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CHEMICAL PROLIFERATION AND DISARMAMENT: A CONGRESSIONAL PERSPECTIVE

by H. Martin Lancaster

Armed Services Committee, House of Representatives, US Congress

I visited Geneva last August as one of four members of the US House of Representatives observer group to the chemical weapons negotiations. Prior visits and discussions with several ambassadors to the talks had left me encouraged about the rate of progress. These earlier visits and the US-Soviet bilateral agreement formed the basis for my August visit. With the assistance of Ambassador Stephen Ledogar and Ambassador Serguei Batsanov, I organized an interparliamentary meeting between US and Soviet legislators who would be tasked with implementing the bilateral agreement in their respective legislative bodies. I envisioned a constructive meeting in an atmosphere of increased momentum toward agreement on the multilateral level.

The interparliamentary meetings took place in Geneva during August 4-9. The meetings were, indeed, constructive and rewarding. Delegates from both nations expressed optimism about the bilateral destruction agreement, pleased that such a policy had taken shape, but concerned about the technical capability of the Soviet Union to comply with the terms of the agreement.

The atmosphere at the Conference on Disarmament which surrounded our exchange was, however, as pessimistic as any I have seen among the nations participating in the multilateral talks aimed at completing the Chemical Weapons Convention (CWC). This distinct shift in mood was brought about in part because of the US-Soviet bilateral agreement, and a feeling that the United States and the Soviet Union were perhaps moving along a path of their own design, with little regard for the manner in which a bilateral agreement should complement a multilateral agreement. There is a feeling among some nations that the bilateral agreement suggests a lesser importance for a multilateral Convention. Some even suggest that the US and the USSR are "ganging up" on the rest of the participants to force their position on unwilling ambassadors. Others feel this is the beginning of the end of the previous alignment of western, eastern and the Group of 21 non-aligned nations, and the beginning of a north/south realignment. There is a feeling, too, that not enough attention is being given the perspectives offered by the multilateral participants, especially when they may differ from those incorporated in the framework of the US-Soviet initiative.

This somewhat guarded approach on the part of our partners in the multilateral talks has been exacerbated by certain elements of the US position,

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and especially by recent proposals which represent an apparent withdrawal from points on which agreement had already been reached. Most notable in this regard are the proposals relative to (1) a two-percent stockpile, the destruction of which would be dependent upon the outcome of an eighth year review conference; (2) retaliatory use of chemical weapons in response to their first use by an aggressor; and (3) the parameters for challenge inspections "anytime, anywhere."

The goal of the Conference on Disarmament is the achievement of an absolute global ban on the production, possession and use of chemical weapons. That is the goal we should support. A watered-down version which allows possessor nations to retain 500 tons of nerve gas or other agent "just in case" is too clever, at best. Given the commitment to elimination of all stocks, it is especially disingenuous to step back to a proposal to see how our neighbors are doing at the eighth year mark so we can then decide whether to continue to destroy our stockpile or to retain our remaining chemical weapons.

Pursuant to this eighth year review conference, a US decision to destroy the two percent stockpile would be made, according to President Bush's proposal, only if all possessor nations have joined the chemical weapons treaty. Since we cannot expect to receive such cooperation from the present leadership of Iraq or from like-minded governments--but we require that cooperation before we will cooperate--we might just as well declare now that we are not really interested in a global ban on chemical weapons and that we will forever maintain 500 agent tons. Perhaps we should say we are simply interested in ensuring that stockpiles are small in nations which possess them and are parties to the CWC. This presumes that non-ad-

herents will maintain stocks as large as they may wish and can afford.

The two percent option has been widely rejected by ambassadors from western, eastern and non-aligned countries. These participants in the talks feel that the *only* option is destruction of 100 percent of chemical weapons stockpiles and to pressure non-adherents down to that level through various sanctions. Our only ally on this issue is our new ally, the Soviet Union. Until the bilateral agreement was signed, however, the Soviets opposed the two percent proposal, and they are now simply being honorable partners, upholding a compromise position to which they agreed.

Furthermore, the non-aligned nations fear that the two percent option will create two classes of countries, "chemical weapons haves" and "chemical weapons have-nots." The potential danger in creating these separate, unequal categories may surface at the eighth year conference, where the "haves" would have veto power in voting on final implementation of the destruction agreement.

This element of the US proposal, in granting more voting power to possessor nations, subtly promotes proliferation as a means for a nation to be able to exercise power at the critical review conference. Given the distinction between "haves" and "have-nots," it behooves nations with no current stockpile of chemical weapons to produce or acquire such weapons as a guarantee that their voice will be heard at the eighth year conference. Clearly such a policy is at odds with the aim of universal chemical disarmament and encourages the proliferation we seek to end.

It is also incredible that we would insist on an option for retaining two percent beyond eight years when we have a destruction agreement with

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Editors: *Matthew Meselson*
Harvard University
Cambridge, Massachusetts

Julian Perry Robinson
University of Sussex
Brighton, UK

Producer: *Lora Lumpe, Federation of American Scientists*

Advisory Committee:

Dr. Will Carpenter, St. Louis, MO
Ambassador Jonathon Dean, Washington, DC
Ambassador Charles Flowerree, Washington, DC
Dr. Shirley Freeman, Melbourne, Australia
Ambassador James Leonard, Washington, DC
Dr. A.J.J. Ooms, Delft, The Netherlands

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the Soviet Union which will get us nowhere near that two percent figure within eight years. We simply cannot destroy the stuff fast enough to destroy 98 percent within eight years. Why would we risk stalling the talks over a non-issue? We surely will have adequate retaliatory stocks (if we should, in the unlikely event, choose to use them) well beyond the eight year mark.

Furthermore, if the CWC is not sufficiently attractive for most countries to join within eight years and to bring pressure to bear on non-signers through sanctions and other means, we probably will have lost the war for a universal ban anyhow.

Though there is little or no support for retention of stockpiles, there is some support for an interim conference prior to the end of the ten year destruction period. A viable alternative to the US proposal might be a conference at either the sixth or eighth year point, but with a commitment in the Convention to destroy 100 percent of all stockpiles without reservation.

At the conference, discussion would focus on the universality of compliance with the CWC. Based on deliberations and conclusions drawn at that time, a decision should be made with regard to the final schedule of destruction of remaining stocks. It might even be possible for the Convention to provide for its extension beyond ten years if a majority, or some other percentage of all signatories, vote in favor of such an option after examining the results of the interim conference.

Clearly, in order to avoid the appearance of discrimination between classes of countries, and in order to dissuade non-possessor nations from acquiring their own stockpiles, voting privileges at any interim conference should not be restricted to chemical possessor and chemical capable countries. Rather all participants should be granted a voice in the proceedings.

Another troublesome element of the US proposal is the insistence that the Convention affirm the right of retaliatory use of chemical weapons which some countries have claimed under the 1925 Geneva Protocol. The Administration has stated that this serves as a deterrent to chemical warfare since it reminds would-be aggressors that we retain our right to retaliate in kind if subjected to a chemical attack.

Since the US ratification of the Geneva Protocol reserves this right, and since reiteration of the willingness to use poison gas as a retaliatory measure may be seen as indicative of a lack of total commitment to condemn the use of chemical weapons, we gain nothing--and we potentially lose credibility--by seeking to include this provision in the text of the CWC. Conversely, ruling out retaliatory use will be a moot issue when *all* chemical weapons are banned and destroyed. Why not leave the Convention silent on this issue and let time take care of it?

Now to the greatest impediment, in my opinion, to conclusion of a Convention: the US has also been criticized for reneging on our agreement--on George Bush's own 1984 draft treaty--to accept challenge inspections "anytime, anywhere, without the right of refusal." Our current position states that challenge inspections should not be allowed near certain installations in the interest of security.

Meanwhile, the British have completed several challenge inspections with "managed access" to facilities, which allows sensitive areas of certain facilities to be "shrouded" or otherwise protected while inspectors verify that no chemical weapons production activity is taking place. Thus, it is agreed, national security interests are adequately protected, and the verification regime remains intact.

The fact that we backed away from our original proposal without having made any significant effort in conducting our own trial challenge inspections, particularly in light of the British experience, contributed to the poor reception afforded our new proposal in Geneva--a reception so poor that the proposal was not even formally tabled at the negotiations.

With the backdrop of the chilly reception our challenge inspection proposal received, the United States has conducted three challenge inspections since last August, using the ideas embodied in our proposals discussed but not tabled at that time. Two commercial facilities and one government installation were chosen for these trial challenge inspections. I certainly welcome this effort to validate our ideas and to show whether or not they will work. We invited British participation in one of these trials and subtle modifications were made in our ideas between the first challenge inspection

and the last. In fact, by the time the government installation trial inspection was conducted, there seemed to be little difference between the British trial challenge inspection regimes and our own.

Though our people insist that these were simply refinements of our August proposal, it appears to me that we recognized that our proposal would not work, that the British inspections worked better and could be incorporated into our own proposal, and modifications were made accordingly. Whether we admit that we have changed our position since last August or not matters little. The important thing is that we have now conducted trial challenge inspections that seem to incorporate the best of the British ideas in a way that should protect the security and proprietary interest of the challenged sites, but also provide the needed data for the challenging country to determine whether or not a violation has occurred. Language to clarify our proposal in light of the trial challenge inspections is now being developed and should be much better received in Geneva. It is hoped that additional trial challenge inspections will be conducted by the US, Great Britain and other participants in the talks.

The results of these inspections will provide useful insight into questions regarding definition of the perimeter and protection of proprietary information. As we accumulate a sufficient database and compare the results of various inspections, we will be able to optimize the value of our trial efforts in comparing the British and other methods to our own. And as we gain more experience in conducting trial challenge inspections, we will gain credibility in offering proposals based on the data

we have collected.

There is much, much more to be done before there is a meeting of the minds on the inspection issue. Agreement is long overdue, and we had better act quickly to achieve that end. It is heartening that we appear to be doing so.

Nevertheless, given that all of these controversial issues were largely responsible for the cloud of pessimism which enveloped last year's sessions, at this point we find ourselves in the unfortunate position of having to polish the United States' tarnished image as a somewhat reluctant participant in the chemical weapons talks. It will take strong, forward-looking leadership to wrest the negotiations from their current stalemate and propel them toward a final Convention. Toward that end, I am hopeful that the Bush administration will approach the 1991 talks with an eye toward real progress through skillful, carefully crafted compromise. Our interests can only be served by exhibiting greater flexibility and by developing a proactive negotiating posture. We gain nothing by remaining obdurate and defensive.

There is reason to be optimistic as a new round of talks begin in Geneva. They will be chaired by Serguei Batsanov, a dynamic, creative and able leader. Moreover, the US team is composed of top-notch negotiators, led by Stephen Ledogar, a respected and effective diplomat. If provided clear direction and the proper tools to respond quickly and effectively as issues arise for negotiation, they will be in a position to realize our shared ambition in concluding a long-awaited and much needed Chemical Weapons Convention.

Forthcoming Events

* At the University of Maryland, Baltimore County (Catonsville, Maryland), a conference on "The Microbiologist and Biological Defense Research: Ethics, Politics and International Security" will be held on 4-5 April. For more information, contact Raymond Zilinskas at 301-455-3708.

* In Geneva, the Preparatory Committee for the Third Review Conference of the BWC will meet during 8-12 April.

* In Moscow, a "Meeting on Eliminating

Chemical Weapons," sponsored by the Soviet Peace Committee, the USSR Academy of Sciences, and the Soviet Trade Union, will be convened during 9-11 April. This invitational conference will address the destruction of existing chemical weapons, as well as the remaining problems in the CWC negotiation.

* On April 23 in Washington, the House Appropriations Committee, Defense Subcommittee is scheduled to hold a hearing on the US chemdemil program.

* In Berlin, a workshop concerning the demilitarization of old left-over chemical weapons will be held at the Technical University during 14-15 May. For more information, contact Dr. K.J. Thomé-Kozniensky by phone at 030-832-6869.

* In May, the Nigerian government will host in Abuja an informational seminar on chemical and biological arms control for countries of the region. For information, contact the Permanent Mission of Nigeria to the UN in Geneva.

What follows is taken from the Sussex-Harvard rolling CBW chronology. The intervals covered in successive Bulletins have a one-month overlap in order to accommodate late-received information. The basic chronology, which is continuously updated, is fuller and provides complete citations of sources. For access to it, apply to Julian Perry Robinson at the Science Policy Research Unit, University of Sussex, Brighton, BN1 9RF, England.

