CONFERENCE OF THE EIGHTEEN-NATION
COMMITTEE ON DISARMAMENT

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

COMMITTEE ON DISARMAMENT

CHEMICAL WEAPONS — WORKING PAPERS 1969-1981 SESSIONS

VOL-II

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ARMS CONTROL AND DISARMAMENT DIVISION OF
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PREFACE

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CHEMICAL WEAPONS

This two-volume compendium is the result of a survey of working papers submitted to the Conference of the Eighteen-Nation Committee on Disarmament, the Conference of the Committee on Disarmament and the Committee on Disarmament during the period 1969-1981. It has been compiled to facilitate research on the issue of chemical weapons (CW) and is a compendium of the more significant material made available to the Committee on Disarmament.

Volume 1 covers the period 1969-1975 and Volume 2, the period 1976-1981. The full index appears in both volumes to facilitate cross references.

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JAPAN

Working Paper on the question of chemical warfare agents to be prohibited by the Convention on the Prohibition of Chemical Weapons

The draft convention on the prohibition of chemical weapons (CCD/420), submitted by the Japanese delegation on 30 April 1974, provides for a comprehensive ban in Article I (a) using purpose criteria on "chemical warfare agents of types and in quantities that have no justification for protective or other peaceful purposes", while limiting the ban initially, by virtue of Article IV and Annex I, to those CWAs (chemical warfare agents) for which verification measures are assured. Those CWAs which are initially left out of the ban would be reduced by stages until a comprehensive ban will be eventually realized.

Furthermore, Japan suggested in Annex I of the draft convention a "table A" on CWAs to be excluded tentatively from the prohibition and a "table B" on CWAs to be prohibited from the outset. Since then, a variety of comments have been made on Annex I by the delegations of Canada, Iran and Sweden. Taking these comments into consideration, an attempt has been made in this paper to visualize the whole range of CWAs by classifying them into CWAs which should be prohibited, CWAs to be prohibited from the beginning and CWAs tentatively excluded from prohibition at the outset, with a view to facilitating the conclusion of the convention on the prohibition of chemical weapons. It is to be clearly understood that the mention "CWAs of types and in quantities" in Article I (a) of the draft convention should now read "CWAs of types and/<u>or</u> in quantities".

1. Separation of CWAs to be prohibited from among chemical substances.

When viewed from the need of separating CWAs from among chemical substances, chemical substances can be divided into four groups, namely: (1) single-purpose chemical warfare agents (SPWA); (2) dual purpose chemical agents for either military or peaceful uses (DPWA); (3) chemical substances only for peaceful use (CCFP) and (4) chemical substances that may be discovered or made known in the future (CCUK) (these are included in each of (1), (2) and (3)).

When viewed from the angle of grouping together those to be prohibited, chemical substances are classified into (a) CWAs to be prohibited and (b) other chemical substances.

"CWAs to be prohibited" refers to the chemical substances belonging to groups (1) and (2) and those in group (4) which may be used as CWAs. "Other chemical substances" refers to those belonging to group (3) and those in group (4) which could not be used as CWAs.

With this whole range of chemical substances as a background, an attempt has been made to show the locations of "CWAs to be prohibited from the beginning of the entry into force of the Convention as indicated in Alternative B in CCD/420" and "CWAs to be excluded tentatively at the beginning as indicated Alternative A in CCD/420", in table I attached to this working paper. This was done in the hope that the locations of the CWAs in the whole family of chemical substances will be clearly sketched out and identified.

2. Classification of the CWAs to be prohibited.

Under present circumstances, the CWAs to be prohibited may be classified depending on their uses as follows:

(i) CWAs which have established themselves as part of the weapon systems of States, and are retained and stockpiled in their arsenals, and on which manuals have been published.

(ii) CWAs which were used during past wars such as World War I, excepting those falling in (i) above.

(iii) Chemical substances which by nature of characteristics such as toxicity could be used as CWAs.

(iv) Chemical substances which may be developed or made known in the future taken out of those falling in (iii) above.

The first important step to be taken in this regard would be to formulate "A table of CWAs to be prohibited" by listing them respectively under these four groups and arrange them systematically. In that case, since all the CWAs belonging to groups (i) and (ii) can be listed in a concrete and exhaustive manner, objective criteria such as toxicity, chemical structural formulae and physical and chemical characteristics are required in sorting out only those falling in groups of (iii) and (iv).

