such as export controls.

Since the entry into force of the treaty, the Technical Secretariat has organized or sponsored some 500 cooperative activities involving more than 5,600 participants.³⁵ Flagship efforts in this area include the OPCW Associate Program, which has trained chemists and chemical engineers from 24 developing and transitional countries in modern chemical industry operations and the management of chemical safety, and arranged internships with major chemical companies. The OPCW also supports small-scale research projects in developing countries on topics such as environmentally sound chemical technologies, safer alternatives to scheduled chemicals, and medical treatment of toxic exposures. In addition, the Technical Secretariat hosts regular meetings of National Authorities from around the world to help with the preparation of CWC implementing legislation and regulations.

Other provisions of Article XI relate to the liberalization of chemical trade among CWC states parties. Some members of the Non-Aligned Movement (NAM), such as Cuba, India, Iran, and Pakistan, object to the continued existence of the Australia Group (AG), an informal forum of 40 countries that harmonize their national export controls on chemical precursors and production equipment. The AG was established in 1985 in response to the finding that both Iraq and Iran had procured chemical weapons precursors and production equipment from companies in several Western countries. Since then, the member states of the AG have adopted common control lists for precursor chemicals, toxins, and dual-use chemical manufacturing equipment and technologies. AG members also share intelligence on suspect chemical weapons programs.³⁶ Given that second-tier suppliers outside the AG provide an alternative source of precursors and production equipment, export controls are not a panacea for preventing chemical weapons production. Nevertheless, such measures slow efforts to acquire chemical weapons and buy time for other policy instruments to be brought to bear.

The relationship between the AG and the CWC is contentious. Whereas the treaty's restrictions on transfers of Schedule 1 and 2 chemicals are targeted exclusively on non-member states, the AG controls also apply to a few CWC states parties that are suspected of pursuing clandestine chemical weapons programs. Former South African diplomat Jean du Preez argues that the sharing of secret intelligence by AG members and the targeted use of export controls have come to substitute for compliance mechanisms within the CWC, such as challenge inspections. Because the AG is nontransparent, however, the accused states have no opportunity to respond to the allegations against them. Moreover, given the flawed U.S. and British intelligence on Iraq's chemical weapons prior to the 2003 Iraq War, the use of national intelligence information as the basis for denying export licenses could end up punishing innocent countries unfairly. Du Preez further contends that the nontransparent nature of AG decision-making has alienated many developing countries, which feel that they committed themselves to the burdens of CWC implementation under false pretences. This frustration may be manifesting itself in the fact that less than half of the states parties have adopted comprehensive implementing legislation and regulations.³⁷

AG members respond to these criticisms by asserting that they have the sovereign right to deny exports of dual-use chemicals and equipment to states of proliferation concern, even if such countries are parties to the CWC. Because of the gaps in the industry verification regime, countries may cheat without being detected. Accordingly, export licensing based on national intelligence information is necessary to fulfill the obligation in Article I "never under any circumstances [...] to assist, encourage or induce, in any way, anyone to engage in any activity" prohibited by the treaty. Moreover, because the CWC was not designed to deal with chemical terrorism, there is a need for additional controls coordinated by the AG, such as a "catch-all" provision requiring an export license for any chemical or piece of equipment suspected of being purchased for chemical weapons purposes. Responding to the charge that the AG violates Article XI by restricting the international trade in chemicals for peaceful purposes, group members counter that

³⁵ OPCW, "The Chemical Weapons Ban: Facts and Figures," OPCW website, www.opcw.org.

³⁶ James I. Seevaratnam, "The Australia Group: Origins, Accomplishments, and Challenges," *Nonproliferation Review*, 13, no. 2 (July 2006), pp. 401–415. See also the Australia Group website, www.australiagroup.net.

³⁷ Jean du Preez, "Ten Years After: Has the Chemical Weapons Convention Met Expectations?", Paper presented at the conference *Freeing the World of Chemical Weapons*, SWP, Berlin, 26 April 2007.

only a tiny fraction of export requests are denied, based solely on the nonproliferation credentials of the recipient, and that AG actually facilitates legitimate trade by increasing confidence that transferred chemicals will not be used for prohibited purposes.