1 November In Saudi Arabia, the commanding general of US troops, General Norman Schwarzkopf, tells a reporter that there is little chance that Iraq, which he says may possess hundreds of medium-range missiles, has succeeded in attaching chemical warheads to them which it could deliver on a vast scale. {IHT & NYT 2 Nov} [See also 14 Sep]

3 November In Israel some 3.4 million gas masks have by now been distributed [see 1 Oct], according to an official spokesman. {Jerusalem domestic service 3 Nov in FBIS-NES 5 Nov}

3 November All Soviet stocks of lewisite, said to total some 7000 tons, are now concentrated in one location, at Kambarka [see 2 Aug and 25-30 Aug], according to the chemdemil expert of a Soviet "green" organization, the Social-Ecological Union, in a letter published in today's *Izvestiya*. {Izv 3 Nov in FBIS-SOV 7 Nov}

3-7 November A "reconnaissance group" from the Czechoslovak Ministry of National Defense visits Saudi Arabia in connection with the possible deployment of a Czechoslovak antichemical unit for the assistance of the Saudi population in the event of CW attack [see 9 Oct] {CTK 7 Nov in FBIS-EEU 8 Nov}. The unit would be stationed in the rear support area about 160 km from the Iraqi border {Prague domestic service 7 Nov in FBIS-EEU 8 Nov}. Saudi Arabia formally invites Czechoslovakia to send in the unit {Prague domestic service 7 Nov in FBIS-EEU 8 Nov}.

The deployment--of 61 vehicles and 170 personnel--begins on 11 December, with transportation by US aircraft from German bases {CTK 11 Dec in FBIS-EEU 14 Dec; Reuter as in CN 11 Dec}, and is completed on 14 December {*Mlada Fronta Dnes* 15 Dec in FBIS-EEU 19 Dec; AP as in CN 17 Dec}.

4 November In New York, what TASS describes as the first part of the 17th round of US-Soviet bilateral negotiations [see 16 Oct] comes to an end. Progress has been made on the drafting of the inspection protocol for the June bilateral agreement [see 1 Jun]. {TASS international service 4 Nov in FBIS-SOV 5 Nov}

6 November The two US Navy Military Sealift Command ships carrying the US stockpile of CW weapons withdrawn from Europe [see 22 Sep] arrive at Johnston Atoll in the Pacific, where, over the next two weeks, the 100,000-odd nerve-gas artillery shells which comprised the stockpile are unloaded and placed in storage igloos. {Reuter as in CN 16 Nov, Tag 22 Nov, Izv 25 Nov in FBIS-SOV 3 Dec, GAO/NSIAD-91-105}

7 November At the UN Security Council, the chair of the Sanctions Committee, Ambassador Marjatta Rasi of Finland, warns that the pharmaceutical products being imported by Iraq under a humanitarian clause of the UN trade embargo might be used for CBW weapons, though there was no evidence that any such diversion was in fact taking place {NYT & DTel 8 Nov}. Iraq "categorically denies" the suggestion {INA 9 Nov in FBIS-NES 9 Nov}.

7 November US combat troops in the Persian-Gulf area are being issued with a 145-page Army intelligence manual, the *Desert Shield Order of Battle Handbook*, describing Iraqi forces and doctrine. On

Iraqi CW it is reported to say: "Chemical weapons are utilized when planners assess fire support or force size as insufficient to attain the objective. Once authorization for chemical weapons use is given corps commanders are given chemical rounds to be delivered by artillery. Chemical warheads include three types: a lethal mustard agent, an incapacitating agent, and tear gas." {Ind 7 Nov}

7 November A court in Pirmasens, FRG finds Claus Vach, one of the organizers of the blockade of the US Army depot at Fischbach [see 29 Jun 88] guilty of *Nötigung* and fines him DM 1800 [see also 6 Jan 89] {DerS 29 Oct, *Pirmasenser Zeitung* 8 Nov}. The blockade had been in demonstration against the storage of US chemical weapons in the FRG [see 22 Sep].

7 November In New Zealand, the Ministry of External Relations and Trade announces the successful completion of a national trial inspection at the DowElanco agrochemical plant in New Plymouth. It says that the general aims of the exercise had been to examine specific problems of verification for countries with modest chemical industries and to see whether auditing of company records could be a worthwhile monitoring technique either as an adjunct to scientific monitoring or as an independent means of verification. {*Pacific Research* Feb 91}

8 November Writers at the US Army War College Strategic Studies Institute, taking issue with a review {NYRB 27 Sep} of their book on Iraqi military power {*Iraqi Power and US Security in the Middle East*}, publish an explanation of why they had doubted that Iraq had used CW weapons against its Kurdish population: "Essentially there are two instances under scrutiny. The first attack allegedly occurred at Halabjah in north-central Iraq [see 18 and 21 Mar 88]. All accounts of this incident agree that the victims' mouths and extremities were blue. This is consonant with the use of a blood agent. Iraq never used blood agents throughout the war. Iran did. The US State Department said at the time of the Halabjah attack that both Iran and Iraq had used gas in this instance. Hence, we concluded it was the Iranians' gas that killed the Kurds [see also 3 May]."

"The second alleged gas attack by the Iraqis against the Kurds occurred at Amadiyyah (in the far northern region of Iraq) after the war had ended [see 29 Aug-3 Sep 88]. This one is extremely problematical since no gassing victims were ever produced. The only evidence that gas was used is the eye-witness testimony of the Kurds who fled to Turkey, collected by staffers of the US Senate. We showed this testimony to experts in the military who told us it was worthless."

A detailed rebuttal of the claims by the reviewer is published alongside their explanation. {NYRB 22 Nov; WT 18 Dec}

11 November In Germany, the new Arms Trade Law--Improvement of the Surveillance of External Trade for the Prohibition of Nuclear, Biological and Chemical Weapons [see 12 Sep]--enters into force {*Bundesgesetzblatt* 10 Nov}. The legislation had passed the Bundestag on 19 September after revision in the Bundesrat, with only the Greens opposing {DB 19 Sep}.

12 November Libyan leader Muammar Qaddafi, in an interview published today in *Der Spiegel*, initially seems to deny the existence of

a Libyan CW-weapons program including the reported poison-gas factories at Rabta and Sebha [see 8 Aug], but then, when asked about the involvement at Rabta of Salzgitter Industriebau GmbH [see 27 Jun], says: "If you want to free the people from poison gas, there must be laws that prohibit such business transactions." And he goes on to say: "Since when have I been held responsible if an industrialist in your country violates your laws? How dare you criticize Libya, whether it produced gas or not? Is Libya the only country in the world that produces gas? Gas is produced in America, in Israel there are plants that produce gas, many countries in the world do this." Later he adds: "As long as Israel is given a free hand to produce all sorts of weapons of destruction, chemical and nuclear weapons, I also have to strive for them, in order to be able to defend myself." {DerS 12 Nov in FBIS-NES 13 Nov}

12-13 November In Brisbane, Australia hosts the second seminar of its Chemical Weapons Regional Initiative [see 2-4 Aug 89]. Participating are all the independent states of the South Pacific and Southeast Asia except for Fiji and Cambodia {*Pacific Research* Nov}: delegations from 21 countries in all--Australia, Brunei Darussalam, Cook Islands, Federated States of Micronesia, Indonesia, Kiribati, Laos, Malaysia, Marshall Islands, Myanmar, Nauru, New Zealand, Papua New Guinea, Philippines, Singapore, Solomon Islands, Thailand, Tonga, Vanuatu, Vietnam, and Western Samoa--and the South Pacific Forum Secretariat. The ASEAN Chemical Industries Club is also represented. A joint statement is adopted, the operative part of which is as follows:

"Seminar participants noted that their countries are not producers of chemical weapons. As part of the chemical demilitarization process, they consider that destruction of chemical weapons should be carried out by those responsible for their production.

"The seminar participants confirmed that their respective Governments all shared a total abhorrence of chemical warfare and chemical weapons. They believed that only the conclusion of a comprehensive, non-discriminatory and universal Chemical Weapons Convention could guarantee that the world would be free from this scourge.

"They reaffirmed their desire for the conclusion at the earliest possible date of a comprehensive, effectively verifiable and non-discriminatory convention which would ban chemical weapons from all environments for all time, and that the destruction of existing chemical weapons be carried out in the most environmentally safe manner. They expressed the hope that all Governments would become parties to such a Chemical Weapons Convention as soon as it was concluded." {*Backgrounder* (Australia, Department of Foreign Affairs and Trade) 23 Nov}

13 November Bulgaria is preparing to send a chemical protection unit of some 300 people to Saudi Arabia, so the commander of the Chemical Troops of the Bulgarian People's Army, Major General Lyubomir Dinev, says in an interview published today in *Narodna Armiya*. {BTA 13 Nov in FBIS-EEU 15 Nov}

13 November In Britain, Prime Minister Margaret Thatcher tells the House of Commons: "We believe that [Saddam Hussein] also has biological weapons at his disposal." {HansC 13 Nov}

13-16 November The US Army Chemical Research, Development and Engineering Center hosts its annual Scientific Conference on Chemical Defense Research. The keynote address, given by Professor Matthew Meselson of Harvard University, is on "The role of antichemical protection in chemical warfare, chemical deterrence and chemical disarmament." [See pp. 17-20 below]

14 November In the UN General Assembly, the First Committee [see 15 Oct] adopts by consensus three resolutions on CBW {TASS 15 Nov in FBIS-SOV 16 Nov}. One resolution urges the CD to "intensify" its efforts during 1991 to conclude the CWC, "noting with appreciation the increasing number of States that have declared their intention to be among the original signatories to the Convention."

The second resolution empowers the Secretary-General to provide services for the Third BW Review Conference, which is to be held during the second half of 1991 after a Preparatory Committee meeting in Geneva during 8-12 April.

The third resolution, which is a strong reaffirmation of the Geneva Protocol and of measures already agreed for upholding its authority, "notes the continuing significance of the Security Council decision [in Resolution 620 (1988)] to consider immediately, taking into account the investigations of the Secretary-General, appropriate and effective measures in accordance with the Charter of the United Nations, should there be any future use of chemical weapons in violation of international law."

14 November The US Army Program Manager for Chemical Demilitarization distributes a draft environmental impact statement for the projected on-site incineration of the holdings of CW agents and munitions at Anniston Army Depot, Alabama, where about 7 percent by weight of agent of the total US CW stockpile is located. The review comment deadline is 31 December 1990. {*Disposal of Chemical Agents and Munitions Stored at Anniston Army Depot, Anniston, Alabama: Draft Environmental Impact Statement*}

GLOSSARY OF ABBREVIATIONS FOR NEWS CHRONOLOGY

AFP	Agence France Press	DerS	<i>Der Spiegel</i>	Izv	<i>Izvestiya</i>
AP	Associated Press	DN	<i>Defense News</i>	JDW	<i>Jane's Defence Weekly</i>
CBW	Chemical/biological warfare	DPA	Deutsche Press Agentur	LAT	<i>Los Angeles Times</i>
CD	Conference on Disarmament	DTel	<i>Daily Telegraph</i> (London)	NYRB	<i>New York Review of Books</i>
CD/	CD document series	DW	<i>Defense Week</i> (Washington)	NYT	<i>New York Times</i>
C&EN	<i>Chemical & Engineering News</i>	FAZ	<i>Frankfurter Allgemeine Zeitung</i>	Obs	<i>Observer</i> (London)
CQ	<i>Congressional Quarterly</i> (Weekly Report)	FBIS	Foreign Broadcast Information Service (Washington)	PA	Press Association
CR	<i>Congressional Record</i> (Daily Edition)	FedR	<i>Federal Register</i>	SFC	<i>San Francisco Chronicle</i>
CW	Chemical warfare	FT	<i>Financial Times</i> (London)	ST	<i>Sunday Times</i> (London)
CWC	The projected Chemical Weapons Convention	G	<i>Guardian</i> (London)	STel	<i>Sunday Telegraph</i> (London)
CWCB	<i>Chemical Weapons Convention Bulletin</i>	GAO	General Accounting Office	Tag	<i>Tageszeitung</i> (West Berlin)
DB	Deutscher Bundestag (official text)	HansC	<i>Hansard</i> (Commons)	TL	<i>Times</i> (London)
		IHT	<i>International Herald Tribune</i>	UPI	United Press International
		INA	Iraqi News Agency	WP	<i>Washington Post</i>
		Ind	<i>Independent</i> (London)	WSJ	<i>Wall Street Journal</i>
		ITP	<i>Inside the Pentagon</i>	WT	<i>Washington Times</i>

15 November In the UN General Assembly, the First Committee unanimously adopts a resolution commending the Secretary-General's study {A/45/372} on the role of the United Nations in the field of verification, empowering him to take appropriate action on the recommendations, within available resources. Included among those recommendations is one proposing that the UN Department for Disarmament Affairs should "develop a consolidated data bank ... on all aspects of verification and compliance ... including data connected with the Biological Weapons Convention and the future chemical weapons convention." {A/C.1/45/L.42.}

15 November President Bush, interviewed on Cable News Network, says in reference to Iraq's chemical weapons and attempts to develop nuclear weapons: "Having demonstrated this recklessness, I don't think the rest of the world would say this is good enough, just what they call the status quo ante, going back to where things were before the invasion [of Kuwait]. You'd have to have some international safeguards." {NYT & SFC 16 Nov}

16 November President Bush pocket-vetoes the Chemical and Biological Weapons Control and Warfare Elimination Act of 1990, the counterproliferation sanctions legislation just passed by the Congress [see 27 Oct], stating that the mandatory sanctions which the law would require "would severely constrain presidential authority in carrying out foreign policy."