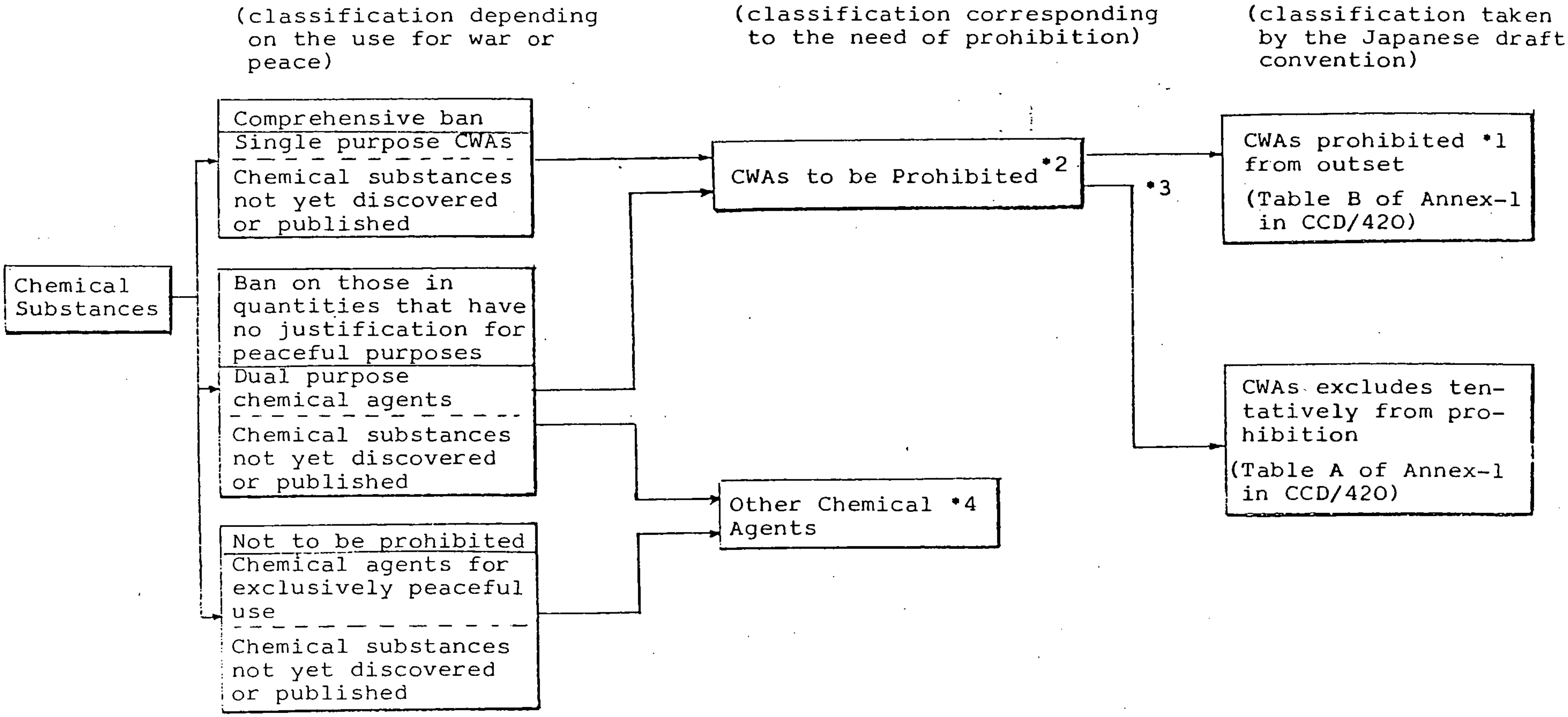
3. Formulation of a table of the CWAs to be prohibited.

On the basis of the above considerations, it is suggested listing the CWAs to be prohibited falling in these four groups and formulate "a table of the CWAs to be prohibited" as indicated in table 2 of this working paper.

The table consists of two supplements (S.T.) one for single purpose CWAs which are banned altogether (S.T.-1) and the other for dual purpose CWAs which are banned except those in quantities for peaceful uses (S.T.-2). CWAs to be prohibited from the outset are distinguished from other chemicals to be excluded tentatively from the ban under item "f" as provided for in the two supplementary tables.

Thus the two alternative tables, namely "table B, the CWAs excluded from the prohibition tentatively" and "table A, the CWAs to be prohibited from the outset" in Annex I of the Japanese draft convention, may be converted into each of the two supplementary tables of table 2 of this working paper.

Table-1 CWAs to be prohibited



Notes:

*1. Fifty-four kinds of organophosphorous agents were presented in CCD/430.

*2. The table should be divided into two supplementary tables (ST); ST-1 (SPWA) and ST-2 (DPWA).

*3. They will be distinguished from each other by the f-item of each ST.

*4. As for phosphorous compounds, those exemplified in working paper CCD/466 are regarded in Japan as chemical agents for peaceful uses.

Date of coming into effect;
Date of amendments;

Supplementary Table-2: Dual purpose CWAs

a	b	c	d	e			f*2	g*3	h*4
No	Names in common use	chemical names	chemical structural formulae	L_D 50 *1			Distinction between prohibition from outset or not	remarks;	reported total amounts of production (details are shown in attached table)
				inh.	p.c.	p.o.			
1									
2									
3									
.									
.									
.									
.									
.									
.									
n	Unknown chemical substances which will be discovered or published			α over	β over	γ over			

notes;

*1 Toxic level is an example. To fill the form in here, systematic investigations will be necessary using other elements such as chemical structual formulae, physical nature etc. as yardsticks. It is intended to present any other paper about this matter. cf. inh. = inhalent, p.c. = peretaneous, p.o. = oral.

*2 With the agreement of the States parties, agents which are listed may be marked depending upon whether those belong to those prohibited from the beginning or those excluded from prohibition tentatively in f. item.

*3 As to agents reported after the coming into force of the convention, the necessary remarks can be filled in here.

*4 The reported amounts of the production of every state should be attached to this table as an addition.

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

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SWEDEN

Working paper on some aspects of on-site verification of the destruction of stockpiles of chemical weapons

Summary

One of the important verification issues with regard to a treaty prohibiting development, production and stockpiling of chemical weapons concerns destruction of existing stockpiles. The present Working Paper tries to summarize the difficulties and possibilities which have appeared in the discussions so far. They are displayed schematically in the attached scheme of options.

By emphasizing the possibilities offered in using toxicity determinations as one verification method some concerns shown by the USSR delegation can be dispensed with. The resulting verification possibility might be applied as a confidence building measure for the negotiations on a chemical weapons ban.

Introduction

The question of verification of destruction of stockpiles of chemical warfare agents and weapons displays one major difficulty: no means are available for disclosure of hidden stocks. (It is not even possible to rely upon on-site inspection to find such hidden stocks.)

However, irrespective of this difficulty the responsibility remains to discuss the existing option: verification of destruction of stockpiles with known locations. At such locations installations and activities other than those concerned with the chemical stockpiles may exist. A party, which has kept his stockpiles non-accessible (or even secret) may thus wish, for this and other reasons, to continue to do so, even if he accedes to let some type of on-site verification of destruction of declared stocks take place. In such cases the party might select particular destruction sites, which would be freely accessible for verification personnel.

