

eliminate the possibility of treaty violation for a surprise attack. In the final analysis, Arbatov concludes, the critical objective is to extend warning time as much as possible to deprive the aggressor of his main advantage—the effect of surprise.

On the other hand, the Soviet military continues to call for decisive counter-offensive capabilities, and to maintain that an ultimate transition to the offense is mandatory for the total defeat of the opponent. Marshal S.F. Akhromeyev asserts that the Soviet Union will remain on the defensive for about 20 days before launching a decisive counter-offensive, while General of the Army Moiseyev states that the defense is “the basic form of military action for repelling aggression at the beginning of the war” (emphasis added). Thus the 1989 edition of the *Dictionary of Military Terms* still maintains that the offense is “the basic form of military action” for defeating an opponent. While there is certainly a difference between the offensive Soviet posture of the past and a defensive posture that calls for a transition to a decisive counter-offensive within 20 days, the break with the past is not as sharp as is sometimes portrayed.

In addition, numerous Soviet military theorists call for a “defensive-offensive” restructuring of the Soviet Armed Forces. Writing in late 1987, for example, Colonel I.D. Pombrik stressed the “defensive-offensive” character of the modern defense, recommending certain measures that would speed the transition from the defense to the offense. He notes that the “defensive-offensive” character of combined-arms groupings created to conduct defensive operations is reflected in a number of qualitative and structural changes. These changes include: 1) locating ACMs in an independent grouping, 2) creating groupings of missile troops and artillery that are capable of conducting both defensive and offensive actions, 3) creating special air echelons, 4) creating special troop groupings designed to form an active front in the opponent’s rear, and 5) creating a reserve in the operational configuration designed to combat air-mobile and air-assault units.

Based on the “dialectical interconnections” of new military technology, operational art, and force structure—as well as the politico-military defensive doctrine—Moscow’s emerging force posture should be characterized by:

- Enhanced capabilities to conduct “defensive-offensive” operations.
- Incorporation of ACMs and other new systems.

- Reduced manpower, number of tanks, and number of air-assault and assault-bridging units.

- Enhanced capabilities for anti-tank, anti-air, anti-helicopter, and anti-assault-landing defense.

- Enhanced capabilities for creating obstacles, laying mine-fields, and implementing engineering measures for *maskirovka*.

- Extensive engineering preparation of probable TVDs, to include the creation and reinforcement of “fortified regions” and troop groupings to man them, defensive regions, and permanent and field fortifications.

While a comprehensive analysis of the military implications of such a force structure are beyond the scope of this article, several points seem obvious. First, while such elements as manpower and heavy armor are being withdrawn, highly effective ACMs and other systems are being added. Second, while the Soviets have announced a withdrawal of air-assault units, current military writings continually stress the “land-air” character of modern combat and resulting requirement for an “air echelon”—an essential element of the Soviet version of the AirLand Battle. Third, while engineering measures for *maskirovka* are an important element of defensive combat, the Soviet military would be the first to acknowledge that *maskirovka* is critical to the achievement of surprise. Finally, even “fortified regions” could be used offensively to secure an aggressor’s flank or rear, allowing him to concentrate overwhelming force on another front.

On the one hand, implementation of Moscow’s announced force reductions and restructuring measures would result in a reduced potential for a surprise attack. The unilateral reductions alone would reduce the potential for a Soviet surprise attack by adding five to 10 days of advance warning to NATO over the current posture. On the other hand, while force restructuring promises a reduction in the quantitative threat posed to the West, it may not result in a diminished qualitative threat. Indeed the essence of perestroika in the Soviet military establishment is the elevation of “quality” over “quantity”—the overriding characteristic that ACMs add to the future battlefield.

### Conclusion

The present review of current Soviet writings reveals specific areas of both convergence and divergence in civilian and

military views of Moscow’s defensive force posture. Civil-military convergence stems from some continuity of views on the nature of a future war. First, Gorbachev’s concept of reasonable sufficiency on the nuclear level fully accords with mainstream military acknowledgement of the declining military utility of nuclear weapons. Second, current force restructuring measures are largely compatible with enhanced military effectiveness in an ACM environment. Third, perestroika in the economy has the long-term effect of retooling the infrastructure required for wide-scale incorporation of ACMs. Finally, the Soviet military agrees that a conventional high-tech battlefield dictates a force structure of reduced size but enhanced mobility, maneuverability, versatility, and effectiveness: the elevation of “quality” over “quantity.”