Perhaps when all CWC member states have robust export-control systems in place, the multilateral trade restrictions in the treaty will become effective, but that is unlikely to be the case anytime soon. A more fundamental problem is that whereas member states must submit aggregate national data declarations to the OPCW on their exports or imports of scheduled chemicals to or from other states parties, such transfers are reported only *after* they have occurred. In contrast, a system of export controls requires making decisions *in advance* about whether or not to authorize specific shipments. In the words of a British government paper, “Exporting states must continue to permit transfers *only* if they believe the items will *not* be misused. They cannot permit transfers simply on the grounds that they cannot *prove* publicly that they *will* be misused.”³⁸

As long as such divergent perceptions of the AG continue to exist, the debate over national export controls and their relationship to the CWC is unlikely to be resolved. One way of sidestepping this controversy would be to focus on expanding international cooperation in the peaceful uses of chemistry in ways that do not create new proliferation risks. One such approach would be for states parties to cooperate in protecting their domestic chemical industries against natural disasters and terrorist attacks by means of improved site security, reduced on-site storage and use of highly toxic materials, and improved plant management and supply-chain operations.³⁹ Such efforts to enhance chemical industry security would create valuable synergies between the implementation of Articles X and XI.

³⁸ United Kingdom, “The Role of Export Controls in the Implementation of the Chemical Weapons Convention,” National Paper for the First CWC Review Conference, RC-1/NAT.12, 29 April 2003, pp. 3–4.

³⁹ Batsanov, “Approaching the 10th Anniversary of the Chemical Weapons Convention (see note 6), p. 350.

Outlook for the Second Review Conference

The CWC provides for the states parties to hold a review conference five and ten years after the entry into force of the convention, and at intervals of five years thereafter unless otherwise decided. The purpose of the review conference is not to consider amendments to the CWC or to make decisions about the day-to-day functioning of the OPCW, but rather to take stock of the treaty's implementation over the past five years with a particular emphasis on the impact of developments in science and technology. Whereas the regular sessions of the Executive Council and the Conference of the States Parties focus on tactical and operational issues, the review conference provides an opportunity to take a strategic overview of CWC implementation to ensure that the treaty remains relevant in a changing technological and security environment.⁴⁰ According to the Canadian analyst D. A. Neill, "The overarching goal of a review conference should be to [...] establish broad axes of effort for the Organization for the coming years; and to identify areas of emphasis upon which the routine consultative and decision-making mechanisms of the Convention will need to focus in order to make progress along these axes."⁴¹

Preparations have already begun for the Second Review Conference, which will take place in The Hague on 7–18 April 2008. As occurred prior to the First Review Conference in 2003, the Executive Council has established a preparatory committee called the Open-Ended Working Group (OEWG), chaired this time by Ambassador Lyn Parker of the United Kingdom. Representatives from some 40 states parties participate in working group meetings. In order to reach consensus on the major issues prior to the review conference, the preparations have been divided into three phases. During the first phase, from autumn 2006 to summer 2007, the OEWG conducted a process of brainstorming to identify the main issues for

discussion and elicit the views of individual countries. The second phase, starting in September 2007, will be informed by a technical report on developments in chemical science and technology over the past five years and their implications for the CWC, prepared by the OPCW Scientific Advisory Board in partnership with the International Union of Pure and Applied Chemistry (IUPAC). The OEWG will also meet with representatives of the chemical industry and with interested non-government organizations (NGOs) to collect ideas and recommendations. In the final phase of the preparatory process, scheduled to begin before the end of 2007, the OEWG will draft the chairman's report, which will serve as the basis of the Report of the Second Review Conference.

Scientific and Technological Developments

The only topic that the CWC specifically mandates the review conference to address is "any relevant scientific and technological developments" (Article VIII, paragraph 22). This issue is critical because rapid changes in drug development and screening techniques, as well as chemical production technologies, are challenging the scope of the CWC's prohibitions and the effectiveness of the verification regime. At the scientific level, the convergence of chemistry with molecular biology, nanotechnology, and information technology is creating a broad range of capabilities to manipulate human physiology for good or ill. For example, the widespread use of combinatorial methods for the rapid synthesis and screening of novel chemicals to identify new drug candidates could be misused to develop novel warfare agents. The pharmaceutical industry is engaged in intensive research on natural body substances called bioregulators, which could provide the basis for a new generation of therapeutic drugs but might also be developed into lethal or incapacitating agents.⁴²

⁴⁰ Michael L. Moodie, "Issues for the First CWC Review Conference," in Jonathan B. Tucker (ed.), *The Chemical Weapons Convention: Implementation Challenges and Solutions* (Monterey, CA: Center for Nonproliferation Studies, April 2001), pp. 59–65.