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Presently it seems impossible to verify destruction without at least some limited on-site presence. Accordingly a second difficulty depends on the reluctance by some countries to agree to some forms of on-site activity with respect to verifying destruction of chemical weapons. They are arguing i.a. the risk for unwanted spread of secret information leading to proliferation. These thoughts were expressed by the Soviet delegation (CCD/PV. 647, p.18 and CCD/PV. 652 p. 19-20) saying that on-site verification of stockpile destruction would reveal the nature of a chemical warfare agent, which might otherwise perhaps have been kept secret. Such a disclosure could not only lead to the unwanted spread of knowledge but might also infringe on industrial rights.

Without disputing these claims the present Working Paper aims at showing in principle that effective on-site verification of destruction of stockpiles containing chemical warfare agents can be carried out without disclosing the chemical nature of the agent in question or infringing on industrial secrets.

To avoid complicating details in the present account conversion of agent stockpiles into peacefully useable chemicals is not treated here. However, similar thoughts can be applied also for that activity. See also below on destruction of stocks of dual-purpose agents.

Generally, rather satisfactory methods now seem to be available for on-site verification of destruction. Different aspects have been touched upon in many Working Papers through the years, e.g. CCD/324, 344, 366, 367, 432, 434, 436 and 453. Especially CCD/434 and 436 by the Canadian and United States delegations respectively make clear how complicated an affair it is to destroy chemical weapons but also that it is feasible. Verification of destruction of stockpiles is envisaged in the Japanese draft convention (CCD/420, 30 April 1974).

However, the use of toxicological verification, described below has so far not been analysed sufficiently. The discussion of this method and its implications for verification is the main purpose of this paper. The implications of chemical analysis for verification purposes are treated for comparison. The different options resulting from application of the two types of analysis alone or together are displayed in the attached scheme.

A successful verification of destruction performed according to carefully established conditions might be an important confidence building measure in trying out acceptable means of verification for a treaty prohibiting development, production and stockpiling of chemical weapons.

Some aspects of such verification activities are outlined below.

Conditions for on-site verification activities

It is assumed that the verification activities are to be carried out by analysts from other countries (in national or international teams). National verification teams from the country, whose stocks are being verified could of course at the same time undertake the same analysis.

In principle destruction of chemical agents (in bulk or in munition, etc.) must take place at any of the following premises:

(a) at or near production plants for chemical warfare agents (including munition filling installations);

(b) at or near existing stockpiles of chemical warfare agents or weapons;

(c) at special, perhaps mobile, destruction plants or facilities.

In the present context alternatives (a) and (b) probably will not be pertinent to discuss for reasons or secrecy presented above. Alternative (c) probably is the one to calculate with. As pointed out in the Introduction it seems possible for a part, which does not wish to disclose other secrets, to choose a destruction site, where such risks do not appear and is freely available for the verification analysts.

It is assumed in the following (with one exception) that the chemical nature of the agents shall not be disclosed by the verification activity. In most circumstances this need not be a necessary condition: obviously large parts of existing stockpiles most probably will consist of well-known chemical agents.

One further reason for secrecy might be that the proportions between different stockpiled agents should not be disclosed. However, this may be of importance only in the long run, and be of less importance as long as confidence building measures are being tested.

Verification by toxicity determination - toxicological verification

Basically this method utilizes the fact that thorough destruction of a toxic substance leads to non-toxic destruction products. This is valid irrespective of the type of substance. Thus, measuring the toxicity of the (known or unknown) substance going into and coming out from the destruction process, it is possible to verify that the substance has been destroyed. The various aspects of the method are described below.

A prerequisite for the method is that the substance being destroyed really is sufficiently toxic to be of interest as a chemical warfare agent - preferably supertoxic. Even if it can be envisaged that, for the purpose of evasion, other substances than actual warfare agents will be destroyed this is of minor importance as it obviously has to be a substance with a comparable toxicity and thus also to some extent usable as a warfare agent.

Substances with a low toxicity which can also have civilian use could of course always be used in war with some effect, e.g. phosgene, cyanides and even chlorine as has been pointed out on many occasions. However, since stocks for civilian purposes would be kept anyway, there would be no sense in trying to verify destruction of dual-purpose agents with a relatively low toxicity. If abnormally large stocks of such agents were found the most obvious way of disposal would be through the chemical production processes for which they normally are used.

The reliability of the toxicity and quantity determination will depend upon randomized sampling methods. Thus the sampling routines must be constructed and performed with great care in order to get representative samples. The fact that samples will have to be taken does not imply that knowledge of the substance to be destroyed has to be passed on. However, the agent containers (for bulk stockpiles or as munition) must be allowed to be measured and counted by the inspection team. Different means of evading a determination of the amount of agent to be destroyed have been pointed out in the United States Working Paper CCD/436. On the other hand such attempts could most probably be revealed or indicated by the randomized sampling.

Standardized handling of the samples could guarantee that no parts of samples were withheld by verification teams for a later, more revealing analysis. One could even conceive of a scheme allowing the sampling and experimental work to be performed by a national verification team under close surveillance of international observers.

The toxicity determination is preferably performed by simple tests on animals: */

(a) injections of series of diluted solutions of the substance in the belly of mice (intraperitoneally);

(b) application of series of diluted solutions on the skin of mice (percutaneously).

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*/ For a discussion of the method see e.g. CCD/435, 16 July 1974, working paper on toxicity of chemical warfare agents, by the United States delegation.

After a standard time the number of dead animals in each series should be counted and the toxicity be calculated from the results (so called LD_{50} tests). Skin damages could be registered in the same way and form the basis for toxicity calculations.

It would not be necessary to observe symptoms leading to the death of the animals since the calculations of the toxicity are based only upon the final outcome. Knowledge of the symptoms might lead to unwanted knowledge of the nature of the substance being destroyed.

A toxicological verification of destruction of chemical warfare agents could be carried out according to the following principal scheme:

(a) quantity and toxicity of agents stockpiled on the place for the destruction, or being transported there, are determined;

(b) a "perimeter" inspection is performed to ensure that no hidden means exist of removing agents without destroying them;

(c) randomized sampling of open, departing transports ensure that no toxic material is taken away by such transport;

(d) after the destruction is declared finished an on-site inspection should be undertaken to ensure that no toxic material is left in the place.