On the other hand, critical elements of Gorbachev’s blueprint for defensive restructuring portend some degree of civil-military divergence. First, the concept of “non-offensive” defense clearly conflicts with the mainstream military notion of “defensive-offensive” defense. Second, the declared politico-military objective of eliminating the potential for surprise attack conflicts with the ubiquitous military requirement for achieving surprise. Third, further cutbacks in the defense budget will accentuate what the Soviet military already perceives as a “field manual/force structure” gap.

In summary, critical elements of the politico-military defensive doctrine conflict with the “dialectical development” of military affairs. Even if the Soviet military were to support a defensive doctrine in theory, the “dialectical interconnections” of military technology, operational art, and force structure threaten to transcend the very essence of the concept. While Gorbachev and others call for a Soviet Armed Forces structurally capable of conducting only the defense, emerging Soviet military art portends a qualitatively different type of force restructuring.

This dilemma in Moscow’s defensive force posture in turn highlights a dilemma for the West. Will policy-makers or evolving technology predominate in defining the military landscape of Europe in the 1990s and beyond? In light of the convergence of offense and defense in a future war fought with ACMs, a purely “non-offensive” defensive restructuring may not be a viable objective in current arms control negotiations—unless, of course, ACMs are added to the agenda. ACT

# The U.S. Chemical Industry Can Live With A Chemical Weapons Convention

Kyle B. Olson

The Chemical Manufacturers Association (CMA), the principal trade association of the U.S. chemical industry, has actively cooperated with the U.S. government to help complete negotiations on a treaty to ban chemical weapons. These efforts have included developing expert analysis of various aspects of the draft treaty, including the feasibility of certain proposed treaty provisions, the treaty’s likely impact on civilian industry, and the agreement’s verification proposals. The unprecedented industry-government relationship has given the diplomatic community access to technical expertise critical to understanding and resolving key outstanding treaty issues.

Over the last several years, CMA, whose member corporations account for more than 90 percent of the basic chemical production in the United States, has broadened its efforts to include other issues of importance to the treaty, including the development of on-site inspection procedures and the creation of a “resource group” of senior corporate analytical chemists. This group has considered the problem of sample analysis and the possibility of developing remote monitoring equipment. CMA also cooperates regularly with its counterparts in Europe, Japan, Canada, and Australia concerning the proposed convention.

### Key Industry Concerns

While supporting a global ban on chemical weapons, CMA has acknowledged on several occasions its concerns over some of the technical issues surrounding an ongoing, permanent system of verification. The rolling text draft of the treaty envisions the creation of a permanent

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*“While supporting a global ban on chemical weapons, CMA has acknowledged its concerns over some of the technical issues surrounding an ongoing, permanent system of verification.”*

international agency which would police the treaty through a system of reports and inspections of both government and commercial chemical manufacturing and consuming facilities.

Although there have been similar efforts on a smaller scale, such as the controls on nuclear materials through the International Atomic Energy Agency and the on-site inspections under the INF Treaty, the sheer scope of the chemical industry and the complexity of chemical weapons verification pose problems of a higher order of magnitude. By some industry estimates there are as many as 50,000 sites at which chemicals are manufactured or consumed in the manufacture of other products in the United States alone. And the United States represents only about one-third of the world’s chemical production and consumption. Although the West German government has estimated that perhaps only 10,000 sites worldwide would be worth monitoring, the sheer number of even these locations is staggering.

Another major concern is the potential cost to industry, both direct and indirect,

under the proposed chemical weapons regime. These costs include the disruption of production, additional paperwork burdens and, most significantly, the potential loss of proprietary information by having to disclose confidential information to the international agency to be created by the convention. Information on a company’s production plans, capacities, customers, process design, and other operating parameters could be extremely valuable to a competitor. The fact is that in the competitive worldwide chemical industry, proprietary knowledge associated with the production of certain chemicals or products using those chemicals is a company’s single greatest possession. Loss of that information can cripple even a giant company, and can be fatal to a smaller enterprise.