⁴¹ D. A. Neill, "The Chemical Weapons Convention: Topics for the Second Review Conference," *Chemical Disarmament Quarterly*, May 2007, p. 15.

⁴² Pål Aas, "The Threat of Mid-Spectrum Chemical Warfare Agents," *Prehospital and Disaster Medicine*, 18, no. 4 (October–December 2003), pp. 306–312.

With respect to novel production technologies, chemical synthesis techniques have made it possible to manufacture hundreds of kilograms of peptide toxins and bioregulators, which formerly had to be extracted in small quantities from their natural source materials with great difficulty and expense.⁴³ At the same time, the production of specialty chemicals has been transformed by the increased use of biologically based production systems. Other technological innovations with important implications for the CWC include the advent of microreactors that, when operated in parallel, can dramatically reduce the footprint of a chemical plant, and multipurpose facilities containing flexible batch production lines that can switch rapidly from one product to another. These developments have made it possible to create a “mobilization” capacity for the production of chemical weapons during a crisis or war without the need to maintain an active stockpile. In view of these changes, the OPCW Technical Secretariat must develop the capability to identify dual-use production facilities that have been deliberately engineered to increase their “breakout” potential.

Advances in chemical science and technology have also rendered the CWC schedules obsolescent and underlined the importance of the General Purpose Criterion as a “catch-all” to ensure that the basic prohibitions of the treaty cover all toxic chemicals and precursors acquired or used for hostile purposes. Because monitoring and enforcing the General Purpose Criterion is chiefly the responsibility of the National Authorities, this obligation must be reflected in domestic implementing legislation and regulations. It is also important to increase awareness of the General Purpose Criterion among the range of actors who work with toxic chemicals, for example, by educating chemists and chemical engineers about the prohibitions in the CWC and creating a professional code of conduct.

Non-Lethal Incapacitating Agents

One area of science and technology of particular relevance to the CWC is the development of so-called “non-lethal” incapacitating agents for law-enforce-

ment and counterterrorism operations.⁴⁴ Chemical incapacitants differ from riot-control agents (RCAs) such as CS tear gas, which are defined in the treaty as “any chemical not listed in a Schedule, which can produce rapidly in humans sensory irritation or disabling physical effects which disappear within a short time following termination of exposure.” In contrast to RCAs, incapacitating drugs (such as the opiate anesthetic fentanyl) have long-lasting depressive effects on the central nervous system, although they are not usually fatal when administered in the proper dose.

The best-known incident involving the tactical use of an incapacitating drug occurred in October 2002, after Chechen rebels seized some 800 hostages at the Dubrovka Theater in Moscow and threatened to detonate explosives if their demands were not met. After a two-day standoff, Russian federal security forces pumped an anesthetic gas (reportedly a fentanyl derivative) into the theater through the air-conditioning system, knocking out most of the rebels, who were then shot at point-blank range. Tragically, however, more than a hundred of the hostages also died from exposure to the gas. This incident demonstrated that because the effects of anesthetic drugs depend on dose and individual susceptibility (with young children and the elderly more susceptible than healthy adults), the concept of a “non-lethal” incapacitant is a myth. Whereas an anesthesiologist in an operating room can precisely control the concentration of anesthetic administered to a patient, it is impossible during a tactical police operation to deliver a dose that can knock out criminals or terrorists without causing significant harm or death to innocent bystanders or hostages. According to Vivienne Nathanson, an expert on science and ethics at the British Medical Association, “It is disingenuous of governments to describe [such] drugs as non-lethal—there is no difference between a drug and a poison except the dose.”⁴⁵

Growing state interest in the use of incapacitating agents for counterterrorism purposes has sparked a debate over the provision in Article II, paragraph 9, of the CWC permitting the use of toxic chemicals for “law enforcement, including domestic riot control.” This exemption was designed to allow the United States to

⁴³ United Kingdom, *The Comprehensive Nature of the Chemical Weapons Convention and Scientific and Technological Change: The General Purpose Criterion*, 22 January 2007.

⁴⁴ Malcolm Dando, “Scientific and Technological Change and the Future of the CWC: The Problem of Non-Lethal Weapons,” *Disarmament Forum*, No. 4 (2002), pp. 33–44.