At the same time, however, he signs an executive order empowering the Secretary of State to impose trade sanctions against foreigners who are found to "knowingly and materially contribute" to CBW-weapons proliferation for as long as such activities continue. His order also authorizes economic and trade sanctions against countries that use or prepare to use chemical weapons. In contrast to the vetoed legislation, the executive order allows exemptions--for military contracts, and for "significant foreign policy and national security reasons." {WP 17 Nov, CQ 24 Nov, C&EN 26 Nov}

Section 1 of the President's executive order states: "It is the policy of the United States to lead and seek multilaterally coordinated efforts with other countries to control the proliferation of chemical and biological weapons. The Secretary of State shall accordingly ensure that the early achievement of a comprehensive global convention to prohibit the production and stockpiling of chemical weapons, with adequate provisions for verification, shall be a top priority of the foreign policy of the United States, and the Secretary of State shall cooperate in and lead multilateral efforts to stop the proliferation of chemical weapons." {Executive Order no 12735}

ca 17 November Iran informs "embassies of governments friendly to the United States" that a shipment of 650 tons of tetraethyl lead currently heading for Abu Dhabi from Ethyl Corporation of America may in fact be bound for Iraq. {Ind 20 Nov}

20 November In the United States, the Department of the Army issues an environmental assessment of its projected handling of the waste brines being generated by chemdemil operations on Johnston Atoll, an assessment which finds that no significant impacts on the environment are to be expected. {*Environmental Assessment: Handling of Waste Brines from Johnston Atoll Chemical Agent Disposal System (JACADS)* Nov 90}

21 November In Paris, the assembled heads of state or government of the 34 countries participating in the Conference on Security and Co-operation in Europe--Canada, the United States and all of Europe except Albania--sign the *Charter of Paris for a New Europe*, which includes the following: "We call for the earliest possible conclusion of the convention on an effectively verifiable, global and comprehensive ban on chemical weapons, and we intend to be original signatories" [see also 7-8 Jun]. {CD/1043}

23 November In Britain, Parliament learns from the Ministry of Defence that the budget of the Chemical Defence Establishment, Por-

ton Down, for the financial year 1990/91 is some 24 million pounds. {HansC 23 Nov}

25-28 November The Canadian Forces Base in Lahr, Germany, is used to simulate an undeclared CW-weapons storage location for the purposes of a bilateral practice challenge inspection conducted there jointly by the Netherlands and Canada. {*The Disarmament Bulletin* (External Affairs & International Trade Canada) no 15}

In the report later submitted to the CD Ad Hoc Committee, 16 conclusions and recommendations are presented, of which the final one is as follows: "The trial challenge inspection showed that, under circumstances of managed access, sensitive information at this type of inspection site could be adequately protected while at the same time providing the inspection team with enough information to draw reliable conclusions with regard to the presence of chemical weapons." {CD/1052}

26 November In Moscow the chief of a Chemical Troops directorate, Professor Major General I Yevstafyev [see 11 Sep], talks in an interview published today by *Izvestiya* about the problems facing the Soviet chemdemil program, on which the USSR Supreme Soviet has still to make the implementing decisions [see 2 Aug]. He speaks of "economic and primarily social and psychological obstacles" in the way of selecting from among the chemdemil options that have been proposed, observing: "The population is angrily protesting the setting up of such facilities. This is what happened in Chapayevsk, in Kambarka, and elsewhere." In his view the available chemdemil technology and associated production standards are "absolutely safe." He speaks of work being done by the USSR Academy of Sciences on "completely new nontraditional methods for the destruction of toxic substances," stating that the "method of pumping reaction masses deep inside geological formations ... appears highly promising." He speaks, too, of the possibility of having Western firms build a chemdemil facility on a turn-key basis.

The way forward, he says, is this: "To set up a special government commission which will select specific sites for the building of [chemdemil] facilities. ... It must be vested with powers enabling it to resolve at the same time questions concerning the improvement of social and daily life conditions for the population in these regions and the building of schools, kindergartens, hospitals, and cultural and education facilities, as well as to fully ensure their supplies of foodstuffs and industrial products." {Izv 26 Nov in FBIS-SOV 28 Nov}

26 November In Geneva the CD Ad Hoc Committee on Chemical Weapons reconvenes for open-ended consultations scheduled to end on 21 December.

27 November The US-Soviet bilateral talks on the chemical weapons ban resume [see 4 Nov] in Geneva. {TASS 27 Nov in FBIS-SOV 28 Nov}

27 November The commanding officer of the US Army Dugway Proving Ground distributes a supplement to the draft environmental impact statement on the projected BL-3 Biological Aerosol Test Facility [see 19 Sep 88], entitled *New Alternative Action to Construct and Operate a Consolidated Life Sciences Test Facility at Dugway Proving Ground, Utah*. The review comment deadline is 24 January 1991.

29 November The UN Security Council adopts, by a 12-2 vote, resolution 678, thereby authorizing "member states cooperating with the government of Kuwait ... to use all necessary means to uphold and implement Security Council resolution 660 (1990) and to restore international peace and security in the area" unless Iraq fully implements that and the subsequent resolutions by withdrawing from Kuwait by 15 January 1991. China had abstained from the vote; Cuba and Yemen voted against. The British and French foreign ministers use identical language in warning Iraq against "initiating

the use of chemical or biological weapons." USSR Foreign Minister Eduard Shevardnadze also warns against the use of chemical weapons. {Ind 30 Nov}

2 December In Iraq there are test launches of three ballistic missiles, fired with dummy warheads into western Iraq over a distance of some 400 miles from near Basra {SFC 3 Dec, FT & DTel 4 Dec, WT 10 Dec, IHT 22-23 Dec}. Unidentified "intelligence sources in London" are later reported as saying that the test was a simulated CW attack {PA 3 Dec as in WT 4 Dec}.

3 December Chile furnishes the CD with data, in CD/828 format, on its production and consumption of scheduled chemicals, including the declaration that "Chile does not produce or possess chemical weapons." {CD/1042}

3 December US Defense Secretary Richard Cheney testifies as follows to the Senate Armed Services Committee: "We obviously are concerned about his [Saddam Hussein of Iraq] chemical capabilities and his ballistic missile capabilities. We have to assume that he has developed or is developing the capability to put chemicals on his ballistic missiles [see 1 Nov], and that would obviously give him the ability to hit cities, to hit targets inside the region." {WT 4 Dec}

4 December The United Nations General Assembly adopts the three resolutions on CBW which its First Committee had adopted three weeks previously [see 14 Nov], respectively resolutions 45/57A, 45/57B and 45/57C. {Xinhua 5 Dec in FBIS-CHI 5 Dec; CD/1045}

5 December In Moscow, within what TASS calls the framework of Soviet-French political consultations, the visiting deputy head of the administration for strategic issues and disarmament of the French Foreign Ministry, G Andreani, meets with USSR Deputy Foreign Minister Viktor Karpov to discuss, among other things, the talks on banning CW weapons. {TASS international service 5 Dec in FBIS-SOV 7 Dec}

5 December In the United States, the Food & Drug Administration issues formal approval on the Army's New Drug Application in respect of its Convulsant Antidote for Nerve Agents (CANA), a buddy-use autoinjector for administering diazepam to incapacitated nerve-gas casualties so as to counteract the convulsions and potential brain-injury which pyridostigmine pretreatment tablets cannot ward off. CANA now moves into mass-production and deployment alongside the Army's Nerve Agent Antidote Kit as an adjunct to atropine/pralidoxime treatment. {USAMRDC Newsletter Jan 91}

5-6 December In Angola, villages near UNITA headquarters in Jamba are attacked with chemical weapons by government aircraft, so a Belgian toxicologist associated with other such allegations in the past [see 22 Feb] says later. He stated that dozens of people were killed, their bodies turning black, and hundreds more harmed. {Johannesburg international service 14 Dec in FBIS-AFR 17 Dec}

6 December In Beijing, some 1000 officers and men of the Chinese People's Liberation Army Antichemical Warfare Corps gather at the Antichemical Warfare Department General Staff Headquarters to mark the 40th anniversary of the founding of the Corps (on 11 December 1950). Xinhua, reporting the occasion, states that during "the several border defensive wars, the antichemical units participating in the battle fought bravely and tenaciously and perfectly fulfilled all antichemical supporting missions, displaying the spirit of fearing no sacrifice. A large number of meritorious collectives and combat heroes have emerged." *Renmin Ribao* says that the Corps "has outstandingly fulfilled all tasks in several self-defense actions, nuclear tests, earthquake relief work, and rushing to deal with chemical accidents." Further, it reports the address of a PLA Deputy Chief of Staff in which he says that the Corps "must resolutely implement the guiding idea for army building during the new historical period, as stipulated by the Central Military Commission. The Corps should

base itself on the present, have the future in mind, keep a close watch on the situation of international struggles, and do a good job in preparation for antichemical security in dealing with regional wars and all eventualities to meet the needs of future operations." {Xinhua domestic service 6 Dec in FBIS-CHI 7 Dec; *Renmin Ribao* 7 Dec in FBIS-CHI 14 Dec}

Shortly afterwards *Zhongguo Xinwen She* reports how the China Institute of Antichemical Command and Engineering, "reputedly the cradle of the Chinese Army's training for its antichemical personnel," has, over the past 40 years, taken "a road that combines teaching, scientific research and production ... [and] turned out nearly 20,000 professionals who have become the backbone of China's antichemical construction." No mention is made in this article (nor was it in the reporting noted earlier) of the imminence of the CWC, but there is an account of the Institute's recent diversification into serving "the national economic construction," as by its "research on handling urban chemical contingencies," including industrial accidents, and in "quarantining the imported-exported food and testing water pollution." The report says, further, that "the Institute also has helped Third World countries train their antichemical personnel and at the same time, has carried out extensive technical exchange with visiting counterparts from more than 10 developed countries." {*Zhongguo Xinwen She* 11 Dec in FBIS-CHI 19 Dec}

10 December In Washington, the Committee for Peace and Security in the Gulf, which is a new bipartisan coalition group that includes many prominent liberal Democrats and moderate-to-conservative Republicans, calls upon President Bush to add the elimination of Iraq's weapons of mass destruction, by force if necessary, to his stated goals in the Gulf. {WT 11 Dec}

11 December The US Department of Commerce Bureau of Export Administration issues, in furtherance of BW-counterproliferation export controls, an advisory notice containing "Guidelines for identifying equipment, materials and technical data that may be of concern for biological weapons purposes and for recognizing suspicious behavior in transactions involving such equipment, materials and technical data." {FedR 17 Dec}

11 December USSR Foreign Minister Eduard Shevardnadze, speaking at a press conference in Houston alongside US Secretary of State James Baker at the conclusion of two days of ministerial talks, says that "if Iraq withdraws from Kuwait on its own initiative ... on our agenda as a next item would be the transition of the Middle East, including Iraq, to a situation where there would be a nuclear-free and chemical weapon-free zone in the Middle East." Secretary Baker says he is sympathetic to the idea but stops short of saying that the United States would ask Israel to give up its nuclear weapons. {WP & WSJ 12 Dec}

11-13 December The Australia Group meets in Paris {IHT 26-27 Jan 91}. It expects to agree, at its next meeting (in May 1991), to place export controls on production technology in addition to the export controls on chemical precursors for CW agents. There are now 14 chemicals on the Group's core list of export-controlled precursors, with 36 others on the warning list {Kyodo 22 Feb in FBIS-EAS 22 Feb}.