International patent law is still at times an uncertain shield, with many companies choosing to leave certain trade secrets unpatented in order to better protect them. The diplomatic community in Geneva has, after years of discussion, taken steps to address this issue. Provisions on confidentiality which move the treaty in a helpful direction were added to the rolling text of the treaty in August of this year.

The sense of many observers is that the negotiators understood the multimillion-dollar price tag attached to potential trade secret losses. Moreover, there was a growing awareness that the same language could protect state secrets as well as those of corporations.

In order to appreciate the complexity of the problem, one must factor in the difficulty of discerning by observation the differences between a chemical weapons production plant and a peaceful, commercial manufacturing facility; the need to protect legitimate national security information and commercial intellectual property; and the daunting logistics associated with monitoring global implementation of the treaty. Effectively monitoring the activities of hundreds, if not thousands, of locations will require skilled professional

chemists and engineers in large numbers, as well as the transportation and analytic capability to move and support them around the world. In addition to the considerable time and expense involved in monitoring treaty compliance, there are a number of issues concerning the technical feasibility of monitoring a treaty.

### Technical Feasibility of Verification

Technically, treaty compliance poses a fascinating problem. The rolling text essentially sets out three different verification schemes:

- Monitoring production of commercial chemicals with military potential which are produced on a large scale (Schedule 3 materials);
- Verifying production of key chemical agent precursors for purposes consistent with the treaty (Schedule 2 materials);
- Verifying nonproduction of weapons agents (Schedule 1 materials).

**Commercial Chemicals.** Each year, millions of tons of the chemicals on Schedule 3 are produced around the world in large quantities. As building blocks in plastics, pharmaceuticals, synthetic fibers and agricultural chemicals, they are essential to virtually all sectors of the global economy. Any system of controls on these materials must recognize their importance and their ubiquity.

Schedule 3 verification will be accomplished primarily through the review of data provided to a technical secretariat of the international agency established by signatory states. This data will, in all likelihood, be reported in an aggregate format. Rather than identifying individual companies producing Schedule 3 materials or identifying the specific customers receiving that material, the state parties will present a report of national totals produced, consumed, exported, and imported. These numbers will, in turn, be used to produce a worldwide "mass balance"—a sort of accountant's balance sheet—with each nation being debited and credited in each category. The primary utility of such a mass balance would be to identify unusually large production, consumption or, perhaps most ominously, losses of certain materials in international trade.

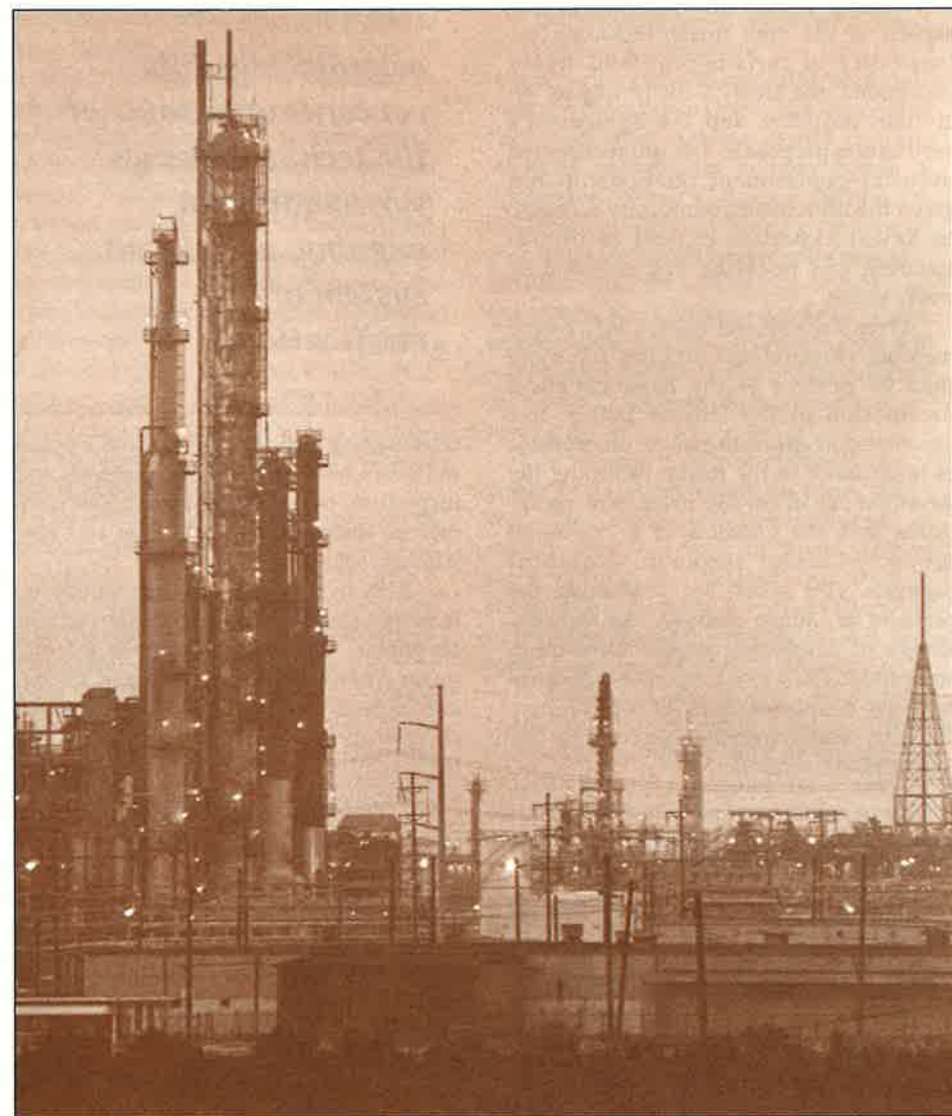
To illustrate, assume Country A is a signatory to the convention. Three companies within Country A's borders produce phosgene, a chemical used in the manufacture of glass, dyes, resins, and plastics, which was also used during World War I