⁴⁵ BBC News, “Using drugs as weapons ‘unsafe’,” 24 May 2007. See also, British Medical Association, *The Use of Drugs as Weapons: The Concerns and Responsibilities of Healthcare Professionals*, May 2007.

employ lethal injection for capital punishment and to enable all member states to use RCAs for domestic riot control and counterterrorism operations, while precluding the use of such chemicals as “a method of warfare.” The law-enforcement exemption is ambiguous, however, with respect to the use of more powerful incapacitating drugs, creating a legal gray zone where different interpretations are possible. Are incapacitants as well as RCAs permitted for law-enforcement purposes? If so, is the use of incapacitants limited to domestic situations, or is it also allowed in foreign counterterrorism and peacekeeping operations?

Arms control experts worry that if a broad interpretation of the law-enforcement exemption becomes accepted state practice, it could create pressures to develop more advanced incapacitating agents and specialized munitions to deliver them, eroding the basic norms in the CWC. Julian Perry Robinson has warned that the “creeping legitimization” of incapacitants could lead a new generation of chemical weapons designed to interfere specifically with life processes.⁴⁶ Similarly, Alan Pearson has expressed concern that powerful incapacitants developed and stockpiled for law-enforcement purposes might be diverted to the battlefield on grounds of “military necessity.”⁴⁷ For these reasons, it is important for CWC member states to set reasonable limits on the types and quantities of incapacitating agents (if any) whose use is consistent with law-enforcement purposes, including domestic or foreign counterterrorism operations, as well as rules of engagement for their use.

A related issue is how incapacitating agents should be monitored under the CWC. At present, these chemicals fall through the cracks in the verification regime. Because incapacitants such as fentanyl are not listed on the schedules, they are not captured by declarations and routine inspections. Moreover, because incapacitants do not meet the treaty definition of a riot-control agent, they are not declarable as RCAs under Article III, paragraph (e). Given that fentanyl and related anesthetic drugs are widely used in hospitals, a blanket requirement to declare all facilities that possess these agents would be impractical. One approach would be for the member states to

adopt a confidence-building measure calling for the voluntary declaration of any stocks of incapacitating agents and associated delivery systems that have been developed and stockpiled for law-enforcement purposes.

Although the issue of “non-lethal” incapacitants has important implications for the future of the CWC, there is currently no consensus among member states about how such agents should be regulated or handled. For this reason, one analyst has argued that “any attempt to resolve this issue at the review conference would have a low probability of reaching a useful conclusion, and a high probability of sparking serious disagreement.”⁴⁸ Because the topic is not yet ripe for discussion at the political level, additional preparatory work is needed. CWC member states should request a respected outside scientific organization such as IUPAC to examine the technical dimensions of the issue in detail. In addition, the EU Presidency should consider hosting a workshop that brings together chemists, pharmacologists, toxicologists, physicians, international lawyers, and specialists in the CWC to discuss all aspects of the incapacitants issue and prepare a menu of policy options for decisionmakers.

Other Issues for the Review Conference

Other important issues that should be addressed during the Second Review Conference in 2008 include the following:

General Purpose Criterion. The review conference should reiterate the comprehensive nature of the CWC’s prohibitions with respect to any toxic chemicals and precursors developed, produced, or acquired for hostile purposes and discuss how the Technical Secretariat can improve its ability to detect and deter noncompliance with the General Purpose Criterion in light of rapid changes in chemical science and technology. In particular, national implementing legislation for the CWC should not be limited to scheduled chemicals but should apply to all prohibited activities involving the use of toxic chemicals or their precursors, undertaken on the territory of a state party or by one of its citizens on the territory of another country.⁴⁹

⁴⁶ Julian Perry Robinson, “Categories of Challenge Now Facing the Chemical Weapons Convention,” Discussion paper, 52nd Pugwash CBW Workshop, Noordwijk, The Netherlands, 17–18 March 2007, p. 18.

⁴⁷ Alan Pearson, “Incapacitating Biochemical Weapons: Science, Technology and Policy for the 21st Century,” *Non-proliferation Review*, 13, no. 2 (July 2006), p. 173.

⁴⁸ Neill, “The Chemical Weapons Convention (see note 41), p. 17.

⁴⁹ United Kingdom, *The Comprehensive Nature of the Chemical Weapons Convention* (see note 43).

Universality. The review conference should extend the Action Plan on Universality and endorse the efforts of the OPCW to achieve universal adherence to the CWC. In addition, individual member states and the European Union should engage in bilateral consultations with Egypt, Israel, and Syria to persuade them of the merits of joining the convention. Another way to exert greater pressure on hold-out countries to ratify or accede to the CWC would be to extend the restrictions on trade with non-states parties to cover Schedule 3 chemicals, which are consumed in large quantities by the chemical and pharmaceutical industries.