The <u>conclusion</u> is that by a limited on-site activity, i.e. the type of toxicological verification described above, effective results can be obtained, taking care of some of the objections, which so far have been raised against on-site verification of destruction of known stockpiles of chemical weapons.

<u>Verification by chemical analysis</u>

The most obvious method for verification of destruction is chemical analysis of in- and outgoing substances. Such methods have been outlined in several of the Working Papers mentioned in the Introduction. (In this paper by "chemical analysis" is understood many different methods ranging from biochemical to physicochemical methods.)

Direct chemical analysis of the samples of the substances in the destruction process would lead to disclosure of which substance is to be destroyed. In controlling also the amounts being destroyed, as mentioned before, these activities might be used to check declared intentions of destruction. This would in most cases seem to be the most rational way of acting and could be used as soon as the agents to be destroyed are known.

Another option would be to allow only "perimeter" sampling from the surroundings of the destruction site. It seems conceivable that from chemical analysis of such samples one might indicate at least that a chemical warfare agent was being destroyed and perhaps also to which group of agents it might belong.

Further, the actual investigations on the destruction site might be kept to a minimum. The method might accordingly be suitable for sites where other activities must be kept secret.

It is even conceivable that the actual chemical analysis might be carried out at laboratories separated from the destruction site. The concept of "black boxes" should be evaluated with respect to this alternative.

An obvious drawback with regard to performing chemical analysis only of perimeter samples is that no estimation can be made about the amount of agent being destroyed. However, chemical analysis of perimeter samples, combined with toxicity tests on randomized samples of the agent might result in a fairly good assessment of the type of substance and the amounts being destroyed.

The <u>conclusion</u> is that use of chemical methods - combined or not with toxicilogical methods - might result in a series of options, ranging from demonstration of destruction activities to complete quantitative and qualitative identification of stockpile agents being destroyed.

Information on actual experiences of applying these options would most probably increase the prospects for the selection of a proper course of action.

Scheme of options on verification of destruction of stockpiles of chemical weapons

Options	Technical aspects	Consequences
Stockpile sites unknown	Methods to find hidden stockpiles do not exist presently	No verification possible
Stockpile sites known		
No on-site activity allowed	Methods for remote verification of destruction do not exist presently	No verification possible
Perimeter inspection allowed		
Chemical analysis of perimeter samples	Chemical type of agent might be inferred from identification of decomposition or destruction products	Verification of destruction activity
Toxicity determinations of perimeter samples	Not applicable	Not applicable
Sampling allowed		
Chemical analysis of samples	Agent will be identified	Verification possible
Toxicity determination of samples	Presence and destruction of toxic material will be demonstrated; identification of agent not possible	Verification possible

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Verification of destruction of declared stocks of chemical warfare agents

In working paper CCD/436 (16 July 1974), the United States delegation described the procedures employed in the disposal of mustard gas at Rocky Mountain Arsenal and outlined some preliminary ideas as to how such a disposal operation could be verified. Since that time, a number of delegations have expressed interest in on-site monitoring of destruction of chemical warfare stocks. The basic purpose of on-site monitoring would be to confirm information provided as to the type and quantity of agent destroyed. To satisfy this purpose, it would be necessary to specify, in detail, what general technical methods and procedures would be used in the confirmation process.

This paper presents in greater detail the preliminary results of our evaluation of possible methods for carrying out on-site monitoring. These ideas are, of course, subject to further refinement.

The techniques discussed below are based on two premises: (1) that the chemical agent would be destroyed either thermally (incineration) or chemically (by treatment with caustic, for example), and (2) that the disposal facility would be similar to that described in CCD/436. If other disposal methods were employed or fundamentally different types of facilities used, substantial changes might be required in the verification techniques applied. Even if major revisions are not necessary, some adjustments may be needed to adapt the basic techniques to a specific situation.

In principle, the objective of confirming the declaration of the type and quantity of chemical agent destroyed is similar to the objective of ensuring accountability in facilities which process nuclear materials. Consequently, some of the techniques which have been developed for safeguarding nuclear material appear to be adaptable for use in CW verification.

Discussion of verification at a specific destruction facility should begin while the destruction operation is in the planning stage. Representatives of the facility management and the observers would co-operate in working out detailed arrangements needed for that facility.

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The observers would arrive at the site before destruction operations were to begin. They would be provided with engineering drawings showing all areas of the destruction facility and with a detailed technical description of the destruction process. On the basis of this information, they would inspect the plant to confirm the information and to ensure that diversion of agent within the plant was not possible. Periodic facility reinspections would be needed during the destruction operations to ensure that no illegal plant modifications had been made. These procedures would serve to provide assurance that agent could not simply be drained off and that a simulated waste material could not be introduced into the plant. Additional assurance might be obtained if the observers were allowed to introduce a tracer material into the chemical agent before destruction.

During the destruction operations, the observers should be authorized to visit any area of the facility at any time under the same conditions as host state personnel and to observe all activities. In order to supplement the observers and to minimize the need for their continuous presence in particular locations during the destruction operations, surveillance of certain areas may be carried out remotely using closed-circuit television systems. Additionally, areas requiring surveillance, but in which facility personnel would not normally be present, might be monitored using cameras that are triggered by a motion detector and random interval timer. The level of observation required could also be reduced by use of tamper-resistant, tamper-indicating seals to close off certain areas of the facility or to prevent tampering with process or monitoring equipment. (Such seals have already been developed for use in nuclear safeguard operations). Provision for supervised access in an emergency or to handle needed maintenance would be made.

The techniques discussed above, while providing important safeguards against certain types of illegal activities during the destruction operations, cannot provide confirmation of data furnished on the type and quantity of chemical agent being destroyed. One technique for verifying the quantity of chemical agent destroyed would be continuous monitoring of the rate at which agent flows into the destruction chamber. From this data, the total quantity destroyed could be calculated.

