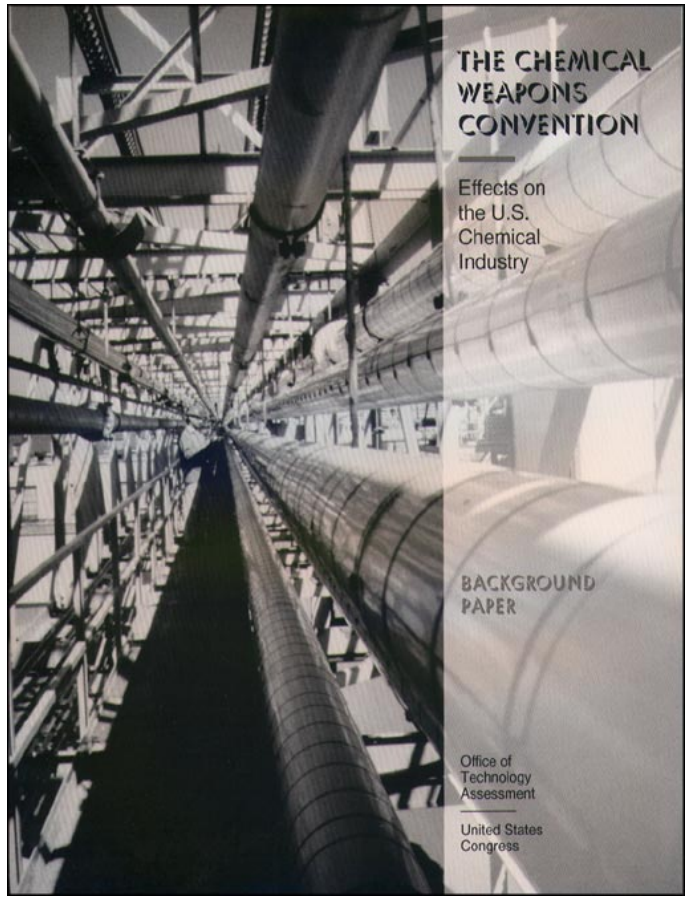
The Chemical Weapons Convention: Effects on the U.S. Chemical Industry

August 1993

OTA-BP-ISC-106
NTIS order #PB93-218873
GPO stock #052-003-01331-2



Recommended Citation:
U.S. Congress, Office of Technology Assessment, *The Chemical Weapons Convention: Effects on the U.S. Chemical Industry, OTA-BP-ISC-1O6* (Washington, DC: U.S. Government Printing Office, August 1993).

For sale by the U.S. Government Printing Office
Superintendent of [)ocuments. Mail Stop : SSOP, Washington, DC 20402-9328
ISBN 0-16 -041851-8

Foreword

Historically, arms control treaties have had little direct impact on private industry. With a few rare exceptions--such as the onsite inspections of missile-production plants mandated by the Intermediate-range Nuclear Forces (INF) Treaty—such agreements have not covered manufacturing facilities but have sought to limit the numbers of deployed weapon systems. For this reason, the impending implementation of the Chemical Weapons Convention (CWC) will bring about a fundamental change in the practice of arms control.

The Convention, which is expected to enter into force in early 1995, bans the development, production, and use of chemical weapons. Since these activities are hard to detect with national technical means of verification such as reconnaissance satellites, the CWC is unprecedented in its requirement for intrusive onsite inspections of commercial production facilities, particularly those manufacturing "dual-use" chemicals that have legitimate commercial applications but can also be converted into chemical-warfare agents. Indeed, the ability to conduct onsite inspections at any one of tens of thousands of chemical plants worldwide will be essential to maintain confidence that all parties to the treaty are complying with its provisions,

This background paper explores the multifaceted challenge of integrating a private, primarily civil industry into the global arms-control regime established by the CWC. The interaction between industry and arms control raises new and challenging issues, such as reconciling the intrusive verification provisions of the treaty with the privacy protections of the U.S. Constitution, and addressing the concern that CWC-mandated declarations and inspections of chemical plants could provide opportunities for industrial espionage. Implementation of the Convention will entail an unavoidable tradeoff between the need to gather enough information to verify treaty compliance and the risk that intrusive inspections could jeopardize valuable trade secrets. The background paper concludes, however, that advance preparation by industry can mitigate such concerns.

The Senate Select Committee on Intelligence and the House Permanent Select Committee on Intelligence requested this background paper. It is one product of a larger OTA assessment, requested by several congressional committees, of the proliferation of weapons of mass destruction.



Roger C. Herdman, Director

Advisory Panel

James E. Goodby, chair[1]
Distinguished Service Professor
Carnegie-Mellon University

James F. Leonard, chair[2]
Executive Dirtxtor
Washington Council on Non-Proliferation

George Anzelon
Associate Division Leader
Lawrence Livermore National Laboratory

Will D. Carpenter
Chemical Industry Consultant

Lewis A. Dunn
Assistant Vice President
Science Applications International Corp.

Randall Forsberg
Executive Director
Institute for Defense and Disarmament Studies

Thomas R. Fox
Director
Office of National Security Technology
Pacific Northwest Laboratories

Alan R. Goldhammer
Director of Technical Affairs
Industrial Biotechnology Association

John M. Googin
Senior Staff Consultant
Martin Marietta Energy Systems, Inc.

Robert G. Gough
Senior Member, Technical Staff
Sandia National Laboratories

Elisa D. Harris[3]
Senior Research Analyst
The Brookings Institution

Geoffrey Kemp
Senior Associate
Carnegie Endowment for International Peace

Joshua Lederberg[4]
Rockefeller University

John W. Lewis
Center for International Security and Arms Control
Stanford University

Lee W. Mercer
Corporate Export Manager
Digital Equipment Corp.

Matthew S. Meselson
Department of Biochemistry and Molecular Biology
Harvard University

Stephen M. Meyer
Center for International Studies
Massachusetts Institute of Technology

Gary Milhollin
Director
Wisconsin Project on Nuclear Arms Control

Marvin M. Miller
Senior Research Scientist
Department of Nuclear Engineering
Massachusetts Institute of Technology

Janne E. Nolan
Senior Fellow in Foreign Policy
The Brookings Institution

William C. Potter
Director
Center for Russian and Soviet Studies
Monterey Institute of International Studies

Barbara Hatch Rosenberg
Division of Natural Sciences
State University of New York at Purchase

Lawrence Scheinman
Associate Director
Peace Studies Program
Cornell University

Leonard S. Spector
Senior Associate
Carnegie Endowment for International Peace

Sergio C. Trindade
President
SE[2]T Interrnational, Ltd.

[1] Resigned Mar. 22, 1993.
[2] Panel member until June 1, 1993; Panel chair after June 1, 1993.
[3] Resigned Jan. 29, 1993.
[4] Ex-officio; Member of Technology Assessment Advisory Council.

NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the advisory panel members. The panel does not, however, necessarily approve, disapprove, or endorse this background paper. OTA assumes full responsibility for the background paper and the accuracy of its contents.

Project Staff

Peter Blair
Assistant Director, OTA
Energy, Materials, and International Security Division

Alan Shaw
Program Manager
International Security and Commerce Program

Gerald L. Epstein
Project Director

PROJECT STAFF

JONATHAN B. TUCKER

Thomas Karas

CONTRACTOR

Dan Fenstermacher

ADMINISTRATIVE STAFF

Jacqueline Robinson Boykin
Office Administrator

Louise Staley
Administrative Secretary

Madeline Gross
Contractor

Expert Reviewers

Calissa W. Brown
Counsel, Legal Department
E.I. Du Pent de Nemours & Co.
Wilmington, DE

Gordon M. Burck
Senior Policy Analyst
EAI Corp.
Alexandria, VA

Sigmund R. Eckhaus
Consultant, Bureau of Multilateral Affairs
U.S. Arms Control & Disarmament Agency
Washington, DC

Barry Kellman
Professor of Law
DePaul University College of Law
Chicago, IL

Kyle B. Olson
Director, Industry and Arms Control
chemical and Biological Arms Control Institute
Alexandria, VA

Richard M. Patterson
Government Relations Manager
Dow Chemical Co.
Washington, DC

Susan D. Leibbrandt
Special Assistant
Assistant to the Secretary of Defense for Atomic Energy (Chemical Matters)
Pentagon

Raymond R. McGuire
Treaty Verification Office
Lawrence Livermore National Laboratory
Livermore, CA

Michael H. McMillan
Chief, Security Office
On-Site Inspection Agency
Washington, DC

Dominic Pastore
Attorney-Advisor
Office of Intelligence Policy & Review
U.S. Department of Justice
Washington, DC

Brad Roberts
Senior Research Fellow
Center for Strategic and International Studies
Washington, DC

Dawn Shiley
Assistant Manager, Government Affairs
Synthetic Organic Chemical Manufacturers Association
Washington, DC

Jessica Stern
Special Projects Program
Lawrence Livermore National Laboratory
Liver-more. CA

Edward A. Tanzman
Manager, Economics and Law Section
Argonne National Laboratory
Argome, IL

Michael P. Walls
Senior Assistant General Counsel
Chemical Manufacturers Association
Washington, DC

Leo Zeftel
Chemical Industry Consultant
Wilmington, DE

NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by outside reviewers. These individuals do not, however, necessarily approve, disapprove, or endorse this background paper. OTA assumes full responsibility for the background paper and the accuracy of its contents.

Contents

1 Overview and Findings 1
Findings 2

2 The Chemical Weapons Convention 5
Verification Challenges 6
Steps Toward Implementation 9
Changing Industry Attitudes 10
Companies Affected by the CWC 12

3 Treaty Obligations for Industry 19
Reporting Obligations 19
Inspection Obligations 24
Costs of Inspections 28

4 Constitutional and Other Legal Issues 33
Routine Inspections 34
Challenge Inspections 37
Penal Sanctions 38
Compliance with Environmental and Safety Laws 39
Liability Issues 40
Export Controls 40

5 Protection of Proprietary Information 43
Patent and Trade-Secret Law 46
Proprietary Data and Reporting 47
Proprietary Data and Inspections 48
Preparing for Inspections 50
Inspector Reliability 53
Safeguarding Reported Data 54
Compensation for Loss of Proprietary Information 57

6 Verification Technologies and Industry 61
Nonintrusive Verification Technologies 62
Unattended Monitoring Equipment 63

Index 67





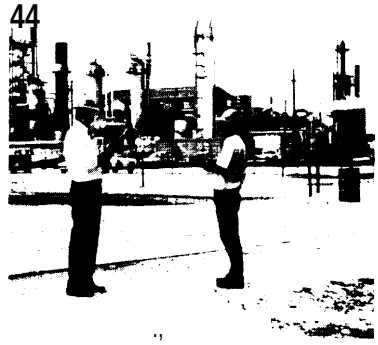


Overview and Findings 1

The Chemical Weapons Convention (CWC), which is expected to enter into force in early 1995, differs from previous arms-control treaties in the magnitude of its effects on private industry, including extensive reporting requirements and onsite inspections of commercial chemical plants. While the CWC will have a direct impact on chemical manufacturers, it will also affect a wide variety of firms that process or consume chemical products, Treaty implementation will involve a delicate balance between the need for intrusive verification to ensure that the participating states are complying with the regime and the desire to minimize any negative consequences for legitimate industrial activities.

Major U.S. chemical companies support the CWC and believe the goal of eliminating chemical weapons warrants accepting additional regulatory burdens. They are concerned, however, that compliance costs may be significantly higher than government officials assume and that the treaty's reporting and inspection requirements could open the door to industrial espionage, harming the international competitiveness of one of the strongest U.S. industrial sectors. Other treaty proponents respond that implementation will not pose undue burdens and that the objective of a chemical weapons-free world is worth some investment and sacrifice on the part of industry.

Congress will need to address these issues in the CWC implementing legislation, which will convert the CWC's provisions into domestic law and codify the procedural and substantive rights and obligations of commercial industry in complying with the treaty. This background paper examines the implications of the CWC for U.S. industry, focusing on industrial compliance with the treaty's declaration and reporting requirements and the protection of trade secrets. These issues are examined with respect to the extent to which they are covered in the treaty text itself or must be included in the implementing legislation.



SIGMUND R. ECKHAUS

The paper also examines some ways to ensure that CWC verification is both effective and consistent with the basic protections in the U.S. Constitution.

FINDINGS

1. Many U.S. chemical manufacturers, processors, and consumers will have at least some declaration and/or inspection obligations under the treaty. The U.S. Government is ultimately responsible for the treaty compliance of all the companies located on its territory, including foreign-owned branches and subsidiaries. Because of the difficulty of identifying and notifying smaller firms that may have treaty obligations, effective implementation of the CWC will require an extensive program of industry education and outreach.
2. Data needed for CWC verification will differ, both quantitatively and qualitatively, from that collected for management and regulatory purposes, and hence will require some augmentation of existing corporate reporting systems. Although the precise reporting obligations are still being worked out, the need to report production data within a shorter timeframe than is typical of domestic reporting may require the development of new accounting subroutines that improve the speed of data collection and analysis. While CWC reporting requirements will only marginally increase the paperwork burden on larger firms, they will be proportionately more onerous for smaller companies.
3. Because the first reporting deadlines are fast approaching, industry will need to proceed rapidly to establish appropriate



United Nations Special Commission inspector in Iraq tests a 500 kilogram botifilled with mustard agent.

mechanisms for tracking the production, processing, and use of treaty-controlled chemicals. Each State Party to the CWC must provide an initial declaration only 30 days after the treaty enters into force, which could be as early as January 1995. After the initial declaration, annual reports on production of treaty-controlled chemicals will be due 90 days after the end of each calendar year.

4. Routine onsite inspections of commercial chemical plants should largely preclude the need for challenge inspections at such facilities, since governments will be unlikely to "waste' a challenge inspection on a declared site. Challenge inspections at chemical plants may still occur, however, if persistent suspicions of noncompliance cannot be resolved through routine inspections. U.S. defense contractors will need to balance the fairly low probability of a challenge inspection at any given plant against the costly preparation needed to minimize the loss of proprietary or national-security information.
5. The chemical industry's primary concern about onsite inspections is the potential for compromise of trade secrets, which are often vital to a firm's competitive edge. CWC inspections will be carried out by multinational teams including inspectors from U.S. political adversaries and economic competitors, who may be tempted to collect collateral information. The extent to which onsite inspections result in a significant loss of proprietary data will depend on a number of factors, including how frequently a site is inspected; the inspectors' prior knowledge, experience, and intent to engage in industrial espionage; and the existence of a party willing to pay handsomely for the stolen information. Given the many other means of conducting industrial espionage, however, CWC inspections may only marginally increase the threat.
6. Although the threat of industrial espionage may arise during CWC inspections, it can be managed with effective planning and preparation. Chemical companies have a number of effective means at their disposal to protect trade secrets, such as shrouding sensitive equipment. The CWC also provides for advance notice of inspections and limits on their duration, and allows States Parties to negotiate facility agreements specifying the terms and scope of the inspections. Nevertheless, effective preparation will require careful planning and action on the part of inspected facilities. The U.S. Government could help chemical companies prepare for treaty implementation by assisting them in their assessment of which sensitive technologies need to be protected, proposing cost-effective solutions, and testing out procedures with mock inspections of commercial plants.
7. Legal challenges to the CWC could result in significant delays in treaty implementation that could seriously embarrass the U.S. Government. Unless questions over the constitutionality of onsite inspections are clearly resolved, chemical companies may seek judicial relief in an attempt to keep foreign inspectors out of their facilities. Solutions to these constitutional problems will have to be laid out in the implementing legislation.
8. The implementing legislation will need to include a mechanism to protect proprietary business information. Under such a provision, information that companies designate as confidential would be shielded from unauthorized disclosure. The chemical industry also wants to clarify the current trade-secret exemption to the Freedom of Information Act so that sensitive data submitted to the U.S. Government under the CWC are not released to competing companies or the public.
9. The chemical industry seeks a nonburdensome administrative process for the arbitration and payment of just claims arising from CWC implementation. Indus-

try may wish to hold the U.S. Government liable for compensating economic darnage to American companies resulting from abuses committed by international inspectors, but the government would have to accept this liability voluntarily.

10. In-process monitoring and sampling systems installed in chemical plants for purposes of CWC verification might be vulnerable to tampering and deception. Nevertheless, the limited use of such systems in conjunction with onsite inspections could help reduce the intrusiveness needed to verify the nonproduction of chemical-warfare agents.
11. Harmonization of U.S. export controls with those mandated by the CWC could eventually result in some liberalization of trade with States Parties that are currently subject to strict export controls. This reform, although unlikely to be fully implemented for several years, would give the U.S. chemical industry a strong incentive to support the treaty.
12. Overall, OTA's analysis suggests that extensive preparation **on** the part of U.S. industry will be needed to minimize the burdens of CWC compliance. Close cooperation between the executive branch and the chemical industry will be essential for the smooth implementation of the treaty provisions.

The Chemical Weapons Convention 2

The Chemical Weapons Convention (CWC) was opened for signature in mid-January 1993 after two decades of arduous negotiations and is expected to enter into force in early 1995.[1] A true disarmament treaty, the CWC bans the development, production, possession, stockpiling, transfer, and use of chemical weapons, with the long-term goal of eliminating this particularly cruel and abhorrent form of warfare (see box 2-A).

After the treaty enters into force, the participating states will have 10 years to destroy their existing stockpiles of chemical weapons and associated production facilities.[2] To prevent states from secretly reacquiring chemical weapons, the treaty imposes controls on ''dual-use' chemicils that have both legitimate uses and can be illegally diverted to the production of warfare agents. Companies must file detailed annual reports about the nature of their production, processing, and consumption of these chemicals and, in many cases, host intrusive onsite visits by intemational inspectors: The purpose of this global monitoring regime is to verify the nonproduction of chemical weapons without unduly constraining the chemical industry's legitimate commercial activities.

Implementation of the CWC will be administered by the Organization for the Prohibition of Chemical Weapons (OPCW), a new international agency to be established in The Hague,



U.S. AIR FORCE

[1] Entry into force of the CWC will occur 6 months after the 65th country ratifies the treaty, but not earlier than 2 years after the treaty is opened for signature. Thus, the earliest date of entry-into-force is January 13, 1995. Since more than 145 countries have already signed the treaty, it appears likely that the 65 ratifications will be obtained by July 1994 so as to meet the targeted January 1995 deadline. A key unresolved question, however, is whether the United States would ratify the treaty if the Russian Federation does not.

[2] There are provisions in the CWC for (1) a 5-year extension of the chemical-weapons destruction deadline if absolutely necessary, and (2) the conversion of chemical weapons production facilities to civilian commercial use, Assuming Russia ratifies the treaty, it is likely to avail itself of both these options.

Box 2-A—Banning Chemical Warfare

Chemical warfare has been a scourge of the 20th century. The first chemical-warfare agent--chlorine gas-was introduced on the battlefield by Germany in 1915 during World War 1. Over the next 3 years, both sides engaged in chemical warfare with a total of 17 different toxic agents, including phosgene, hydrogen cyanide, and sulfur mustard, which causes severe damage tot he skin, eyes, and lungs. The physical and psychological effects of gas warfare were so horrifying that during the interwar period, countries negotiated the 1925 Geneva Protocol banning the use of chemical weapons in war.

Despite the ban on use, however, the major powers continued to develop, produce, and stockpile new poisonous agents; these activities were not prohibited by the Geneva Protocol. Before and during World War II, Germany developed and stockpiled potent nerve agents (e.g., tabun, sarin) capable of causing convulsions and rapid death, and the Allied powers followed suit. Although thousands of tons of mustard and nerve agents were stockpiled by both sides, they were not used in combat. During t he Cold War, t he United States, the Soviet Union, and their allies continued to accumulate vast quantities of chemical weapons, raising the spectre of chemical warfare in a NATO-Warsaw Pact conflict in Central Europe.

This threat, combined with the growing proliferation of chemical weapons in the developing world-particularly in the Middle East-prompted the Committee (later Conference) on Disarmament, a multilateral forum in Geneva affiliated with t he United Nations, to begin work in the early 1970s on a treat y banning t he production, stockpiling, and use of chemical weapons. Some 40 countries participated directly in the negotiations, and many others sent observers. Although the talks moved at a glacial pace for more than two decades, the waning of the Cold War created an opportunity for rapid progress, and Iraq's large-scale use of chemical weapons during its war with Iran gave renewed political impetus for a global ban.

During the 1991 Persian Gulf War, Saddam Hussein's threat to initiate chemical warfare against U.S. and other coalition forces also brought home the dangers of chemical-weapons proliferation for the United States and its allies. The negotiators in Geneva realized that they had a limited window of opportunity to bring the treaty to completion before international interest and consensus were lost. After a final push to resolve the most contentious issues (e.g., the conduct of challenge inspections), the negotiations were brought to a successful conclusion in early September 1992 and the treaty was opened for signature in mid-January 1993.

Netherlands. The OPCW will be an analogue at the international level of U.S. domestic environmental and safety regulatory agencies such as the Environmental Protection Agency. It will include a Technical Secretariat made up of international civil servants who will compile data on chemical plants and conduct onsite inspections. Furthermore, since the States Parties to the CWC are ultimately responsible for the treaty compliance of the relevant industrial facilities operating on their territories, each participating government must establish a "National Authority' whose responsibilities include serving as a liaison between its domestic industry and the OPCW, collecting data from industry, and ensuring that inspections are carried out.[3]

VERIFICATION CHALLENGES

Close monitoring of the global chemical industry will be essential to ensure that commercial plants are not diverted to illicit production of chemical weapons. Unlike nuclear weapons, which require a large, specialized, and costly industrial base, chemical-warfare (CW) agents can be made

[3]The structure of the U.S. National Authority is still being developed. It will probably be based on the current responsibilities of U.S. Gov ernment agencies involved in CWC implementation (the Departments of Commerce, Defense, Energy, Justice, and State, and the Arms Control and Disarmament Agency).

PARLIAMENTARIANS FOR GLOBAL ACTION



Signing ceremony for the Chemical Weapons Convention, Paris, January 1993.

PARLIAMENTARIANS FOR GLOBAL ACTION



U.S. Secretary of State Lawrence Eagleburger expresses strong support for the treaty at the signing ceremony.

with commercial equipment generally available to any country. Moreover, nearly all of the chemicals used to make CW agents have legitimate commercial uses in the manufacture of products such as pesticides, pharmaceuticals, plastics, and paints. For example, thiodiglycol, a sulfur-containing solvent used in ballpoint pen ink and other legitimate products, is easily converted to mustard agent in a one-step process.

The effectiveness of the CWC will depend on the signatories' faith in the verification regime, which is designed to assure all participating states that dual-use chemicals are not being illegally diverted to make chemical weapons. As then-Vice President George Bush told CWC negotiators in 1984:

> For a chemical weapons ban to work, each party must have confidence that the other parties are abiding by it . . . . No sensible government enters into those international contracts known as treaties unless it can ascertain-or verify—-that it is getting what it contracted for.[4]

Some analysts consider it likely that some current and future signatories of the CWC may eventually attempt to violate the treaty; it is also

4 Vice President George Bush, address before the Conference on Dis armament in Geneva on Apr. 18, 1984, *Department of State Bulletin*, vol. 84, June 1984, pp. #43.

possible that a rogue chemical company motivated by greed could produce CW agents under contract to a foreign power without the knowledge or approval of its national government.[5] Given these potential threats, the CWC verification regime will serve five primary functions:

1. *assure the destruction* of existing chemical-weapons stocks and production facilities,
2. *detect violations* through rigorous accounting and monitoring,
3. *deter noncompliance* by increasing the economic and political costs of cheating,
4. *build confidence in the* regime by demonstrating that States Parties are abiding by their treaty obligations, and
5. *provide strategic warning* of a country's intent to violate the treaty so that the other Parties can take defensive measures.[6]

The intrusive monitoring needed to detect—and thereby deter—treaty violations will make unprecedented demands on private industry, and will entail some unavoidable costs.[7] Unlike the Nuclear Non-Proliferation Treaty, which distinguishes between nuclear-weapon states and non-weapon states, the CWC is *nondiscriminatory in* that it imposes a uniform set of rights and obligations on all participants. Each State Party, whether or not it possesses chemical weapons, will be subject to the same reporting and inspection requirements.