Destruction of Chemical Weapons. Although some discussion of chemical weapons destruction at the review conference is unavoidable, no decisions should be taken that could constrain future options for addressing the problem. The best outcome would be for both the United States and Russia to allocate the resources needed to complete destruction by 29 April 2012, but this option may no longer be realistic. In early 2008, the OPCW Executive Council plans to visit both countries to assess the status of destruction efforts. Information obtained during these visits could provide a useful basis for discussion.

National Implementation. In addition to ensuring that all states parties adopt implementing legislation that includes a suitable reference to the General Purpose Criterion, it is essential that these laws be translated into effective subsidiary regulations. Accordingly, the Technical Secretariat's legal assistance programs should be expanded. Outreach to the global chemical industry is also necessary to persuade companies to provide more detailed information about OCPFs to their respective National Authorities.

In addition to addressing key issues related to CWC implementation, the review conference will provide an opportunity for the OPCW to engage with various stakeholders interested in chemical disarmament and nonproliferation, including representatives from the public, private, and civil spheres. In particular, the NGO community should be better integrated into the process than occurred at the First Review Conference in 2003, when NGOs were excluded from the formal meetings and were forced to hold a forum at a separate location.

Conclusions

Over the past decade, the CWC has served to delegitimize the possession and use of chemical arms. As reflected by the large number of states parties, the great majority of the international community supports the abolition of this entire category of weaponry. At the same time, much remains to be done to improve the implementation of the CWC. First, the remaining hold-out states—particularly the four countries believed to possess significant stocks of chemical weapons—must be brought into the regime. Second, the process of chemical weapons destruction must be accelerated in a safe and environmentally responsible manner so that it can be completed by the 2012 deadline or soon thereafter. Third, the regime for verifying the nonproduction of chemical weapons should be strengthened to close gaps in the monitoring of relevant industry sites. To this end, states parties should reaffirm the central importance of the General Purpose Criterion, increase the number of OCPF inspections, expand the use of sampling and analysis during industry inspections, request challenge inspections for clarification purposes, and ensure effective national implementation. Innovative approaches to international assistance and cooperation are also needed so that developing countries have a strong incentive to join the convention and implement it fully.

New risks to the CWC have emerged over the past decade, particularly those associated with chemical terrorism and the rapid changes in chemical science and technology. In addition, the process of economic globalization has greatly expanded the volume of international trade in dual-use chemicals and equipment, increasing the chances for diversion and misuse. Although only a small minority of countries intend to retain or reacquire lethal chemical weapons, there is growing interest in the use of “non-lethal” incapacitants for peacekeeping and counterterrorism operations. These developments raise important policy issues that must be addressed before state practice in this area becomes established in an *ad hoc* manner. In particular, it is vital to develop reasonable guidelines for the use of incapacitating drugs in law-enforcement operations, both at home and abroad.

The Second Review Conference in April 2008 offers an important opportunity for states parties to renew their political commitment to the CWC, discuss problems of implementation, and develop practical solutions. Member states should also look forward to the time when all declared chemical weapons have been destroyed and the core mission of the OPCW transitions to preventing covert rearmament. Given the dual-use nature of chemical technology, the future development and use of toxic chemicals for hostile purposes—either by states or terrorist organizations—can never be ruled out. Only through continued vigilance and effective implementation of the CWC will it be possible to safeguard future generations from the horrors of chemical warfare.

Abbreviations

ACW	Abandoned Chemical Weapons
AG	Australia Group
CWC	Chemical Weapons Convention
CWDF	Chemical Weapon Destruction Facilities
CWPF	Chemical Weapons Production Facilities
CWSF	Chemical Weapons Storage Facilities
DOC	Discrete Organic Chemicals
GC-MS	Gas Chromatograph-Mass Spectrometer
IUPAC	International Union of Pure and Applied Chemistry
NAM	Non-Aligned Movement
NGO	Non-Governmental Organization
NPT	Nuclear Nonproliferation Treaty
OCPFs	Other Chemical Production Facilities
OCW	Old Chemical Weapons
OEWG	Open-Ended Working Group
OPCW	Organization for the Prohibition of Chemical Weapons
PSF	Phosphorus, Sulfur, or Fluorine
RCAs	Riot-control Agents
SAB	Scientific Advisory Board (OPCW)
SSSF	Single Small-Scale Facility