12 December Israeli Prime Minister Yitzhak Shamir, speaking in Washington about the Shevardnadze proposal the day previously, says: "Our answer is positive in principle. We are ready to start a serious study of all these problems in order to limit and annihilate any possibility of the use of nonconventional weapons in our area." {IHT & *Aerospace Daily* 13 Dec}

In Tel Aviv, *Al Hamishmar* reports that in June President Mubarak of Egypt had obtained the agreement of President Saddam Hussein of Iraq to the establishment of an Egyptian-Israeli committee "to initially discuss chemical disarmament and submit operational proposals to the countries of the region, and at a later stage to discuss nuclear disarmament" [see also 28-30 May]. There had been

mixed Israeli reaction to the proposal, so the report continued, including opposition from Foreign Minister David Levi and support from Labor Party chairman Shimon Peres. Meanwhile, there had reportedly been direct Israeli-Iraqi contacts on the issue in Geneva, up until the end of August. {*'Al Hamishmar* 12 Dec in FBIS-NES 12 Dec}

12 December The US Army announces that Fort Detrick scientists are to collaborate with the Institute of Poliomyelitis and Viral Encephalitis in Moscow (an organ of the USSR Academy of Medical Sciences) in developing and testing a vaccine against hemorrhagic fever {WT 13 Dec}. A US-Soviet agreement to that effect had been signed on 6 December {*USAMRDC Newsletter* Jan 91}.

13 December The Iraqi Government announces that civil-defense exercises are to be held throughout the country on 15 January, which is the day when the UN Security Council ultimatum [see 29 Nov] expires. Public-information broadcasts are now starting to give advice on air-raid precautions: people are being told, among other things, to watch for small birds falling dead from the sky and to supply themselves with towels soaked in water as a mask against poison gas. {DTel 14 Dec}

13 December In West Germany, two more former executives of Imhausen-Chemie GmbH [see 8 Aug] are arrested on suspicion of having helped Libya build a chemical-weapons factory [see 12 Nov]. {IHT 14 Dec}

13 December President Bush approves a set of new unilateral US export control procedures and regulations intended to streamline and clarify export-license processing and to enhance efforts to stem the spread of missile technology and nuclear, biological and chemical weapons. Part of the package is an "Enhanced Proliferation Control Initiative" (EPCI) scheduled to take effect by 16 February 1991, implementing portions of the previous month's Executive Order on the subject [see 16 Nov]. {"Statement by the Press Secretary," "Fact sheet on export control procedures" and "Fact sheet on Enhanced Proliferation Control Initiative" 13 Dec, NYT 15 Dec, DN 17 Dec}

The White House fact sheet on the EPCI describes it as including the following elements:

- "1. The United States shall adopt worldwide export controls on 50 precursors for chemical weapons and shall urge all nations that manufacture these chemicals to adopt equivalent controls.
 - "2. Export licenses shall be required for proposed exports of potentially chemical-weapon-related industrial facilities, and related designs and technology.
 - "3. Export licenses shall be required for any export destined for a publicly-listed company, ministry, project, or other entity that is engaged in activities of proliferation concern.
 - "4. Export licenses shall be required when an exporter knows or is informed by the US Government that a proposed export may be destined for a project of proliferation concern. (A similar regulation already applies to exports of possible nuclear-weapon concerns.)
 - "5. Current regulations shall be supplemented by control lists of (i) dual-use equipment and technology related to chemical weapons, biological weapons, and missiles, and (ii) countries to which such equipment and technology shall be controlled.
 - "6. Civil and criminal penalties shall be imposed upon US citizens who knowingly participate in activities that promote the spread of missile technology and chemical weapons. (Similar penalties already apply in the areas of nuclear and biological weapons.)"
- It is reported that the Administration will shortly be publishing the list of "countries of concern" referred to at 5(ii). {ITP 20 Dec}

14 December The World Health Organization announces that the USA and the USSR have agreed to destroy their last remaining cultures of smallpox virus by the end of 1993, now that smallpox has finally been eradicated. {Reuter as in DTel 15 Dec}

14 December In London, the Foreign Office hosts a one-day international seminar on export controls against chemical weapons {*Notes on Arms Control* (ACDRU) Jan 91}. It is attended by 26 Australia-Group and East-European ("Leipzig Group") countries. They agree to cooperate and to produce a collated list of the chemicals that each government controls {Ind 10 Dec, FT 18 Dec}.

14 December In Washington, the American Association for the Advancement of Science convenes a seminar on CBW Proliferation and Arms Control within its Fifth Annual Colloquium on Science and Security.

15 December In Washington the Director of US Central Intelligence, Judge Webster, says to the *Washington Post* that Iraqi military forces have a stockpile of roughly 1000 tons of deadly chemical agents on hand, "much of it loaded ... in almost every type of weapon," including a persistent nerve agent. He says, further, that Iraqi poison gas has been moved into Kuwait, his aides later stating that this deployment included CW warheads for Iraqi FROG missiles {WP 16 Dec, IHT 17 Dec}.

17 December Libya has plans to build a biological-weapons plant near Sebha, perhaps in conjunction with a CW-weapons plant being built there, according to a report in *Der Spiegel* attributing unidentified West-European intelligence sources. The report also speaks of a further plant for CW weapons being planned for construction south of Sirt, as well as a new CW-weapons project at Rabta [see 12 Nov]. {DerS 17 Dec}

17 December Brazil and Argentina are close to finalizing the draft of a treaty forbidding the production and use of CBW weapons, so Brazilian Foreign Minister Francisco Rezek is today reported, continuing: "There is no reason to wait for a treaty to be drafted abroad because we know very well what we want." He says, further, that he believes Chile, Paraguay and Uruguay will "probably" also sign the treaty, which he expects to be finished in the next few months. {*Folha de Sao Paulo* 17 Feb in FBIS-LAT 20 Feb}

18 December President Bush, speaking to the press, indicates that the United States and other nations will take steps to rein in Iraq's nuclear and chemical weapons capabilities regardless of whether Iraq withdraws from Kuwait in compliance with the UN Security Council resolutions [see also 15 Nov]. {WP 19 Dec}

20 December The British Government adds more CW precursor chemicals to the list, now totalling 37, of those for which export licenses are required {Statutory Instruments 1990/2632}. Further, the trade minister responsible, Tim Sainsbury, announces that a license will be required to export goods which the exporter knows, or has grounds for suspecting, may be for use in the production, storage, handling, detection or identification of chemical or biological weapons. He says: "Existing controls have been strengthened against a background of increased international concern about the proliferation of such weapons and the efforts of certain countries to acquire or develop them" {FT 21 Dec}.

21 December The US Department of Commerce issues for industry comment a draft list of the categories of equipment that are being considered, because of their potential applications in the manufacture of chemical or biological weapons, for new export regulations under the Administration's Enhanced Proliferation Control Initiative [see 13 Dec]. There are 23 categories, ranging from Hastelloy chemical process equipment to freeze-drying and microencapsulation equipment and pathogenic or toxigenic organisms. Comments on the draft are due by 18 January. The new regulations are scheduled to be issued on 14 February {ITP 17 Jan 91}.

The chemical and electronic industries, so it is later reported, embark upon intensive lobbying to dissuade the Administration from so large an expansion of unilateral export controls {*Science* 1 Feb 91}. A revised list "pares down some of the categories, eliminates

others and targets many of the restrictions to applications for chemical and biological warfare" {DW 4 Feb 91}. It would still bring a large number of US companies within the purview of export-control laws for the first time {WT 19 Feb 91}.

The still unpublished list of "countries of concern" to which export of these technologies is to be controlled is reportedly also proving controversial; it is said to include such major US trading partners as Argentina, Brazil and India, with arguments being made to extend the list to all non-Western countries {DW 4 Feb 91}. A compromise--just the Middle East and Southwest Asia, by region, without listing individual countries--is being predicted at the end of February at which time the new regulations are still unissued {WP 27 Feb 91, IHT 28 Feb 91}

22 December In Iraq the Speaker of the National Assembly, Sa'di Mahdi Salih, states that Iraq, if attacked, will use chemical weapons, which he says are comparable in effectiveness to nuclear weapons. {Paris Radio Monte Carlo 22 Dec in FBIS-NES 24 Dec; G & TL 24 Dec}

26 December In Riyadh, at the first of what are expected to be weekly news briefings by the US Defense Department, Lt-Col Tom Coury says that it is the Department's "intelligence assessment" that Iraq will probably use chemical weapons against coalition forces if war comes. {NYT 27 Dec}

26 December An unidentified source in the Iraqi Information Ministry is reported on Radio Monte Carlo as saying that Iraqi authorities are preparing to distribute 800,000 gas masks to government employees. {Radio Monte Carlo 26 Dec in FBIS-NES 26 Dec}

27 December In Washington the US General Accounting Office submits to the Senate Governmental Affairs Committee a report on the medical projects in the Defense Department's Biological Defense Research Program. The conclusion of the report is that millions of dollars have been spent unnecessarily because part of the total expenditure had been on research "that did not address validated biological warfare threat agents"--i.e., agents "assessed by the intelligence community as being developed or produced" as weapons. Agents under study in the BDRP which were not "validated threats" included the viruses of Rift Valley fever, Chikungunya, Lassa fever, and Korean and Argentine hemorrhagic fevers. The GAO also found duplication of some of the work by federal civilian agencies. {GAO/NSIAD-91-68; WP 29 Jan; Science 1 Feb 91; C&EN 4 Feb 91}

28 December In the United Kingdom, the Department of Health is issuing guidance to Regional Health Authorities regarding National Health Service support for the Defence Ministry's Operation Granby--the UK contribution to Desert Shield {Obs 6 & 13 Jan 91; Ind 10 & 11 Jan 91}. The guidance details preparedness for an influx of battle casualties from the Gulf, including CW ones. It states that the National Health Service is not being asked to expect biological-warfare casualties {NHS (England) Support for MoD's Operation Granby: Guidance for Clinical and Administrative Medical Staff Dec 90}. "Ministerial sources" quoted subsequently in the press say that any BW casualties are likely to be cared for at British military bases in Cyprus {Ind 11 Jan}.

The Ministry of Defence tells reporters that front-line British soldiers in Saudi Arabia are being inoculated against BW weapons, following a Cabinet decision to that effect several weeks previously [see also 13 Nov] after consultations with the US Government in the light of new intelligence. An official spokesman declines to say which BW agents the immunization program is covering, but there is much unattributed reference to anthrax. {TL 29 Dec}

The Foreign Office announces that British civilians in Bahrain,

Qatar and the eastern and central provinces of Saudi Arabia, estimated to number more than 21,000, are shortly to be issued with gas masks. {Press Association 28 Dec in FBIS-WEU 31 Dec; TL 29 Dec}

28 December The US Defense Department issues a statement about American forces in the Gulf region which says: "We are committed to providing maximum protection for our troops, including protection against chemical and biological weapons. We expect to begin a program of inoculations soon." An official says that the program is planned to begin "in a matter of weeks" [see also 28 Sep] and that an effort is being made to expand production of vaccines {IHT 29-30 Dec}. The Pentagon statement follows press reports about the immunization plans which had attributed unidentified "senior Administration officials" {NYT 28 Dec}. Department spokesman Pete Williams later says that a program to produce enough vaccine to protect US troops against Iraqi BW agents had been started within days of Iraq's invasion of Kuwait {JDW 12 Jan 91}.

The Defense Department declines to say how many troops are to be immunized, however, or against what diseases {NYT 6 Jan 91}, though officials are reported to be concerned over shortages of anthrax vaccine {NYT & DTel 29 Dec, WP 31 Dec} and to be seeking additional supplies from Britain {Newsweek 7 Jan 91} (which, it is later reported, has been supplying Saudi Arabia with the vaccine {Ind 6 Jan 91}). Newsweek reports a short while afterwards that "Iraqi military defectors have revealed to Western intelligence agencies that Iraq has been conducting research on the anthrax bacillus" {Newsweek 7 Jan 91}. There are unconfirmed reports of US Defense Department preparations to immunize also against botulism {NYT 4 Jan 91}.