(and, reportedly, during the Iran-Iraq War) as a chemical weapon, in an aggregate quantity of one million tons. Ten other companies within Country A consume 500,000 tons of phosgene. Country A's companies export 600,000 tons while other companies import 100,000 tons. As a result, Country A will report the following information to the international agency enforcing the treaty: "Phosgene produced: 1 million tons; phosgene consumed: 500,000 tons; phosgene exported: 600,000 tons; phosgene imported: 100,000 tons." Aggregate exports will, presumably, be broken down by nation of destination. For example, Country B: 20,000 tons; Country C: 40,000 tons; Country D: 40,000 tons. It is also assumed that imports would be accounted for in the same manner.

Schedule 3 essentially exists as an acknowledgement by the negotiators in

Geneva that certain materials are produced in such large quantities and used so widely that attempts to aggressively monitor them would have little chance of success while being terribly resource intensive. It is also worth noting that the materials on Schedule 3, while having been used in the past or having the potential to be used as chemical weapons agents in their own right, are substantially less effective in this regard than the nerve agents and mustards found on Schedule 1. The combination of limited military utility and widespread civilian use have resulted in political decisions being made regarding the degree of control felt necessary for these materials.

As a result, the Schedule 3 regime would be extremely hard pressed to detect a low-level, long-term program to build up a stockpile for possible military use. On the other hand, gross deviations from estab-



A typical commercial chemical plant. Part of the complexity of verifying a chemical weapons treaty is the difficulty in distinguishing by observation between a chemical weapons production plant and a nonmilitary manufacturing facility.

lished trading patterns could show up. In addition, apparently aberrant orders could be verified through consultation with the affected state parties who will have more detailed information at their disposal.

As will be discussed below, definitions of feasibility are very fluid. Nonetheless, the international reporting and monitoring scheme proposed for Schedule 3 seems not only feasible, but inexpensive to implement. Given the costs of the other treaty provisions, being able to adequately verify this production "on the cheap" is a major advantage. The chemical industry's attitude toward Schedule 3 verification has generally been ambivalent, not seeing much need for it but having relatively few, if any, concerns over its potential impacts on legitimate commerce.

## Chemical Classifications in the Draft Treaty

### Schedule 3:

Commercial chemicals produced on a large scale; total national production to be reported to technical secretariat.

### Schedule 2:

Key chemical agent precursors; production to be monitored at declared producing and consuming facilities.

### Schedule 1:

Chemical weapons agents banned by draft treaty; nonproduction at declared facilities to be verified and the operation of government research facilities producing Schedule 1 materials to be monitored.