Because of the large size and economic importance of the U.S. chemical industry and allied sectors, the CWC has important implications not only for national security but also for the health of the American economy. The United States is home to roughly 20,000 chemical manufacturing plants, or about a third of the world's total chemical production capacity. Chemical manufacturers of varying size and capability are distributed throughout the country, with no state having fewer than 25 facilities. In 1991, U.S. chemical manufacturers sold more than 101 billion metric tons of raw materials and specialty organic chemicals valued at $85.5 billions That same year, the total value of shipments of primary, intermediate, and formulated chemical products was $292.3 billion, and the U.S. chemical industry employed 846,400 people with a payroll of $31 billion.[9] The chemical industry is also important to U.S. competitiveness because of its positive trade balance. In 1992, ***net*** exports of U.S. chemical products were worth about $16 billion, compared to the overall U.S. merchandise trade balance of -$96.3 billion.[10]

Given the large size and importance of the chemical industry to the U.S. economy and to

---

5 Kathleen C. Bailey, ''Problems With a Chemical Weapons Ban" *Orbis,* vol. *36, No. 2,* spring 1992, pp. 239-251.

[6] J. Aroesty, K. A. Wolf, and E. C. River, *Domestic Implementation of a Chemical Weapons Treaty,* report No. R-3745-ACQ (Santa Monica, CA: RAND Corp., October 1989), p. 45.

[7] Previous arms control accords have affected U.S. industry only tangentially. The safeguards associated with the Nuclear Non-Proliferation Treaty (NPT) call for materials-accounting and inspection of a relatively small number of civilian nuclear facilities to ensure there is no diversion of plutonium or enriched uranium to illicit nuclear-weapons production. Since the United States is considered a nuclear-weapon state under the NPT, it is not required to adopt these standards; it has, however, voluntarily offered to place civilian nuclear facilities under safeguards, The 1987 Intermediate-range Nuclear Forces (INF) Treaty also entitles Soviet—now Russian-teams to inspect two contractor-operated U.S. aerospace facilities: Martin-Marietta's missile-launcher production plant in Middle River, MD, and Hercules Corp. 's missile production plant in Magna, UT.

[8] U.S. International Trade Commission *Synthetic Organic Chemicals: United States Production and Sales, 1991,* USITC Publication 2607 (Washington DC: International Trade Commission February 1993), p. 3.

9. U.S. Bureau of the *Census, Annual Survey of Manufacrurers 1991,* report No. M91(AS)- 1 (Suitland, MD: Bureau of the Census, December 1992), p. 1-16.

10. Net chemical trade figure calculated from 1992 total export and import figures in U.S. Bureau of the Census, Economics and Statistics Administration *U.S. Merchandise Trade: Exports, Imports (C.I.F. Value), December 1992* (Suitland, MD: Bureau of the Census, Feb. 18, 1993), exhibit 4, p. 6. The merchandise trade balance in 1992 was obtained from U.S. Department of Commerce, Bureau of Economic Analysis, Survey *of Current Business,* vol. 73, No. 3, March 1993, p. 73.

world trade, the implementation of the CWC must be perceived as fair and as not imposing heavier burdens on some nations than on others. To this end, the negotiators of the CWC sought to develop a verification system that would effectively negate the military potential of the industry without unduly constraining its legitimate commercial activities. This task proved to be a major challenge, and it took negotiators several years to hammer out an inspection regime that achieves a delicate balance between the intrusiveness needed for effective verification and the protection of legitimate national-security and trade secrets.[11]

STEPS TOWARD IMPLEMENTATION

Before the CWC can enter into force and be implemented, two additional steps must take place. First, at least 65 countries must ratify the treaty six months before it can enter into force. Second, for implementation to occur, a Preparatory Commission (PrepCom), made up of representatives of the initial signatory states, must negotiate the details of treaty implementation (including reporting formats and procedures for conducting onsite inspections) and establish out of whole cloth the international organization that will administer the treaty regime. The PrepCom, in which the U.S. Government participates, has begun meeting in The Hague and is aiming to complete its work on verification procedures by the end of 1993.[12]

Since the CWC is binding on governments rather than private individuals and corporations, States Parties must pass enabling legislation that translates the treaty obligations into domestic law and thus obligates companies to comply .13 The Us. implementing legislation for the CWC will need to include provisions that, inter alia:

1. establish the organizational structure, powers, and responsibilities of the U.S. National Authority;
2. lay out the rights and obligations of the U.S. chemical and related industries with respect to declarations, reporting, and inspections;
3. impose penal sanctions on firms and individuals that violate the treaty;
4. protect classified information at government facilities and proprietary data at commercial plants;
5. satisfy the constitutional concerns of private companies with respect to protection from unreasonable searches and seizures, due process, and fair compensation for damages, while preventing companies from obtaining court injunctions to block inspections;
6. comply with Federal and State environmental regulations that cover the destruction of CW agents and inspections of chemical plants; and
7. modify U.S. export control regulations to harmonize them with treaty requirements.[14]

The Clinton administration is expected to include a draft of the U.S. implementing legislation along with the CWC when it submits the treaty to the Senate for its advice and consent to ratification, The first draft of the implementing

---

[11] See "The Spy in the Ointment fOr Negotiators, " *New Scientist,* No. 1647, Jan. 14, 1989, p. 27. Although U.S. negotiators often stressed industry concerns about protecting proprietary information, a much greater problem in the CWC negotiations was the need to shield sensitive national-security information from foreign spying, particularly during challenge inspections of military and intelligence facilities.

[12] For an overview of the PrepCom process, see Lois R. Ember, "Chemical Arms Treaty Makes Unprecedented Demands of Industry, " *Chemical and Engineering News*, vol. 71, No. 23, June 7, 1993, pp. 7-18. The Henry L. Stimson Center, a policy research institute based in Washington, DC, also publishes *The CWC Chronicle*, a periodic newsletter devoted to CWC implementation.

[13] In th, jargon of international law, some parts of the CWC are not "self-executing" because these provisions cannot enter into force without additionat domestic legislation.

[14] For example, current U.S. export control laws require the U.S. Government to issue an export license before certain foreign nationals can inspect any U.S. chemical plant. Obtaining such a license now takes as long as 6 months. As a result, the implementing legislation will have to create exceptions for OPCW inspectors with regard to export-control regulations that apply to inspections by non-U.S. nationals.

legislation will be prepared as a collaborative effort by lawyers from the Departments of Commerce, Defense, Justice, State, the Arms Control and Disarmament Agency, and others; this draft will then be introduced in Congress and considered by the congressional committees with jurisdiction. Unlike the treaty itself, which must be ratified by a two-thirds majority of the Senate, the implementing legislation must be approved by a simple majority of both the House and the Senate. To meet the planned entry-into-force deadline of January 1995, Congress will need to complete the treaty ratification process (including passage of the implementing legislation) by July 1994.

CHANGING INDUSTRY ATTITUDES

The attitude of the U.S. chemical industry toward a ban on chemical weapons has changed markedly over the past 70 years. During World War I, a segment of the industry was heavily involved in the production of chemical weapons and lobbied successfully against Senate ratification of the 1925 Geneva Protocol banning their use.[15] During the Vietnam War, however, tie public outcry over the employment of napalm and the herbicide Agent Orange convinced U.S. chemical manufacturers that military production could seriously damage their public image. Since then, mainstream U.S. corporations have sought to avoid any association with chemical warfare and have taken a much more supportive attitude toward chemical arms control.

The Chemical Manufacturers Association (CMA), the U.S. industry's leading trade association, represents 180 chemical companies that own more than 90 percent of the nation's chemical production capacity. In 1978, the CMA began supporting the negotiation of a global ban on chemical weapons, for three reasons:

- The U.S. chemical industry was no longer involved in manufacturing chemical weapons and hence did not have an economic stake in military production.
- The association recognized that it would be better off participating in the negotiations and shaping the treaty proactively rather than being faced with an unsatisfactory fait accompli.[16]
- Industry representatives noted the positive public-relations benefits to be gained by strongly supporting a ban on chemical weapons, and the seriously adverse effects on the industry's image of opposing a ban.

As a result, the CMA actively supported the multilateral chemical weapons negotiations in Geneva, while seeking verification measures that would reasonably deter illicit military production without unduly burdening legitimate commercial activities. In October 1987, the CMA's Board of Directors formally adopted a policy committing the chemical industry to work on behalf of the treaty .17 The Association also established a Chemical Weapons Work Group made up of senior executives from 10 major chemical companies. This body has since met on a regular basis with U.S. Government officials to discuss outstanding issues in the negotiations.

The Government-Industry Conference Against Chemical Weapons, held in September 1989 in Canberra, Australia, was another watershed event. Attended by some 400 delegates from more than 60 countries, this conference brought diplomats engaged in the Geneva talks together with representatives of about 95 percent of the world's chemical production capacity. During the conference, trade associations from the United States, Australia, Canada, Japan, and Western Europe jointly issued a formal statement pledging "to

15 The United States finally ratified the Geneva Protocol in 1975.

16 Kyle B. Olson, "Disarmament and the Chemical Industry," in Brad Roberts, cd., *Chemical Disarmament and U.S. Security* (Boulder, CO: Westview Press, 1992), p. 99.

17 Kyle B. Olson, "The Proposed Chemical Weapons Convention: An Industry Perspective, " *Chemical Weapons Convention Bulletin, No. 3,* autumn 1988, p. 2.

work actively with governments to achieve a global ban on chemical weapons, and . . . to contribute additional momentum to the Geneva negotiating process. ’

The Canberra Conference also spawned a new international industry forum that subsequently met regularly in Geneva to provide practical input to the CWC negotiating process.[19] Participation by this industry forum resulted in a number of treaty provisions designed to limit the intrusiveness of inspections and to safeguard proprietary information. In particular, chemical industry experts helped shape the procedures for inspections of commercial plants. According to Will Carpenter, chairman of the CMA’s Chemical Weapons Work Group: ‘‘We were able, through very good, effective communications, to bring the diplomats to reality as to what needed to be involved in the treaty for it to be technically sound. ’ ’[20]

For example, in June 1991 the CMA and its foreign counterparts urged the negotiators to expand the verification regime beyond plants producing dual-use chemicals—which are located primarily in Western countries-to cover a wide variety of chemical plants throughout the world. According to this proposal, all chemical plants with the capability to produce CW agents or their precursors would be subject to randomized inspections.[21] Industry was prepared to accept such a broad verification regime if the CWC negotiators developed inspection procedures that would allow companies to safeguard their legitimate business interests.[22] Although the probability would be low that any given plant would be inspected, the expanded coverage would distribute the burden of inspections more equitably among the States Parties and help deter proliferants from using ordinary chemical plants for illicit CW agent production. In response to this proposal, the CWC negotiators expanded the scope of the inspection regime considerably, although not as much as industry had suggested.[23]

Now that the treaty has been concluded, the CMA plans to support the treaty through the ratification process. The chemical industry’s endorsement of the CWC is not unconditional, however. As one analyst has observed: “The chemical industry believes that the convention will not be unduly injurious to its interests, but only if the inspection procedures are carefully developed and scrupulously honored. ’[24] If chemical companies perceive the treaty’s verification provisions as too onerous, they could trigger a political backlash that would make it more difficult for the United States and other countries to implement the treaty regime.

Because of strong public support for banning chemical weapons, U.S. chemical producers are unlikely to go on record opposing Senate ratification of the CWC. Instead, they will try to ensure that their interests are protected in the implementing legislation and during the deliberations of the

18 Cited in Julian Perry Robinson, ‘‘The Canberra Conference,’’ *Chemical Weapons Convention Bulletin, No. 6,* November 1989, pp. 18-19.

19 The participating industry associations were the CMA, the Council of European Chemical Industry Federations. the Japan Chemical Industry Association, the Canadian Chemical Producers Association, the Chemical Confederation of Australia, and the Chemical Industries Association (UK).

20 ‘‘Chemical Industry Rallies Behind Chemical Weapons Bin, ’ *Chemecology*, vol. 21, December 1992/January 1993, p. 4.

2] Will Carpenter, ‘‘Completing the Chemical Weapons Convention: An Industry View, ’ *Chemical Weapons Convention Bulletin, No. 15,* March 1992, p. 3.

22 Olson, ‘‘Disarmament and the Chemical Industry, ’ op. cit., p. 10’2.

23 The U.S. Government, after initially favoring the industry proposal, became concerned about a number of highly sensitive military facilities that produce or store treaty-controlled chemicals, In order to avoid exposing such sensitive sites to routine international inspections, U.S. negotiators narrowed the definition of the facilities covered by the routine-inspection regime. Some developing countries also sought to narrow the definition to minimize what they perceived to be the negative impact of the inspection regime on their nascent chemical industries.

24 Brad Roberts, ‘‘Framing the Ratification Debate, ‘‘ in B. Roberts, cd., *Chemical Disarmament and U.S. Security* (Boulder, CO: Westview Press, 1992), p. 145.

Table 2-I—Chemical Schedules and Associated Treaty Obligations

	Schedule 1	Schedule 2	Schedule 3	Other relevant
Agents	CW agents, key final-stage precursors.	Potential CW agents, other key precursors.	Oid CW agents, other precursors.	Discrete organic chemicals and organic chemicals containing phosphorus, sulfur, or flourine (PSF chemicals).
Commercial uses	Low or none	Low to moderate	High	High
Annual production threshold for reporting	100 g	1 kg (for BZ), 100 kg (for other potential CW agents), 1 metric ton (for precursors).	30 metric tons	200 metric tons for non-PSF chemicals; 30 metric tons for PSF chemicals.
Activities to be reported annually	Production, processing, consumption, acquisition, import, and export data for the previous calendar year, and anticipated forthe next year.	Production, processing, consumption, import, and export data for the previous calendar year, and anticipated for the next year.	Production, import, and export data for the previous calendar year, and anticipated for the next year.	Production data for the previous calendar year.
Deadline for initial declaration	30 days after entry into force.	30 days after entry into force.	30 days after entry into force.	30 days after entry into force.
Deadline for annual reports	90 days after end of previous calendar year.	90 days after end of previous calendar year.	90 days after end of previous calendar year.	90 days after end of previous calendar year.
Production threshold for inspections	10 kg	10 kg, 1 metric ton, or 10 metric tons, depending on subclass	200 metric tons	200 metric tons

PrepCorn. The upcoming debate over the implementating legislation in both houses of Congress is likely to attract extensive participation by corporate general counsels and industry lobbyists, including chemical trade associations such as the CMA, the Synthetic Organic chemical Manufacturers Association (SOCMA), the National Agricultural chemicals Association (NACA), and the Pharmaceutical Manufacturers Association (PMA). Another possible channel for industry dialogue with U.S. Government policymakers on CWC implementation may be the Industry Sector Advisory Committee for Chemicals and Allied Products (ISAC-3), a private-sector panel reporting to the U.S. Trade Representative Office.[25]

COMPANIES AFFECTED BY THE CWC

The CWC bans any toxic chemical agent, regardless of origin, that interferes with life processes and does not have legitimate civil applications in the quantities in which it is produced. This so-called "general-purpose criterion' allows the treaty to apply to all conceivable CW agents, including production of novel chemicals that might be developed in the future, even if

25 The Trade&t of 1974 established a private-sector advisory system for the Office of the U.S. Trade Representative (USTR). The primary forum is the Advisory Committee on Trade Policy and Negotiations, which reports directly to USTR. Subordinate to the Advisory Committee are 17 industry sector advisory committees (ISACS) and 3 functional committees (on standards, customs, and intellectual property rights). 'There is some question, however, about whether ISAC-3 has the legal authority to advise the U.S. Government on CWC matters.

Table 2-l—Cent inued

	Schedule 1	Schedule 2	Schedule 3	Other relevant
Initial inspection & facility agreement	Mandatory	Mandatory (unless State Party and OPCW agree to waive it)	Optional	Optional
Notice of routine Inspections	24 hours	48 hours	120 hours	120 hours
Duration of routine inspections	As specified in facilit y agreement.	96 hours	24 hours	24 hours
Access during rout Ine Inspections	Automatic access to dectared plants.	Automatic access to plant site and specified areas within declared plants; agreed access to other areas and plants at plant site.	Automatic access to plant site and specified areas within declared plants; agreed access to other areas and plants at site for clarification of ambiguities.	Automatic access to plant site; managed access todedared plants; agreed access to other plants at site for clarification of ambiguities.
Maximum number of routine inspections	Determined based on characteristics of facility.	2 per year per plant site.	2 per year per plant site, plus limit on the combined number of inspections of Schedule 3 and "other relevant" sites.[1]	2 per year per plant site; plus limit on the combined number of inspections of Schedule 3 and "other relevant" sites.
Restrictions on exports	Exports to States Parties only	For first 3 years, exports only to States Parties and to non-Parties that file certifications of non-prohibited use; after 3 years, to States Parties only.	Exports only to States Parties and non-Parties that file certifications of non-prohibited use; possibility of stricter controls after 5 years.	No restrictions.

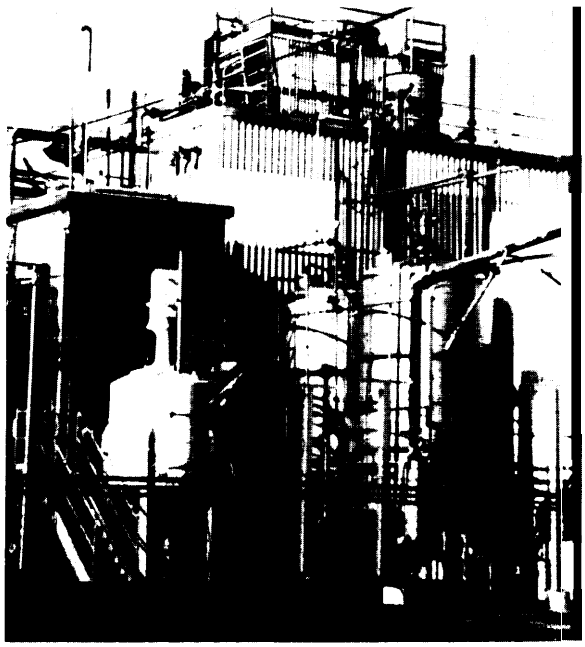
SOURCE: Arms Control and Disarmament Agency, Office of Technology Assessment, 1993.

1 Th, combined number of annual inspections shall not exceed 3 plus 5 percent of the total number of plant sites declared by a State Party, or 20 inspections, whichever is less.

they are not now listed in the treaty itself. Further, the CWC bans or controls certain intermediate compounds, or ''precursors, ' that can be converted to known CW agents in one or a few reaction steps. The treaty also bans the military use of biological toxins, which can be purified from living matter, produced by microbial fermentation, or synthesized chemically.

Known treaty-relevant chemicals that are explicitly covered by the verification provisions of the CWC range from actual chemical-warfare agents to key final-stage precursors and more distant precursors. Depending on their utility for producing chemical weapons and the extent to which they have legitimate commercial and industrial uses, these compounds (or families of compounds) are listed in three ''schedules' in an annex to the treaty. Each schedule is associated with a different set of reporting requirements and inspections, which are structured so that the most hazardous compounds are subject to the most stringent controls (see table 2-l).

. *Schedule 1* covers 12 toxic chemicals or groups of chemicals that have no or low commercial use. These compounds include standard CW agents (e.g., sulfur and nitrogen mustards, lewisite, and the nerve agents tabun, sarin, soman, and VX), and key


SIGMUND R. ECKHAUS

Plant that produces the ' 'dual-use" chemical thiodiglycol, which is both a key ingredient of ballpoint pen ink and an immediate precursor of mustard agent.

final-stage precursors used in "binary" chemical weapons.[26] Two biological toxins are also included on the list: ricin (extracted from castor beans) and saxitoxin (purified from contaminated shellfish). Although large-scale production of Schedule 1 chemicals is banned and existing stockpiles must be destroyed, States Parties may maintain a total of 1 metric ton (about 2,200 pounds) of Schedule 1 chemicals for the development of defenses and for medical, pharmaceutical, or research purposes .[27]

. *Schedule 2* covers toxic chemicals and precursors that have low to moderate commercial use. The list includes three chemicals with warfare potential that have never been used in combat (the pesticide Amiton, the hallucinogen BZ, and the toxic gas perfluoroisobutene), and several precursor chemicals or groups of chemicals that are one or more steps removed from CW agents but are produced cornmercialy volumes for legitimate industrial applications. An example of a Schedule 2 precursor is thiodiglycol, the immediate precursor of sulfur mustard. Producers of Schedule 2 chemicals above an annual threshold quantity must declare the relevant plants and production volumes, and all such facilities will be subject to an initial (baseline) inspection and no more than two routine inspections per year.

- *Schedule 3* covers "dual-use" chemicals produced in high commercial volume. It includes precursor chemicals that are several reaction steps removed from CW agents, such as phosphorus trichloride. This category also covers some highly toxic gases (e.g., phosgene, hydrogen cyanide, cyanogen chloride) that were used as warfare agents in World War I but are currently produced in the millions of tons annually for industrial purposes, Facilities producing 30 metric tons per year of any Schedule **3** chemical must be declared; those producing 200 metric tons or more are subject to randomized inspection.
- Reporting obligations also apply to "other relevant' facilities that produce more than 200 metric tons per year of any discrete organic chemical, with the exception of pure hydrocarbons (to exclude oil refineries) and

---

26 "Binary" chemical weapons contain two separate cannisters filled with relatively nontoxic precursor chemicals that must react to produce a lethal agent, such as sarin or VX. The two components are either mixed together manually immediately before use or are brought together automatically while the binary bomb or shell is in flight to the target.

27 According to the CWC, production of Schedule 1 chemicals for protective purposes may take place only at a Single small-scale Facility and atone other designated facility, both of which are subject to systematic inspections. Synthesis of Schedule 1 chemicals for research, medical, or pharmaceutical purposes, but not for protective purposes, maybe carried out at laboratories in aggregated quantities of less than 10 kilograms per year per facility. Laboratories that produce more than 100 grams of agent per year will be subject to reporting and inspection obligations.

explosives (which are covered by other regulations).[28] A lower production threshold for reporting (30 metric tons) applies to facilities that produce so-called "PSF" chemicals, that is, organic chemicals containing phosphor-us (P), sulfur (S), or fluorine (F), the basic building blocks of CW agents.

The CWC covers all companies and other relevant facilities on the territory of a State Party that *manufacture, process, or consume* Schedule 2 chemicals or that *manufacture* Schedule 3 and other treaty-controlled chemicals beyond the specified threshold quantities, For this reason, various ''downstream' users of Schedule 2 chemicals may have to file declarations and accept routine inspections, including firms in such diverse sectors as plastics, automobiles, aerospace, electronics, pharmaceuticals, paper, mining, and photographic materials.

Only a few pharmaceutical companies that produce toxic anticancer drugs are covered under Schedule 1. According to preliminary estimates, however, between 200 and 300 U.S. plants produce, process, or consume more than the threshold quantity of Schedule 2 chemicals, and roughly 1,000 produce more than the threshold quantity of Schedule 3 chemicals. Finally, at least 10,000 plants are believed to produce more than the threshold quantity of discrete organic chemicals.[29] These rough estimates suggest that because of the broad scope and relatively low production thresholds of the CWC, a majority of U.S. chemical manufacturers and some processors and consumers will face declaration and/or inspection obligations under the treaty.

Many smaller, privately owned producers, formulators, processors, and downstream users of scheduled chemicals are not yet aware that they are covered by the CWC. Although the Chemical Manufacturers Association has kept its members well informed about the treaty, it represents only a portion of the U.S. chemical industry. The great majority of smaller firms and their respective trade associations have not had the time or resources to track the negotiations in Geneva or to assess the full implications of the concluded treaty. Small chemical companies may not even subscribe to the Federal Register, and informing them of regulatory changes has been a serious problem in the past,

Since the U.S. Government will be held legally accountable for industry compliance with the CWC, it will be necessary to prepare a national register containing a complete inventory of all companies and facilities on U.S. territory that are subject to treaty obligations. Developing such a register is a challenging task that still remains to be accomplished, despite preliminary attempts.[30] Given the widespread ignorance of the CWC among smaller chemical companies, effective implementation of the treaty will require an extensive program of industry education and outreach.

As a first step in this outreach process, in February and March 1993 the U.S. Arms Control and Disarmament Agency (ACDA) sponsored one-day seminars in five cities across the United States to inform chemical manufacturers, pharmaceutical companies, and other downstream processors about their treaty obligations.[31] Although ACDA sent invitations to 2,400 compa-

---

28 The treaty defines a discrete organic chemical as a compound of carbon other than an oxide, sulfide, or metal carbonate. The extent to which this definition covers polymers is not yet clear.

29 Interview with Sigmund R. Eckhaus, consultant to the U.S. Arms Control and Disarmament Agency, Dec. 23, 1992.

30 Other participating countries face a similar challenge, although on a smaller scale. The Japanese Trade Ministry has conducted an initial survey of Japanese factories that will be subject to CWC reporting and inspection obligations. Rough estimates are that about 100 chemical manufacturing facilities in Japan will be liable to inspection, while between 2,000 to 3,000 plants-about half of all chemical factories in Japan—will have to file annual reports on their operations to the government. See ''Chemical Plants Face Inspection Under CW Convention+ *KYODO* (Tokyo) in English, Mar. 27, 1993, reprinted in JPRS-TAC-93-O07, Apr. 13, 1993, p. 1.