Among those in Saudi Arabia subsequently receiving inoculations against anthrax are American and British journalists. {DTel 16 Jan 91}

28 December The Soviet Union and the United States agree to extend the deadline, hitherto 31 December, for drafting the detailed verification provisions for their June 1990 bilateral CW agreement, including the inspection protocol [see 4 Nov]. The head of the USSR Foreign Ministry Information Directorate, Vitaliy Churkin, later reports that, during the three "intensive" rounds of bilateral talks thus far [see 27 Nov], "several issues of an objective nature" had emerged which still needed further study. {TASS 4 Jan 91 in FBIS-SOV 7 Jan 91}

6 January 1991 Belgian Defense Minister Coëme, responding to a parliamentary question, says that construction of the projected chemdemil facility at Houthulst for destroying unearthened World War I CW munitions will start later in the year. It is expected to cost BFr145 million. {Teletext 6 Jan}

6-9 January UK Prime Minister John Major visits Saudi Arabia. Reporters accompanying him are told that Britain will seek a requirement by the international community that Iraq, as part of any peaceful resolution of the Gulf crisis, dismantles its stockpile of CBW weapons [see also 18 Dec 90]. {DTel & FT 7 Jan}

Responding to a question at a press conference, the Prime Minister rules out British use of nuclear weapons in response to Iraqi CW attack: "We have plenty of weapons short of that. We have no plans of the sort you envisage." {DTel & Ind 9 Jan}

British embassy officials begin the distribution of gas masks to British civilians in the region [see 28 Dec 90]. {DTel 8 Jan}

7 January In Israel, where civil-defense authorities had decided the week previously to accelerate the distribution of gas masks [see 3 Nov 90], some 3.5 million citizens have by now received their boxes of anti-CW protective kit, about 90 percent of the urban-sector popu-

lation {WT 31 Dec 90; Jerusalem domestic service 8 Jan in FBIS-NES 8 Jan}. But the 1.75 million Palestinians in the occupied territories remain without, though some 180,000 masks, purchased overseas, are said to have been earmarked for them, and further supplies are becoming available from indigenous production {DTel 8 Jan}. The Defense Ministry decides to delay the issue of protective kits to residents of Judaea, Samaria and the rural sector of southern Israel {Jerusalem domestic service 8 Jan in FBIS-NES 8 Jan}.

8 January In Geneva, the CD Ad Hoc Committee on Chemical Weapons [see 26 Nov 90] convenes for its final session under its 1990 chairmanship.

9 January US Secretary of State James Baker, meeting in Geneva with Iraqi Foreign Minister Tariq Aziz during the final days before expiry of the UN deadline [see 29 Nov 90], hands him a letter addressed to President Saddam Hussein from President Bush which, after reading, he declines to accept. The letter, in its latter part, says: "Should war come, it will be a far greater tragedy for you and your country. Let me state, too, that the United States will not tolerate the use of chemical or biological weapons, support of any kind of terrorist actions, or the destruction of Kuwait's oil fields and installations. The American people would demand the strongest possible response. You and your country will pay a terrible price if you order unconscionable actions of this sort." {IHT 4 Jan}

12 January The US Congress authorizes President Bush to use force to remove Iraq from Kuwait.

13 January In Lebanon the Syrian Forces Command is reported to have distributed gas masks to its troops operating in areas adjacent to the border strip in western al-Biqa' {Voice of Lebanon 13 Jan in FBIS-NES 14 Jan}. The UNIFIL command in the south has received gas masks for its 6000 personnel {Voice of Lebanon 11 Jan in FBIS-NES 14 Jan}.

13 January In Israel military sources are reported as saying that "at the present stage there is no need to inoculate the population against biological warfare" [see also 28 Dec 90]. {Jerusalem domestic service 13 Jan in FBIS-NES 14 Jan}

14 January In Iraq, the National Assembly votes to resist all attempts to force an Iraqi withdrawal from Kuwait. Immediately after the vote, several hundred demonstrators take to the streets calling for chemical weapons to be used against the US troops massing in Saudi Arabia. {FT 15 Jan}

14 January In Israel, the Supreme Court orders the army to begin distributing antichemical protective kits to Palestinians [see 7 Jan]. The court acted after it was petitioned by a resident of Bethlehem whose lawyers state that the army has secretly been distributing kits to Jewish settlers on the West Bank while denying them to Palestinians. {WP 15 Jan}

14 January The London newspaper *The Independent* quotes unidentified "intelligence reports" as indicating that half of the 36 Chinese-supplied CSS-2 ballistic missiles deployed by Saudi Arabia to the south of Riyadh "are likely to have been fitted with chemical warheads." {Ind 14 Jan}

15 January The United States and the Soviet Union are scheduled to resume their bilateral CW talks in Geneva [see 28 Dec 90]. {TASS 4 Jan in FBIS-SOV 7 Jan}

15 January In the United States, Brunswick Corporation announces that its defense division has received an \$11.8 million order from the

Marine Corps for 100 of the new XM21 Remote Sensing Chemical Agent Alarm systems. Some alarms of this advanced type are already deployed with Desert Shield forces. Further orders are expected, both from the Marines and from the Army {DN 28 Jan}. The Marine Corps has another developmental alarm system on order as well for its units deployed to the Gulf: the lightweight Individual Chemical Agent Detector (ICAD) made by Environmental Technologies {DW 17 Dec 90}.

15-16 January The US Army convenes public hearings in Tooele and Salt Lake City, Utah, on its supplemental draft environmental impact statement for the projected Biological Aerosol Test Facility at Dugway Proving Ground [see 27 Nov 90].

16 January UK Foreign Secretary Douglas Hurd states before the House of Commons Foreign Affairs Committee that Britain will reconsider its undertaking not to use nuclear weapons against Iraq--an assurance which Britain, like the United States, has made to all States Parties to the Nuclear Nonproliferation Treaty--if Iraq is found to be in possession of a nuclear explosive device. {FT 17 Jan} [See also 6-9 Jan]

16 January From Turkey, much alarm is reported among the population of Diyarbakir about the possibility of Iraqi CW attack, with many people fleeing the city or attempting to protect their houses. {*De Standaard* (Brussels) 16 Jan, *De Morgen* (Brussels) 22 Jan}

16 January In Iraq, shortly before midnight Greenwich Mean Time, targets begin to come under attack by aircraft and cruise missiles of the multinational force, the UN Security Council deadline [see 29 Nov 90] having passed some 19 hours previously. What the United States calls "Operation Desert Storm" has begun.

At least one air-defense artillery unit in Saudi Arabia receives orders to start taking anti-nerve-gas pretreatment tablets. {NYT 18 Jan}

17 January President Bush, announcing the start of the air war against Iraq, says that the targets attacked included chemical weapons facilities in Iraq.

The Chief of Staff of French Armed Forces, General Maurice Schmitt, reportedly says that Iraq is no longer in a position to launch a serious chemical attack because the air attacks have neutralized launching sites for such arms. {IHT 18 Jan}

Israeli Defense Forces spokesman Brigadier Nachman Shai tells a news conference in Tel Aviv that, although Iraqi chemical weapons (and nuclear) installations had been damaged, it is premature to say they have been totally destroyed. {FT 18 Jan}

17 January In Israel, official instructions are broadcast to the general public to open the anti-CW protective kits and keep them within reach. {Radio Jerusalem and IDF Radio 17 Jan in FBIS-NES 17 Jan}

Jerusalem police complain that Arab demonstrators are protecting themselves against tear gas by wearing gas masks [see also 14 Jan]. The army is reported as threatening to open fire on Arabs doing so. {IHT 18 Jan}

17 January In Southampton, the UK Department of Trade and Industry, through its Export Control Organization, convenes the first of a series of one-day seminars for business corporations on the role of export controls in NBC- and missile-technology counterproliferation efforts.

18 January Iraq launches guided missiles against Israel in the early hours of the morning, the first of many such modified-Scud missile attacks over the coming days and weeks. Initial reports refer, er-

roniously, to CW warheads. Israeli radio reports that 13 people are being treated in hospitals for atropine poisoning after using the auto-injectors included in their anti-CW protective kits. Three elderly women and an infant suffocate through misuse of their gas masks. {*Evening Standard* 18 Jan, NYT & WP 19 Jan}

18 January In Moscow, the Chief of the Soviet Chemical Troops, Colonel General Stanislav Petrov, is quoted as follows on the possible consequences of the air-raids on Iraqi CBW installations [see 17 Jan]: "According to available information, Iraq possesses facilities for the production of chemical weapons, and has stocks estimated at 2000 to 4000 tons of war gases [see also 14 Dec 90]. In our opinion, in the event of an air strike using conventional means of destruction on production and storage facilities, the seals will be broken on most of the multi-ton containers and some of the chemical munitions. It can be predicted that if this occurs, the depth to which dangerous concentrations of substances like sarin and tabun will spread under the conditions typical of the Persian Gulf region will not be more than several dozen kilometers, while concentrations above permissible levels will spread to about 100 kilometers.

"As far as biological weapons are concerned, it is impossible to rule out the possibility that Iraq has at its disposal agents for typhus, cholera, anthrax and tularemia, and also stocks of agents for extremely rare African and Asian diseases that are usually untreatable and lead to death [see also 28 Sep 90]. The consequences of the escape of pathogens into the atmosphere during the destruction of their storage sites are difficult to predict. In principle it is impossible to rule out a situation in which national borders will not be borders for the spread of epidemics.

"Due consideration should be given to the fact that during the destruction of both chemical and biological weapons, it may be primarily the peaceful population that suffers." {*Trud* 18 Jan in FBIS-SOV 24 Jan}

18 January In Geneva the CD Ad Hoc Committee on Chemical Weapons concludes its work for 1990 [see 8 Jan], adopting a report containing a new rolling text of the draft CWC. {CD/1046}

20 January In Riyadh the commander of US forces in the Gulf, General H Norman Schwarzkopf, says in television interviews that the air war against Iraq has severely damaged the country's nuclear, chemical and biological arms installations, adding, however, that Iraqi bombs and artillery shells containing CW agent still remained a threat. And, "I think the jury is still out on whether or not they have a chemical capability for their Scuds [see 3 Dec 90], but I would certainly say we're encouraged by the fact that they haven't used them so far." {IHT & NYT 21 Jan}

US Air Force spokesman Major-General Burton Moore says next day that, five days into the bombing campaign, Iraqi CW plants are still a priority target, and that Iraq still has capacity for both storage and production of chemical and biological weapons. {FT 22 Jan}

An assessment--not a new one [see 26 Dec 90]--is shortly afterwards made public in which Western officials say Iraq will most likely use CW weapons against opposing ground forces if a land battle breaks out. {IHT 24 Jan}

22 January The Conference on Disarmament reconvenes in Geneva--with 39 national delegations, now that there is only one German state.

22 January The *Washington Times* reports that the Czechoslovak antichemical unit operating with coalition forces on the Kuwait-Saudi border [see 3-7 Nov 90] has detected trace quantities of CW agent in the air, this finding being taken by the unit as evidence of the destruction of a large stockpile of chemical munitions. {WT 22 Jan}

23 January From Baghdad, CNN television reports that US bombs damaged what Iraqi officials described as an important factory producing formulated milk for babies. But the Chairman of the US Joint Chiefs of Staff, General Colin Powell, says: "It is not an infant-formula factory, no more than the Rabta chemical plant in Libya made aspirin. It was a biological-weapons facility, of that we are sure" {IHT & NYT 24 Jan}. White House press secretary Marlin Fitzwater says the Iraqis had hidden a BW-weapons factory "behind the facade of baby milk production" {WP 24 Jan}. Later, there is skeptical, but inconclusive, comment on the US statements from the original French builder of the plant and from New Zealander technicians who had worked there {WP 8 Feb}.

23 January In Bonn, Federal Economics Minister Jürgen Möllemann announces that about 110 German companies have been investigated on suspicion of violating the international embargo on trade with Iraq, and that nine cases are likely to go to court, including the case of a company said to have helped in Iraqi development of biological weapons. {IHT 17 Jan, FT 24 Jan}

23 January In Washington, at a Defense Department press briefing, the Chairman of the Joint Chiefs of Staff says that Iraqi BW facilities have been "seriously damaged" and that efforts are still under way to hunt down other facilities believed to be involved in the production of BW weapons. As for CW weapons, the focus of the air offensive had been on production facilities rather than munition storage bunkers, meaning that Iraq still posed a CW threat in the form of CW artillery, air power and multiple rocket systems. {FT & NYT 24 Jan}

At a counterpart press briefing in the British Defence Ministry in London, the Deputy Director of Operations, Major General Alex Hartley, says that the Iraqi BW research facility at Salman Pak [see 17 Jan 89] was understood to be extensively damaged, as was the CW-agent factory at Samarra [see 20 Oct 90] {FT 24 Jan}. Kurdish sources in London had earlier stated that these two installations had been damaged during the first four days of bombing, as had CW plants at Fallouja and al-Qaim {Ind 22 Jan}.

24 January Finland announces its intention of donating 5000 gas masks and an unspecified amount of first-aid equipment to Palestinians living in the Israeli occupied territories [see 7 Jan] {G 25 Jan}. Other European countries, for example Sweden {Stockholm international service 4 Feb in FBIS-WEU 5 Feb}, France {*Antenne-2* television 8 Feb in FBIS-WEU 11 Feb} and Denmark {AFP 18 Feb in FBIS-WEU 19 Feb}, have been sending masks or are going to do so. The UN Relief and Works Agency later distributes masks to relief workers in the occupied territories donated by Canada {Ind 5 Feb}.