Critics of the system of verification, reporting, and monitoring for Schedule 3 have claimed that a nation determined to cheat could easily falsify its declarations of production and consumption, particularly as they apply to transactions which are wholly domestic in nature. While this might be true, and could be rather easily done in a closed, nonmarket economy state, a variety of independent sources of both public and private data exists which can be used to crosscheck the information being provided to the international authority. Again, given the relative inefficiency of Schedule 3 materials, it is unlikely that a state would choose to place its emphasis on developing weapons in this category.

**Key Chemical Agent Precursors.** In many ways, verification of the nonproduction of Schedule 2 materials for weapons purposes is the thorniest of the problems associated with the proposed convention. On the one hand, the key precursors identified in that list also have significant com-

mercial applications. Depending on the definitions used (more on this later), Schedule 2 materials are probably produced at about a hundred locations around the world and utilized by hundreds more.

These inspections will be the most intrusive and, because of the corresponding endangerment of confidential information, potentially the most damaging to industry. Each signatory state will be required to identify and declare all producing and consuming facilities as part of its compliance with the convention. Such declarations will include not only information on the location of the facility, but also data on the quantities of Schedule 2 chemicals produced and/or consumed at that location. These declarations will subsequently

be verified by inspection teams from the technical secretariat. These teams will attempt to prove both a positive and a negative:

- That the plant is producing the materials and the quantities stated in its declaration, and
- That the plant is not exceeding its declared quantities nor producing prohibited materials (Schedule 1).

Both exercises pose problems for the inspectors. Verification of production will call primarily for the skills of an experienced accountant, in that inspectors will be forced to rely upon the documents and records in the plant concerning raw materials, production, work schedules, and shipments of the finished product as the most important instruments available to them. No matter how expert he or she may be, a chemical engineer cannot simply look at a reactor vessel and gauge how much material has or has not been generated during the preceding year—perhaps the

maximum production capability, but not actual production, which is a function of many other factors.

An obvious concern is that a country or a facility intent on violating the treaty could convincingly falsify the records and thus camouflage illegal production. While undoubtedly the case, one might question whether any state would choose to use a declared facility for illicit weapons manufacture in the first place. The very fact that on-site inspections will take place is a significant deterrent. A more likely scenario and substantial source of concern is the use of undeclared facilities to circumvent the treaty. Nonetheless, the paper audit will be more valuable and better focused in Western facilities than will the various sampling and measuring activities in the production facility itself.

The distinction is made between Western countries and those in the Third World or Eastern Bloc because of the vast amount of corroborative evidence available to a paper auditor in the West. Among these bits of evidence are the numerous environmental and safety and health-driven reporting requirements mandated by U.S., European, Japanese, and other national government regulations. The situation may be different in the South and East, where documentation and corroborative evidence may be more difficult to come by. In particular, the less sophisticated reporting and record keeping standards of some Third World industry and, conversely, the planned-economy penchant for making all the numbers "come out right" will make the problem more difficult.

The inspection of actual production facilities and the taking of samples from various points in that facility will produce information that, at best, may suggest violations and which will, more often, serve only as a demonstration of the technical secretariat's authority to enter and examine the workings of declared facilities. Much has been made of the need to secure transport and analyze the samples taken as part of an on-site inspection. This is primarily a question of logistics, with the majority of the remaining questions centering on means of assuring adequate protection of the data from a confidentiality standpoint. This issue should not be minimized. To address the other facet of this compliance problem, the proving of the negative, the inspection team will be forced to rely heavily on in-plant examinations. Given that some records will be off-limits to the verification team in the interests of preserving confidentiality, the paperwork could be essentially useless for this pur-

pose. It is here that sampling and equipment inspections could pay dividends, though again the likelihood of a nation utilizing a declared Schedule 2 facility as a weapons production plant seems remote. (That, of course, is precisely because the facility is declared and subject to routine inspections in the first place.)

The analytical work associated with verification, including the taking, sealing, and transportation of samples, and the actual scientific appraisal, is relatively straightforward, at least in terms of detecting constituent chemicals. Modern gas chromatographs, which determine the constituent elements and compounds of samples by examining the spectrum present in vaporized samples, routinely identify materials at levels approaching parts per trillion. (This is the equivalent of standing in space and picking out one-inch segments from a line 15 million miles long.) The problem will lie in interpreting the results of the analysis. For example, if an analysis of waste stream samples taken from a consuming plant resulted in an anomaly at levels of one or two parts per billion or even trillion, how would the inspectorate and the treaty signatories react? Our increasingly sophisticated analytical capabilities raise the prospect of false positives to the level of near certainty. While it represents a political question, the resolution of such matters will have a significant impact on the procedures observed by the personnel of the technical secretariat.