Two methods which would help to confirm the nature of the material being destroyed would be to measure the toxicity of the agent to animals, as recently suggested by Sweden, and to conduct a chemical analysis of the agent. Either method would require taking small samples periodically near the flow meter, which should not be difficult technically.

In addition, to confirm the nature and quantity of agent it would be necessary to monitor any chemical substance that is added to the agent or to its decomposition products. For example, chemicals used in hydrolyzing an agent or in treating the effluent should be monitored to confirm that their use was consistent with the description of the destruction process.

Air sampling, a less intrusive technique, might supplement, but not replace, sampling of the agent stream. Current air sampling techniques can collect and concentrate chemicals which are present in the air at extremely low levels. At a destruction site, traces of the agent and its decomposition products, as well as traces of other chemicals involved in the destruction process could be collected and analysed, although sophisticated instrumentation may be required.

This procedure would yield information on the types and relative concentrations of the chemicals present in the air in different locations at the facility. It would provide additional assurance to the observers that the type of material being destroyed had been correctly represented, but would not be adequate to confirm the information on quantity. It should be noted that air sampling would have to be conducted before disposal operations were to begin so that the "chemical background" would be known. This preliminary sampling would be conducted at the locations inside and outside the destruction facility where sampling would be carried out during the destruction operations.

It would also be very desirable to check whether or not the nature of the waste handling equipment and the toxicity of the decomposition products, as well as their general composition, were consistent with that expected from the nature of the material ostensibly being destroyed. For example, most nerve agents contain one phosphorus atom per molecule. Also commonly present are either one atom of fluorine or one atom each of sulphur and nitrogen. In addition, if a tracer had been added to the agent feed, analysis of the concentration of the tracer in the effluent would help provide assurance that no diversion of agent had occurred.

Another technique which could be useful if the identity of the agent were known is the material balance. This would involve comparing the amount of decomposition products actually produced with the quantity which should result from a given quantity of agent. For this method to work, there could not be any significant loss of gases, liquids or solids from the system. It should be possible to meet this condition for chemical detoxification processes. For incineration methods, some gases may be lost, permitting only a crude balance to be obtained even when measured as accurately as possible.

In order to carry out their work, it would be essential for the observers to have their own technical facilities at the site. A well-equipped workshop would be needed for calibration, maintenance and repair of monitoring equipment. On-site chemical and toxicological laboratories with sophisticated equipment would also be necessary for conducting agreed upon measurements.

SUMMARY

In summary, we believe that the provisions we have described for on-site monitoring would provide assurance that the nature and quantity of material destroyed were as represented. In our view, such monitoring must cover the entire disposal process and include observers and instruments. We believe this can be accomplished in a manner which is not unreasonably intrusive.

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The use of seals and monitoring devices in CW verification

In an earlier presentation to the Committee (CCD/332) the United States' delegation noted the possibility of using unattended, tamper-indicating seals and monitoring equipment as a part of a CW verification system. As pointed out in CCD/332, seals and monitoring devices could help to ensure that CW agent production was not resumed illegally at a shut-down facility. Subsequent evaluation has shown that the use of seals and monitoring devices could also be used to assist the on-site observers needed to monitor destruction of declared CW stocks and help to reduce the number of observers required.

This paper describes several types of seals, cameras and sensors which have been developed for safeguarding nuclear facilities. Various methods by which such devices could assist in CW verification are discussed.

Fibre optic seals

Current fibre optic seals are improved versions of the seal described in CCD/332. The basic concept, however, remains the same. Glass or plastic fibres are grouped in a bundle to form a cable, which is placed around the item to be sealed. The two ends of the fibre cable are interlaced to form a single bundle and the seal made by securing the interlaced bundle in a special collar. Finally, the end of the bundle is trimmed, illuminated and photographed.

Because of uncontrollable variables in the assembly process, the pattern made by the fibre ends is different in every case, giving each seal a unique "fingerprint". While such a seal could be removed and then reassembled, it does not appear to be possible to reproduce the fingerprint.

In order to verify that the seal had not been tampered with, an observer would compare the current pattern of the fibre ends with that established when the seal was emplaced. Such a comparison can be done quickly and reliably without removing the seal. Any difference in patterns would indicate that the seal had been tampered with.

The fibre optic seal described above must be examined periodically by an observer in order to detect attempts at tampering. Depending on the frequency of inspection, a significant period could elapse before tampering was detected. The frequency of such inspection could be substantially reduced if such a seal could be monitored remotely. In principle, remote monitoring would provide a capability to detect tampering attempts immediately. A fibre optic seal with a remote monitoring capability is already under development in the United States. In this device one-half of the end of the fibre optic bundle is illuminated by a light-emitting diode. The light is transmitted along the fibre loops and detected as it emerges at the other end of the fibres. Tampering with the seal will break the light path, thus altering the signal received at the monitoring stations. In order to ensure that a false signal is not substituted, the seal contains an authenticating device based on transmission of pseudo-random numbers.

The signal from the seal could be transmitted through standard telephone lines to the remote monitoring station. Alternatively, it could be transmitted using existing commercial communications satellites. The latter arrangement would allow seals installed at mothballed facilities to be monitored reliably from great distances. Since the seals themselves are expected to cost only several hundred dollars, this approach could help to provide some CW verification capability for nations which do not possess sophisticated national technical means of verification.

In connexion with verification of stockpile destruction, such seals could be used to protect on-site monitoring equipment from tampering, to prevent unobserved entry into key portions of the facility and to ensure that important valves and perhaps other process control devices were not changed for evasion purposes. In addition, seals on entrances, key process control equipment and ventilation machinery could serve to ensure that a mothballed production facility was not surreptitiously reactivated.

Such remotely-monitored seals would not eliminate the need for on-site visits by observers. On-site visits would be necessary to emplace the seals, for periodic maintenance and checking of seal positions, and to ascertain the reason for signal disruption. Nor would seals make evasion impossible. Given sufficient time and resources, seals could be bypassed. If, however, seals are emplaced properly and in sufficient numbers the effort which would be required to bypass them may be increased to a level sufficient to deter an evasion attempt.