24 January Czechoslovakia furnishes the CD with updated information [see 17 Aug 89] for the year 1989 on its manufacture and consumption of scheduled chemicals, including its production of test quantities (1-60 kg) of blister and nerve gases at Zemianske Kostolany, the location of the National Defense Ministry's Military Facility No 072. {CD/1048}

25 January Iraq lost three-quarters of its chemical arms capacity during the week of air raids, according to French Armed Forces Chief of Staff General Maurice Schmitt speaking today in Paris. He says there is no evidence that Iraq can install chemical warheads on Scud missiles. {NYT 26 Jan}

25 January In Geneva there is a further meeting of the Pugwash/SIPRI Thiodiglycol Project [see 29 Jun-2 Jul 90].

25 January In Washington, unidentified administration officials reportedly say that the Defense Department has authorized the US commander in the Persian Gulf to use "nonlethal riot-control gases" in certain circumstances against Iraqi forces. Explaining the decision, Department spokesman Pete Williams says it had been driven by a desire to "save lives": "We think the commander should have the authority to use tear gas in search and rescue operations is the reason. This is not chemical warfare on the battlefield. It is basically tear gas." {NYT 26 Jan}

Subsequent commentary by a senior Soviet CW defense official, I Yevstafyev [see 26 Nov], suggests that this talk of using irritant agents perhaps indicates that "some people are in fact very interested in provoking Iraq to use chemical weapons." {Sovetskaya Rossiya 8 Feb in FBIS-SOV 14 Feb}

26 January Iraq has a large underground chemical-weapons factory in the north of the country, at Chiyayigaran near Dahuk, according to the Turkish newspaper *Milliyet*, which attributes the information to Kurdish sources in Iraq. {*Milliyet* 26 Jan in FBIS-WEU 31 Jan}

26-27 January In Geneva, the Pugwash Chemical Warfare Study Group meets for its 16th international workshop. There are 54 participants from 21 countries.

27 January In Washington, White House Chief of Staff John Sununu, is asked during a television interview whether it was possible that the United States would respond with chemical weapons against Iraqi use of them. He replies: "No, it is not." {*This Week with David Brinkley* (ABC News)}

28 January Iraq asked the Soviet Union, unsuccessfully, to sell it chemical warheads for Scud missiles "not all that long ago," according to a news item on today's Moscow television. {*Television News Service* 28 Jan in FBIS-SOV 28 Jan}

28 January In Moscow, Colonel General Stanislav Petrov, Chief of Chemical Troops, is once again [see 18 Jan] interviewed in the press on the subject of Iraqi CW weapons. He says that Iraq has 10-12 development, production and storage facilities for chemical munitions, and that the agents stockpiled are primarily mustard gas, hydrogen cyanide, tabun and sarin. He mentions the possibility of Iraq also having botulin toxin weapons. {TASS international service 28 Jan in FBIS-SOV 28 Jan; Reuter as in WT 29 Jan}

28 January In Baghdad, President Saddam Hussein is asked during an interview with CNN correspondent Peter Arnett whether Iraq would use chemical weapons in a land war in Kuwait. He replies: "We shall use the weapons that will be equatable to weapons used against us by our enemies." Of the *al-Hussein* missile that has been fired at Israel [see 18 Jan] and Saudi Arabia, he says: "It can carry nuclear, chemical or biological warheads." {WP 29 Jan; Mother of Battles radio 2 Feb in FBIS-NES 6 Feb}

28 January The *Washington Post* publishes what it says are particulars from the initial US assessments of the damage inflicted on Iraq during the first 10 days of the allied bombing attacks. It states that about 50 percent of the country's capacity to manufacture new chemical and biological weapons has been destroyed. {WP 28 Jan}

Unidentified "military intelligence analysts" are subsequently reported in the *New York Times* as saying that "the allied forces now face the much more difficult task of eliminating thousands of tons of chemical and biological weapons already stockpiled at hundreds of sites across Iraq." {NYT 30 Jan}

28-30 January The UN Institute for Disarmament Research (UNIDIR) convenes a conference in Moscow on "Strengthening the Biological Weapons Convention."

30 January Traces of nerve gas had been detected in Saudi Arabia some days previously, perhaps released from a damaged Iraqi factory, Associated Press reports. The agency responsible for the reported detection is not identified, but there is speculation that it was the Czechoslovak anti-CW unit [see 21 Jan]. {Prague radio 30 Jan in FBIS-EEU 31 Jan}

30 January In Riyadh, General Schwarzkopf, speaking at a press briefing about the air campaign as it nears the end of its second week, states that the 31 chemical, biological and nuclear facilities which were targeted had been attacked with over 535 sorties: "Precision-guided missiles and TLAM cruise missiles have struck hard at [those 31] facilities, as have many aircraft. ... Over half those facilities have been severely damaged or destroyed. We have absolute confirmation that we've destroyed over 11 chemical and biological storage areas. We've also destroyed or heavily damaged three chemical and biological production facilities, and we're going to continue a relentless attack on this very, very heinous weapon system." A chart shown at the briefing indicates that of the 31 targeted facilities, 18 were chemical, 10 biological and 3 nuclear. {CENTCOM briefing 30 Jan}

30 January The German government announces that it is sending Patriot missiles, poison-gas reconnaissance vehicles, anti-gas protective clothing and other special supplies to Israel to combat possible Iraqi CW or BW attacks upon the country {DPA 30 Jan in FBIS-WEU 31 Jan 91; DTel & WP 31 Jan}. The first of several cargo aircraft transporting the equipments arrives in Israel the next day {NYT 1 Feb}.

30 January In the US Congress, the Senate approves legislation aimed at assuring compensation for Vietnam-War veterans who had been exposed to the herbicide Agent Orange [see also 27 Oct 90]. The bill had passed the House the day previously. The new legislation, which the President has indicated he supports, codifies last year's decision by Veterans' Affairs Secretary Edward Derwinski that Vietnam veterans with soft-tissue sarcoma or non-Hodgkin's lymphoma are to become eligible for disability payment [see 18 May 90]. Further, the legislation is to require the National Academy of Sciences to take over the task of reviewing the scientific evidence and to report on whether other illnesses may have resulted from exposure to Agent Orange. {WP 18 & 31 Jan, NYT 30 Jan, *Science* 1 Feb}

31 January In Taiwan a Defense Ministry spokesman states that the national army neither possesses nor is developing chemical weapons, and that foreign-media reports to the contrary are completely untrue. He says, however, that the national army has increased its anti-CW efforts, including production of protective gear and anti-CW training. {Taipei domestic service 1 Feb in FBIS-CHI 5 Feb}

31 January French Defense Minister Pierre Joxe states that France will not respond in kind to Iraqi CW attack. And he says: "The issue regarding the use of chemical armaments does not arise for France because none of its units is equipped with them." {Paris domestic service 31 Jan in FBIS-WEU 1 Feb}

31 January In Geneva the CD accepts the applications for participating non-member status from 34 countries. There are two newcomers: Chile and Costa Rica. Of the 36 observers during the previous year [see 13 Feb 90], four have not applied for the present year: Bahrain, Honduras, Ireland and Sudan. {CD/INF/25/Add.1}

31 January In the US Senate a bill (S.320) is introduced under bipartisan sponsorship that is identical with the CBW counterproliferation sanctions legislation which the last Congress passed but which the President then pocket-vetoes [see 16 Nov 90]. {CR 31 Jan}

31 January In the United States, the National Academy of Sciences publishes the report on export controls which had been mandated in the 1988 Omnibus Trade and Competitiveness Act, and on which a panel had been working since August 1989. The report advocates the use of surprise on-site verification methods to ensure that commercial technology-transfers are not being used for military purposes, the enforcement of export controls to be centralized and unified within the Bureau of Export Administration. And export controls covering weapons of mass destruction, including chemical agents, should be treated as matters of national security. {*Finding Common Ground: US Export Controls in a Changed Global Environment*; DN 4 Feb}

2 February Front-line British forces in Saudi Arabia are being encouraged to take inoculation against plague, both because of indications that Iraq may use it as a BW weapon and because the disease is now rife in Kuwait City, so it is reported in today's *Daily Telegraph*. {DTel 2 Feb, WP 9 Feb}

3 February In Iraq, President Saddam Hussein has authorized front-line commanders to use CW weapons, so it is reported in today's London *Sunday Times*, which says that forces had been warned accordingly during the previous week. {ST 3 Feb}

3 February In Riyadh, Colonel Ahmad al-Rubay'an, spokesman for the Joint Forces Operations Theater Command, says that, of 429 Iraqi prisoners just captured after the engagement at al-Khafji, 304 were carrying gas masks. {Saudi Arabian television 3 Feb in FBIS-NES 4 Feb}

3 February An unidentified Iraqi engineer, speaking in Jordan, is quoted in the German press as saying that "technical problems" continue to prevent Iraq from fitting its Scud missiles with CW warheads, but that a solution is being sought "feverishly" {IHT 4 Feb}. The "technical difficulties concern the 'relative inaccuracy of the Scud missiles,' the Iraqi engineer stressed," says the *Frankfurter Allgemeine Zeitung*, continuing: "The Scud attacks on Israel [see 18 Jan] have shown that there is a 'large deviation' between the target and the object that was hit. However, this must not happen in the event of a poison gas attack, because such an attack must not hit Jordan. It is difficult to attach a heavy gas container to a warhead without causing a ballistic deviation. In addition, there are also problems in the area of electronics about which he did not elaborate" {FAZ 4 Feb in FBIS-NES 5 Feb}.

3 February French military spokesmen say that the bombing of Iraq's CW potential has caused the release of a toxic cloud {French domestic radio 3 Feb in FBIS-WEU 4 Feb}. Nerve gas, but not mustard gas, has been detected in trace quantities "almost everywhere" [see also 30 Jan] {AFP 3 Feb in FBIS-WEU 4 Feb; DTel 4 Feb}. A US military spokesman next day says that air attacks on CW targets had been carried out in such a way as to minimize, if not eliminate, the release of toxic substances {IHT 5 Feb}.

4 February In Brussels the European-Community governments agree, at the request of France, to send gas masks to Palestinians in the Israeli-occupied territories [see also 24 Jan]. {IHT 6 Feb}

5 February Australia furnishes the CD with a lengthy paper on *Strategy for Preparing for the Implementation of the Chemical Weapons Convention in Australia*. The strategy described in the paper had

been finalized by the Australian Government in October, after consultations. The paper serves to illustrate the fact that there is a wide range of tasks that must be undertaken or initiated ahead of time by any government if it is to be able to commit its country in good faith to the CWC when it is ready.

The paper also serves to place the matter of national export controls before the CD, for appended to it is a list of the 50 CW-agent precursors that are subject to Australian export controls. The list draws attention to chemicals on it which are not included in Schedules 1, 2A or 3 of the CWC rolling text, suggesting that one of them--*tris*-ethanolamine--be added to Schedule 3; three other such suggested additions--ethyl-*bis*-ethanolamine, methyl-*bis*-ethanolamine and thiophosphoryl chloride--are proposed elsewhere in the paper. {CD/1055}

6 February In Bonn, the Chancellor's cabinet approves proposals that would increase penalties for violations of German export-control laws and of the UN sanctions against Iraq; the proposals would also give new powers to German customs and security agencies, including rights to tap telephones and intercept mail, and the Federal Intelligence Service would be required to provide prosecutors with information gained from its own mail intercepts {DPA 6 Feb in FBIS-WEU 6 Feb; IHT 7 Feb}. Parliament is expected to approve the proposals because of public outrage over German industrial involvement in Iraqi armament, of which new disclosures continue to surface in the media.

Stern magazine reports the involvement of a Thyssen AG subsidiary, and eight German subcontractors, in construction of the CBW facility at Salman Pak [see 23 Jan and see also 28 Sep 90] {*Stern* 7 Feb}. Thyssen denies delivering poison-gas laboratory equipment, as alleged, but says that during 1981-82 it had supplied equipment for the laboratory's central heating, fire protection, energy supply and telephone system {FT 21 Feb}.