Industry has, for the most part, accepted that there will be costs it will have to bear as part of the verification regime. Most of those costs will stem from Schedule 2 inspections. Industry has also committed itself to working with the negotiators in Geneva to minimize those damages consistent with the larger goal of achieving an effective treaty.

**Chemical Agents.** Finally, there is the technical issue associated with verification of the controls placed on production of Schedule 1 materials. Given the tightly controlled nature of the government research facilities which will be allowed to participate in such production, this activity should present very few technical problems. Again, in terms of verifying the presence or absence of Schedule 1 materials which might be produced illicitly at a declared facility or other facility inspected under the treaty (see the discussion of ad hoc inspections below), the analytical methods are there. Schedule 1 materials, in particular, have the verification virtue of being extremely nasty and therefore relatively easy to discern from other materials.

### The Costs of Verification

If we acknowledge that the technology probably exists to verify a chemical weapons ban, it is still necessary to come to grips with the question of how to provide adequate resources to the international agency to be created by the treaty. In the last year or so, a growing appreciation of the magnitude of the problem and the levels of funding and manpower necessary to adequately verify treaty compliance has pushed the annual operating estimates for the international authority to the \$200 to \$300 million range. Though this number might be expected to decline over the years



During a trial inspection of a chemical manufacturing facility, an inspector verifies the volume of a 4,000-gallon kettle. The inspection was conducted as a cooperative effort between ACDA and CMA.

as the convention takes greater effect, it represents a tremendous commitment in a time of tight government budgets. These numbers assume a verification regime which attempts to visit all declared production and consumption facilities (Schedule 2) on a regular and perhaps annual basis.

The international agency will also monitor the destruction of existing chemical weapons stocks, the operation of the few government Schedule 1 facilities producing such materials for research, and will conduct challenge inspections. Finally, the agency's technical secretariat will have to staff and maintain chemical analysis laboratories; many industry experts believe a 1:1 ratio of lab support to inspectors will be necessary.

### Ad Hoc Inspections

None of these activities, however, is as potentially demanding of resources as the proposed extension of verification to non-

declared facilities, both military and commercial. Negotiators in Geneva are currently looking for a mechanism that would send inspectors into such locations in order to guard against clandestine production. Proposals for an "ad hoc" regime have been offered by the Federal Republic of Germany and the United Kingdom, which, while differing in detail, are similar in that they both vastly expand the number of sites subject to periodic inspection. It is very likely the treaty will encompass an "ad hoc" system of some kind.

In industry's analysis, ad hoc inspections will have a curious effect on the allocation of manpower within the agency. First,

inspections of declared facilities will become less and less "rewarding" through repetition in the years following implementation. This means the inspectorate will be tempted to place more and more emphasis on other targets.

Second, should the possibility of "quotas" for nations interested in calling for such inspections be realized, past experience suggests that some nations (including the United States and the Soviet Union) will make a point of calling for the maximum number of such visits they are permitted. This would be done to reinforce their right to call for ad hoc inspections in the future.

Given the zero-sum nature of tasks versus resources, each ad hoc inspection means fewer Schedule 2 inspections. With a system of quotas and more Western nations than Eastern Bloc countries, this also means a larger percentage of ad hoc inspections might be targeted at the Soviet Union and its allies than toward the United States and Europe. This is significant because the

## Government-Industry Cooperation in Canberra

Industry played a key role at the Government-Industry Conference Against Chemical Weapons, hosted by the Australian government in Canberra from September 18 to 22. The meeting, attended by some 400 delegates from over 60 countries, was the first to join representatives of the international chemical manufacturing industry with diplomats involved in setting their respective states' chemical weapons policies.

The Australians hosted the meeting at the request of U.S. Secretary of State James A. Baker III. The meeting produced the first formal statement by the international chemical manufacturing industry which pledged private manufacturers "to participate in national measures designed to facilitate early implementation" of a treaty.