Cameras

The employment of surveillance cameras is another potentially useful technique. In a number of situations film or television cameras could be used to assist the observers in maintaining surveillance. For example, in areas not requiring continuous observation, film cameras could be used to record activities. A compact, tamper-indicating camera package has been developed that uses a 16 mm motion picture camera modified to take a single picture each time it is triggered. (Recently, a similar system using an 8 mm camera has been developed.)

The camera package includes a system of "motion detectors" based on an array of photocells and accompanying electronic circuitry. The motion detectors respond to a rate of change in luminance (the amount of light reflected from an object). Up to 10 cells can be pre-selected to detect motion in the areas of interest. This feature reduces the number of photographs an observer must examine, since only those events of special concern are recorded. Furthermore, the feature detects such attempts at deception as insertion of a false scene in the camera's field of view or movement of the camera.

Whenever an activity occurs in the areas programmed, the camera will take a photograph and record the time and date on the picture frame. In addition, the camera is also programmed to take photographs at fixed and at random intervals. A dot on the frames that are motion-triggered enables an observer to distinguish motion-triggered photographs from those that are time-triggered.

Use of the motion detection feature, as described above, would be limited to areas in which motion does not occur routinely. If moving machinery is located in the area or personnel are normally present, only a random time trigger could be used.

The camera, though normally receiving its power from the plant electrical system, is also equipped with a stand-by battery power supply sufficient for short periods of power interruption. The camera package can run unattended for as long as 3 months without replacement of the film (about 4,000 picture frames).

Closed-circuit television systems could enable observers at destruction facilities to maintain surveillance of areas of interest that may pose a toxic hazard. In addition, such systems could enable a single observer to watch activities in several areas, thus reducing the total number of observers required. Development of a tamper-resistant closed circuit television system has proven more difficult than development of seals or film cameras. However, a prototype system has been constructed and given limited testing.

The television system which can be used for either direct observation or unattended operation, possesses a data storage capacity for up to 90 days. It is designed to be resistant to deception by substitution of the picture (video) signal on the transmission line or by direct substitution of the scene in the TV camera field of view. The overall approach used is similar to that employed in the film camera package. Pictures are selectively recorded when a change occurs in the area being viewed or at random intervals. Protection against tampering with the video transmission line is provided by encoding the luminance levels of the output video signal.

The system employs a commercial high resolution, closed circuit TV system coupled with a 16 mm movie camera adapted for single frame use. Pictures are photographed directly from the monitor with time indicated on each frame by means of a digital clock located in the movie camera's field of view. The video signal from the TV camera is encoded for protection against substitution of false video information on the transmission cable line to the recording station. Encoded video signals are instantaneously decoded in the recording station so that a continuous clear picture is present at all times on the monitor. Coding security is ensured by using matching sets of random words stored on punched tape in the camera's secure container and in the secure recording station.

Motion detectors, utilizing the video signal, monitor selected spots in the TV camera field of view and signal the photographic camera to record a picture when there is motion at any of these locations. The camera can also be triggered by a random interval timer.

A secure container (described in the next section of the paper) houses the TV camera, encoder, and random word tapes. The recording station, which stores all of the data, consists of a small room secured by a radiofrequency intrusion monitor.

<u>Tamper indicating containers</u>

In the plan for verification of stockpile destruction described in CCD/(other US paper), confirmation of the quantity of material destroyed rests primarily on flowmeter data. It is particularly important, therefore, to ensure that such data are correct. A number of evasion techniques, such as putting the flowmeter on a closed loop, can be detected by physical inspection of the facility. However, it is also important to prevent tampering with the flowmeter itself.

Devices that have been developed to protect nuclear monitoring equipment against tampering could be adapted to protect flowmeters and other monitoring instruments. Several different techniques which together would provide unambiguous evidence of attempts to tamper with monitoring devices are described in a recent

IAEA document.*/ While these techniques differ in detail, each depends on the need to remove material in order to penetrate the container in which the instruments are located. Once material is removed, undetectable repair is very difficult, if not impossible.

For example, a flowmeter and its associated recording devices could be enclosed in a transparent cyclinder which has a highly reflective metal coating on the interior surfaces. When such a cylinder is penetrated, the metal surface at the point of entry must be removed. The metal coating cannot be replaced until the opening is closed, but the interior surface is then no longer accessible for repair. The reflective metal surface also enhances the detection of any unsuccessful penetration efforts.

Access to the instruments for calibration purposes and to retrieve recorded data could be provided by a transparent door with a metallized interior surface. The door would be fastened to the glass cylinder by bolts through which a fibre optic seal is laced. Removal of the door would require destruction of the seal. In addition, an irreversible electro-mechanical counter within the cylinder would register each time the door is opened. Interruption of electrical power to a monitor either for a period exceeding the standby battery capability, or as a result of tampering with the unprotected power supply, would be detected by electrical voltage sensors and registered on a second irreversible electro-mechanical counter. If desired, a signalling device to alert an observer to power interruption could be incorporated.

Future developments

The systems described in this paper are still under development. Further refinements can be expected as a result of the field testing which is now under way. The United States delegation will endeavour to keep the committee informed as improvements are made.

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*/ "Tamper Indicating Radiation Surveillance Instrumentation," W.N. Chambers and J.F. Ney, IAEA Document No. IAEA-SM-201/12. (Presented at the International Symposium on the Safeguarding of Nuclear Materials, Vienna, 20-24 October 1975).

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Review of proposals for defining chemical warfare agents in a CW Agreement

During the course of the Committee's discussion of restraints on chemical weapons, a number of delegations have made proposals for defining (or delimiting) the chemical substances that would be covered in a CW agreement. This working paper contains a review of these proposals.

In the view of the United States delegation, an adequate basis for forming judgments on the question of definition already seems to exist. It is the hope of the United States delegation that this working paper will help to provide the framework for achieving substantial agreement in this area in the relatively near future.