6 February The Libyan foreign ministry denies allegations made the day previously on German television that a large underground storage facility for nuclear and chemical weapons is being built 40 km from Tripoli. {JANA 6 Feb in FBIS-NES 8 Feb; UPI as in CN 8 Feb}

6 February In Washington, unidentified "Bush administration sources" say that Iraq, during the previous week, had moved a special chemical weapons brigade into southern Kuwait, the brigade having with it multiple rocket launchers and FROG-7 heavy artillery rockets armed with CBW warheads. An intelligence assessment reportedly was that the warheads most probably contained sarin, anthrax spores or dusty mustard. {WT 7 Feb}

6-8 February In the Netherlands, experts from 17 countries meet for a technical seminar to prepare the ground for the third review conference of the Biological Weapons Convention. The meeting is opened by Netherlands Foreign Minister Hans van den Broek. {Reuter 6 Feb}

7 February In France, President Mitterrand, when asked on television about the likely coalition response to any Iraqi use of CW weapons, says: "We must not use chemical weapons. We have weapons, conventional weapons, which will allow us to uphold the law in this conflict and make it prevail, but we must not succumb to this wish for a riposte in kind. There is a desire to lead us to that, but we must refuse" [see also 31 Jan] {*Antenne-2* television 7 Feb in FBIS-WEU 8 Feb}. Conservative opposition parties subsequently criticize him for needlessly abandoning, as they put it, a psychological weapon of deterrence {*Le Monde* 10-11 Feb in FBIS-WEU 13 Feb; FT 13 Feb}

7-8 February In the UK, National Opinion Polls ask 1010 people representative of the population of Great Britain how the allies should respond if Iraq resorts to chemical weapons. Two percent favor withdrawal or ceasefire; 9 percent don't know; 11 percent, retaliation in kind; 14 percent, the use of battlefield nuclear weapons; 29 percent, a conventional response; and 35 percent, the devastation of Baghdad with B-52 bombers. {ST 10 Feb}

8 February Iraq asks the United Nations to dispatch a fact-finding mission to determine whether the factory in Baghdad whose bombing two weeks previously had been reported by CNN [see 23 Jan] produced children's milk or biological weapons. {Baghdad radio 9 Feb in FBIS-NES 11 Feb; IHT 9-10 Feb}

8 February Germany and the United Kingdom furnish the CD with a joint report on two joint practice challenge inspections conducted the previous summer, one at an air force operational base in Germany, the other at an ammunition storage facility in the UK. The report describes the procedures and concepts that were tested, including "managed access" techniques, and includes detailed inspection reports as prepared by the inspectors. It concludes that the joint exercises have "served to reaffirm to both countries the value of the concept of challenge inspection as an effective means of deterring circumvention of the Chemical Weapons Convention." {CD/1056}

11 February In Moscow, a senior foreign-policy adviser to President Gorbachev announces, as the President's personal envoy Yevgeny Primakov leaves for Baghdad, that the Soviet Union is calling on both sides in the Gulf war formally to renounce the use of any chemical, biological or nuclear weapons. {FT 12 Feb}

11 February In Riyadh, US CENTCOM spokesman Brigadier Richard Neal (Marine Corps) says that targets attacked in Basra have included both chemical-weapons plants and chemical-weapons storage facilities, and that targeting experts had selected special bombs for the purpose so as to ensure, as he puts it, minimum impact on the environment. {IHT 12 Feb}

At the Pentagon press briefing, the Joint Staff Director of Operations, Lt-Gen Thomas Kelly, says: "There is very, very, very little NBC production going on in that country--it ranges from zero to maybe ten percent of what they had before the war" {transcript of Pentagon briefing, 11 Feb}. Several days later, General Kelly says that some of Iraq's chemical weapons may have lost their potency over the previous four weeks because of Iraqi manufacturing technology yielding an unstable product. He says, further, that the remaining threat of Iraqi CW is "nowhere near as significant as it was at the outset" {WP 19 Feb}.

11 February An unidentified US military official reportedly says that Iraqi troops may have sown landmines filled with nerve and mustard gases in southern Iraq. {IHT 12 Feb; *Pravda* 15 Feb in FBIS-SOV 22 Feb}

13 February The US General Accounting Office issues a report on the now-completed withdrawal of US CW weapons from Germany [see 6 Nov]. The operation had cost about \$62 million, more than 10 percent of which had been paid by Germany. {GAO/NSIAD-91-105; ITP 21 Feb}

14 February The head of the USSR CD delegation, Serguei Batsanov, who is today formally elected chairman of the CD Ad Hoc Committee on Chemical Weapons, speaks to the press of the breakthrough in the CWC negotiation which he must now seek: "A qualitative breakthrough means the achievement of true security of states," adding that this calls for the complete destruction of chemi-

cal weapons, the full prohibition of CW use, and inspection on request. He says he also wants "to make active efforts" on assistance in protecting future States Parties who have no CW weapons against such weapons. He sees the Gulf war as somewhat decelerating the activities of delegations, but observes: "It seems to me that top-level efforts to ban chemical weapons worldwide should blend well with the new security structures which will emerge after the end of the war." {TASS 14 Feb in FBIS-SOV 15 Feb}

14 February Sweden introduces into the CD at plenary level the proposal for a new nonproduction-verification scheme which it had circulated for consultations during the intersessional meetings. The core of the proposal is its concept of "capable plant sites": States Parties would be obliged under the proposal to declare all such sites regardless of whether scheduled chemicals are actually produced there. The proposal differentiates itself from the current provisions (in draft Article VI) for civil-industry controls in the following terms: "processing and consumption of chemicals listed on Schedules 2 and 3 are not subjected to verification measures; no facility agreements will be required; a Schedule 4 for chemical conversion processes is established; selective on-site inspections on short notice will replace systematic routine on-site inspections; on-site inspections can take place at facilities producing Schedule 3 chemicals; on-site inspections can take place at facilities capable of producing listed chemicals, the capability being indicated by the use of certain chemical conversion processes; by using declarations on planned activities as a basis for the verification the inspections can be focused on ongoing activities instead of on past activities; the total verification effort in terms of on-site inspection can readily be adjusted to be commensurate with the resources available at the Technical Secretariat; [and] objects for inspections may be proposed by States Parties in a non-confrontational way, thus maximizing the cost-effectiveness of the inspection effort without introducing accusations" {CD/1053}.

14 February Australia announces at the CD that it "intends to host a workshop for regional chemists in Melbourne in the middle of this year with the aim of providing the necessary background and training to those technical advisers in government who will be required to complete declarations and assemble technical data." Plans are to hold a multilateral trial inspection of a Melbourne chemical plant in association with the Workshop.

Australia proposes in the CD plenum that each unattributed footnote in the rolling text, of which there are a great many, entering disclaimers, qualifications, reservations, &c, be deleted unless the delegation responsible expressly lays claim to it.

Australia also proposes that the provisions of the treaty relating to destruction of CW weapons ensure a clear commitment to environmentally safe procedures.

15 February President Bush transmits to the US Congress his administration's latest annual report on *Soviet Noncompliance with Arms Control Agreements*. On CBW, the report reaffirms what is said in earlier reports [see 23 Feb 90], notably the US determination that the USSR has maintained an offensive BW capability in violation of the BWC.

Referring to the 29 December 1989 (confidential) bilateral exchange of chemical-weapons data in furtherance of the Wyoming Memorandum of Understanding, the report says that "the Soviet Union declared seven storage depots: five for munitions and two for bulk agent."

20 February Unidentified US and allied Arab officials, including a "senior Bush administration official involved in the final preparations for a ground war," reportedly say that any significant Iraqi resort to CW against coalition troops would lead to a major escalation of the

war and could trigger a contingency plan for a march on Baghdad to hunt down Saddam Hussein. Leaflets being dropped on Iraqi lines warn that anyone using chemical weapons may subsequently face trial as a war criminal. These developments are said to result from a US assessment that Iraq is now virtually certain to use CW weapons against attacking forces. Unidentified officials are quoted as saying that Saddam Hussein has already given troops dug-in in Southern Kuwait the authority to use chemicals against any allied assault [see also 3 Feb] {LAT 21 Feb}. Intercepted radio messages are later cited as evidence of this authorization {STel 3 Mar}.

20 February The US Senate, with White House concurrence, passes legislation requiring the president to impose sanctions on countries and companies developing or using CBW weapons: automatic and mandatory sanctions in the case of the weapons being used. What is adopted is an amendment to the original bill [see 31 Jan], which, rather than allowing the president to waive sanctions if he thought the national interest so required (as the White House had previously insisted [see 16 Nov]), would have allowed him to delay the imposition of sanctions against proliferator companies pending the action of their own governments against them {IHT 22 Feb, CQ 23 Feb}. The House of Representatives is expected to take up similar legislation early in March {ITP 28 Feb}

21 February In Poland, *Gazeta Wyborcza* reports that the commander of Soviet forces in Poland has refused to allow trial inspections under the projected CWC to be conducted at Soviet bases in the country. {Ind 22 Feb}

21 February Bulgarian President Zhelyu Zhelev, visiting the grave of Georgi Markov in England, promises a thorough investigation of the latter's assassination in 1978, hinting that British security services have been asked to assist the investigation [see also 17 Feb 90]. {Ind 22 Feb}

21 February British defense officials say that, in the past few days, Iraq has moved nerve- and mustard-gas munitions to front-line artillery and multiple-rocket-launcher units in Kuwait and southern Iraq, and that Iraq is now believed able to fire CW warheads on Scud missiles {FT & DTel 22 Feb}. The latter is being said by Israeli authorities, too {G 21 Feb, DTel 22 Feb}.

22 February On Moscow television, the chief of Combat Training of the USSR Ministry of Defense Chemical Troops, V I Buktoyarov, speaks of a reorientation of the chemical defense schools, such as the Kostroma Chemical Defense Higher Military Command School which is now in its 26th year, saying: "the schools are changing to new combat training plans and programs as from 1991/1992. These programs incorporate ecological and environmental protection issues. There will be many jobs for our chemical expert graduates in the national economy in peacetime too." {Utro 120+30 22 Feb in FBIS-SOV 26 Feb}

22 February The US Defense Department, as part of its \$15 billion "Operation Desert Storm" supplemental budget request, seeks an extra \$349 million for procurement of anti-CW personal protective gear "consisting of protective overgarments, gloves with inserts, overboots, hoods and filter canisters, cooling vests, chemical agent detection kits, personal skin decontamination kits and spare parts for protective masks." {DW 26 Feb}

24 February Coalition forces, before dawn, commence a large-scale multi-pronged ground offensive into Iraq and Kuwait which soon encircles the 42 Iraqi divisions in the theater of operations and initiates their destruction or rout.

The 2nd US Marine division reports encountering CW agents when one of its bulldozers sets off a chemical mine, so General Schwarzkopf is quoted as saying at a press briefing [see also 11 Feb]. {FT 25 Feb}

25 February In Tunis, the chairman of the Palestine Liberation Organization, Yassir Arafat, says during a radio interview that the use of napalm by coalition forces in the Gulf justifies Iraqi use of chemical weapons in retaliation. {FT 26 Feb}

25 February In Budapest, the Political Consultative Committee of the Warsaw Treaty Organization, comprising the foreign and defense ministers of the now-six member states, agrees to wind up the military organization by 31 March. {Ind 26 Feb}

26 February In London, defense officials say that all Iraq's storage bunkers for CBW weapons have by now been destroyed, as have production facilities. The whereabouts of any front-line stocks of chemical weapons in Kuwait, however, have not yet been identified. {FT 27 Feb}

Two days later, London officials say that British troops had discovered Iraqi chemical mines on the Gulf battlefield [see also 24 Feb]. {Ind 1 Mar}

26 February In Riyadh, US spokesman Brigadier Richard Neal says that, despite the dire situation of Iraqi forces facing the coalition ground offensive, there were no reports of chemical weapons being used. "I don't have an explanation of why they haven't used chemicals during the retreat." {Ind 27 Feb}

General Schwarzkopf next day says at a briefing: "I don't know the answer. I just thank God that they didn't." But he speculates that maybe it was because the principal remaining Iraqi delivery system for CW agents, namely artillery, had effectively been destroyed. He speaks of other explanations he has heard: that the Iraqi chemical-weapon stock had degraded in the desert and could not be upgraded because the production facilities had been destroyed [see also 11 Feb]; and that the Iraqis might have feared nuclear retaliation. {Ind, NYT & WP 28 Feb}

28 February Kuwait City is finally cleared of Iraqi forces. The coalition offensive is suspended at 0500 hrs GMT.

28 February UK Prime Minister John Major speaks in the House of Commons of the conditions which Iraq must satisfy before allied forces relinquish control of southern Iraq and economic sanctions are lifted. He says that the conditions should include "a commitment from Iraq to destroy, under international supervision, all its ballistic missiles and weapons of mass destruction, and not to acquire such weapons in the future." He says that his government will seek this commitment through the United Nations. {HansC 28 Feb}

No Chemical Arms Found on Battlefields

Despite the many reports of Iraqi deployment of chemical munitions in the Kuwait theater of operations, as of mid-March, it appears that none have been found. Indeed, the *Washington Post* reported a week after the cease-fire that, "US military officers have virtually concluded that the most controversial weapon in Iraq's arsenal--chemical weapons--never entered the combat theater." {WP 7 Mar}

The Role of Chemical Defense in Chemical Warfare, Chemical Deterrence and Chemical Disarmament*

by Matthew Meselson

Introduction. Chemical defense serves several essential roles--in chemical warfare, in chemical deterrence, and in chemical disarmament. A factor of central importance in each of these roles is the high degree of protection against chemical weapons that can be achieved by practical measures of chemical defense. This sets chemical weapons apart from conventional weapons, against which no comparable degree of protection of combatants can generally be achieved. The unique effectiveness of chemical defense has important implications for warfare, deterrence and disarmament.