31 The seminars were held in Washington, DC, New Brunswick, NJ, Houston, TX, Los Angeles, CA, and Chicago, IL.

Table 2-2—Selected List of U.S. Chemical Trade Associations

Name of Association	Number of Active Members
Adhesive and Sealant Council	180
Adhesives Manufacturers Association	22
American Coke and Coal Chemicals Institute	75
American Wood Preservers institute	150
Chemical Manufacturers Association	180
Chemical Specialities Manufacturers Association	440
Chlorine institute	190
Compressed Gas Association	221
Cosmetic, Toiletry and Fragrance Association	230
Drug, Chemical and Allied Trades Association	600
Dry Color Manufacturers Association	50
Formaldehyde institute	57
Metal Finishing Suppiiers Association	225
National Agricultural Chemicals Association	85
National Association of Printing ink Manufacturers	150
National Paint and Coatings Association	500
Pharmaceutical Manufacturers Association	100
Powder Coating institute	97
Roof Coatings Manufacturers Association	43
Soap and Detergent Association	140
Society of the Plastics Industry	2000
Synthetic Organic Chemical Manufacturers Association	225

NOTE: Companies may belong to more than one association.

SOURCE: Council of Chemical Association Executives, 1993 Staff and *Issues* Directory (Washington, DC).

nies that deal in chemicals listed in the treaty, attendance at the seminars was disappointing, with a total of only 110 companies participating. Many chemical manufacturers appear to be waiting for the domestic implementing legislation to learn about their treaty obligations. Another way of reaching smaller firms might be through specialized trade associations, which often alert their membership to new regulations (see table 2-2). The U.S. Government also plans to launch a major public-affairs campaign both before and after the CWC enters into force to explain the purpose and modalities of the treaty.

I Industrial Sectors

The CWC will affect the various segments of the chemical industry in different ways. Although the industry is often viewed as a coherent sector, in fact it is a highly heterogeneous group of manufacturing companies whose operations differ both qualitatively and quantitatively. Some chemical firms produce feedstock and intermediate compounds, while others chemically convert or mechanically process and formulate these basic chemicals into products such as plastics, pesticides, detergents, pharmaceuticals, dyes, inks, flavors and fragrances, and gasoline additives.[32]

In general, chemical products are divided into two broad classes: *commodity chemicals,* or basic chemicals that are produced in vast quantities and where fims compete mainly on the basis of price; and *specialty chemicals,* more complex molecules with unique properties that allow them to command higher prices and require a major investment in research and development. Whereas commodity chemicals are manufactured continuously by feeding raw materials into a process reactor and simultaneously removing the reaction product, specialty chemicals are usually produced through a batch process in which raw materials are introduced intermittently into a reactor under changing process conditions and the product removed at the end.

Batch production ranges in sophistication from "tolling' (in which the customer provides a raw material and receives a product, often after a single reaction step) to ''custom' syntheses of complex intermediates or end-products made to order for large manufacturers of drugs, pesticides, and other specialty chemicals.33 The roughly 230 custom chemical companies in the United States

32 M.L. Burstall, ''The Industrial Context of Chemical Warfare,' in Julian Perry Robinson, cd., *The Chemical Industry and the Projected Chemical Weapons Convention: Proceedings of a SIPRI/Pugwash Conference, SIPRI Chemical & Biological Warfare Studies No. 4* (New York, NY: Oxford University Press, 1986), p. 36.

33 Synthetic Organic Chemical Manufacturers Association "The Batch Chemical Industry: Fact Sheet, " April 1993.

generally have fewer than 100 employees (many of whom perform several different jobs) and annual sales of less than $40 million each.[34] As discussed below, small to medium-sized batch producers may have more difficulty in complying with CWC reporting requirements because they have smaller staffs and must change their production processes more frequently.

I Foreign Ownership

Another characteristic of the U.S. chemical industry that is relevant to CWC implementation is the fact that foreign-owned companies account for roughly a third of U.S. chemical production .35 Numerous U.S.-based chemical manufacturers also have overseas branches and subsidiaries, some of which operate plants in developing countries. The CWC holds the U.S. Government responsible for the treaty compliance of all the companies on its territory (including foreign-owned branches and subsidiaries) but not for treaty violations committed by a U.S.-owned company located on foreign soil. Nevertheless, the treaty does make the United States responsible for violations committed by U.S. citizens living abroad and requires the government to take action against them.

Although it is widely agreed that a state has broad powers to enforce rules on the persons and property within its borders, international law is not settled with regard to "'extraterritoriality, ' or a government's claim of authority to control companies outside its national borders. Foreign courts have rejected attempts by the United States to apply export controls to overseas companies that are owned or controlled by U.S. nationals or that process goods of U.S. origin.[36] The CWC clearly states that its obligations apply extraterritorially with respect to individuals but is silent with respect to companies. Some legal scholars contend, however, that the U.S. Government should prosecute all U.S.-owned entities that engage in treaty-prohibited activities, regardless of their location.

The issue of extraterritoriality is important because a State Party might seek to circumvent the treaty by colluding with a foreign subsidiary of one of its domestic companies to manufacture chemical weapons on the territory of a non-Party to the treaty .37 (If the weapons were subsequently given to the host state, however, the State Party would violate the treaty's ban on assisting another state to acquire chemical weapons; if they were shipped to the State Party's own territory, that would violate the ban on possession.) In order to close such potential loopholes, some analysts argue that States Parties should be encouraged to extend their extraterritorial jurisdiction as far as possible in an effort to induce overseas subsidiaries to comply with the treaty .[38]

A potential source of leverage may derive from the fact that the CWC will ban exports of Schedule 2 chemicals to non-Parties 3 years after the treaty comes into force; until then, exporters must obtain end-use certificates ensuring that recipients employ the chemicals only for legiti-

34 Stephen C. Stinson, '' Custom Chemicals,' *Chemical and Engineering News, vol. 71, No. 6,* Feb. 8, 1993, p. 35. Of the 230 batch producers in the United States, 95 produce specialty fine chemicals and the other 135 are diversified companies that perform some batch production of intermediates or fine chemicals for sale or internal use. Because most large chemical manufacturers also engage in some batch processing, however, the total number of batch-processing facilities in the United States is more than 2,000.

35 Michael p. Walls, Chemical Manufacturers Association personalcommunication. In 1987, the book value of European chemical companies' assets in the United States reached $26.5 billion, the largest investment of foreign-owned assets in any one industry. "World Chemicals: The Challenge of Asia, " *The Economist,* vol. *326, No. 7802,* Mar. *13, 1993,* p. *28.*

36 *Charles* Doyle, ''Extratcrritorial Application of American Criminal Law, ' *CRS Report for Congress (U.S.* Congress, Congressional Research Service, Report No. 92-713A, Sept. 11, 1992).

37 David A. Koplow, ''Imng Arms and Chemical Arms: Extraterritoriality and the Draft Chemical Weapons Convention, " *Yale Journal of International Law,* vol. 15, No. 1, winter *1990,* p. 68.

38 Ibid, p. 70.

mate commercial purposes. Export of Schedule 3 chemicals to non-Parties may also be banned 5 years after the treaty enters into force, although a final decision on this proposal has yet to be made. Thus, a U.S.-owned subsidiary located in a country that refines to sign or comply with the CWC could eventually lose its ability to import key precursor chemicals from treaty adherents and might have to cease operations.[39]

39 Gordon Burck, senior policy analyst, EAI Corp., personal communication.

Treaty Obligations for Industry 3

The CWC empowers an international authority to collect unprecedented quantities of information from private nondefense companies and to conduct intrusive inspections of their manufacturing facilities. Those treaty obligations affecting U.S. industry are discussed in the following sections.

REPORTING OBLIGATIONS

The CWC will require producers and some processors and consumers to create a paper trail for all the treaty-controlled compounds they work with, so that inspectors can monitor their manufacture and ultimate use. To this end, the companies will have to file initial declarations and annual reports on their activities. Although the reports will allow a margin of error of a few percentage points, they will provide a general picture of each relevant plant's activities and a baseline for inspection. The U.S. National Authority will collect the required data from industry and transmit reports on a yearly basis to the OPCW's Technical Secretariat.[1]


SIGMUND R. ECKHAUS

I Overlap With Other Reporting Requirements

U.S. chemical companies must already report on a regular basis to several regulatory authorities, including the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the International Trade Commission, the Bureau of the Census, and hundreds of State and local agencies. These statutory reporting requirements cover all

[1] The data may be collected by one or more U.S. Government agencies with current regulatory responsibilities, such as the Department of Commerce, EPA, or OSHA, so as to build on existing channels with industry.

aspects of commercial chemical production, including quantities of feedstock materials, processed materials, and end-products; characteristics and toxicity of materials; statistical and chemical data on gaseous, liquid, and solid wastes; and reports on the transportation of hazardous materials and on worker health and safety.[2] For example, each chemical manufacturing facility must file on a yearly basis a Toxic Release Inventory covering the use of317 toxic chemicals and their release into air, water, and solid waste.

According to the Chemical Manufacturers Association, compliance with U.S. environmental regulations cost the industry about $4,9 billion in 1992.[3] Collection and tabulation of regulatory data require a major effort on the part of large chemical companies, which may have more than 150 separate production sites. For example, atone major chemical manufacturer with some 50,000 employees, about 1,700 people spend most of their time satisfying the requirements of Federal and State regulatory agencies for environmental and statistical data.[4] The U.S. chemical industry's long experience with such domestic regulations will be helpful in preparing the additional reports mandated by the CWC. Indeed, many firms may view the treaty as a form of ''supranational regulation.

Nevertheless, the information currently envisioned as necessary for CWC verification differs both quantitatively and qualitatively from that collected for internal management or for domestic regulatory purposes.[6] The major discrepancies between the reporting requirements mandated by the CWC and by U.S. domestic environmental regulations are listed in table 3-1, and can be surnmarized as follows:

- Environmental regulations do not cover all of the chemicals relevant to the CWC.
- Of the chemicals that are covered, some of the annual production thresholds at which companies must file reports are higher than those specified by the CWC.
- Some environmental regulations apply to chemical manufacturers but not to processors or consumers, which are covered under the CWC.
- Some environmental regulations require prospective rather than retrospective reporting.
- The reporting deadlines for the CWC are shorter than those required by EPA, and estimates of futrue production must be updated more frequently.

There is also a difference in certain key definitions between the Toxic Substances Control Act (TSCA) and the CWC. In TSCA, the "processing' of a chemical may result in a ''different

---

[2] Relevant regulations are derived from several laws that control toxic chemicals in the workplace, transportation% and the environment, including the Toxic Substances Control Act (TSCA), the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the Resource Conservation and Recovery Act (RCRA), the Superfund Amendments and Reauthorization Act (SARA), and the Occupational Safety and Health Act (OSHA). See Kyle B. Olson, "Domestic Regulation of the U.S. chemical Industry and Its Application to a chemical Weapons Ban,' in Thomas Stock and Ronald Sutherland, eds., *National Implementation of the Future Chemical Weapons Convention, SIPRI Chemical & Biological Warfare Studies No. 11 (New* York, NY: Oxford University Press, 1990), p. 102.

[3] Michael P. Walls, Senior Assistant General Counsel, CMA, letter in response to OTA questionnaire, Feb. 26, 1993.

[4] Julian P. Perry Robinson and Ralf Trapp, ''Summary Report of the Proceedings, " in J. P. Robinson, cd., *The Chemical Industry and the Projected Chemical Weapons Convention: Volume II, SIPRI Chemical and Biological Warfare Studies No. 5 (New* York, NY: Oxford University Press, 1986), p. 6.

[5] Will D. Carpenter, "Implementing Global Chemical Weapons Disarmament: Chemical Industry Perspective, " in Eric H. Arnett, cd., *Implementing a Global Chemical Weapons Convention: Proceedings from a 1989 Annual Meeting Symposium* (Washington DC: AAAS Program on Science, Arms Control, and National Security, 1989), p. 23.

[6] Mark Mullen, *Verification of a Chemical Weapons Convention: Summary of Lessons Learned from the Verification Experience of the International Atomic Energy Agency, Briefing,* vol. *2, No. 6,* Dec. *20, 1991* (Los Alamos National Laboratory, Center for National Security Studies), p. 22.

form or physical state from that in which it was received. The CWC, in contrast, draws a clear line between processing (defined as "a physical process, such as formulation, extraction and purification, in which a chemical is not converted into another chemical' and consumption (''conversion into another chemical via a chemical reaction ").[8]

In addition to these discrepancies, U.S. regulatory laws do not permit releasing industry data submitted to the government to an international organization such as the OPCW. Employing EPA and OSHA data for CWC compliance would therefore require amending the various regulatory laws, which would be a long and drawn-out process. For these reasons, the U.S. Government cannot simply ''piggyback' on existing reporting requirements to meet its CWC declaration obligations. Nevertheless, U.S. officials hope to minimize the added burden to industry by building as much as possible on existing reporting channels.

Direct Costs of Reporting

The major U.S. chemical companies currently track production activities with computerized accounting systems, which integrate plant manufacturing data with inventory and import-export accounts. To satisfy CWC requirements, companies will need to modify these systems to collect additional information and to meet shorter reporting deadlines. Within 30 days after the treaty enters into force, each State Party must submit to the OPCW an initial declaration that provides data for the previous 3 calendar years on the quantities of each Schedule 2 chemical produced, processed, consumed, imported, or exported, and less extensive information on other treaty-controlled chemicals. In subsequent years, companies will have to file annual reports updating the initial declarations 90 days after the end of the calendar year; these reports will contain data on prior-year activities and plans for the upcoming year.

If the United States is to meet its CWC obligations, U.S. chemical companies will need to generate production statistics more quickly, in greater detail, and on more compounds than in the past.[9] These tasks may require the development of new accounting software and subroutines that improve the speed and timeliness of data collection and analysis. Since U.S. manufacturers will have to submit initial declarations—including data on the previous calendar year's activities—within 30 days after the CWC enters into force (most likely in January 1995), companies must start preparing to collect such data by the beginning of 1994.

Although the CWC will increase the cumulative reporting burden on firms that produce, process, or consume scheduled chemicals, the largest chemical companies anticipate no signifl-cant increase in employees or compliance costs as a result of the treaty.[10] For large chemical companies, the time and effort to comply with CWC reporting requirements will be small relative to total sales and other regulatory costs. According to Will Carpenter, a retired Monsanto executive and consultant to the Chemical Manufacturers Association, the costs of CWC implementation will be ''incremental' and ultimately ''acceptable. '[11] Nevertheless, the size of

---

[7] Section 3, Toxic Substances Control Act, P.L. 94-469.

[8] ''Definitions arid Criteria, '' article II, paragraph 12, in Conference on Disarmament *Draft Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction,* extracted from CD/1 173, Sept. 3, 1993 (henceforth "Draft Chemical Weapons Convention"), p. 12.

[9] Interview with Kyle B. Olson, Director, Industry and Arms Control, Chemical and Biological Arms Control Institute, Alexandria, VA, Dec. 22, 1992.

[10] Michael P. Walls, CMA, letter in response to OTA questionnaire, Feb. 26, 1993.

[11] ''Industry Urges Quick Implementation of U.N. Chemical Weapons Agreement, " *International Trade Reporter,* vol. 10, Jan. **20, 1993, p. 79.**

Table 3-l-Comparison of Reporting Requirements **for the CWC and Selected U.S. Environmental Laws**

	TSCA	FIFRA	TRI	CWC
Types of chemicals	**All** chemical substances manufactured or **imported into the United States except for R&D substances, pesticides, tobacco products, nuclear materials, firearms and ammunition, food, food additives, drugs, and cosmetic devices.**	**Active ingredients in pesticides (rodenticides, insecticides, herbicides, fungicides, and antimicrobial).**	**317toxic chemicals and 20 chemical categories.**	**CWC agentsand precursors large-volume toxic chemicals used as warfare agents in the past, and other discrete organic chemicals.**
Companles covered	**Manufacturers and importers. (Under some sections of TSCA, processors and distributors.)**	**Manufacturers of active ingredients, formulators, and registrants.**	**Manufacturers, processors, users.**	**Manufacturers, processors, users.**
Production threshold for reporting	**No threshold quantity.**	**No threshold quantity.**	**A facility must file a form if it manufactures or processes 25,000 pounds or more of a listed toxic chemical or uses 10,000 pounds of a listed toxic chemical.**	**Threshold ranges from 100 g to 200 metric tons per year depending on the type of chemical and its utility for production of CW agents.**
Type of data reported	**Before beginning production of a new chemical, firms must submit a Pre-Manufacture Notice (PMN) stating quantity of new chemical to be produced during first year and maximum quantity during anyone of the first 3 years. PMN submissions also require all available data on chemical toxicity, byproducts, use, environmental releases, disposal practoces human exposure, and effects on health and the environment. Firms must submit a Significant New Use Notice (SNUN) for new uses of existing chemicals that have been designated in a Significant New Use Rule (SNUR).**	**Each active ingredient and formulation must be registered with the EPA, along with voluminous testing data on health and environmental effects. No quantity information required for registration. Companies must also submit annual reports on quantities of active ingredients and formulated products made at each production facility.**	**Releases of each listed chemical to the environment, transfers of the chemical to off-site locations, source reduction, and recycling activities.**	**Production, processing, or consumption of schedule 2 chemicals and production of Schedule 3 and "other relevant" chemicals.**

Table 3-1-(Continued)

	TSCA	FIFRA	TRI	CWC
Aggregation of production data	Varies according to section of TSCA.	Reported for each chemical at each facility, aggregated over the reporting year.	Reported for each chemical at each facility, aggregated over the reporting year.	Reported for each chemical at each plant or plant site, aggregated over the reporting year.
Protection of proprietary data	Firms may designate proprietary data as confidential and protect them from release. Health and safety data cannot be claimed confidential under most circumstances.	Firms may protect certain limited data from release.	Reported data are made available to the general public in various formats, including a publically accessible on-line database.	Firms may designate proprietary data as confidential and protect them from release.
Timellne	Firms must file a PMN on a one-time basis at least 90 days before prodution begins. ASNUN must be fried 90 days before production begins. There are certain exemptions for abbreviated review periods.	Firms are required to report on production of controlled chemicals during the previous calendar year by March 1, and must also report estimated production for the coming year.	Reports must be fried on or before July 1 for the previous calendar year.	U.S. National Authority must issue an annual report on previous year's activities 90 days after end of the calendar year, so data maybe required earlier from industry.
Penalties for late fillng or fallure to file	Civil penalties of up to $25,000 per violation per day, and/or criminal penalties of fine plus up to 1 year in prison.	Civil penalties (up to $5,000) and criminal penalties (up to $25,000, 1 year in prison) maybe assessed for serious violations of the Act.	Civil and administrative penalties of up to $25,000 per chemical per day.	Civil and/or criminal penalties may be specified in the U.S. implementing legislation.
Revised declarations	Firms must keep EPA informed of new data on substantial risk of chemicals, including test data.	Registrants must keep EPA informed of new testing data on the adverse health and environmental effects of pesticides.	Not required by law.	Companies must file a revised report if new orders result in unexpected production of scheduled chemicals, in some cases 5 days before production starts.

TSCA - Toxic Substances Control Act, P.L. 94-469

FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. 136-136y.

TRI - Toxic Release Inventory, Sec. 313, Emergency Planning and Community Right-to-Know Act, 40 CFR 370

SOURCE: U.S. Environmental Protection Agency, Office of Technology Assessment, 1993.

the additional burden will depend to a large extent on the design of the reporting formats to be issued by the OPCW Technical Secretariat; these formats are still being negotiated by the PrepCom. To keep paperwork within reasonable bounds, it would be desirable to develop simple, standardized data declaration forms so that companies can simply check off boxes and fill in blanks. U.S. industry representatives also want to ensure that the PrepCom and the implementing legislation require industry to submit no more information than is truly essential to verify treaty compliance. Obviously, the more information that is requested, the greater the risk that trade secrets may be disclosed---either deliberately or unintentionally.

The reporting burden will be proportionately more onerous for small and medium-sized companies, which have a smaller base of management and operating personnel and less experience in providing information to regulatory agencies. Since the reporting thresholds in the CWC are relatively low, some smaller companies may be required to fill detailed production reports for the first time. In addition, the treaty requires that a chemical plant report to the National Authority any significant change in its declaration of anticipated activities for the next year; each such change must be reported 5 days before it occurs. This requirement will impose a greater burden on custom manufacturers, who make small batches of chemicals on order to meet short-term or seasonal demand. Since these films are often unable to predict their production over the coming year, they will have to amend their annual reports fairly often. [12] Many small companies could benefit from specialized data-collection packages designed to their requirements.

INSPECTION OBLIGATIONS

To confirm that the activities of commercial plants that produce, process, or consume scheduled chemicals are consistent with their declared purpose, the CWC verification regime calls for two types of onsite inspections. Declared commercial facilities that produce, process, or consume Schedule 2 chemicals, which could be converted fairly easily to military use, will be subject to *routine* inspections. The number, intrusiveness, and duration of these inspections will vary according to the chemicals used at a given facility, its process equipment, and its production activities. Schedule 3 and "other relevant' facilities will also be subject to routine inspection on a less stringent basis. Supplementing the routine-inspection regime will be the right of a State Party to request a *challenge* inspection of any declared or undeclared facility on the territory of another State Party that is suspected of clandestine activities such as CW agent production or storage.

Unlike onsite inspections by domestic regulatory agencies, which are performed by U.S. Government officials, inspections under the CWC will be carried out by international civil servants employed by the OPCW Technical Secretariat and drawn from the countries participating in t-he treaty regime. Depending on the size and complexity of a site, the typical inspection team will probably consist of 6 to 10 people, including a team leader, a chemical engineer, a process engineer, an analytical chemist, and technicians and interpreters. This team may break up into subteams during the inspection.[13] The inspectors may be equipped with portable analytical instruments, computers, and safety equipment, although the technical parameters of these devices remain to be determined by the PrepCom. Inspectors visiting U.S. facilities will be accompanied by escorts from the inspected facility who are

---

[12] Dan Charles, "Chemical Weapons Ban: Now for the Hard Work, " New Scientist, vol. 137, No. 1857, Jan. 23, 1993, p. 7.

[13] Dr. Leo Zeftel, ''Plant Inspections, ' presentation at a Seminar on the Chemical Weapons Convention and Its Impact on the U.S. Chemical Industry, sponsored by the U.S. Arms Control and Disarmament Agency, Washington DC, Feb. 11, 1993.

well-versed in its layout and activities; in some cases, they may also be escorted by one or more U.S. Government officials who are familiar with the provisions of the treaty.

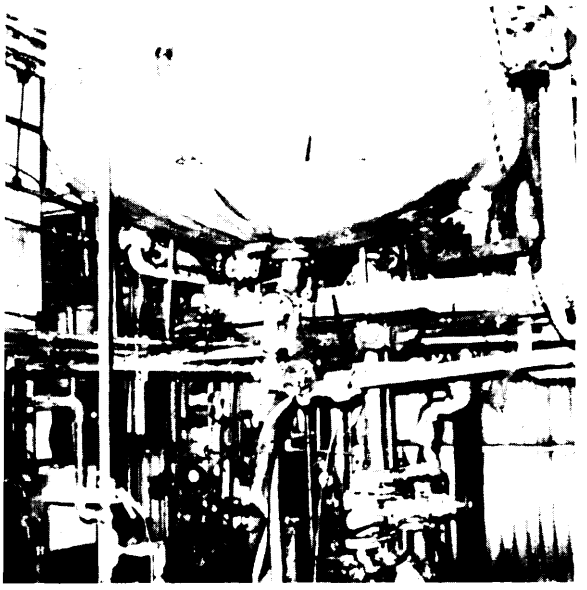
Routine Inspections

Routine inspections of commercial chemical plants are designed to detect—and thereby deter—the use of declared facilities for CW agent production. In particular, routine inspections will verify that:

- the plant is not being used to manufacture CW agents;
- the quantities of dual-use precursor chemicals produced, processed, or consumed are consistent with legitimate declared needs; and
- controlled chemicals are not diverted to a secret onsite or offsite location for illicit purposes.[14]

Commercial facilities subject to routine inspection are those involved in the production, processing, or consumption of Schedule 1 and 2 chemicals or the production of Schedule 3 chemicals. For example, a few U.S. defense contractors will be subject to routine inspection because they consume more than the threshold quantity of Schedule 2 chemicals (e.g., for the production of composite materials) or use Schedule 1 chemicals for the development of chemical defenses (e.g., detectors and protective gear). Inspections of Schedule 2 and 3 facilities will begin as soon as possible after the treaty enters into force, while inspections of ' 'other relevant' facilities will likely be phased in later.