Approaches to defining lethal and other highly toxic CW Agents

The proposals for delimiting lethal and other highly toxic CW agents can be grouped into five general categories:

(a) Purpose Criterion

(b) General Toxicity Standard

(c) General Structural Formulas

(d) Other Agent Properties

(e) Listing of Specific Agents

Purpose Criterion

Under this approach the prohibition would apply to "chemical substances of types and in quantities that have no justification for peaceful purposes" and to "weapons, equipment and means of delivery designed to use such agents for hostile purposes or in armed conflict". An analogous approach has already been embodied in the Biological Weapons Convention.

There appears to be broad support, perhaps even a consensus, for incorporating a general purpose criterion in any CW agreement. This criterion is employed in the draft conventions submitted by the Soviet Union and six other countries (CCD/361) and by Japan (CCD/420). It has also been supported by ten non-aligned delegations (CCD/400), as well as the delegations of Canada (CCD/414) and the United States (PV.702). To establish whether a consensus exists it would be useful to know the views of the delegations which have not yet expressed an opinion.

The use of a "general purpose criterion" has been discussed in connexion both with a single, comprehensive prohibition and a step-by-step approach to prohibition. Judging from the views expressed in the Committee, it would be compatible with either approach. In the case of the first step of a phased approach, the criterion would apply only to those substances, for example all lethal and other highly toxic chemicals, which were within the scope of the first-step agreement.

The Committee's discussions also indicate that many delegations believe that, in addition to a general purpose criterion, specific technical criteria should be used to define the substances which are to be prohibited. The various criteria which have been suggested are outlined in the following sections.

General Toxicity Standard

In this approach one or more toxicity criteria would be established to supplement the general purpose criterion. It was first suggested by the Japanese delegation (CCD/301) that a toxicity threshold be established to separate super-toxic substances from less toxic, and therefore less dangerous, substances. All substances falling above this threshold would be presumed, because of their extremely high toxicity, to be single-purpose CW agents.

Important work has already been done in the Committee toward establishing specific toxicity standards. In its initial presentation, the Japanese delegation proposed that the upper toxicity threshold be set at an LD_{50} value of 0.5 milligramme per kilogramme of body weight (subcutaneous administration). The Netherlands (CCD/320) and the United States (CCD/435) have stated that a value close to the one proposed by Japan may well provide a suitable demarcation line. Use of neostigmine (LD_{50}= 0.4 mg/kg) as a reference compound for the toxicity threshold has been proposed by the Canadian delegation (CCD/473). Finally, a slightly different threshold value, 1 mg/kg, has been suggested by the Swedish delegation (CCD/322).

In a subsequent paper (CCD/372) the Swedish delegation proposed that the threshold be expressed in terms of toxicity by inhalation (LCT_{50} in mg.min/M^3). It was suggested that the threshold be established between the lethal dose values for mustard gas (LCT_{50}= 1500) and phosgene (LCT_{50} = 3200). Thus, the threshold value would be roughly 2350. (This value is roughly equivalent to the LD_{50} value for the subcutaneous route proposed by the Japanese delegation in CCD/301).

The Canadian delegation later proposed (CCD/414) that the threshold value be 500 mg.min/M^3 which lies between the lethal does values for the nerve gas tabun (LCT_{50} = 400) and mustard gas (LCT_{50} = 1500). In a more recent Canadian proposal (CCD/473), phosgene (LCT_{50} = 3000) was suggested as a reference substance on which the threshold could be based.

In CCD/473, the Canadian delegation suggested an important refinement of the toxicity threshold approach. They recommended that separate standards of lethality be adopted for the three principal routes of entry into the body (inhalation, absorption through the skin, injection). It was also recommended that a reference toxic material be adopted to establish the threshold for each route. While this proposal has yet received little discussion, it has been described as "promising" by the United States delegation (PV.702). In addition to the reference substances already mentioned (injection route: neostigmine; and inhalation route: phosgene), nicotine was proposed as the reference substance for the skin absorption route.

The threshold approach outlined in CCD/301 was extended by the Canadian delegation in CCD/414, which suggested establishing a second, lower toxicity threshold to separate those substances which could be useful as lethal chemical warfare agents from those that have no practical potential for such use. The Canadian delegation proposed that the value of the lower threshold be the LCT_{50} value for chlorine. This suggestion has been supported in principle by the Japanese delegation (CCD/430). This value appears to be a useful starting point for discussion.

Judging from the Committee's discussions, toxicity criteria are considered to have broad applicability. Their use has been supported by a number of countries, including Canada, the Federal Republic of Germany, Japan, the Netherlands, Sweden and the United States.

It is important to note that a number of working papers (CCD/365, CCD/374, CCD/375, CCD/387, CCD/430, CCD/435, CCD/473) have emphasized the importance of adopting standard experimental procedures for measuring toxicity if toxicity criteria are to be used to delimit the agents subject to restriction or prohibition.

General Structural Formulas

The possibility of employing a general structural formula as a supplementary criterion was first proposed by the Netherlands delegation (CCD/320). In that paper a general structural formula for supertoxic organophosphorus compounds was presented. In CCD/365 the United States delegation presented a revised formula for organophosphorus compounds. In addition, the possibility of developing separate general formulas for mustard, arsine and carbamate compounds was discussed. Further refinements of the formula for organophosphorus compounds have been made in working papers presented by Japan (CCD/374) and the Netherlands (CCD/383).

Other Agent Properties

While toxicity and structure are closely related to potential utility as chemical warfare agents, other properties play a role as well. Several delegations have suggested that evaluation of these properties could help delimit substances which should be subject to restriction. In working paper CCD/373, the Italian delegation outlined the properties which it believed characterize potential CW agents, including toxicity and dissemination characteristics.