In chemical warfare, a good chemical defense greatly limits the damage inflicted by chemical attack. Historically, this was seen in the dramatic effect that anti-chemical protection--chiefly the gas mask--had in limiting the importance of chemical weapons in World War I. Developments since then--greatly improved masks, protective clothing, detectors and other equipment and doctrine--have further increased the margin of protection and the ascendancy of the defense.

In addition, chemical defense acts as a deterrent to the initiation of chemical warfare. The better a force is protected against chemicals, the less incentive there will be for a chemically-armed adversary to initiate chemical warfare. Examination of official documents clearly shows that such defensive deterrence operated in the European theatre in World War II, where both sides knew the other was well equipped for chemical defense and neither side used chemicals. Indeed, chemical warfare has never been initiated against forces with adequate anti-chemical protection.

Chemical defense can also help prevent the proliferation of chemical weapons. If good anti-chemical protection is generally available, the acquisition of chemical weapons becomes less cost-effective, whether for first use or for retaliation in kind. Evidence for the operation, albeit imperfect, of such defensive stability is seen in the fact that nearly all modern military establishments deploy gas masks and other anti-chemical protective equipment, while far fewer have actually stockpiled chemical weapons.

Finally, chemical defense has an essential role in chemical disarmament. There are several reasons why this is so. First, the prevalence of good chemical defense favors compliance with a chemical disarmament treaty by making chemical weapons less militarily useful, thereby reducing the incentive for having them. Second, the prevalence of chemical defense facilitates verification. The more effective the defenses he faces, the more large-scale and therefore more easily detectable are the preparations the would-be violator is forced to make in order to achieve military significance. Third, should violations nevertheless occur, chemical defense renders them much less dangerous.

Since a chemical disarmament treaty, to be effective, must be multilateral, it follows that access to measures of anti-chemical protection should be widely diffused among its members. This argues for a considerable degree of openness and accessibility in matters of chemical defense.

The conclusion is clear. Anti-chemical protection is essential today, when the possession of chemical weapons is not prohibited by international law and when several nations possess stocks of chemical weapons. Moreover, chemical defense will remain essential after the entry into force of the Chemical Weapons Convention.

Chemical defense in World War I. The first German cloud attacks with chlorine gas in Belgium in April 1915 caused some British and French scientists to become deeply pessimistic, arguing that the preponderance of Germany in industrial chemistry would give that nation a major advantage. Others argued that the gas threat would be largely offset by anti-chemical protection, based on knowledge of human physiology and other sciences in which the Allies were proficient. The latter view proved correct.

Chemical weapons caused about three percent of an estimated 15 million casualties on the Western Front. Although much effort was expended in the provision and use of chemical munitions and although gas caused much misery to troops on both sides, it was not a very important weapon in World War I, owing largely to the effectiveness of the defenses that even then could be provided against it, chiefly the gas mask.

* Adapted from M. Meselson's Keynote Address to the Sixth Annual Scientific Conference on Chemical Defense Research, US Army Chemical Research, Development and Engineering Center, Edgewood Area, Aberdeen Proving Ground, Maryland, 13-16 November 1990.

Nearly all of the innovations that first saw widespread use in World War I subsequently became standard in military establishments around the world: machine guns, barbed wire, tanks, motorized transport vehicles, radios, aircraft, submarines--but not gas. Without doubt, the effectiveness and availability of anti-chemical protection has been a major factor in limiting the spread of chemical weapons.

Some authors writing between the world wars, using inaccurate data, argued that chemical weapons were much more effective than conventional weapons in producing casualties in World War I. But records of German ammunition production and of British casualties in Europe in 1918, the year in which chemical warfare reached its highest stage of development, show that chemicals produced no more casualties, shell for shell, than did high explosive munitions. About one-fifth of German artillery shell production was chemical and about the same proportion of admissions to British medical units attributable to artillery were chemical. This does not include battle fatalities that never reached aid stations or hospitals, nearly all of which resulted from bullet and shrapnel wounds, not from chemicals. American records show a higher rate of hospitalized chemical casualties, but must be interpreted with care in view of a 1926 Army Medical Department report that attributed a high proportion of the recorded US chemical casualties to malingering.

Even against mustard--the "king of battle gasses"--the gas mask kept casualties far below what they would otherwise have been. Mustard was the principal agent used in the war with significant effects not only on the eyes and lungs, against which masks could afford protection, but also on the skin. Although few men had protective clothing, most of the mustard casualties were to the eyes and lungs. Most of these, however, resulted not from penetration of the mask but rather from failure to wear it. Without adequate training and detectors and with masks far less comfortable than those of today, troops frequently failed to mask or they unmasked too soon. Inadequate training and the lack of detectors also caused men to remain in contaminated trenches and dugouts for prolonged periods without realizing the hazard, when relocation could have prevented skin burns. Relatively few were injured by passing through contaminated areas, and fewer still from direct exposure to liquid mustard from exploding munitions. Because of difficulties in Allied production efforts, Germany had a monopoly on mustard from its introduction in July 1917 until nearly a year later, in June 1918, when French supplies first became available. Nevertheless, even the limited defensive capabilities then available kept the massive and one-sided use of mustard by Germany from having any important effect on the course of the war.

The official British history of World War I states that "gas achieved but local success, nothing decisive; it made war uncomfortable, to no purpose." In *The Real War*, British military historian Basil Liddell Hart wrote that gas had a chance to accomplish something when it was first used but not later, because of the introduction of chemical defenses.

The detailed study done for the US Army by Dorothy Kneeland Clark at the Johns Hopkins Operations Research Office, published in 1959, reached the same conclusion.

Chemical defense in World War II. Poison gas was used on a limited scale by Japan against China but it was not used in Europe, even though both sides produced large stockpiles of mustard and other agents, including, in Germany the nerve agent Tabun. It is commonly said that chemicals were not used because of the threat of retaliation in kind. While this may have been a factor, available documents also show that military staffs on both sides were skeptical about the utility of chemical weapons and did not recommend their use. For example, in 1944 Winston Churchill instructed his Joint Planning Staff to examine whether chemical weapons might be useful against the launching of the German missiles then bombarding England. The report sent back to him concluded: "Gas attacks are unlikely to be any more effective than bombing with high explosives." German military opinion was similar. At the end of the war the commander of the German chemical troops, Generalleutnant Hermann Ochsner, told British interrogators: "Gas was not considered a useful weapon compared to other munitions." Of course, each side knew that the other's military forces had good anti-chemical protection.

By the start of World War II, tens of millions of gas masks had been distributed to civilians throughout Britain. As a result, both British and German chemical warfare experts concluded that poison gas attacks on British cities would cause fewer casualties than an equal weight of conventional weapons. Regarding the possible effects of gas delivered by German V-1 and V-2 missiles, German chemical commander Ochsner wrote in a 1949 report for the US Army: "There was no room for hope that if the V weapons had been given a gas charge, the effect would have been any greater than that of an explosive charge. Under existing circumstances [with the British population protected], gas casualties undoubtedly would have been less than those caused by explosive bombs." Similarly, the British biologist J.B.S. Haldane advised US military representatives in 1940 that the Germans were unlikely to replace high explosives with gas in the London bombing because "people would soon learn to protect themselves, since they have been educated to it, and all have gas masks."

Without chemical defense, there is no doubt that gas would have been considered a highly effective weapon in World War II. As it was, chemical defense on both sides precluded any concerted military advocacy for initiating chemical warfare. While other factors, including political ones, also enforced restraint, the prior restraint of military skepticism kept recommendations for initiation from being made to national command authorities.

Lesser wars. Poison gas has been used in only a few of the more than 200 wars fought since World War I, and in every case it was initiated against forces entirely lacking or highly deficient in protective equipment. This was so, for

example, in Ethiopia (1935-36), China (1938-42), Yemen (1966-67), and in the recent Iran-Iraq War.

Iraqi gas attacks caused only a small proportion of total Iranian battle casualties. Nevertheless, the use of gas against poorly prepared Iranian military units and against completely unprotected civilians in Iranian towns, combined with intense apprehension that Iraq would use gas against Teheran in the War of the Cities were certainly among the factors contributing to the collapse of Iranian morale in 1988. But the Iran-Iraq War provides no example of gas attacks with major tactical impact on well prepared troops.

In short, history provides no example of the initiation of chemical warfare against well-protected forces, nor any evidence that chemicals can be more than marginally effective against forces with good protective equipment and training.

Rationale for chemical weapons. If anti-chemical protection is so effective, and if both the United States and the Soviet Union have good chemical defenses, why have they both produced and maintained large chemical stockpiles--tens of thousands of tons on each side--until the recent bilateral agreement to cease production and cut back stocks?

Influential studies done for the US Army in the 1950s and 60s showed that chemicals were generally not competitive with high explosive weapons for direct casualty production against protected forces. Instead of casualty production, the effect of anti-chemical protective posture in slowing enemy tempo then became and still remains the principal US rationale for maintaining an arsenal of chemical weapons for possible retaliation in kind.

The additional burden that wearing anti-chemical protective equipment and taking other anti-chemical measures imposes on military units has long been recognized, even in World War I. In a modern war of maneuver, anti-chemical protective posture will slow the tempo of combat and logistical operations. The tactical effect of chemicals on a target force then depends mainly on their effect in slowing its tempo and disrupting its time-table and on the effect on troop morale. While the morale factor is hard to study, British and US experience in WWI and in modern exercises, including training with live agent, indicates that well-trained well-protected troops with otherwise good morale will continue to function well in a chemical environment.

Anti-chemical gear can slow troops down for two kinds of reasons. First, masks, gloves, and other equipment can interfere with vision, speech intelligibility, personal recognition and dexterity. But with practice in anti-chemical gear, these problems generally have minimal effects on the achievement of simulated combat missions and further improvements are on the way or can be envisaged. The other effect, which can be more serious, is that protective clothing and the mask can limit body cooling. In cool and temperate weather this is of little consequence, but in hot weather

soldiers must avoid prolonged strenuous activity in full protective gear or risk heat exhaustion. When the temperature is high and attack with agents that threaten the skin appears likely, commanders must limit the duration of the most strenuous operations, such as dismounted assault, order partial opening of the protective ensemble, or confine such operations to the cooler hours of the day and to night time.

Although anti-chemical protection clearly hampers military operations to some degree, the effects on military outcome are difficult to quantify or even define. There are three ways to approach the problem: history, model building and field exercises. I have already summarized some of the evidence from World War I. Model building starts with various measured parameters and makes assumptions about their interactions and effects. Models can be useful for certain specialized purposes but are of dubious value for predicting overall effects on unit mission performance. For example, the summary of a large study done for the US Defense Department in 1975 stated: "The conclusion of this analysis is that the model predicts degradation in unit mission effectiveness that is quite severe and is not supported by any troop tests or field experiments currently available."

Large-scale field exercises, if carefully done and evaluated, can provide more reliable information. Such exercises have shown, not surprisingly, that wearing protective gear seriously degrades the performance of units engaged in prolonged, strenuous effort in hot weather. The same is true of units poorly trained and poorly motivated to operate with chemical defenses. In contrast, trained combined-arms units exercising in temperate weather up to about 80°F (27°C) have been little hampered by the gear, even in sustained operations. In the hot desert in the sun, well trained troops in protective gear have successfully conducted assault exercises for up to two hours. Under common European weather conditions, military units have routinely exercised at or near full anti-chemical protection for several days continuously.

Of course, the net utility of using chemicals depends not only on their effects on the target force but also on the costs imposed on the user. There is a trade-off between the effect of chemicals in slowing enemy tempo and disrupting his timing *versus* the increased logistic burden, the diversion and attrition of firepower and other assets, and the operational complications and uncertainties incurred by the user. Oschner, in his 1949 report, cited such costs as the reason for not even considering the use of chemicals either in the German drive through France and Belgium in 1940 or the attack of Russia later. It is noteworthy, however, that there are many contemporary studies of the burden of chemical defense on the target force but few studies of the opportunity costs and other costs to the user.

But wherever the balance lies, there is no room for doubt that modern anti-chemical protection is highly effective. In summary, chemical defense greatly reduces the damage of chemical attack; it deters the use and even the proliferation of chemical weapons; and without it chemical disarmament would not be possible.

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