Before routine inspections begin at Schedule 2 facilities, the OPCW Technical Secretariat will conduct an initial (baseline) inspection of each plant to assess the risk it poses to the goals of the treaty and hence the frequency and intensity of future inspections. These initial inspections are likely to take up to 3 years to complete. Priority in making the initial inspections will go to the facilities of higher risk, that is, those plants that could be used most easily to produce chemical weapons.



SIGMUND R. ECKHAUS

Reactor used for the production of dimethyl methylphosphonate (DMMP), a chemical that has commercial applications but can also be converted into nerve agents.

During the initial inspection of each Schedule 2 facility, the OPCW and the U.S. National Authority will negotiate *a facility agreement* with the close participation of the plant owners. This agreement will define the verification procedures on a plant-specific basis, laying out areas of the site that will be inspected, where samples can be taken, which plant records can be audited, necessary safety measures, and ground rules for escorts. Some parts of a site maybe excluded from routine inspection, such as research and development laboratories, pilot plants, and nonrelevant production units.

The CWC requires the negotiation of facility agreements for all Schedule 2 facilities, unless

[14] Yuri V. Skripkin, ''Some Technical Aspects of Verification of the Non-Production of Chemical Weapons in the Chemical Industry, ' in S. J. Lundin, cd., *Verification of Dual-use Chemicals Under the Chemical Weapons Convention: The Case of Thiodiglycol, SIPRI Chemical & Biological Warfare Studies No. 13* (Oxford, England: Oxford University Press, 1991), pp. 118-119.

both the OPCW and the State Party specifically waive it as unnecessary. Facility agreements are not required for Schedule 3 and ''other relevant' facilities, which pose less of a threat to the goals of the treaty and thus require less intrusive inspection. At the latter sites, plant officials are expected to work out an informal ''inspection plan' when the inspectors arrive at the plant gate. Nevertheless, States Parties have the option of negotiating a more detailed facility agreement for Schedule 3 and ''other relevant" plants if they so choose.

The OPCW Technical Secretariat will select Schedule 3 and "other relevant" plants for inspection using software that takes into account weighting factors to ensure an equitable geographic distribution. Each Schedule 2 or 3 plant may not receive more than two routine inspections per year, and there is a annual ceiling on the total number of inspections of Schedule 3 and ''other relevant' facilities.

Routine inspections will involve three mutually reinforcing elements: visual inspection of production equipment, chemical sampling and analysis, and auditing of plant records. In some cases, it maybe possible to determine from visual inspection alone if a chemical plant is capable of engaging in illicit activities, since production of CW agents would probably involve the use of corrosion-resistant reactors and special containment measures. Nevertheless, if a government is bent on acquiring a CW capability and is willing to cut corners on agent shelf-life, environmental protection, and worker safety, CW agents could be manufactured with standard chemical production equipment, which would simply be replaced when corroded. For this reason, chemical sample collection and analysis will be needed to provide evidence of clandestine CW agent production that cannot be detected by visual inspection alone.

Sensitive analytical instruments (e.g., combined gas chromatography and mass spectrometry) can detect telltale traces of CW agents or their degradation products in samples from the production line, the waste stream, or even the walls and floor of a plant. Onsite analysis of samples should normally be able to verify the presence or absence of scheduled compounds or their degradation products. Nevertheless, if a treaty violator has attempted to eliminate or conceal traces of CW agent production before an inspection by decontaminating the production line or by producing a closely related commercial chemical in the same reactors (e.g., the pesticide methyl-parathion instead of the nerve agent sarin), the results of onsite chemical analysis may be inconclusive. in such cases, the treaty gives the inspection team the right to send a sample to an offsite laboratory for more sophisticated testing.

The facility agreement may rule out sampling at certain points along the production line that could disrupt production or reveal sensitive proprietary information, as long as the plant officials offer acceptable alternative ways to resolve the inspectors' compliance concerns. For example, if a plant is using a process containing a proprietary catalyst, the plant managers could give the inspectors samples of both the feedstock and the final product, but not of the intermediate mass containing the catalyst. While the facility agreement should be structured to protect proprietary information unrelated to CWC verification, it should also give the inspectors enough flexibility to make cheating difficult, thereby reinforcing the deterrent effect of the inspections. For example, the agreement might permit random sampling of undeclared vessels connected to declared reactors if such vessels could be used to divert chemicals for CW agent production.[15]

If suspicions of illegal activity emerge during an inspection, the inspectors may request to go beyond the explicit terms of the facility agree-

15 Conference on Disarmament, ' 'Report on the Second United States Trial Inspection document No. CD/CW/WP.301, June 27, 1990, p. 13.

ment; if plant officials refuse, they could be suspected of hiding something. In this case, plant officials must find a way to satisfy the inspectors' concerns, for example by allowing them to examine additional records or by permitting a walk-through of an additional area of the plant after taking the time to shroud sensitive equipment. Since CWC inspectors will generally seek to avoid controversy, they are unlikely to overstep their authority by making unreasonable requests.

The full impact of routine inspections on U.S. industry is not likely to be felt until about a decade after the CWC enters into force. For the frost 5 to 10 years of CWC implementation, most inspection resources will go to the task of monitoring the elimination of chemical-weapons stockpiles and CW agent production facilities. Commercial sites not subject to inspection initially will be phased gradually into the system. As a result, it will take several years before the CWC reaches a steady state in which international inspectors are routinely inspecting chemical plants.[16]

Another factor constraining the number of inspections of U.S. chemical plants will be the limited resources of the international inspectorate in terms of time, money, and manpower. The OPCW Technical Secretariat will employ at most about 1,000 international civil servants, of whom between 250 and 400 will be inspectors. Since a team of roughly 6 to 10 inspectors will be required to inspect each site, no more than a few dozen sites can be inspected at a time, or a few thousand per year, only some of which will be in private industry. Given that more than 25,000 chemical plants worldwide will be subject to inspection, the odds that any given U.S. plant will be inspected will be fairly low. Thousands of U.S. chemical plants will be declared, but only a small fraction will actually be inspected.

I Challenge Inspections

A State Party to the CWC that seeks to violate the treaty might engage in clandestine agent production at an undeclared site. For this reason, routine inspections of declared sites will be supplemented by the right of any participating state to request a ''challenge '' inspection of any facility on the territory of another State Party that is suspected of containing a clandestine CW storage or production facility. In this way, challenge inspections provide a "safety net' to cover violations that cannot be detected through routine inspections; they also allow the participating countries to ventilate their compliance concerns before the court of world opinion.

Challenge inspections can take place at *any* government or privately owned facility, declared or undeclared. For challenges of undeclared facilities, the inspection team will arrive onsite within 48 hours after the host country has been notified; the two sides may then negotiate for a maximum of 72 hours over the degree of access needed to demonstrate treaty compliance.[17] Officials at undeclared plants must grant some access to the site 102 hours (5 days) after the challenge is announced. (For declared plants, some access must be granted 39 hours after a challenge is announced.) The duration of a challenge inspection may not exceed 84 hours, unless extended by agreement with the inspected State Party.

Depending on the outcome of negotiations during the inspection, inspection of the site may involve visual exarnination of production facilities (including the taking of instant photographs), sample collection and analysis, and access to plant records pertinent to production of treaty-controlled chemicals. To reduce the potential for mischievous or intelligence-motivated challenge inspections, the OPCW's 41-country Executive Council can block a challenge request within the frost 12 hours after it is presented if the request is

16 Will D. Carpenter, chemical industry consultant, personal communication, May 12, 1993.

17 Communications channels for informing a challenged site of an impending inspection remain to be worked out.

judged to be "frivolous, abusive, or beyond the scope' of the treaty. Since representation on the Executive Council gives weight to States Parties with the largest chemical industries, these countries will be in a position to oppose inspections that appear motivated primarily by intelligence-gathering.

Moreover, although the CWC imposes no numerical limit on challenge inspections, the U.S. chemical industry believes they will be relatively rare, high-profile events. Since challenge requests will be tantamount to an allegation of noncompliance, they will carry a political cost that States Parties will most likely only wish to incur for the most serious suspected violations. For this reason, governments will probably not wish to expend their political capital by challenging a declared commercial facility that is already subject to routine inspections.[18] Challenges of commercial plants may still occur, however, if persistent suspicions of noncompliance cannot be resolved through routine inspections alone.

During a challenge inspection, plant officials are obligated to provide only the minimum amount of information necessary to demonstrate treaty compliance and need not disclose military or business secrets. At plants in the United States, the U.S. Government may provide escorts to make sure that the international inspectors follow the guidelines set out in the CWC. (Although government escorts are not required by the treaty, they will probably be present at least during initial routine inspections and challenge inspections, if finding permits.) Should an adversarial situation develop during an inspection, the government escorts may intervene to help resolve the controversy without embarrassment for the United States. At the end of the visit, the inspection team must make a preliminary draft report on the inspection available to the host country for review and attempt to resolve any compliance concerns in discussions with plant officials.

COSTS OF INSPECTIONS

Estimates of the cost of preparing for and hosting CWC inspections at U.S. chemical plants vary greatly, since they depend primarily on the labor costs of personnel involved with the inspections. In order to test out procedures for both routine and challenge inspections, countries participating in the CWC have conducted more than 200 National Trial Inspections (NTIs) at their own government and industrial facilities.[19] To date, the United States has performed seven NTIs, two of which were simulations and five actual mock inspections. The second U.S. NTI, for example, was a mock inspection of a production facility for a Schedule 2 chemical (thiodiglycol, the immediate precursor of mustard agent), including an initial declaration, a baseline inspection and preparation of a facility agreement, and a routine inspection.[20] while these exercises have served primarily as a means to develop and refine monitoring and verification measures for the treaty, they have also helped to assess the potential impact of the inspections on industry.

After the first U.S. NTI, the participating company reported a cost of $10,000 for its time (100 man-hours) in preparing for the trial inspec-

---

18 Michael P. Walls, "The Private Sector and Chemical Disarmament," in Brad Roberts, cd., *The Chemical Weapons Convention: Implementation Issues, Significant Issues Series,* vol. XIV, No. 13 (Washington DC: Center for Strategic and International Studies, 1992), p. 44. Indeed, during the CWC negotiations the chemical industry favored routine inspections as a way of minimizing challenge inspections of industry, which would have been suggestive of a treaty violation.

19 Battelle Memorial Institute and EER Systems Corp. have developed a computer database on these inspections known as the "chemical Weapons Convention National Trial Inspections Information System. '

20 Sigmund R. Eckhaus, "U.S. National Trial Inspection at a Thiodiglycol Facility, in S. J. Lundin, cd., *Verification of Dual-use Chemicals Under the Chemical Weapons Convention: The Case of Thiodiglycol, SIPRI Chemical & Biological Warfare Studies No. 13 (New* York, NY: Oxford University Press, 1991), pp. 106-117.

tion, including the use of its own analytical capabilities.[21] Industry representatives stressed, however, that this cost estimate was of questionable accuracy because it assumed different procedures than would probably be used for real inspections involving foreign nationals. In practice, the cost of hosting routine inspections will depend on several factors, including the size of the inspection team, the amount of access granted to the facility, and the number of samples analyzed onsite.

Inspections will also be more costly if they interfere with normal production. For example, the treaty entitles the inspectors to ask plant officials or workers to take samples from the production line under the inspectors' supervision and to operate idle equipment to demonstrate its function. Interference with production is likely to be rare, however, because the CWC states explicitly that onsite inspections must be conducted so as to cause the ''least possible. . . disturbance to the facility or area inspected. The inspection team shall avoid unnecessarily hampering or delaying the operation of the facility and avoid affecting its safety. ''[22] Industry expects the inspectors to follow this guideline closely, only interfering with ongoing production if such action is absolutely necessary to resolve compliance concerns. Officials of the inspected plant also have the right to deny unreasonable requests for reasons of safety or undue disruption, provided they can find some other means of demonstrating to the inspectors' satisfaction that the facility is treaty-compliant.

The upper bound of estimates for the cost of an onsite inspection at a commercial site apply to facilities that:

- are particularly large and complex,
- have extensive areas containing activities relevant to the CWC, and
- are engaged in highly proprietary or classified defense activities, such as the manufacture of advanced composite materials for ''stealth' aircraft.

In such cases, the Department of Defense has estimated that the cost per facility could be as high as $200,000 to $500,000 because of the need for extensive site preparation involving a large number of man-hours, including training escorts, shrouding sensitive equipment, and conducting mock inspections.[23]

The higher range of inspection costs could also result if a chemical company decides to:

- shut down production temporarily in areas to be visited by inspectors for safety reasons or to protect trade secrets; or
- reconfigure or relocate production or consumption of scheduled chemicals to protect trade secrets related to other, commercially more important products manufactured in the same plant.[24]

While such shutdowns and relocations would result in considerable costs and job losses, they are likely to be quite rare. The Pentagon's higher range of cost estimates for CWC inspections may also be exaggerated for three reasons:

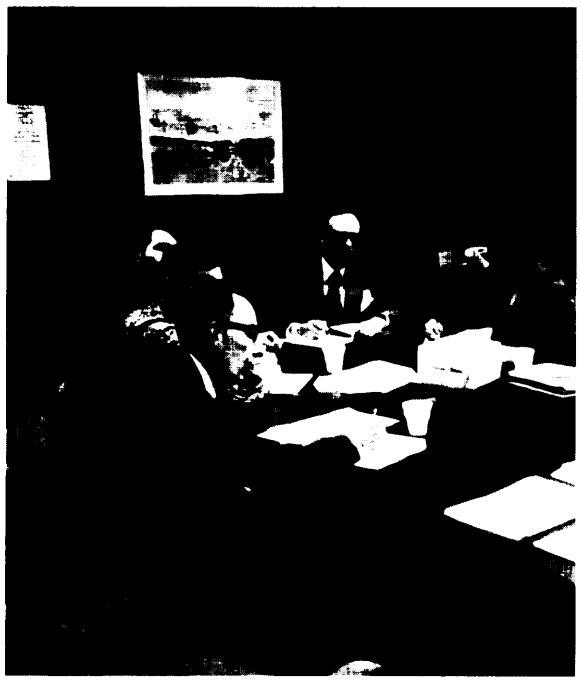
- some preparation expenses will be one-time only, such as the purchase of shrouds or the reconfiguration of controls and gauges;
- the figures probably overestimate the number of personnel (and hence man-hours) required to prepare for and conduct inspections; and

21 Conference on Disarmament, ''Report on a United States National Trial Inspection Exercise, ' document No. CD/922, June 22, 1989, p. 13.

22 6&conduct of Inspections, '' appendix I, annex 2, paragraph 40, *Draft Chemical Weapons Convention,* op. cit., p. *80.*

23 Susan D, Leibbrandt, Special Assistant to the Assistant to the Secretary of Defense for Atomic Energy (Chemical Matters), Office Of the Secretary of Defense, personal communication, April 1993.

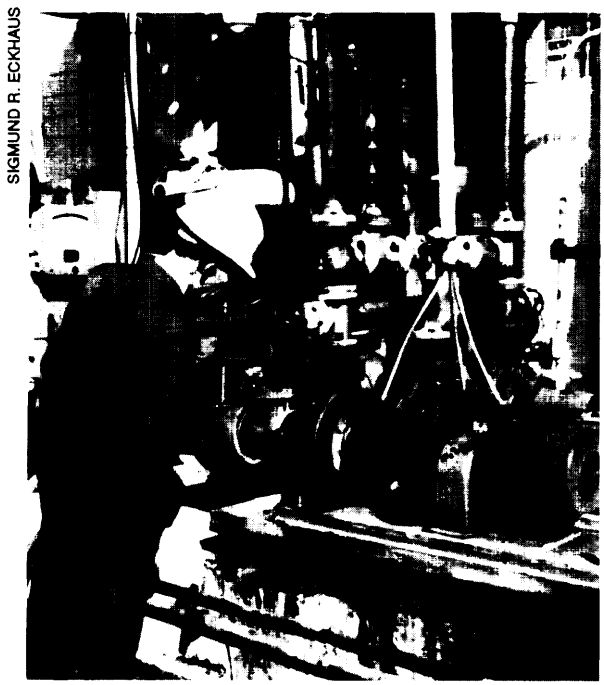
24 Interview with Dr. Leo Zeftel, chemical industry consultant, Dec. 22, 1992.



Initial plant briefing



Perimeter monitoring



Inspection of equipment



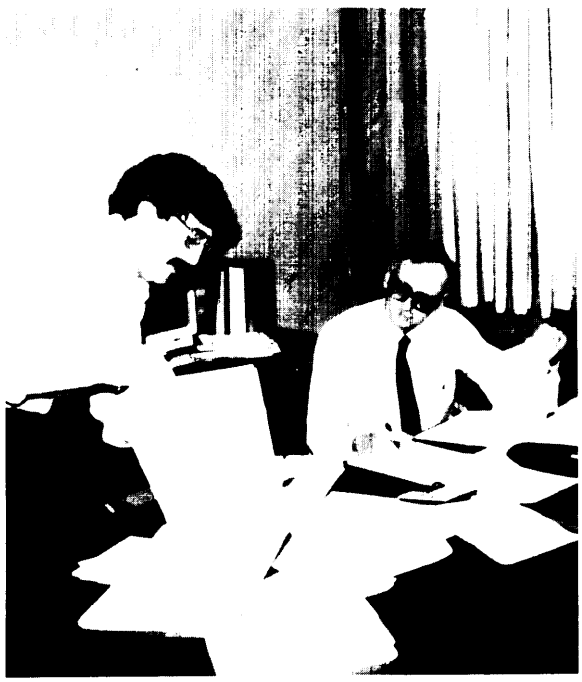
Inspection of product


SIGMUND R. ECKHAUS

Sample collection


SIGMUND R. ECKHAUS

Sample analysis


SIGMUND R. ECKHAUS

Records audit

The U.S. Government has conductedfour National Trial Inspections (NTIs) of commercial chemical plants that produce some of the dual-use chemicals listed in the Chemical Weapons Convention. These mock inspections have served two purposes: to help negotiators develop effective onsite inspection procedures and to enable companies to prepare for future inspections of their own facilities. The photographs shown here were taken during the first three U.S. trial inspections, NTI-1 took place in February 1989 at the Akzo Chemicals plant in Gallipolis Ferry, WV which produces DMMP, a Schedule 2 chemical; NTI-2 occurred in March 1990 at the Alcolac plant in Baltimore, MD, which then produced thiodiglycol, another Schedule 2 chemical; and NTI-3 was conducted in September 1990 at the Monsanto Agricultural Co. plant in Luling, LA, which produces a phosphorus herbicide. The purpose of the first two NTIs was to test procedures for routine inspections; the third tested procedures for a challenge inspection of industry using a negotiated, managed-access approach.

. costs to industry will tend to decline over time as plant officials move down the learning curve and develop more efficient ways to prepare for and host inspections.

A number of factors may also influence the frequency and intrusiveness of onsite inspections. First, as mentioned above,the limited resources of the OPCW Technical Secretariat in terms of workforce, money, and time will constrain the total number of inspections per year. Second, the degree of experience and expertise demonstrated by the international inspectors, and the extent of industry cooperation with the verification regime, could lead to a reduction over time in the number of inspections and the relative size of inspection teams. Finally, the frequency and intrusiveness of inspections may be influenced by the prevailing international political situation. If international tensions are low, inspections of chemical facilities may tend to be pro forma and relatively nonintrusive, requiring only modest preparations that can be undertaken at low cost. If, however, the international community enters a renewed period of heightened tensions, CWC inspections might be used increasingly for harassment and espionage, forcing companies to undertake more extensive protective measures and hence increasing implementation costs.[25]

No specific U.S. Government fund has been established to defray the costs to industry of preparing for inspections. Instead, companies will have to absorb these expenses as an additional cost of doing business. Some of these costs may, of course, be passed on to the consumer in higher prices. Although defense contractors are generally prepared to spend money to prepare for inspections on the assumption that they will be reimbursed by the U.S. Government, this issue has not yet been decided. Indeed, companies without government contracts would object strongly if they were required to absorb the costs of inspections while competitors with defense contracts were reimbursed by the taxpayers, giving them an unfair advantage. U.S. chemical companies also want to ensure that the costs of preparing for and hosting inspections are allocated equitably among all of the States Parties so that treaty compliance does not weaken the international competitiveness of U.S. fins.

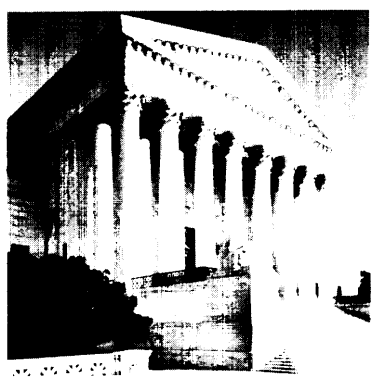
25 Robert G. Gough, Sandia National Laboratories, personal communication.

Constitutional and Other Legal Issues

4

Unavoidable tensions exist between the U.S. Govemment's responsibility to uphold the basic constitutional rights of its citizens and the intrusive verification measures needed to ensure that no chemical weapons are being produced on its territory. For example, the *Fourth* Amendment of the U.S. Constitution shields both citizens and corporations against "unreasonable searches and seizures, ' while the Fifth Amendment protects them from self-incrirnination and government confiscation of private property without due process and fair compensation.[1] These constitutional protections cannot simply be preempted by an international treaty. While arms-control treaties have the force of law, they can only be implemented domestically to the extent that they meet the legal standards of the U.S. Constitution.[2]

Although the great majority of U.S. companies will want to be good corporate citizens by complying voluntarily with the CWC's reporting and inspection obligations, it is possible that a handful of firms may consider onsite inspections a form of harassment and refuse to allow an inspection team to enter their plants. Indeed, the large number of facilities potentially subject to routine or challenge inspections makes it likely that a few such cases will arise. Thus, unless the legal questions over the constitutionality of the CWC are clearly resolved, a company might be able to keep foreign inspectors out of its plants. Such



U.S. SUPREME COURT

[1] The Fourth Amendment reads, ' 'The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation% and particularly describing the place to be searched, and the persons or things to be seized. " The Fifth Amendment states, in part, "No person shall . . . be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation. '

[2] Eric Hamburg, *Arms Control Verification and the U.S. Constitution*, working paper (Stanford University: Center for International Security and Arms Control, August 1989).

a legal challenge could result in significant delays in treaty implementation, seriously embarrassing the U.S. Government. It will therefore be necessary to address these constitutional issues in the domestic enabling legislation before the treaty enters into force.

ROUTINE INSPECTIONS

CWC inspection teams will expect to conduct routine inspections of privately owned facilities in the United States without the need to obtain a valid search warrant. Yet the Fourth Amendment generally bans Government searches conducted at random or on the basis of vague suspicions, without ''probable cause' to believe that the search will uncover evidence of illegal activity. Although the meaning of "probable cause" is somewhat ambiguous, it has been characterized as ''a fair probability that contraband or evidence of a crime will be found in a particular place. ' According to numerous Supreme Court rulings, a constitutionally valid search cannot occur until the government persuades a U.S. judge or magistrate that probable cause exists and the judge has issued a valid search warrant. The purpose of this procedure is to allow a neutral intermediary to evaluate the legitimacy of the government's search request. However, the Supreme Court has explicitly avoided any ruling on whether foreign policy or national security interests can justify an exemption from the usual Fourth Amendment requirement for search warrants to precede searches.[4]

Both routine and challenge inspections of declared commercial facilities under the CWC raise Fourth Amendment issues because they call for possibly warrantless searches in some areas where there is a reasonable expectation of privacy. Routine inspections are less problematic than challenge inspections from a constitutional standpoint because of the scope and nature of the affected entities (routine inspections apply to selected commercial facilities, whereas challenge inspections cover potentially any location in the United States, including private residences) and the reasons for the search (routine inspections are preplanned, whereas challenge inspections are based on suspicion). Accordingly, while the CWC does not explicitly address the constitutionality of routine inspections, U.S. negotiators insisted that the treaty provisions on challenge inspections recognize the right of privacy enshrined in the Fourth Amendment. To this end, Part X of the CWC Verification Annex states that a challenged facility must give the inspection team the greatest possible access "taking into account any constitutional obligations it may have with respect to proprietary rights or searches and seizures. ' Ironically, because the CWC provides an explicit waiver on constitutional grounds for challenge inspections but not for most routine inspections, the latter are now actually somewhat more problematic from a Fourth Amendment standpoint.