According to a senior official involved in the conference, the U.S. chemical manufacturing industry, represented by the Chemical Manufacturing Association (CMA) has been aggressive in setting the chemical weapons arms control agenda. "In some senses, the CMA has been ahead of the U.S.," the official said. In praising industry, the official also noted the positive public relations benefits to be gained by strongly supporting a chemical weapons agreement. In addition, as the chairman of the conference, Australian Foreign Minister Gareth Evans noted in his summary statement, verification of an agreement would not likely overburden industry. "While the regulatory burden of the convention on industry would be significant," Evans said, "it would not be significantly different in kind from that which the industry already experiences."

In addition to producing a formal statement from industry in support of a chemical weapons convention, the conference also spawned a "new international industry forum" which will meet in Geneva, to provide "practical input into the convention making and implementation process."

—Lee Feinstein

current structure of the worldwide chemical industry assures a large majority of "routine" Schedule 2 inspections will be targeted at the more heavily developed West.

Returning to the question of feasibility, some have suggested that automated monitoring systems could not only better police treaty compliance but also reduce demands on the inspectorate's manpower. The Soviet Union has been particularly enthusiastic on this point in its comments in Geneva.

There are problems with this thinking. After years of experience with remote sensors and recorders in industry, the overwhelming consensus of industry experts is that the things break. Any monitor would need to be maintained, presumably by representatives of the international agency. Since many Schedule 2 facilities are "batch" plants, which change their products on a regular basis, any monitor would need to be recalibrated regularly as well.

Although a smart, robust monitoring system is certainly not beyond our technology today, pulling that hardware together will require research and development. This will pose an additional drain on the international agency's bank account.

A final factor, which also impacts technical feasibility, concerns the number of

chemicals to be monitored. While the schedules in the rolling text of the draft convention are fairly brief, the use of classes or families of chemicals, such as organo-phosphorous compounds with ethyl or methyl bonds, expands the list to potentially thousands of materials. While many have not even been synthesized yet, the extension of the schedules in this manner could profoundly complicate verification, from the targeting of inspections to the analysis of samples. An additional factor is the cloud placed over legitimate research into the commercial uses of schedule materials.

One approach to the problem might be to limit the lists to specific materials but retain a flexible system for case-by-case expansion. The treaty is designed to outlaw intent; the schedules primarily exist as an administrative tool. In any event, the range of facilities and materials actively addressed by the convention will define the resources needed.

### Political Concerns

The final area in which feasibility must be questioned is the political. Given the optimistic assertions regarding the technology of verification, and assuming adequate financial support, the following point will

always be true: Verification is not and cannot be foolproof. A state which is determined to obtain chemical weapons can and will. It may be difficult and it could be more expensive, but it can be done. This is a function of the relatively low-level technology needed to produce simple weapons and the availability of basic materials.

Politically, then, is a treaty feasible? It has been argued that the moral force of a treaty is important enough in its own right to justify the convention politically. While this may be correct, the fact is that what may be acceptable to the United States or Soviet Union may not work for Israel or Chad.

Given the minor role chemical weapons plays in their arsenals and the sophistication of their defenses against attack, the superpowers might be satisfied with a confidence level of, for instance, 75 percent—that is, a verification regime that has a 25 percent chance of missing a violation. This is particularly true in that development of a strategically significant quantity would be more likely to be discovered than a small-scale production effort. Thus, East-West attacks, which are already unlikely, become even more remote improbabilities.

A smaller state confronted by an aggressive neighbor is going to need stronger assurances. This problem remains to be addressed and delves into the question of how to punish nations which violate the treaty. Ironclad guarantees will be wanted by small nations with chemical weapons stockpiles before they will be willing to renounce them.

This final question, then, is the one for which no answer is yet forthcoming. The greater the degree of assurance required, the greater the need for an ever more intrusive regime. The more intrusive the regime, the greater the resources needed. The greater the resources needed, the greater the expectations of assurance. And the greater the dissatisfaction with a regime that is imperfect.

A chemical weapons ban is feasible if the fact that it will have certain limitations is recognized as inevitable. The questions of resources and political acceptability are more problematic than technical issues; even there, however, considerable work remains to be done.

The U.S. chemical industry strongly supports a comprehensive chemical weapons ban, though it seeks to minimize the inevitable costs and disruptions for manufacturers and users of chemicals. It has taken and will continue to take steps which support these objectives. **ACT**