In the great majority of cases, routine inspections will not pose Fourth Amendment problems because companies will consent to inspection by negotiating a facility agreement in advance. In cases where U.S. companies seek to deny entry to CWC inspectors on constitutional grounds, legal scholars have proposed two possible remedies.

| "Pervasive Regulation" Exception

The Supreme Court has ruled that a company's expectation of privacy under the Fourth Amendment can be reduced by the extent to which it is regulated or licensed by the government. Indus-

---

[3] *Illinois v. Gates*, *462* U.S. **213 (1983).**

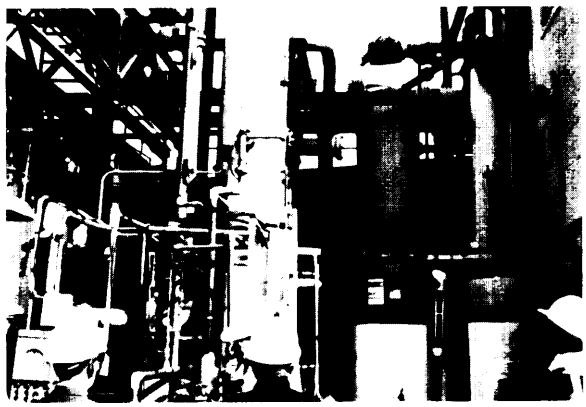
[4] Edward A. Tanzman, ''Constitutionality of Warrantless On-Site Arms Control Inspections in the United States,'' *Yale Journal of International Law*, vol. **13, No.** 1, 1988, p. 67.

[5] ''Conduct of Inspections,'' appendix I, annex 2, paragraph 41, in Conference on Disarmament, *Draft Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction*, extracted from CD/1173, Sept. 3, 1993, p. **159.**

tries that are "pervasively regulated" because they pose risks to public health or safety may be required to submit to warrantless searches, on the grounds that requiring a warrant would give the target of the search sufficient advance notice to conceal violations. The legal premise of pervasive regulation is that the statute that regulates the industry is the fictional equivalent of a search warrant.

For example, in a 1981 case, *Donovan v. Dewey*[6], *the* Supreme Court established a new standard permitting extensive government inspections of commercial property without a warrant. The case concerned the Federal Mine Safety and Health Act, which directs Federal officials to inspect underground mines at least four times a year and surface mines at least twice a year to enforce safety standards. This statute specfically provides for inspections without advance notice and requires the Secretary of Labor to institute court actions in cases where inspectors are denied admission. In declaring the Act constitutional, the Supreme Court found that the government had ''greater latitude' to conduct warrantless inspections of commercial property than of private homes.[7]

The Court ruled that warrantless safety inspections of mines were justified because of the notorious history of serious accidents and unhealthful working conditions in the mining industry, along with Congress's determination that unannounced inspections were necessary if the safety laws were to be effectively enforced. Yet the Court warned that warrantless inspections of commercial property would be constitutionally objectionable if their occurrence was ''so random, infrequent, or unpredictable that the owner has no real expectation that his property will from time to time be inspected by government officials. *Dewey* therefore appears to permit warrantless inspections of commercial establishments if the law specifies a regular number of inspections that must be carried out within a prescribed period and according to reasonable standards.


SIGMUND R. ECKHAUS

Onsite inspections under the CWC must be consistent with constitutional protections against ''unreasonable searches and seizures. '

In a 1987 case, New *York v. Burger, the Court* established three tests that must be met for a pervasively regulated industry to be searched without a warrant:

1. there must be a ''substantial government interest' involved,
2. the warrantless inspections must be "necessary to further the regulatory scheme, ' and
3. there must be "certainty and regularity of its application.

The 1986 case of *Dow Chemical Co. v. the United States* raises some doubt, however, about the extent to which the "pervasive regulation" rationale for warrantless inspections applies to the U.S. chemical industry.[10] Dow filed suit against the EPA after some of the agency's inspectors, who had been denied access to one of the

[6] 452 U.S. 594 (1982).

[7] Donovan v. Dewey, 452 U.S. 594, 598-599 (1981).

[8] Ibid.

[9] New *York v. Burger, 482* U.S. 691 (1987).

[10] *Dow Chemical Co. v. the United States, 476* U.S. 227 (1986), p. 238.

company's plants, hired a commercial plane to overfly the plant and take high-resolution color photographs for regulatory purposes. The company's attorneys argued that the overflight constituted an illegal search under the Fourth Amendment. Although the Supreme Court rejected this line of argument, it found that individual chemical firms still have some constitutional right to privacy, albeit not as much as private citizens in their homes.[11]

Edward A. Tanzman, a legal scholar at Argonne National Laboratory, contends that because of the Court's dicta in the *Dow* case, there is some uncertainty as to whether the U.S. chemical industry qualifies as being pervasively regulated. In order to meet the *Burger* criteria for warrantless inspections, he contends, the implementing legislation would have to provide probable cause for a pervasive regulatory scheme (e.g., that the treaty-controlled facilities pose a potential threat to public health and safety) and mandate inspections that are ' 'certain and regular" (e.g., every few months).

One way to meet the latter requirement, Tanzman suggests, would be for the implementing legislation to establish a comprehensive inspection scheme that ''pervasively regulates' the domestic chemical industry. Under this proposal, the U.S. National Authority would conduct its own regular inspections of declared chemical plants to verify that the initial CWC declarations are accurate and complete. Once the National Authority had established a' 'certain and regular' presence of its own inspectors and thus lowered the industry's expectation of privacy at declared sites, the international inspectors would have legal grounds to conduct their own warrantless inspections.

It is unlikely, however, that the U.S. National Authority would have the resources to implement a pervasive regulation scheme, which would also be anathema to industry. Thousands of U.S. Government inspections would have to be conducted to establish the legal basis to conduct far fewer international inspections. Whether this complex and costly solution is really necessary remains a matter of debate. Some analysts believe that the "certain and regular" test can be met in other ways than the *timing* of the inspections, for example, by ensuring consistency and regularity in the overall application of the regulatory scheme.

I Administrative Warrants

Another proposed solution to the Fourth Amendment problem would be for the implementing legislation to allow CWC inspectors to use the ''administrative warrant' procedure developed by U.S. regulatory agencies for unannounced inspections of private companies.[12] In a 1978 case, *Marshall v. Barlow's, Inc.*[13], *the* Supreme Court struck down as violating the Fourth Amendment a provision of the Occupational Safety and Health Act authorizing Federal inspectors to conduct warrantless searches of any employment facility covered by the Act for safety hazards and violations. The Court held that Federal regulation for limited purposes did not constitute ''pervasive regulation, and that giving OSHA inspectors unlimited discretion to choose which businesses to inspect and when to do so could render companies potentially vulnerable to arbitrary searches with no assurance as to limitations on scope. The Court also found that warrantless inspections were not necessary to serve an impor-

---

*11 David A. Koplow, ''Back to the Future and Up to the Sky: Legal Implications of 'Open Skies' Inspection for Arms Control, " *California Law Review, vol. 79, No.* 1, March 1991, pp. 467-469, For example, the chemical industry believes that aerial overflights of chemical plants using aircraft equipped with sensitive ''sniffers" for scheduled compounds could present a threat to proprietary data and would thus be subject to legal challenge on Fourth Amendment grounds.

12 J. Aroesty, K. A. Wolf, and E. C. River, *Domestic Implementation of a Chemical Weapons Treaty,* report No. R-3745-ACQ (Santa Monica, CA: RAND Corp., October 1989), p. 26.

13 436 U.S. 307 (1978).

tant governmental interest, since most businesses would consent to inspection. [14]

In those cases where a business to be inspected refused consent, the Court ruled that OSHA inspectors should apply to a Federal judge or magistrate for an *administrative search warrant*, using a streamlined procedure that does not require notifying the inspected party in advance. To obtain such a warrant, the government must demonstrate ' 'administrative probable cause, ' meaning that the public interest in the inspection (e.g., protection of public health and safety) outweighs the invasion of privacy involved .15 The standard for obtaining an administrative warrant is much less demanding than that for a criminal warrant, and the procedure is relatively easy and straightforward. The inspectors need only show that a specific business has been chosen for inspection on the basis of a general administrative plan. Even without the need to show criminal probable cause, however, the requirement for an administrative warrant assures the interposition of a neutral officer to establish that the inspection is reasonable and properly authorized,[lb]

Administrative warrants can only be used for searches that are conducted primarily on the basis of *neutral and objective criteria* rather than on suspicion of a violation. For example, when administrative searches are used to enforce building codes, the choice of which building to inspect must be based on its age, the date of the last inspection, or whether the structure has exterior fire escapes or a sprinkler system. If the principal intent of the inspection is to find evidence of a suspected violation, a criminal search warrant is required.

Critics of the administrative-warrant solution argue that routine CWC inspections do not fully meet the constitutional criteria for administrative searches, since they are based only partly on neutral and objective criteria. Routine inspections will occur with *some* regularity but not as much as required for administrative searches under domestic regulatory schemes, and the choice of which facilities to inspect will be influenced by the ease with which they could be misused to produce chemical weapons. As a result, Tanzman contends that U.S. courts may find the process of issuing administrative warrants for routine inspections too pro forma and not sufficiently protective of Fourth Amendment rights.

Advocates of the administrative-warrant approach respond that routine inspections meet the broad constitutional standards for issuing administrative warrants and that the courts will not hold an international treaty to the same strict legal standard as a domestic regulation. These analysts also point out that routine inspections are not based on suspicion but are simply intended to verify that a plant operations are consistent with its declared activities. Moreover, the advance-notice requirement makes the inspections less arbitrary.

In sum, legal analysis suggests that the CWC verification regime can and should respect constitutionally protected rights while fulfilling treaty obligations. The debate over the best way to ensure that routine inspections comply with the Fourth Amendment has not yet been resolved, however, and will have to be addressed by the government attorneys drafting the CWC implementing legislation.

CHALLENGE INSPECTIONS

Under the challenge-inspection provisions of the CWC, a State Party can request an international inspection and have it carried out at any location or facility (public or private) on the

14 *Marshall* v. *Barlow's, Inc.,* 436 U.S. 307, 314 (1978).

15 Edward A. Tanzman and Barry Kellman, *Harmonizing the Chemical Weapons Corn' ention With the United States Constitution,* technical report No, DNA-TR-91-216 (Alexandria, VA: Defense Nuclear Agency, Apr. 1992), p, 46.

16 Congressional Research Service, *The Constitution of the United States of America: Analysis and Interpretation* (Washington, DC: U.S. Government Printing Office, 1987), p. 1167.

territory of another participating country that is suspected of a treaty violation (e.g., clandestine production or stockpiling of CW agents). The CWC also states that if the inspected State Party provides less than fill access to the facility, activities, or information in question, it must make ''every reasonable effort' to provide alternative means to clarify the possible noncompliance concern that generated the challenge request. 17

Challenge inspections are by definition based on suspicion because they can only be triggered when the requesting State Party has ''questions concerning possible noncompliance with the provisions of this Convention. ''[18] Indeed, the general nature of the noncompliance concern must be included in the inspection request. Since the purpose of the inspection is to find evidence of a suspected treaty violation, more is involved than simply assessing compliance with a regulatory scheme. Challenge inspections are therefore inherently discriminatory and cannot justify the use of an administrative warrant. Instead, if a challenged facility refuses to grant access to international inspectors, U.S. officials will need to obtain a search warrant that meets the criteria for *criminal* probable cause, which are stricter.

There are good reasons, of course, why it would be undesirable in most cases to require a criminal search warrant for challenge inspections. First, the need to establish probable cause for an inspection could compel the challenging party to disclose sensitive intelligence information it would not want to release. Second, obtaining a warrant could impose an unacceptable delay on the inspection, whose effectiveness derives largely from being carried out on relatively short notice .19 Nevertheless, search warrants will probably be sought where the challenged facility does not voluntarily provide access.

While plant officials may not use constitutional privacy rights as an excuse to evade their treaty obligations, they may refuse on legitimate Fourth Amendment grounds to allow the inspectors to enter arbitrarily into private homes or businesses to search for contraband or telltale evidence.[2] Because the CWC states that challenge inspections must respect constitutionally protected privacy rights, the United States cannot be held in violation of the treaty if, after a search warrant has been denied on constitutional grounds, the owners of the challenged plant continue to block access to international inspecters. In nearly all cases, however, the CWC should satisfy the chemical industry's constitutional concerns by allowing States Parties to negotiate the extent and nature of intrusiveness before a challenge inspection begins.

PENAL SANCTIONS

The CWC requires States Parties to enact legislation making violations of the treaty a crime under domestic law, and imposing penal sanctions on individuals or corporations that engage in such activities. In addition, the treaty allows inspectors to ask questions of plant personnel; although answers are not compelled, there would be pressure to respond. Some legal scholars believe that these provisions may conflict with the Fifth Amendment, which protects individuals from being forced to give self-incriminating testimony. For example, if evidence garnered during an inspection could lead to the bringing of criminal charges against the plant manager for violating the CWC or, more likely, some other domestic statute, forcing the manager to answer

---

17 Appendix I, Annex 2, paragraph 43, *Draft Chemical Weapons Convention,* op. *cit.,* p. 160.

18 ''Procedures for Challenge Inspections, '' Article IX, paragraph 8, *Draft Chemical Weapons Convention,* op. cit., p. 37.

19 Edward A. Tanzman and Barry Kellman, ''Legal Implications of the Multilateral Chemical Weapons Convention: Integrating International Security With the Constitution" *International Law and Politics, vol. 22,* 1990, p. 498.

20 David A. Koplow, *"Arms* Control Inspection: Constitutional Restrictions on Treaty Verification in the United States, " New York *University Law Review,* vol. 66, May 1988, p. 355.

domestic statute, forcing the manager to answer questions might violate his or her Fifth Amendment protection against self-incrimination. Thus, for the treaty to comply with the Constitution, a plant manager questioned by international inspectors must retain the right not to respond to questions in a way that might be incriminating.

A related issue is whether evidence obtained from a CWC inspection of the violation of an unrelated statute, such as an environmental or worker-safety law, could be used in a subsequent criminal prosecution against the plant owner.[21] In legal parlance, this issue is known as the ''fruit of the poisonous tree" problem: is evidence obtained from a potentially tainted source admissible in a criminal prosecution? Some legal scholars contend that the transfer of information from CWC inspectors to U.S. law enforcement officials should be strictly regulated so that treaty inspections do not become criminal searches in the guise of administrative inspections. This constitutional problem can be avoided if the implementing legislation states that evidence gathered during CWC inspections may only be used in prosecutions directly related to the treaty. Such "use immunity" means that no evidence obtained during a CWC inspection could be used against the plant manager if he were subsequently prosecuted for another offense on the basis of independent evidence.

Promising use immunity for evidence of crimes unrelated to the CWC would encourage cooperation with inspections by companies that are in full compliance with the treaty but fear being accused of violations of domestic environmental or worker-safety laws.[22] Advocates of this approach also contend that U.S. courts would be more likely to uphold the constitutionality of warrantless CWC inspections if evidence of unrelated criminal conduct discovered during an inspection could not be used to prosecute plant personnel.[23]

Since reasonably effective mechanisms for enforcing U.S. domestic environmental and worker-safety laws already exist, government authorities should not have to rely on CWC inspections for this purpose. Nevertheless, some legal analysts argue that violators of domestic laws should not be able to exploit use immunity under the CWC as a shield for criminal activity, and that if U.S. Government officials escorting international inspectors happen to observe evidence of violations of domestic laws, that evidence should be admissable in court. The issue of use immunity will have to be resolved in the implementing legislation.

Congress will also have to decide whether penal sanctions should be invoked only for violations of the fundamental ban on acquisition of chemical weapons, or whether they should also apply to mere technical breaches of the reporting obligations. A related issue is whether the penal sanctions required by the CWC should be criminal (including prison sentences), civil (fines or other administrative penalties such as the loss of a license), or some combination of the two.

COMPLIANCE WITH ENVIRONMENTAL AND SAFETY LAWS

Onsite inspections under the CWC will have to comply with U.S. Federal, State, and local environmental regulations, raising issues that may have to be addressed in the implementing legislation. Some analysts have raised the concern that if toxic chemicals are involved in the production of a commercial product, samples obtained from the production line might have to be considered hazardous waste. As a result, the transport and disposal of such samples would have to follow regulations pursuant to the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act (RCRA), and

---

21 Tanzman and Kellman, *Harmonizing the Chemical Weapons Convention,* op. **cit., p. 61.**

22 Tanzman and Kellman, ''Legal triplications of the Multilateral Chemical Weapons Convention, ' op. cit., p. 517.

23 Tanzman and Kellman, *Harmonizing the Chemical Weapons Convention,* op. cit., p. **62.**

other laws. Plant owners would also have to include accidental releases of toxic chemicals during inspections in their Emergency Response Plans.

The samples taken by the inspection teams are expected to be relatively small in volume (in the hundreds of grams), minimizing the problem of disposing of them according to established procedures. Nevertheless, since State environmental regulations can be more (but not less) stringent than Federal regulations and thus vary in severity, some legal scholars have suggested that the CWC implementing legislation should preempt State environmental laws by establishing a uniform Federal standard for the disposal of toxic samples.[24] Environmental groups such as Greenpeace oppose this proposal, however, on the grounds that applying a single Federal standard to the disposal of samples would set a bad precedent. Not only would it undermine the States' authority to regulate other hazardous wastes unrelated to the treaty, but it could weaken their ability to ensure that the destruction of chemical-weapon stockpiles meets adequate public-health standards.[25]

LIABILITY ISSUES

U.S. chemical companies are concerned about being held liable for damages should members of a CWC inspection team be injured or killed by exposure to plant hazards, or should inspections result in the accidental release of hazardous chemicals that damage plant workers or the surrounding environment. In order to ensure the safety of the inspectors, the OPCW will be required to certify and issue protective equipment such as gas masks and flashlights. The precise technical parameters of these items are to be negotiated by the PrepCom, giving the United States an opportunity to make sure this equipment meets the necessary safety standards.

Nevertheless, U.S. companies are currently responsible for any serious injury suffered inside their facilities; to limit their liability, they require all visitors to sign a waiver freeing the company from future litigation. Since the CWC does not address the liability issue, chemical companies want legally binding guarantees from the U.S. Government that they cannot be sued or held responsible for physical injury, including death, that occurs during an inspection.[26] Such a waiver might be provided in the implementing legislation, the facility agreement, or both. Another solution might be for the OPCW to set up an insurance find to cover injury or death suffered by inspectors in the line of duty and to waive any claim on the inspected facilities. The PrepCom and the implementing legislation will also need to assign liability for accidental damage to a chemical facility caused by international inspectors.

EXPORT CONTROLS

Another task for the implementing legislation is to establish punishments for U.S. companies that violate the trade restrictions on dud-use chemicals mandated by the CWC, At the same time, the U.S. chemical industry wants the implementing legislation to remove any discrepancies between the multilateral export controls imposed by the CWC and unilateral U.S. controls on chemical precursors and equipment, both in terms of the items controlled and the proscribed destinations, At present, U.S. companies must obtain an export license to sell dual-use chemicals and equipment to states that are not members of the Australia Group, a forum of chemical-exporting countries that since 1985 has coordinated national export controls in this area. U.S. chemical exports are also subject to unilateral export-control regimes such as the Enhanced Proliferation Control Initiative (EPCI) and the

---

24 Prof. Barry Kellman, DePaul University College of Law (Chicago), presentation on 'Implementing Legislation of the Chemical Weapons Convention" sponsored by The Committee for National Security, Washington, DC, Apr. 16, 1993.

25 Sebia Hawkins, Greenpeace, personal communication, June 7, 1993.

26 Barry Schneider, ''The Russians Are Coming, " *Across the Board,* vol. **28, No. 3,** March 1991, p. 27.

Iran-Iraq Arms Nonproliferation Act. Although the CWC mandates export controls only on specified chemicals, the U.S. unilateral controls also cover chemical production equipment, technical data, and licensed process technologies.

The U.S. Government defends unilateral controls on the grounds that they slow the spread of chemical weapons by making their acquisition more difficult and costly. But industry representatives complain that unilateral controls increase the time, cost, and uncertainty associated with foreign trade and reduce the ability of U.S. firms to compete in foreign markets. According to a statement by the Dow Chemical Co., U.S. unilateral export controls restrict the company's efforts to supply its customers and subsidiaries efficiently and to share product, process, and production technology and innovations intra-company.[27]

After the CWC enters into force, the Australia Group countries are likely to liberalize their export controls on "dual-use' chemical precursors and equipment for countries that sign, ratify, and demonstrate full compliance with the treaty, while tightening controls on chemical trade with non-Parties.[28] Such a liberalization of U.S. chemical export controls would benefit U.S. industry. For example, if a country that is currently subject to stringent export controls ratifies the CWC and remains in full compliance with the treaty, then one could make the case that U.S. companies should have an easier time obtaining export licenses to sell that country precursor chemicals and technologies.[29] Tightened trade restrictions with likely non-Parties (e.g., Iraq, Libya, Syria, and North Korea) would not create much of a problem for U.S. firms because these states are not major export destinations, at least for treaty-controlled chemicals. At the same time, liberalized trade with States Parties would eliminate many of the unilateral constraints that have put U.S. companies at a disadvantage with respect to their foreign competitors.

An opportune time to reform U.S. export controls might be either during the drafting of the CWC implementing legislation or the reauthorization of the Export Administration Act. Given the likely delay in fully implementing the inspection regime, however, the U.S. Government may be reluctant to relax unilateral export controls until certain states of proliferation concern that have signed and ratified the CWC have clearly demonstrated their compliance. For this reason, restrictive chemical export controls-and, presumably, their impact on U.S. industry--+ould well continue for at least the next decade.

---

27 Dow Chemical CO., Government Relations Department, "Issue Profile: Chemical Weapons, " 3-page unpublished document, Feb. 12, 1993, p. 1.

28 Under the CWC, controls on export of Schedule 2 chemicals will begin 3 years after the treaty enters into force; until then, end-use certificates will be required certifying that the chemicals will be used strictly for civilian purposes. Controls on export of Schedule 3 chemicals may also be implemented 5 years after entry-into-force, although a final decision has not yet been made.

29 Dan Charles, "Chemical Weapons Ban: Now for the Hard Work, " New Scientist, vol. 137. No. 1857, Jan. 23, 1993, p. 7.

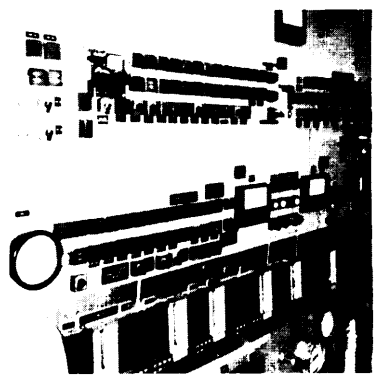
Protection of Proprietary Information

5

U.S. industry's primary concern about CWC inspections is the potential loss of ''confidential business information' (CBI), a general term covering trade secrets and other types of proprietary data. A trade secret is a commercially valuable plan, process, device, or formula, such as the chemical structure of a new pesticide or the recipe for Coca-Cola. CBI also applies to information on a company's costs, profits, suppliers, customers, manufacturing capacity, production schedules, and marketing plans. (See table 5-l.)

Protection of CBI is particularly critical in the chemical industry because U.S. chemical manufacturers face a highly competitive business environment both at home and abroad in which proprietary knowledge related to chemical products and processes is vital to a firm's success. Since basic synthesis methods have been published for most commodity chemicals, a company's competitive edge in the marketplace is often based on know-how or production techniques that provide small but significant margins of efficiency, yield, and cost, or result in a superior product that is purer, more attractive, or has a longer shelf-life. According to one analysis:

> In many cases, it is a small difference in expertise which gives one company the competitive edge over its competition—small differences which can ''make or break' a company's balance sheet. [1]



Because proprietary information is often the basis for a chemical company's competitive edge, both nationally and

[1] L. Zeftel, P. Weinberg and J. Schroy, ''Approaches to the Use of Instruments in Monitoring the Production of Chemical Weapons and Precursor Chemicals, '' in S. J. Lundin, cd., *Non-Production by Industry of Chemical-Warfare Agents: Technical Verification Under a Chemical Weapons Convention, SIPRI Chemical & Biological Warfare Studies No. 9 (New* York, NY: Oxford University Press, 1988), p. 147.

Table 5-I-Examples of Confidential Business Information

Manufacturing and process Information
• The formula of a new drug or specialty chemical
• A synthetic route that requires the fewest steps or the cheapest raw materials
• The form, source, composition, and purity of raw materials or solvents
• A new catalyst that improves the selectivity, efficiency, or yield of a reaction
• The precise order and timing with which chemicals are fed into a reactor
• Subtle changes in pressure or temperature at key steps in a process
• Isolation methods that give the highest yields consistent with good recycling of solvents and reagents
Business Information
• Expansion and marketing plans
. Raw materials and suppliers
• Manufacturing costs
• Prices and sales figures
. Names of technical personnel working on a particular project
• Customer lists

SOURCE: Office of Technology Assessment, 1993.

internationally, the theft of trade secrets can result in a major loss of revenue and investment—even for a large company. Industrial espionage can enable a competitor to obtain at minimal cost information that its originator acquired only through an enormous investment of time and money, thereby erasing the competitive advantage of that investment in R&D. For this reason, the theft of trade secrets ''can cripple even a giant company, and can be fatal to a smaller enterprise. ' This threat to proprietary information is probably greatest for U.S. chemical companies, which currently lead the world in many innovative processes. In contrast, chemical manufactureers in many other countries use older generations of chemical processes that are more widely known, so that there is less of value to "steal."

The value of proprietary information also depends on the industrial sector. Highly competitive, leading-edge industries such as speciality chemicals, biotechnology, and pharmaceuticals invest large amounts in research and development and must protect the resulting technical knowledge in order to recoup their investment and return a profit. Development and testing of a new pesticide takes an average of 10 years and $25 million.[3] Innovation in the pharmaceutical industry is even costlier. Each new drug that reached the market in the 1980s required an average of 12 years of research, development, and testing, and an after-tax investment (compounded to its value on the day of market approval) of roughly $194 million in 1990 dollars.[4] Yet although trade secrets are most critical to specialty-chemical producers, even commodity-chemical manufacturers using mature technologies can suffer serious economic losses from stolen trade secrets.[5]

The U.S. chemical industry has long been a major target of industrial espionage, which has been termed a serious threat to the nation's economic competitiveness.[6] For example, Rohm and Haas, a Philadelphia chemical manufacturer, spent more than 5 years investigating the theft of a secret formula for making latex paints. This search ultimately led to an Australian competitor, which was duplicating the Rohm and Haas product ''molecule for molecule, ' according to

[2] Kyle B. Olson, "The U.S. Chemical Industry Can Live With A chemical Weapons Convention%" *Arms Control Today*, vol. 19, No. 9, November 1989, p. 21.

[3] Tom Mauro, "When the Government Gives Away Companies' Trade Secrets, " *Nation's Business, Nov.* 1983, pp. 62-64.

[4] U.S. Congress, Office of Technology Assessment *Pharmaceutical R&D: Costs, Risks, and Rewards, OTA-H-522* (Washington DC: U.S. Government Printing Office, February 1993), p.1.

[5] J. Aroesty, K.A. Wolf, and E.C. River, *Domestic Implementation of a Chemical Weapons Treaty, report No.* R-3745-ACQ *(Santa* Monica, CA: RAND Corp., October 1989), p. *73.*

[6] William Carley, "As Cold War Fades, Some Nations' Spies Seek Industrial Secrets, *Wall Street Journal,* June 17, 1991, pp. Al, As.

[7] Orr Kelly, "Where There's a Profit, There's a Spy, " *U.S. News and World Report,* May 9, 1983, pp. 16-17.

company officials.[7] In addition to corporate spying, industrial espionage is reportedly conducted by the intelligence agencies of certain foreign governments, including U.S. political and military allies. With respect to the chemical industry, one analyst writes:

> U.S.-designed chemicals are counterfeited in large quantities abroad, cutting into three billion to six billion dollars in sales annually. German, French, South Korean, Japanese, Israeli, and Taiwanese chemical companies, at times in cooperation with their government, work hard to procure information on the American chernical industry and on each other. Free-lance consultants are paid hundreds of thousands of dollars a year to track technological developments in this U.S. industry. The methods of collecting information include both the complex and the mundane. A surprisingly common method is flying over chemical plants, particularly during their construction or renovatio.[8]

A nationwide survey of U.S. companies conducted in 1992 under the auspices of the American Society for Industrial Security's Standing Committee on Safeguarding Proprietary Information offers more detailed insights into the nature of the industrial espionage problem.[9] Out of a pool of 5,000 companies that were sent the questionnaire, 246 companies responded anonymously. These companies were from a wide variety of industries, including the chemical industry. Compared to an earlier survey conducted in 1985, the results of the 1992 survey showed a large rise in both the number of incidents involving the loss of proprietary information (an increase of 280 percent) and foreign involvement in these incidents (an increase of 360 percent).

Analysis of the data provided by the 11 respondents from the U.S. chemical industry yielded the following findings:[10]

- Eight of the 11 companies (73 percent) reported attempts to misappropriate proprietary business information, including technology and business plans, compared with 49 percent of all survey respondents.
- The 8 affected companies reported a total of 21 incidents, 6 of which cost the companies $86.25 million. (Costs were not provided for the other incidents, nor was the methodology by which the specified costs were calculated.)
- Customer lists, pricing data, and manufacturing process information were the types of proprietary information stolen most often.
- Current or former company employees were involved in 37 percent of the chemical-industry incidents, compared with 58 percent for the survey as a whole. Foreign firms or governments were involved in 35 percent of the chemical-industry incidents.
- The methods used to steal information from the chemical industry were varied and much more high-tech than the average industry. Approximately 24 percent of the incidents of communications intercept and electronic surveillance reported in the overall survey took place in the chemical industry.

The findings of this survey may be questioned on methodological grounds, since those companies affected by industrial espionage would arguably be more likely to return the questionnaire than others. Nevertheless, taken at face value, the data suggest that the chemical industry is one of the top five industries targeted by foreign companies and governments, and that the problem of industrial espionage is growing.

---

[8] Peter Schweizer, *Friendly Spies: How Americats Allies Are Using Economic Espionage To Steal Our Secrets (New* York, NY: Atlantic Monthly Press, 1993), p. 256.

[9] Richard J. Heffernan and Dan T. Swartwood, "Trends in Competitive Intelligence, " *Security Management,* January 1993, pp. 70-73.

[10] Dan T. Swartwood, President, Strategic Corporate Safeguarding, Inc. (Severna Park, MD), ' 'Proprietary and Trade Secret Theft in the U.S. Chemical Industry, " unpublished manuscript, May 1993.

PATENT AND TRADE-SECRET LAW

One way to safeguard proprietary technology is to file for patent protection. In exchange for a temporary monopoly that prevents others from producing, using, or selling an invention for a period of 17 years, the inventor makes a detailed description publicly available by filing it with the U.S. Patent and Trademark Office.[11] Much proprietary information in the chemical industry remains unpatented, however, for three reasons:

1. *Under U.S. law, a patent can be obtained only for a process, machine, product, or composition of matter that is novel, nonobvious, and useful,* Industrial know-how may be nonpatentable because it involves an improvement on a known process rather than a true innovation.
2. *Access to the information contained in a patent might help a rival firm to develop a similar but competing product or process. Since* patents require disclosures in applications and grants, companies may wish to protect sensitive information through secrecy instead.
3. *U.S. chemical companies often complain that enforcing a patent can be difficult or impossible because there are inadequate safeguards against patent infringement by unscrupulous foreign competitors.* Indeed, many countries either do not protect intellectual property rights or do not enforce the laws they do have.[12] As a result, many U.S. companies view published patents as ''a license to steal' and prefer to leave certain types of intellectual property unpatented and to protect them through secrecy.

U.S. State laws protect a company's trade secrets against unauthorized use or disclosure. According to the Uniform Trade Secrets Act, adopted by about half of the U.S. States, a trade secret may be any kind of information that requires at least some minimal investment or expense to generate and gives the holder an actual or potential commercial advantage because it is not widely known to competitors or to the public. Unlike a patent, ownership of a trade secret provides no legal protection against its independent discovery by others; the chief advantage is that a trade secret does not require any public disclosure of information. On the contrary, the law states that the holder of a trade secret must take concrete steps to preserve its confidentiality .13

Given the importance of proprietary business information for the U.S. chemical industry, company representatives are worried that intrusive declarations and inspections could allow trade secrets to fall into the hands of foreign competitors, adversely affecting the U.S. industry's competitiveness in both domestic and international markets. The most sensitive proprietary information concerns production process technologies and marketing data, such as customer and price lists. To recover damages in court for the theft of CBI, a company must prove that the information was stolen. Yet in many cases, the first indication that trade secrets have been compromised is when a foreign competitor starts selling a similar product

11 Patent protection applies to the idea underlying an invention, rather than any specific expression Of it. The patented invention may be licensed, publically disclosed, or distributed during the period of protection without altering its legal status. A patent also protects against independent discovery: in suing for patent infringement, it is not necessary to prove that a competitor deliberately copied the invention. See U.S. Congress, Office of Technology Assessment, *Finding* a *Balance: Computer Software, Intellectual Property, and the Challenge of Technological Change, OTA-TCT-527* (Washington DC: U.S. Government Printing Office, May 1992), p. 12.

12 U.S. companies do have one recourse in such cases. Under the Omnibus Trade and Competitiveness Act of 1988, the U.S. Trade Representative (USTR) is authorized to identify, investigate, and retaliate against foreign countries that deny adequate and effective protection of intellectual property rights. Any interested party may file a petition with the USTR requesting that such an action be taken. This measure is known as ''Special' 301, since it is an expansion of section 301 of the Trade Act of 1974. Even so, there is no guarantee that such an action will be effective.

13 U.S. Congress, Office of Technology Assessment, *Finding a Balance,* op. cit., pp. 78-82.

at a lower price that does not reflect the costs of its own investment in research and development.

Perhaps the greatest threat of loss of proprietary data would be to small chemical companies that concentrate on particular markets or technology niches and whose business depends on the exclusive possession of highly specialized know-how. For example, some custom-chemical producers are expert in a single process (e.g., phosgenation, bromination, or sulfonation) while others have concentrated on serving a particular market (e.g., pharmaceuticals, pesticides, or photographic chemicals).[14] A specialty-chemical company whose economic survival depends on a cost or quality advantage in one type of reaction or product would be particularly vulnerable to industrial espionage carried out by a CWC inspector linked to a foreign company. Even visual inspection alone might reveal a unique process configuration that could be of great value to a competitor.

PROPRIETARY DATA AND REPORTING

Environmental laws that affect the chemical industry, such as the Toxic Substances Control Act (TSCA) and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), include specific provisions to protect trade secrets and other proprietary data reported to regulatory authorities. For example, Section 10 of FIFRA permits a manufacturer to mark portions of submitted data as confidential and imposes criminal penalties on Federal employees who knowingly disclose such information.[15] In response to these laws, U.S. domestic regulatory agencies such as EPA and OSHA have developed complex and often legalistic procedures for preventing the disclosure of such information, and they generally do an effective job.[16]

Despite these controls, however, there appears to be a certain amount of "leakage" of proprietary information from U.S. regulatory agencies. Indeed, a recent study commissioned by the Chemical Manufacturers Association suggests that even if individual pieces of data do not warrant trade-secret protection, a trained engineer could combine them with other available information to "reverse-engineer' a company's technological secrets. The study also found that many chemical companies obtain their competitors' compliance reports under false pretenses by hiring consulting or law firms to serve as anonymous intermediaries.[17] Given this experience, the Chemical Manufacturers Association is concerned that proprietary information submitted to the U.S. Government for purposes of CWC verification might not be adequately protected from deliberate or inadvertent disclosure. To address this problem, the CMA seeks to minimize the quantity and sensitivity of information that must be included in treaty-mandated declarations and reports. For example, industry would prefer to declare production of scheduled chemicals in broad ranges rather than precise figures.

The chemical industry is also concerned that the Freedom of Information Act (FOIA), which allows individuals and companies to request the declassification and release of official U.S. Government documents, might be interpreted to provide broader access to proprietary information submitted to the National Authority under the CWC. Particularly worrisome to industry is the fact that foreigners have the same rights under the

---

14 Stephen C. Stinson, "Custom Chemicals, " *Chemical and Engineering News,* vol. 71, No. 6, Feb. 8, 1993, p. 35.

15 Edward A. Tanzman and Barry Kellman, "Legal Implications of the Multilateral chemical Weapons Convention: Integrating International Security With the Constitution " *International Law and Politics,* vol. *22,* 1990, pp. 515-516.

16 Kyle B. Olson, "Domestic Regulation of the U.S. Chemical Industry and Its Application to a Chemical Weapons Ban," in Thomas Stock and Ronald Sutherland, eds., *National Implementation of the Future Chemical Weapons Convention, SIPRI Chemical & Biological Warfare Studies No. 11* (Oxford, England: Oxford University Press, 1990), p. 106.

17 SRI International, *Analysis of Impact of U.S. Federal and State Reporting Requirements on Sensitive and proprietary Company Information: Final Report* (Menlo Park, CA: SRI International, Project 3307, July 1992), p. 4.

FOIA as do U.S. citizens. Some analysts allege that foreign corporations, often working through U.S. consulting and law firms, systematically file FOIA requests to gather information on U.S. corporate secrets.[18]

U.S. Federal courts have ruled that proprietary data qualifies for withholding under the FOIA if government disclosure would be likely to harm the competitive position of the person or corporation that submitted the information. Many agencies notify a submitter of business information that disclosure is being considered; the submitter then has an opportunity to convince the agency that the information qualifies for withholding. If the submitter and the government disagree on whether the information is confidential, the submitter may file a ''reverse' FOIA lawsuit to block disclosure under the law.[19] Nevertheless, the U.S. Court of Appeals for the District of Columbia has ruled that certain corporate information provided to the U.S. Government and designated confidential may not be withheld from disclosure under the FOIA if it does not meet the definition of a "trade secret. "[20] The chemical industry believes that this interpretation is too narrow and wants all information that companies consider confidential to be exempted from disclosure.[21]

To protect proprietary data submitted for CWC verification purposes, the implementing legislation might include strict rules against unauthorized disclosure. A useful model that already exists in U.S. law is the Chemical Diversion and Trafficking Act (CDTA) of 1988, which is designed to help combat the diversion of legitimate chemical shipments to illegal drug manufacturing.[22] The CDTA requires chemical manufacturers and distributors to file reports on transactions involving precursor chemicals and equipment used in the manufacture of illicit drugs, and gives the U.S. Drug Enforcement Administration (DEA) the authority to monitor potential diversions of chemical shipments. According to the statute, the Attorney General must take 'such action as maybe necessary' to prevent the unauthorized disclosure of information contained in the reports, and to "issue guidelines that limit, to the maximum extent feasible, the disclosure of proprietary business information. . . .' A company that suffers damages from the unauthorized disclosure of information may bring a civil action against the violator for appropriate relief, although not against DEA personnel.[23]

PROPRIETARY DATA AND INSPECTIONS

The U.S. chemical industry has been inspected for years, but only by domestic Federal and State agencies.[24] CWC inspections, in contrast, will be carried out by multinational teams under the auspices of an international organization that is

---

18 Schweizer, *Friendly Spies,* op. cit., p. 270.

19 U.S. House, Committee On Government Operations, *A Citizen's Guide on Using the Freedom of Information Act and the Privacy Act of Z974 to Request Government Records,* 103rd Congress, 1st Session, House Report 103-104 (Washington, DC: U.S. Government Printing Office, 1993), p. 13.

20 *National Parks and Conservation Association v. Rogers, 498* F.2d 765 (D.C. Cir. 1974), *and National Parks and Conservation Association v. Kleppe, 547* F.2d 673 (D.C. Cir. 1976).

21 Michael P. Walls, ' 'The private Sector and Chemical Disarmament,'' in Brad Roberts, cd., *The Chemical Weapons Convention: Implementation Issues, Significant Issues Series,* vol. XIV, No. 13 (Washington, DC: Center for Strategic and International Studies, 1992), p. 46.

22 Title VI, Subtitle A, Public Law No. 100690, *Anti-Drug Abuse Amendments Act of 1988,* 21 U.S.C. para 830 *et seq.*

23 P.L.100-690, Sec. 6052, in *Laws of 100th Congress—2nd Sess.,* p. 102 STAT.4314.

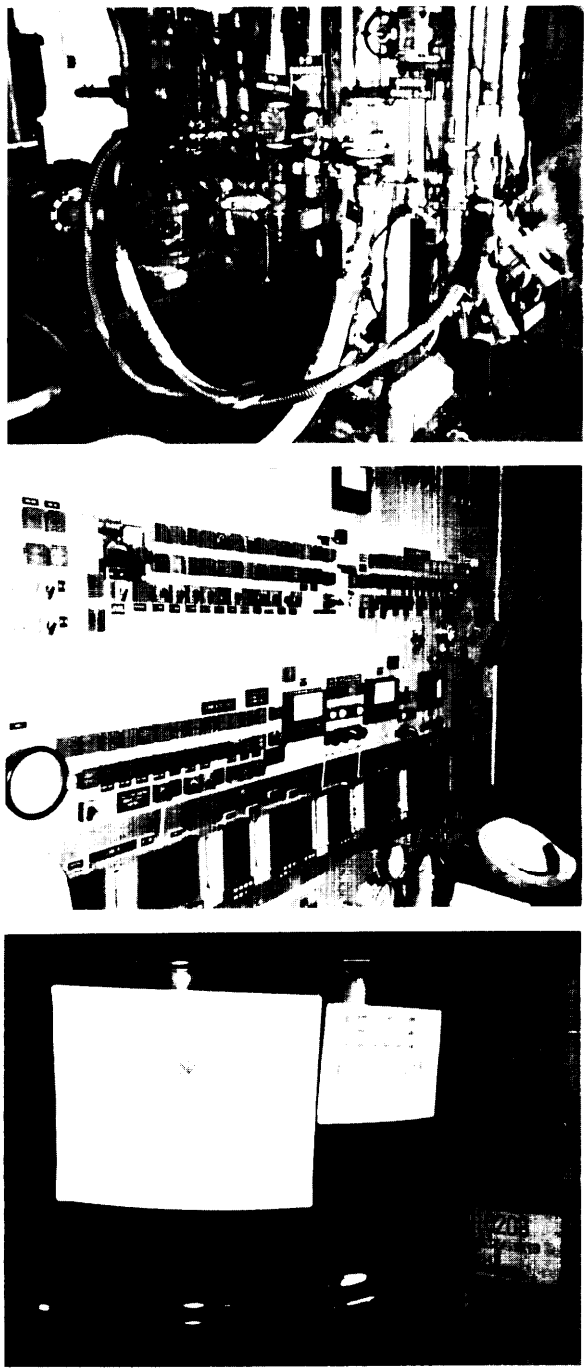
24 The one exception t. this rule Concerns a few U.S. pharmaceutical companies that produce sterile drugs for injection or ophthalmic use for sale in the United Kingdom. These companies must register with the British Medicines Control Agency, which periodically inspects the U.S. plants. The inspected facilities are given a notice of between 1 and 2 months, and must bear the costs of the inspection. In order to protect proprietary data, the Medicines Control Agency must obtain the U.S. company's permission before releasing any information.

not accountable to U.S. law, raising concerns about the potential loss of trade secrets. According to industry analysts, proprietary data might be compromised during an onsite inspection of a chemical plant in the following ways:

- manifests and container labels could disclose the nature and purity of feedstock materials ,and the identity of key suppliers;
- instrument panels might reveal the precise temperature and pressure conditions for a specific production process;
- chemical analysis of residues taken from a valve or seal on the production line could disclose proprietary information about other products made with the same equipment;
- access to piping and instrumentation diagrams, combined with visual information, could enable a trained chemical engineer to deduce certain flow and process parameters; and
- audits of plant records, ranging from cus - tomer lists to process documentation, could reveal a variety of sensitive information,

How serious is the threat of industrial espionage under the cover of a CWC onsite inspection? Although the innards of a chemical plant are bewildering to a neophyte, a skilled chemical engineer might be able to deduce a fair amount of valuable information from the configuration of the plant. According to an industrial-security expert, ‘ ‘There’s a lot that can be learned about a plant from an onsite inspection, provided that you know exactly what you’re looking for. "[25] This expert claims that an international inspector intent on spying would come equipped with extensive knowledge of the target facility and a laundry-list of specific questions to be answered.

The third U.S. National Trial Inspection, held at Monsanto Agricultural Co. Luling, LA plant, tried to assess the potential for industrial espionage during a CWC inspection. The team that carried out the trial inspection included a Mon-



SIGMUND R. ECKHAUS

Potential sources of proprietary information that might be divulged during onsite ins piping configurations (top), instrument panels (middle), and container labels (bottom).

[25] Telephone interview with Henry Clements, vice president, Technology Strategic Planning, Inc. (Stuart, FL), May 2 6, 1993.

santo chemical engineer, unfamiliar with the operation of the Louisiana plant, who was asked to determine how much useful proprietary data he could collect during the course of the inspection. By visually examining the plant and auditing plant records, he was able to deduce enough information about the production process to save a potential competitor signficant development time and money. This finding maybe a worst-case assessment, however, since the Monsanto engineer was allowed to concentrate on his "spying' assignment for two and a half days, did not perform regular inspection duties, and was not as closely supervised as the other team members.[26]

In practice, it would not be easy for a company or a foreign government to infiltrate a CWC inspection team for purposes of industrial espionage. To steal trade secrets from a particular plant, an unethical inspector with links to a foreign company or government would have to be assigned to the team that visited the facility of interest. He would also have to know precisely what type of information to look for and where in the plant to find it. Moreover, his access to the plant site would be governed by the agreed parameters of the inspection. Given the technical difficulties and political risks involved in suborning an international inspector, companies or foreign governments would probably favor less risky methods of gaining access to trade secrets. Hiring, bribing, or blackmailing a current or former company employee would almost certainly be easier and more cost-effective.

Another industrial espionage scenario would be for an individual CWC inspector to come across valuable proprietary information in the course of an inspection that he might then be tempted to sell to his own former employer or some other interested company. Industry officials also worry that even if the international inspectors have no intention of disclosing trade secrets, they might do so inadvertently. The inspectors will inevitably have access to highly sensitive proprietary information in the course of their work, which they will tend to discuss informally among themselves. This exchange of information---even if innocent in itself-could result in inadvertent leaks.

It seems likely that the extent to which CWC inspections could result in significant losses of proprietary information will depend on a number of situational factors, including:

1. how frequently a site is inspected (the treaty permits a maximum of two routine inspections per year of commercial plants);
2. the amount of access provided to the site and to related documentation;
3. the inspectors' prior knowledge, experience, and intent to engage in industrial espionage;
4. the existence of a private company or foreign government willing to pay handsomely for misappropriated information; and
5. the relative cost of obtaining information from a CWC inspection compared with alternate means, such as bribing a current or former employee.

6. any event, one should keep the U.S. chemical industry's concerns over proprietary information in perspective. Given that the chemical industry has long been targeted for industrial espionage, it is likely that the CWC's reporting and inspection requirements will only marginally increase the industry's exposure to foreign spying. By improving routine security practices, chemical manufacturers should be able to reduce losses of proprietary information from *all sources*, only a fraction of which will be directly attributable to CWC implementation.

PREPARING FOR INSPECTIONS

Although the threat of industrial espionage will exist during CWC inspections, it can be managed

[26] Conference on Disarmament, ''Report on the Third United States Trial Inspection Exercise, " document No. CD/1 100, Aug. 14, 1991, p. 20.

through advance preparation and planning. An respected facility can limit the ability of inspectors to collect proprietary data through a good understanding of potential collection techniques, effective assessment procedures. and well-trained personnel and escorts.

The CWC states that '' [i]n conducting verification activities, the Technical Secretariat shall avoid undue intrusion into the State Party's chemical activities for purposes not prohibited under this Convention. ''[27] Clearly, inspectors will not need to know the details of a proprietary process to determine that it is not involved in the production of chemical weapons. The treaty also entitles companies to take active measures to minimize any loss of proprietary information associated with CWC inspections. Special provisions for this purpose were built into the treaty at industry's request. For example, the inspected facility may request that all sample analyses be carried out onsite and limited to determining the presence or absence of treaty-controlled chemicals.

In preparing for inspections, it is essential to assess which items need to be protected and to follow up this assessment with a concrete plan of action. A chemical plant preparing for a CWC inspection might undertake some or all of the following measures:

1. inventory plant equipment and processes and identify which activities are particularly sensitive and vulnerable to observation;
2. determine which aspects of a critical process or item of equipment must be protected, such as its size, shape, or very existence;
3. prepare an inspection route through the facility to keep inspectors out of areas containing activities unrelated to the treaty;
4. train a core group of senior plant managers to escort the inspectors;
5. inform plant personnel about which parts of the facility will be subject to inspection, how to make their work areas secure, and how to interact with the inspectors to prevent them from damaging the facility and to answer their questions without revealing sensitive information;
6. shield proprietary equipment by installing shrouds, boxes, or screens (although shrouding control panels and other equipment could interfere with production to some extent);
7. turn off computers, cover up labels and manifests, and remove sensitive documents; and
8. in those few cases where proprietary information cannot be protected by covering or shrouding, limit the inspectors' access to highly sensitive areas of the facility—provided the plant officials can satisfy the inspectors' compliance concerns by other means,

Auditing Records

Since giving inspectors access to production records arguably creates the greatest risk for loss of proprietary data, companies will need to draw the line at that information essential to verifying treaty compliance.[28] Facility agreements and established guidelines will determine the types of records that can be examined. For example, CWC inspectors may request access to production records to determine the relative amounts of raw materials consumed and to verify the production figures stated in the declaration. The inspectors may also wish to calculate a rough materials balance for the plant by comparing records on the consumption of raw materials with those on the production and shipping of finished product.

To the greatest extent possible, however, companies will be allowed to screen records for proprietary information. Plant officials should not have to open up their most sensitive files,

[27] Article IV, paragraph 10, in Conference on Disarmament, *Draft Corn) ention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction,* extracted from CD/l 173, Sept. 3, 1993, p. 23.

[28] Michael P. Walls, Chemical Manufacturers Association, personal communication.

including data on process variables (temperature, pressure, catalysts, and reaction times), production yields, product mix, or supplier and customer lists. CWC inspectors, for their part, will be expected to retiain from engaging in "fishing expeditions and to use auditing only to answer specific compliance questions that arise during an inspection.

Companies subject to CWC inspections can also take measures to protect sensitive production records. Multiuse plants often keep records on feedstock materials used to manufacture both treaty-controlled and uncontrolled chemicals at the same site. Since all production records relating to scheduled chemicals are potentially subject to audit, however, chemical companies may find it desirable to segregate these records to protect proprietary data not directly relevant to treaty compliance.[29] Although setting up a separate accounting system for scheduled chemicals would entail a significant upfront investment, it would make it easier for companies to generate and update reports and would probably save money in the long run.

Inspected companies can also make arrangements with the OPCW Technical Secretariat to protect proprietary information that does not need to be removed from the facility. During the second U. S. National Trial Inspection, for example, the host company installed a locked container at the site for storing sensitive documents and drawings that would be needed by the inspection team for reference on subsequent visits. Although the inspectors took away some calculations and sketches to write their report, no confidential facility drawings, piping and instrumentation diagrams, documents, or descriptions of operating procedures were removed from the site.[30]

In sum, concerns about loss of proprietary information can generally be minimized through adequate preparation. Since preparing for inspections costs money, however, companies will generally undertake the bare minimum needed to protect their legitimate trade secrets. The extent to which commercial chemical plants (including certain defense contractors) will need to prepare for inspections depends on the sensitivity of the work being done there. Ideally, the vulnerability-assessment process should identify the most cost-effective approach for shielding proprietary or national security information. Without careful planning, companies may tend to overprotect their proprietary assets, resulting in unnecessary preparation costs. For example, instead of preparing a costly shroud, it may be sufficient to cover a label or gauge with a piece of tape, move an object to another room, or turn it around.

The U.S. Government could support the chemical industry by providing guidance on how companies can best prepare for inspections so as to protect their trade secrets. Measures the government could take to facilitate industrial preparation include:

- providing special vulnerability-assessment and training programs,
- encouraging companies to pool their resources,
- providing tax breaks and material aid such as shrouds,
- carrying out additional National Trial Inspections of commercial plants as a useful training mechanism for both government and industry personnel, and
- encouraging chemical plants to prepare facility agreements for Schedule 3 plants, even though they are not mandated by the CWC. Since facility agreements specify which parts of a plant are subject to inspecticm,

29 It is possible, however, that Some inspection teams may insist on seeing all production records on chemicals manufactured in a given plant to make sure that the segregated information on treaty-controlled chemicals is accurate.

30 Conference on Disarmament, Ad Hoc Committee on Chemical Weapons, "Report on the Second United States Trial Inspection Exercise," document No. CD/CW/WP.301, June 27, 1990, p. 5.

what records may be reviewed, and where samples may be taken, drawing them up could help companies prepare for routine inspections.

The U.S. Department of Defense has created an interagency program known as the Defense Treaty Inspection Readiness program (DTIRP), which is administered by the On-Site Inspection Agency (OSIA). This program is designed to help defense contractors and government-owned facilities prepare for foreign arms-control inspections such as those mandated by the INF, START, and Open Skies treaties and the CWC.[31] In advance of CWC implementation, the OSIA has already undertaken vulnerability assessments of certain government facilities and is prepared to conduct similar assessments of defense contractors; the agency is also working with the Department of Commerce to provide advice and assistance for private industry .32 Non-defense chemical manufacturers could benefit from a civilian version of DTIRP.

In conclusion, CWC implementation involves an unavoidable tradeoff between the need to protect U.S. trade secrets and to establish a treaty verification regime with enough teeth to deter violators and build international confidence in the regime. The CWC as written, however, provides ample flexibility to balance these two desirable objectives.

INSPECTOR RELIABILITY

Because of the technical complexity of CWC verification, the international inspectors will need to be highly trained specialists who possess a detailed knowledge of chemical engineering, industrial processes, or analytical chemistry techniques. Although some individuals currently employed by local or national regulatory authorities might have the necessary qualifications, many inspectors will probably come from the chemical industry. Unfortunately, the recruitment of inspectors from industry could give rise to real or perceived conflicts between the role of an international civil servant and residual identification with national or corporate interests. Individuals who maintain strong ties to their fomer employers—particularly those who plan eventually to return to their previous jobs—may be tempted to engage in industrial espionage. Furthermore, in those countries where the government owns, controls, or is closely aligned with the national chemical industry, an inspector linked to a government entity or a nationalized company may be tempted to funnel sensitive data from reports and inspections to the state-run industry. In sum, as one analyst has pointed out, "The dilemma is that the very people who would be best qualified for inspection duties because of their industrial experience could also be most capable of violating confidentiality while performing those duties. "[33]

This dilemma might be addressed in a number of ways. First, within 30 days after the treaty enters into force, the OPCW Technical Secretariat will publish a list of inspectors for review by the participating countries, and States Parties to the CWC will have the right to prohibit individuals whom they consider untrustworthy from conducting inspections on their territory. This ability to vet inspectors will enable countries to screen out those considered most likely to engage in abuses. Although participating countries can reject inspectors at any time, each request will only become effective after 30 days to prevent coun-

31 U.S. Senate, Select Committee on Intelligence, *Intelligence and Security Implications of the Treaty on Open Skies*, 103rd Congress, 1 st Session, report No, 103-44 (Washington, DC: U.S. Government Printing Office, 1993), p. 16.

32 Interview with Michael H. McMillan, Chief, Security Office, On-Site Inspection Agency, June 3, 1993.

33 Julian P. Perry Robinson, cd,, *The Chemical Industry and the Projected Chemical Weapons Convention: Volume II, SIPRI Chemical and Biological Warfare Studies No.5 (New* York, NY: Oxford University Press, 1986), p. 29.

tries from rejecting inspectors as a means of delaying an inspection.

Second, the OPCW should seek the highest standards of inspector reliability and impartiality, backed up with an active internal-security program and stringent disciplinary measures. Although the CWC empowers the Director General to strip inspectors of their diplomatic immunity if they are found guilty of a serious breach of confidentiality, it will take political courage to implement this provision. Some analysts contend that CWC inspectors should not be allowed to return to employment in private industry for at least 5 years. Others go further, arguing that it would be preferable not to draw inspectors from industry at all but to train them from the ground up so that their first loyalty is to the international organization. [34]

Finally, because of the economic insecurity associated with short-term appointments, one way to reduce the temptation for inspectors to engage in spying would be to give them greater job security by creating a professional corps and a career track for them within the agency .35 The availability of permanent positions would also make it easier to attract the most qualified individuals. Given the inherently stressful nature of field inspection work, which tends to cause ''burn out" after a few years, inspectors might be rotated at regular intervals to desk jobs within the Technical Secretariat, where they could analyze data obtained from other onsite visits. Unfortunately, the financial constraints on OPCW funding may severely limit the number of career-track positions open to inspectors.

SAFEGUARDING REPORTED DATA

Protecting the proprietary information contained in the declarations and inspection reports submitted under the CWC from unauthorized disclosure will require special safeguards, both during the collection of data from industry by the U.S. National Authority and the subsequent transfer of this information to the OPCW Technical Secretariat. Both the National Authority and the Technical Secretariat plan to establish secure databanks to store confidential information provided by companies.[36]

In response to suggestions from the world chemical industry, the CWC also contains a special ''Annex on the Protection of Confidential Information, ' which is designed to safeguard proprietary business information disclosed in required declarations, reports, and inspections.[37] This annex includes the following provisions:

- In administering the treaty, the OPCW will demand 'only the minimum amount of information and data necessary for the timely and efficient carrying out of its responsibilities.
- Data designated by industry as confidential will be subject to a system of formal classification, secure storage, and other security measures to protect against unauthorized disclosure.
- Staff members of the Technical Secretariat must enter into individual secrecy agreements covering their period of employment and 5 years thereafter.
- Dissemination of confidential business information within the OPCW will be on a strict ''need-to-know' basis.
- Officials will handle as much information as possible in a form that precludes direct identification of the facilities concerned.
- Inspectors will not be allowed to participate in challenge inspections of chemical plants in their native countries.

---

34 Barbara Hatch Rosenberg, State University of New York at Purchase, personal communication, May 28, 1993.

35 Aroesty et al., Domestic *Implementation, Op.* cit., p. *54.*

36 *E* P. Yesodharan, ''The Chemical Weapons Convention: A Point of View from Industry, ' *UNIDIR Newsletter, No. 20,* December 1992, p. 29.

37 *Draft Chemical Weapons Convention,* op. cit., pp. *169-174.*

- The OPCW plans to establish a ‘ ‘Commission for the Settlement of Disputes Related to Confidentiality, ’ which will consider breaches of confidentiality involving members of the Technical Secretariat.
- The Director General of the OPCW will develop ‘ ‘appropriate punitive and disciplinary measures’ for the wrongful disclosure of confidential information. He will have the power to waive immunity from prosecution for individual inspectors accused of “serious breaches of confidentiality.

If the monetary rewards of industrial espionage are sufficiently high, however, they could blunt the deterrent effect of the threatened punishment. The Director General’s power to waive the diplomatic immunity of an inspector will also have little practical effect unless the accused individual is in the custody of a government with both the power and the political will to prosecute.[38] One possible solution would be to require all parties to the CWC to either prosecute or extradite inspectors found guilty of violating the confidentiality guidelines. There is a trade-off, however, between the need to maintain industry’s confidence in the integrity of the OPCW and the possibility that aggressive measures to enforce the security regulations could undermine the morale and effectiveness of the inspectors. Indeed, CWC violators might even use false allegations of espionage to intimidate honest inspectors from carrying out their tasks. The reason international civil servants enjoy immunity from prosecution is so that they can perform their work free from threats and harassment; exceptions to this important principle of international law are warranted only if there is clear evidence of abuses.

1 The IAEA Experience

Useful lessons about the ability of large international organizations to keep secrets can be drawn from the experience of the International Atomic Energy Agency (IAEA), the multilateral organization charged with administering the provisions of the Nuclear Non-Proliferation Treaty. Similarities between the nuclear and chemical nonproliferation regimes include extensive reliance on private-sector declarations, reports, and onsite inspections, although the scope of IAEA activities is much narrower.[39] The founding Statute of the IAEA forbids the disclosure of proprietary data, as do the individual safeguards agreements negotiated between the agency and signatory countries. According to the Statute, IAEA staff

> We shall not disclose any industrial secret or other confidential information coming to their knowledge by reason of their official duties for the Agency. Each member undertakes to respect the international character of the responsibilities of the Director General and the staff and shall not seek to influence them in the discharge of their duties.[40]

The IAEA has also established staff rules and regulations for implementing these principles, and the Director General may impose disciplinary measures or summarily dismiss a staff member for serious misconduct.[41] For example, the confidentiality of safeguards-related information is ensured by access on a ‘‘need-to-know’ basis

38 Burrus M. arnahan, “Chemical Arms Control, Trade Secrets, and the Constitution: Facing the Unresolved Issues, ” *The International Lawyer*, vol. 25, No. 1, spring 1991, p. 174.

39 Although the IAEA has always had, in theory, the power to conduct ‘‘ special’’ or challenge inspections, until recently all its inspectors have focused only on declared nuclear facilities intended for peaceful uses and have relied primarily on record checks and mass balances of a few fissionable materials.

40 Article VII.F, ‘ ‘Staff, in *Statute of the International Atomic Energy Agency As Amended Up to 2.9 December 1989* (Vienna: IAEA, June 1990), p. 18.

41 A. von Baeckmann, ‘ ‘The Chemical Weapons Convention and Some IAEA Experiences, ‘‘ in S. J. Lundin, cd., *Non-Production by Industry of Chemical-Warfare Agents: Technical Verification Under a Chemical Weapons Convention, SIPRI Chemical & Biological Warfare Studies No. 9 (New* York, NY: Oxford University Press, 1988), pp. 183-184.

only by those individuals charged with inspecting a particular facility.

Although the best rules cannot rule out the unauthorized disclosure of confidential information through theft, accidents, or misconduct of individual staff members, the IAEA does not appear to have had serious problems with the leakage of information, When the agency was established, protecting proprietary data was a matter of deep concern to Western Europe and Japan, yet no member-country or operator has ever lodged a complaint against the IAEA alleging that trade secrets have been compromised.[42] In view of this experience, the Chemical Manufacturers Association believes that there is "a reasonable likelihood" that the OPCW will be able to safeguard the confidential business information in its possession.[43] Even so, given the difficulty of limiting access to data within a multinational organization, the most effective means of protecting proprietary information may be to store and handle it in a form that has limited utility for industrial espionage—for example, by not identifying specific facilities by name.

Like the IAEA, the OPCW will face conflicting demands in its handling of data related to monitoring activities. Whereas the IAEA observes strict limits on the release of such information both internally and in public statements, it must also make enough data publicly available to maintain the credibility of its assurances.[44] In recent years, the IAEA has come under increasing pressure to provide more detailed information on safeguards implementation to the agency's Board of Governors and, through its annual report, to the public. While such greater openness might allow countries to exploit sensitive information for political or commercial purposes, the advantages appear to outweigh the disadvantages. As Lawrence Scheinman has pointed out:

> There is a tension between interest in *confidentiality* of information on the one hand, and demand for. . . providing more and more detailed information on safeguards implementation in the name of increasing *credibility,* on the other. Optimizing between these two values is a problem of political choice that may be even more significant in a Chemical Weapons Convention due to the even more intense degree of competition in the world chemical market than in the nuclear market and the resulting likely higher sensitivity regarding proprietary information.[45]

COMPENSATION FOR LOSS OF PROPRIETARY INFORMATION

The CWC gives industry no mechanism for financial compensation if inspections result in the loss of valuable proprietary information through inadvertence or industrial espionage. U.S. companies have generally been willing to absorb the incidental expenses associated with treaty compliance as a cost of doing business, but some firms contend that they should be able to sue for economic damages resulting from the theft or inadvertent disclosure of proprietary information by members of the U.S. National Authority or the OPCW Technical Secretariat. Although it has not yet been decided whether such a compensation mechanism is justified or how such claims would be adjudicated, various legal approaches to this issue are discussed below.

---

42 Lawrence Scheinman, Cornell University, personal communication.

43 Michael P. Walls, CMA, response to OTA questionnaire.

44 James F, Keeley, *International Atomic Energy Agency Safeguards: Observations on Lessons for Verifying a Chemical Weapons Convention, Arms Control Verification Occasional Papers No. 1* (Ottawa, Canada: Dept. of External Affairs, Arms Control and Disarmament Division, September 1988), p. 31.

45 Lawrence Scheinman,' 'Operational Considerations, '' in H. Bruno Schiefer and James F. Keeley, *International Atomic Energy Agency Safeguards as a Model for Verification of a Chemical Weapons Convention, Arms Control Verification Occasional Papers No. 3* (Ottawa, Canada. Dept. of External Affairs, Arms Control and Disarmament Division, October 1988), p. 57.

I Claims Against the OPCW

Under certain circumstances, American companies can sue a foreign government or an international organization in U.S. Federal court for damage or loss to property in the United States resulting from actions committed by foreign or international civil servants in their official capacity. The CWC, however, specifically rules out this legal avenue for compensation by granting the OPCW legal immunity and thus shielding it from law suits. By ratifying the treaty, the U.S. Government would accept this stipulation.

I Claims Against an Inspector

The Director General of the OPCW has the power to waive the immunity of an individual inspector suspected of stealing trade secrets. To win a civil suit against the inspector, the damaged company would only need to present a preponderance of evidence; proof beyond a reasonable doubt would not be necessary. Even so, there are obvious problems of proof when the only evidence for theft of trade secrets is that several months after a U.S. company is inspected, a foreign plant starts shipping a product believed to have been made according to a secret process developed by the U.S.firm. It would be extremely difficult to prove that the theft had occurred, much less identify the guilty party in a multinational inspection team or trace his connection to the benefited company. Even in the unlikely event it were possible to catch and convict an inspector for divulging trade secrets, the harmed company could not obtain compensation if the guilty individual were unable to pay damages. A more appropriate target for a damage suit would be the foreign company that benefitted from the stolen information, but here again, it would be hard to prove that a theft of trade secrets had occurred.

| Claims Against the US. Government

The Fifth Amendment provides that if private property is seized by the U.S. Government, the affected individual or corporation is entitled to due process of law and compensation for the fair market value of the loss. Such government expropriation can result either from a‘ ‘taking’ of private property in the public interest (e.g., by ‘‘eminent domain’ or from a ‘‘tort’ such as the theft or breakage of property by a U.S. official. In *Ruckelhaus v. Monsanto Co., the* Supreme Court ruled that trade secrets are a form of property and are thus protected by the Fifth Amendment from government expropriation.[46] Even if U.S. officials reveal trade secrets, however, such disclosure is only considered an unjust ‘‘taking’ if it results in tangible economic damage to the affected company. In such cases, American firms may have grounds to sue the U.S. Government for fair compensation.[47]

Whether the U.S. Government would be liable for the loss of proprietary data resulting from CWC inspections under the Fifth Amendment ‘ ‘takings’ ‘ clause is a matter of legal debate. Under the ‘‘state action’ doctrine, the court must examine whether ‘‘a sufficiently close nexus exists between the state and a challenged action, so that the action may fairly be treated as that of the state itself. ” [48] According to one view, the U.S. Government cannot be accused of ‘taking’ private property simply by complying with the CWC verification regime, since it bears no direct responsibility for the theft of corporate trade secrets by international inspectors operating outside their mandate.

The counterargument is that the U.S. Government, in pursuing the security benefits of participation in the CWC, is deliberately putting private U.S. companies in a position where they will be vulnerable to losses of proprietary information.

---

46 *Ruckelhaus* v. *Monsanto Co.*, 467 U.S. 986, 1001-04 (1984).

47 Such a suit could be filed under the Tucker Act, 28 U.S.C. 1491.

48 *Black's Law Dictionary*, 6th ed. (St. Paul, MN: West Publishing Co.,1990), p.1407.

This argument is strengthened by the fact that industry's participation in the veification regime is involuntary and may even be enforced by government officials through administrative or criminal search warrants. It is therefore possible to argue under the "state action' doctrine that any economic harm to private companies arising from the inspections is the result of a deliberate decision by the United States to sign and ratify the CWC and to implement the verification regime.[49]

Yet even if the courts establish that the theft of trade secrets by international inspectors is indeed a "state action,' the U.S. Government would not be financially liable for the resulting damages unless it took an affmative step to accept this liability. The reason is that the doctrine of ''sovereign immunity' allows the Federal Government to deny recovery of damages resulting from the acts of Federal employees or foreign inspectors. Although the Federal Tort Claims Act (FICA) provides a limited waiver of this immunity by permitting suits against the United States for official misconduct, in recent years the right to sue the U.S. Government for damages under the FTCA has been limited by several exceptions, which have been broadly applied to matters affecting national security.[50] Thus, if Congress wishes to enable companies harmed by CWC inspections to recover monetary damages from the U.S. Government, it will need to waive sovereign immunity under the FTCA. Such a waiver might be included in the implementing legislation.

Administrative Claims Procedure

In all of the legal remedies discussed above, the costs and risks of litigation (either against an individual inspector or the U.S. Government) would give the chemical industry little assurance that it could recover damages resulting from CWC verification. As an alternative to litigation, some analysts want Congress to establish a ''nonburdensome administrative process' for the arbitration and payment of just claims.[51] This process would have the effect of placing on the U.S. Government the financial liability created by the misconduct of international civil servants, unless and until fair compensation can be obtained from some other source. Given the size of the U.S. Federal deficit, however, any additional fmancia1 burden of this type would be undesirable.

Complex legal questions would also attend the establishment of a nonburdensome administrative claims procedure, including what criteria a complainant would have to meet to justify payment of claims arising from CWC implementation, and how the value of lost proprietary data would be quantified. Should Congress decide to set up a compensation mechanism, the implementing legislation might establish guidelines for assigning the ''burden of proof" to a company's claim that a CWC inspection resulted in the loss of a valuable trade secret. If the burden of proof is set too high (e.g., the requirement for an exact causal link), this test could probably not be met and companies would never be compensated for their losses. Yet if the burden of proof is set too low, the U.S. Government would effectively become an insurer of last resort for any loss of trade secrets, even those unrelated to CWC inspections. A reasonable balance between these alternatives might be to expect a firm to provide a ' 'preponderance of evidence" that a trade secret was lost as a direct result of treaty compliance and not through some other form of industrial espionage. Companies making claims might also be required

---

[49] Tanzman and Kellman, ''Legal Implications of the Multilateral Chemical Weapons Convention' op. cit., pp. 510-511.

[50] The ''discretionary function'' exemption, for example, provides that an administration official who exercises discretion within his delegated regulatory function cannot be held liable for the consequences of that decision.

[51] Edward A. Tanzman and Barry Kellman, *Harmonizing the Chemical Weapons Convention With the United States Constitution*, technical report No, DNA-TR-91-216 (Alexandria, VA: Defense Nuclear Agency, April 1992), p. 67.

to demonstrate that trade secrets were lost despite concerted efforts to protect them.[52]

International Trust Fund

The OPCW might establish its own administrative procedure for compensating companies or individuals for losses suffered as a result of CWC verification activities. In this case, the government of the inspected state would adjudicate or settle damage claims arising out of onsite inspections and would be reimbursed by the OPCW for somewhat less than 100 percent of the loss. All of the other States Parties would cover the reimbursement by paying into an international trust fund set up for this purpose. Since the United States will contribute about a quarter of the OPCW's budget, it would end up providing a substantial share of any trust fund set up to compensate industry, no matter who was at fault for the loss of trade secrets and without retaining any direct influence over the procedures established to adjudicate claims. Nevertheless, requiring all States Parties to the CWC to share in the costs of industrial espionage committed by members of the Technical Secretariat would give the participating states a stake in ensuring that the rules on handling confidential information are enforced to the maximum extent possible.[53] The proposal to create such an international trust fund may eventually be addressed by the PrepCom.

Industry Self-Insurance Scheme

The U.S. chemical industry might set up its own self-insurance fund, which would not have to be specified in the implementing legislation. Under such a scheme, chemical companies would contribute to the fund an amount proportional to their yearly profits or market share, and would be insured for the loss or theft of proprietary information during CWC implementation. All participating firms would then be able to submit damage claims to an adjudication process. U.S. industry is unlikely to support such a self-insurance scheme, however, on the grounds that companies should not be held responsible for any damages arising from treaty-mandated inspections. As a politically more viable alternative, a hybrid scheme might be established in which the U.S. Government provides some of the funding or assumes responsibility for the task of examining and adjudicating claims.

In sum, the drafters of the implementing legislation will need to decide whether to establish a mechanism for compensating firms for losses of proprietary information and, if so, the best way to go about it.

---

52 Prof. Barry Kellman, presentation on 'Implementing Legislation for the Chemical Weapons Convention, ' sponsored by The Committee for National Security, Washington, DC, Apr. 16, 1993,

53 Carnahan, ''chemic~ Arms Control, Trade Secrets, and the Constitution, ' op. cit., pp. 178-179.

Verification Technologies and Industry 6

The PrepCom now meeting in The Hague will determine the types and parameters of monitoring equipment that will be permitted for CWC verification. Ideally, such equipment should permit effective detection of violations while minimizing unnecessary intrusiveness and avoiding the collection of proprietary information. Some verification experts have proposed establishing a series of 'decision points' in the inspection routine so that a plant visit could be terminated early if visual inspection or nonintrusive sampling techniques demonstrate that a plant is not producing chemical weapons. If suspicions persist, then more intrusive inspection measures—such as sophisticated chemical analysis or auditing of plant records-could be applied in a graduated manner.[1] For example, chemical sampling and analysis might begin with 'classification testing, ' or screening samples for the presence of the basic molecular components of CW agents (e.g., a phosphorus-alkyl bond or the presence of fluorine). If no such signatures are found, the inspection could be terminated.ated. If classification testing gives positive results, however, more intrusive analytical methods would be warranted.[2]

Since auditing of plant records during an inspection risks compromising proprietary data, companies will generally try to demonstrate their treaty compliance through visual inspection and chemical sampling, providing access to production records only if needed to resolve compliance concerns that cannot be



PACIFIC NORTHWEST LABORATORIES

[1] Kenneth E. Apt, Robert K. Sander, and Lawrence E. Wangen, ''Chemical Analysis for Verification of a CW Treaty, ' *Verification Technologies,* March/April 1991, pp. 7-12.

[2] Classification testing for elements such as phosphorus, sulfur, or fluorine has certain limitations because some known agents do not contain these elements (e.g., lewisite, nitrogen mustards, and BZ). Furthermore, detection would be complicated by significant environmental contamination from pesticides and herbicides containing sulfur and phosphorus. Thus, in many cases, classification tests will need to be more specific than simply identifying elements, particularly if non-classical agents are suspected.

addressed by other means. A graduated approach to verification would help satisfy industry's desire to protect proprietary data, while facilitating the OPCW's task of inspecting a large number of sites with limited financial and technical resources.[3]

The PrepCom will have to develop procedures for standardizing analytical instruments for use in inspections, Some analysts worry that monitoring instruments might be abused for purposes of industrial espionage. According to one scenario, a monitoring instrument might be built with a covert microelectronic memory chip that would store all the raw data from a sample analysis. Later on, the data stored on the chip could be read out to identify proprietary chemical components present in the sample. In order to mitigate such concerns, instruments must be designed such that no nonvolatile memory can be taken from the inspection site without the approval of plant officials. More generally, all analytical instruments used in CWC inspections will need to be certified and maintained by the OPCW and checked by the inspected State Party before being brought onsite. Standardization (or at least prior approval) will also be necessary to ensure that instrumentation used in the inspections does not pose a safety hazard.[4]

NONINTRUSIVE VERIFICATION TECHNOLOGIES

One way to mitigate the conflict between warrantless inspections and Fourth Amendment privacy rights would be through the development of 'constitutionally nonintrusive verification technologies. Since Fourth Amendment protections do not extend to evidence of illegal conduct (e.g., drug smuggling), the Supreme Court has ruled that a warrantless search may be constitutionally permissable if it is performed with a highly selective monitoring device that can detect an illegal activity without picking up collateral information.[6] For example, a suspicious package can be searched for illegal drugs without a warrant if the search method (e.g., sniffing by a trained dog) indicates only the presence or absence of contraband, without revealing any additional information or exposing personal items that would otherwise remain hidden from public view.[7] Thus, onsite inspections would not contravene the privacy protections of the Fourth Amerndment if the monitoring instruments were highly selective for evidence of a treaty violation, while minimizing access to collateral information.

So-called "blinded' instrumentation involves the use of special software to indicate only whether or not a sample contains treaty-controlled chemicals. Extremely sensitive analytical instruments, such as a combined gas chromatograph/mass spectrometer (GC/MS), can detect trace amounts of CW agent byproducts in samples taken from a plant's production line or waste stream. (Waste stream samples must be taken before or shortly after the effluent is discharged into a river, where dilution can rapidly exceed the detection threshold.) A GC/MS normally displays the spectral peaks of unknown compounds on the screen and matches them with a computer against a stored library of reference spectra, yielding a list of candidate identifica-

[3] Kyle B. Olson, ''The Proposed Chemical Weapons Convention: An Industry Perspective, ' *Chemical Weapons Convention Bulletin, No. 3,* autumn *1988,* p. 3.

[4] The PrepCom will have to agree on the detailed technical parameters of all analytical instruments to be used during on-site inspections of chemical facilities.

[5] Edward Tanzman and Rebecca Haffenden, "Constitutional and Legal Implications of Arms Control Verification Technologies," conference paper for the U.S. Defense Nuclear Agency Conference on Arms Control and Verification Technology, Williamsburg, VA, June 2, 1992, p. 3.

[6] Ibid, pp. 4-5.

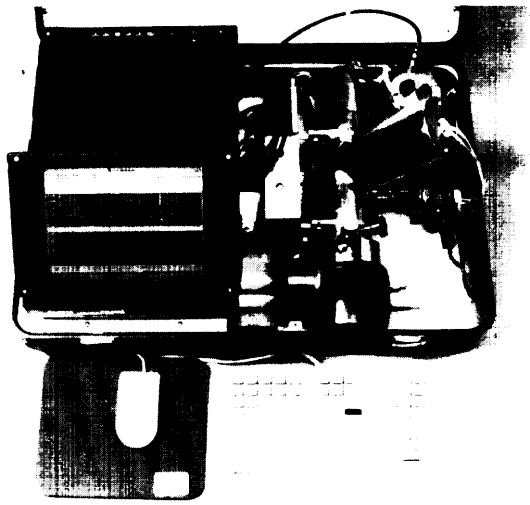
[7] Ibid, p. 4.

tions. The results are given in terms of 'goodness of fit' according to a predetermined mathematical algorithm, and indicate the probability that a compound detected in the sample is the same as a reference compound. In principle, a blinded instrument would perform the computer matching without displaying the actual spectral data on the screen; the readout would indicate only which treaty-controlled chemicals were present in the sample. Although the raw data might indicate the presence of other, proprietary compounds, the operator would not have access to this information.

Critics note, however, that blinded instrumentation suffers from two technical drawbacks. First, since the output is normally expressed in terms of the probability of a match between the sample and the reference compound, it is almost always necessary for the analyst to examine visually the spectra of samples with a fit of greater than some predetermined probability and make a subjective judgment. Second, since the analysis would be limited to the list of known reference compounds programmed into the computer's memory, it would not detect novel or unusual CW agents. While one can program an analytical instrument to detect *families* of CW agents rather than specific compounds, even a large spectral library could not detect a supertoxic agent with an entirely new chemical structure, such as a rare biological toxin. Although a standard instrument would also be unable to match the spectrum of a novel CW agent to that of any known reference compound, the raw data might well suggest to the operator that a novel agent was present. For these reasons, blinded instrumentation may not provide an optimal solution to the problem of achieving effective verification while protecting proprietary information.

UNATTENDED MONITORING EQUIPMENT

Some analysts contend that deploying unattended monitoring equipment in commercial chemical plants would help reduce the frequency and intrusiveness of onsite inspections, thereby saving scarce resources and reducing the verification burden on industry. Two proposals for the deployment of such devices are discussed below.



LAWRENCE LIVERMORE NATIONAL LABORATORY

Portable gas chromatograph/rnass spectrometer (GC/MS) developed to support onsite analysis for the Chemical Weapons Convention. This equipment can detect and identify minute quantities of organic chemicals controlled by the CWC.

Continuous Monitoring of Production

Continuous surveillance of chemical-plant operations with permanently emplaced instruments may eventually offer a means to detect illicit CW agent production while minimizing the number of onsite inspections. Unattended monitoring stations would be controlled by a microcomputer and coupled to a safeguarded recording system for in-house record-keeping. Flow meters and other sensors would record the quantity of raw material that enters the reaction vessel, the amount of product leaving the vessel, and confirm the identity of the end-product.

Some chemical companies have begun using unattended monitoring stations to obtain a continuous record of plant operations in case a plant accident or spill leads to environmental or worker-safety litigation. In the context of CWC verification, unattended monitoring stations might be used to confirm that CW agents are not being

produced and that the quantities of precursor chemicals moving through a plant are consistent with legitimate declared production. A precedent for this type of remote surveillance is the use by IAEA inspectors of unattended video recorders to monitor safeguarded nuclear facilities. With advances in communications technology, it is now possible to monitor plant operations from great distances by transmitting data over telephone lines or satellite links. An unattended monitoring station installed in a chemical plant might therefore be programmed to notify the OPCW Technical Secretariat in The Hague automatically when a suspected treaty violation occurred. Alternatively, the data could be recorded onsite and read out manually during routine inspections for comparison with the plant's own records.[8]

Unattended monitoring stations would be anathema to most of the U.S. chemical industry, however, if the stations were emplaced in critical process areas and were able to collect proprietary information, either inadvertently or deliberately. For example, if a proprietary catalyst were being used in a manufacturing process in the same plant as the synthesis of a scheduled chemical, an unattended monitoring station might pick up the catalyst in the plant atmosphere. Moreover, although the use of unattended monitoring stations might reduce the *frequency* of onsite inspections, it would not necessarily reduce their *intrusiveness.* The reason is that in order to set up the monitoring equipment, the inspectors would have to learn more about the chemical process being monitored than they would during a routine inspection.

Apart from industry objections, unattended monitoring stations have technical drawbacks that would complicate their use in CWC verification. At present, no entirely automated monitoring system is capable of guaranteeing the accuracy of the information it collects or of offering sufficient long-term consistency for fully remote operation. One difficulty is that the measuring instruments must be maintained and calibrated at regular intervals to ensure accuracy, In addition, all elements of an unattended monitoring station must be protected against intentional tampering, which can be very difficult to police. Changing the calibration of an instrument, for example, can make a large flow of material appear small. One way to minimize tampering is to enclose the instrument and transmitter in a secure box that can only be opened by authorized personnel, and to incorporate data-protection and authentication features to ensure that the signals being transmitted are from the actual monitoring instrument and not from a process simulator.[9]

Over the next several years, improved, self-calibrating instruments are likely to be developed that can function reliably for extended periods of time. Even so, considerable time and money would have to be spent to make such instruments tamper-proof, and such measures still would not preclude covert activities designed to bypass the instruments and violate the CWC.[10] For example, since multipurpose plants change their piping configuration fairly often, a cheater could install new feed pipes to divert chemicals around an online sensor or a reactor fitted with a continuous monitoring device. This circumvention scenario might be countered by inspecting the plant at regular intervals to ensure that deliberate repiping around sensors has not occurred. According to one chemical verification expert, however, instruments capable of useful continuous monitoring would be ''horrendously expensive and more

---

[8] Conference on Disarmament, "Report on a United States National Trial Inspection," document No. CD/922, June 22, 1989, p. 9.

[9] D. D. Drayer, cd., *Equipment for Potential Unattended Use in Treaty Verification Applications* (Albuquerque, NM: Sandia National Laboratories, report No, SAND-90-0572, May 1990), pp. 22-23.

[10] O. V. Perroni, "Possibilities for Automatic Monitoring of Chemical Products, " in S. J. Lundin, cd., *Non-Production by Industry of Chemical-Warfare Agents: Technical Verification Under a Chemical Weapons Convention, SIPRI Chemical & Biological Warfare Studies No, 9 (New* York, NY: Oxford University Press, 1988), p. 101.

intrusive than inspections, " while instruments of lesser capability and cost would not provide reliable data. [11]

| Automatic Sampling Systems

As an alternative to fully unattended monitoring stations, automated sampling devices might be installed in chemical plants at established points along the production line. The frequency of in-line sampling could be determined by the inspectors, and might be conducted on a random basis or in accordance with the inspection schedule. [12] One such approach, known as ''Sample Now, Analyze Later" (SNAL), involves taking samples automatically from the production line at random intervals, The collected samples would then be analyzed once or twice a year during a routine onsite inspection.[13]

A prototype SNAL device, developed by a team at the University of Hamburg, can store 1,200 samples over a period of a year on a single polyethylene cassette tape. The device extracts a few micrograms of material directly from the production line through a silicon transfer membrane and deposits the sample on a magnetic cassette tape along with data on the location, date, and time of the sampling. The polyethylene tape can be stored for long periods under conditions that preserve the sample. Several months later, inspectors can use a portable instrument to analyze the sample and read the associated data.[14] Nevertheless, industry may resist the installation of SNAL systems, which could also be vulnerable to tampering or circumvention.

In sum, because of the drawbacks of automated monitoring and sampling systems, exclusive reliance on such systems will not 'square the circle' of ensuring effective verfication while protecting legitimate industrial secrets. Nevertheless, the limited use of such systems in conjunction with routine inspections could help reduce the intrusiveness and frequency of onsite visits needed to verify the nonproduction of CW agents.

---

11 Raymond R. McGuire, Treaty Verification Office, Lawrence Livermore National Laboratory, personal communication, May 13, 1993.

12 Yuri v. Skripkin, ''Some Technical Aspects of Verification of the Non-Production of Chemical Weapons in the Chemical Industry,'' in S. J. Lundin, cd,, *Verification of Dual-use Chemicals Under the Chemical Weapons Convention: The Case of Thiodiglycol, SIPRI Chemical & Biological Warfare Series No. 13 (New* York, NY: Oxford University Press, 1991), pp. 120-123.

13 A. Verweij and H. L. Boter, ''Verification of Non-Production of Chemical-Warfare Agents in the Civil Chemical Industry," in S. J. Lundin, cd., *Non-Production by Industry of Chemical- Warfare Agents: Technical Verification Under a Chemical Weapons Convention, SIPRI Chemical & Biological Warfare Studies No. 9* (New York, NY: Oxford University Press, 1988), p, 94.

14 Gerhard Matz, University of Hamburg, ''Sampling Organics on a Magnetic Tape Reporter System for Retrospective Analysis by a Mobile Mass Spectrometer, " paper given at the Chemical Weapons Convention Verification Technology Research and Development Conference, Herndon, VA, Mar. 3, 1993.

Index

Accounting software, 21
ACDA. See U.S. Arms Control and Disarmament Agency
Administrative claims procedure, 58-59
Administrative warrants, 36-38
American Society for Industrial Security, 45
Auditing of plant records, 26-27,51-53,61-62
Australia Group, 40-41
Automatic sampling systems, 65

"Blinded" instrumentation, 62-63
Bush, George, 7

Canberra Conference, 10-11
Carpenter, Will, 11,21
Challenge inspections
  constitutional and legal issues, 34, 37-38
  costs of, 28-32
  OTA findings on, 3
  treaty obligations affecting industry, 24, 27-28
Chemical Diversion and Trafficking Act, 48
Chemical industry, described, 16-17
Chemical Manufacturers Association
  companies affected by CWC, 15
  on costs of compliance with environmental regulations, 20
  on costs of CWC implementation, 21
  industry attitudes toward CWC, 10-12
  proprietary information and reporting, 47
  safeguarding reported data, 56
Chemical sampling and analysis, 4, 26-27,3940,61-65
Chemical schedules and associated treaty obligations, 12-15, 24-26
Chemical trade associations, 12, 16. See also Chemical Manufacturers Association
Chemical Weapons Convention
  companies affected by CWC, 12-18
  constitutional and legal issues, 33-41
  implementation steps, 9-10
  industry attitudes toward, 10-12
  industry impacts overview and findings, 1-4
  protection of proprietary information, 43-59
  provisions of, 5-6, 11
  reporting requirements, compared with those for environmental laws, 20-23
  treaty obligations affecting industry, 19-32
  verification system challenges, 6-9
  verification technologies and industry, 61-65
Claims for loss of proprietary information. See Compensation for loss of proprietary information
Clean Air Act, 39-40
Clean Water Act, 39-40
CMA. See Chemical Manufacturers Association
Committee on Disarmament, 6
Commodity-chemical manufacturers, 16-17,44
Compensation for loss of proprietary information
  administrative claims procedure, 58-59
  approaches to compensation issue, 56-57
  claims against inspectors, 57
  claims against OPCW, 57
  claims against U.S. Government, 57-58
  OTA findings on, 3
  industry self-insurance scheme, 59
  international trust fund for, 59
Competitiveness
  CWC provisions and, 8-9
  disclosure of proprietary information, 48
  inspection costs and, 32
  patent and trade secret law enforcement and foreign competitors, 46-47
  protection of proprietary information, 43-44
  Conference on Disarmament, 6
Confidential business information. See Proprietary information
Constitutional and other legal issues, See *also* Proprietary information
  challenge inspections, 37-38
  compliance with environmental and safety laws, 39-40
  extraterntoriality, 17-18
  export controls, 40-41
  foreign ownership of chemical companies, 17-18
  importance of resolving legal issues, 9, 33-34
  liability issues, 40
  OTA findings on, 3

penal sanctions, 38-39
routine inspections, 34-37
Continuous monitoring of production, 63-65
Cost issues. See Economic impacts
Criminal search warrants, 37-38
CWC. See Chemical Weapons Convention

Defense Treaty Inspection Readiness Program, 53
Disclosure of proprietary information, 4648,54-56
Donovan v. Dewey, 35
Dow Chemical Co., **41**
Dual-use chemicals, 5,7, 11, 14,25,4041

Economic impacts
compensation for loss of proprietary information, 56-59
on chemical industry of compliance with environmental regulations, 20
of CWC reporting requirements, 21-24
of inspections, 28-32, 52
revenue and investment losses from trade secret theft, 43-45
of verification technology, 64-65
Education and outreach efforts, 2, 15-16
Enhanced Proliferation Control Initiative, 40-41
Environmental Protection Agency, 21, 35-36,47
Environmental regulations
costs to chemical industry of compliance with, 20
evidence of violation obtained from CWC inspections, 39
onsite inspection compliance with, 39-40
"pervasive regulation" rationale for warrantless inspections, 35-36
proprietary information and reporting, 47
reporting requirements compared with CWC requirements, 20-23
EPA. See Environmental Protection Agency
Export Administration Act, 41
Export controls, 4, 17-18,4041
Extraterritoriality, 17-18

Facility agreements, 3, 25-27, 34,40,51
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 47
Federal Mine Safety and Health Act, 35
Federal Tort Claims Act, 58
FIFRA. See Federal Insecticide, Fungicide, and Rodenticide Act
Fifth Amendment rights, 33,38-39,57-58
Foreign involvement in industrial espionage, 3,44-47,53-54
Foreign ownership of chemical companies, 17-18
Fourth Amendment rights, 33-38,62-63
Freedom of Information Act, 3,47-48

Geneva Protocol, 6, 10
Government-Industry Conference Against Chemical Weapons, 10-11
IAEA. See International Atomic Energy Agency
Implementing legislation
compensation for loss of proprietary information, 58-59
constitutional and other legal issues, **33-34, 37, 39**
enactment of, 9-10
export controls, 40-41
industry attitudes toward CWC, 11-12
industry impact overview and findings, 1-4
liability issues, 40
"pervasive regulation" inspection scheme, 36
protection of proprietary information, 24,48
required provisions in, 9-10

Industrial espionage
compensation for loss of proprietary information, 56-59
inspector reliability, 53-54
OTA findings on, 3
proprietary information and inspections, 49-51
revenue and investment losses from trade secret theft, 43-45
safeguarding reported data, 55
use of monitoring instrument for, 62
Industry Sector Advisory Committee for Chemicals and Allied Products, 12
Industry self-insurance scheme, 59
Inspections
chemical schedules and, 12-15
claims against inspectors, 57
constitutional and legal issues, 34-38
costs of, 28-32
inspector reliability, 53-54
OTA findings on, 3
preparing for, 50-53
proprietary information and, 48-50
safeguarding reported data, 11, 54-56
treaty obligations affecting industry, 2, 24-28
International Atomic Energy Agency (IAEA), 55-56,64
International trust fund for compensation to companies, 59
Iraq-Iran Arms Nonproliferation Act, 40-41
ISAC-3. See Industry Sector Advisory Committee for Chemicals and Allied Products

Legal issues. See Constitutional and other legal issues
Liability issues, 40

Marshall v. Barlow's, Inc., 36-37
Monitoring equipment. See Verification technologies
Monsanto Agricultural Co., 49-50

National Authorities, 6. See *also* U.S. National Authority
New *York v. Burger, 35-36*
Noncompliance concerns. See Challenge inspections
Nonintrusive verification technologies, 62-63
NT'I. See U.S. National Trial Inspections
Nuclear Non-Proliferation Treaty, 8,55

Occupational Safety and Health Act, 36-37
Occupational Safety and Health Administration, 21,47
On-Site Inspection Agency, 53
OPCW. See Organization for the Prohibition of Chemical Weapons
Organization for the Prohibition of Chemical Weapons
auditing of plant records, 52
claims against, 57
compensation for loss of proprietary information, 56-59
costs of reporting, 21-24

establishment of, 5-6
inspection obligations, 24-28, 32, 62
inspector reliability, 53-54
liability issues, 40
preparing for inspections, 51
safeguarding reported data, 54-56
U.S. National Authority reports to, 19
OSHA. See Occupational Safety and Health Administration
"Other relevant" facilities, 12-15,24-26
Outreach efforts, 2, 15-16

Patent law, 46-47
Penal sanctions, 38-39
Persian Gulf War, 6
''Pervasive regulation" legal premise, 34-36
Preparatory Commission
international trust fund proposal, 59
liability issues, 40
monitoring equipment guidelines and provisions, 61-62
negotiation of reporting format, 24
negotiation of treaty implementation, 9
PrepCorn. See Preparatory Commission
Production records. See Auditing of plant records
Production reports. See Reporting requirements
Proprietary information. See *also* Constitutional and legal issues
compensation for loss of propriety information, 56-59
facility agreements and, 26-27, 51
importance of protecting, 43-45
inspections and, 48-53
inspector reliability, 53-54
OTA findings on, 3
patent and trade secret law, 46-47
reporting and, 47-48
safeguarding reported data, 11, 54-56
verification technologies and industry, 61-65

Ratification of Chemical Weapons Convention, 9-11
RCRA. See Resource Conservation and Recovery Act
Reporting requirements
chemical schedules and, 12-15, 17
costs of reporting, 21-24
CWC overlap with other reporting requirements, 19-21
OTA findings on, 2-3
proprietary information and, 47-48
safeguarding reported data, 11, 54-56
Resource Conservation and Recovery Act (RCRA), 39-40
Rohm and Haas, 44
Routine inspections
challenge requests and, 28
constitutional and legal issues, 34-37
costs of, 28-32
OTA findings on, 3
treaty obligations affecting industry, 24-27
Ruckelhaus v. Monsanto Co., 57

Safeguarding reported data, 11,54-56
Safety regulations, 39-40. See *also* Environmental regulations
Schedule 1 chemicals, 12-15, 25
Schedule 2 chemicals, 12-15, 17,21,24-26,28-32
Schedule 3 chemicals, 11, 12-15, 18,24-26,40-41
Scheinrnan, Lawrence, 56
Specialty-chemical producers, 16-17,44,47

Tanzman, Edward A., 36, 37
Toxic Release Inventory, 20, 22-23
Toxic Substances Control Act (TSCA), 20-23,47
Trade restrictions, 4,40-41
Trade secrets. See Proprietary information
Treaty obligations
chemical schedules and, 12-15, 24-26
destruction of chemical weapon stockpiles and production facilities, 5
inspection obligations, 24-28
reporting obligations, 19-24
TRI. See Toxic Release Inventory
TSCA. See Toxic Substances Control Act

Unattended monitoring equipment, 63-65
Uniform Trade Secrets Act, 46
U.S. Arms Control and Disarmament Agency (ACDA), 15-16
U.S. Court of Appeals for the District of Columbia, 48
U.S. Department of Commerce, 53
U.S. Department of Defense, 29,53
U.S. Drug Enforcement Administration, 48
U.S. National Authority
compensation for loss of proprietary information, 56
direct costs of reporting, 24
establishment of, 6, 9
facility agreement negotiations, 25-27
''pervasive regulation" inspection scheme, 36
proprietary information and reporting, 47
reports to OPCW, 19
safeguarding reported data, 54-55
U.S. National Trial Inspections, 28-32,49-50,52
U.S. Patent and Trademark Office, 46
U.S. Supreme Court, 34-37, 57,62
"Use immunity," 39

Verification system. See *also* Inspections; Reporting requirements
challenges of verification, 6-9
companies affected by CWC, 12-18
implementation steps, 9-10
industry attitudes toward CWC, 10-12
OTA findings on, 2
Verification technologies
automatic sampling systems, 65
continuous monitoring of production, 63-65
OTA findings on, 4
monitoring equipment guidelines and provisions, 61-62
nonintrusive verification technologies, 62-63
unattended monitoring equipment, 63-65
Visual inspections, 26-27,61-62

Warrantless searches, 35-37,62