The most detailed analysis of the use of additional criteria has been presented by the delegation of the Federal Republic of Germany (CCD/458). The additional criteria employed are shelf life, perceptibility, volatility, explosion stability, and resistance to atmospheric influences. In the proposed method, each of the properties would be evaluated for a given substance and assigned a weighting factor. An overall evaluation number for the agent is obtained by combining toxicity data with the product of the individual weighting factors. It was suggested that these evaluation numbers be used to define the limits of potential CW agents.

Listing of Specific Agents

Another approach would simply be to list the agents which would be subject to prohibition or restriction. This course has been suggested by the Italian delegation (CCD/335). It has been pointed out, however, by the United States delegation (CCD/360, CCD/365) that there is no way at present to know whether such a list would include all the major agents in the arsenals of States or under development. Another criticism expressed was that a definition based solely on a list of known agents could be circumvented by a slight modification of the structure of an agent on the list or by development of a new type of super-toxic agent.

The United States delegation also stated (CCD/365), however, that a list of known dual-purpose agents would most probably include all which are now or have been in the arsenals of States. For this reason, it was suggested that a list of known dual-purpose agents might be a useful supplement to a general purpose criterion.

In working paper CCD/373 the Italian delegation put forward a list of substances which it believed should certainly be considered chemical warfare agents. The list was not intended to be an exhaustive one, but rather as a starting point for a more thorough study.

A somewhat different approach to the use of lists was adopted in the Japanese draft CW convention (CCD/420). The draft provides both for a list of chemicals which would be obligatorily banned and for a list of chemicals which would be temporarily exempted from the provisions of the treaty. A list to illustrate the compounds which should be banned from the outset was provided in Table 1 of the Japanese working paper CCD/466.

Combination of Technical Criteria

Since the various technical criteria are generally complementary, a combination of several such criteria could be used. Several delegations have drawn attention to this possibility. In particular, the Japanese delegation has suggested (CCD/430) the combined use of toxicity standards, structural formulas and lists. Since analysis of such a combination of criteria can become relatively complex, the Swedish delegation has presented (CCD/461) a conceptual model which illustrates the interrelationships of the various criteria.

The United States delegation has expressed a tentative view (PV.702) that for the purpose of defining lethal chemical agents in an initial agreement, it would be adequate to rely on a general purpose criterion and two toxicity standards, as proposed by Canada in CCD/414. These criteria could be supplemented by other means, including illustrative lists or structural formulas, if such additional means are considered desirable.

Approaches to Defining Other Categories of Chemicals

The only working paper which has dealt specifically with the problem of defining other categories of chemicals was presented by the Canadian delegation in 1974 (CCD/433). In that paper, the scheme of definition presented in CCD/414, was applied to other categories of chemicals.

Summary and Conclusions

1. There appears to be broad support, perhaps even a consensus, for incorporating a general purpose criterion in any CW agreement. To establish whether a consensus exists, it would be useful to know the views of delegations which have not yet expressed an opinion.

2. Many delegations believe that, in addition to a general purpose criterion, one or more specific technical criteria should be used to define the substances which are to be prohibited.

3. The use of toxicity as an additional criterion has general applicability and has received broad support.

4. Those delegations that have expressed views on toxicity thresholds appear to be in general agreement. If other delegations are prepared to support the proposals that have been made, wide agreement on a general approach may be possible in the near future. It is not necessary at this stage to decide precisely what numerical values should be adopted or what detailed testing procedure should be used. These questions, though important, can best be dealt with once agreement is reached on a general approach

5. The applicability of the other approaches that have been suggested is less general. Nonetheless, such criteria may have utility in some areas. In the view of the United States delegation a judgment on the need for such additional criteria can best be made once a consensus is reached on the types of agents to be covered in an agreement.

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

CCD/501
2 July 1976
Original: ENGLISH

LETTER DATED 1 JULY 1976 FROM THE AMBASSADOR IN CHARGE OF POLITICAL AFFAIRS AT THE PERMANENT MISSION OF FINLAND TO THE SPECIAL REPRESENTATIVE OF THE SECRETARY-GENERAL TO THE CONFERENCE OF THE COMMITTEE ON DISARMAMENT TRANSMITTING A WORKING PAPER BY THE GOVERNMENT OF FINLAND

ON METHODOLOGY FOR CHEMICAL IDENTIFICATION OF CW AGENTS AND RELATED COMPOUNDS — PROGRESS OF A FINNISH RESEARCH PROJECT

In accordance with the instructions received from my Government I have the honour to send to you herewith a working paper entitled "Methodology for chemical identification of CW agents and related compounds — Progress of a Finnish research project" and to request you kindly to circulate it to the members of the CCD as an official document.

(Signed) Esko Rajakoski
Ambassador

WORKING PAPER BY THE GOVERNMENT OF FINLAND TO THE CCD

Methodology for chemical identification of CW agents and related compounds. - Progress of a Finnish research project.

CONTENTS:

Introduction

The Finnish project for development of chemical methodology for identification of CW agents and related compounds was initiated 1972. The goal and progress of this project were discussed in four previous working papers (CCD/381, 412, 432 and 453). Briefly, the goal is to develop national CW-control capacity for possible future international use in connexion with verification of production (or non-production) of CW agents, destruction of stocks, or alleged use. This paper summarizes the progress made during the last year and describes in some detail typical results obtainable by the two most advanced instrumental methods used. It also outlines our thinking regarding the general approach.

For greatest possible flexibility the methodology is developed on three levels: (1) fast field tests, (2) simple procedures adaptable to local or mobile laboratories, and (3) methods for research laboratories. There is obviously much overlap in these methods, however.

Initially, the project focused primarily on identification of organophosphorus nerve agents. Presently, particular attention is also devoted -- especially regarding the fast field tests -- to about a dozen other CW agents known to be stockpiled in various countries or otherwise assumed to pose the most serious threat. Furthermore, the structure-analytical instrumental methods used (particularly the nuclear magnetic resonance and mass spectrometries) provide considerable possibilities for identification of any other compounds, including previously unknown structures.

Recently, instrumentation has been expanded by a new acquisition: the JEOL JMS 01SG-2 high resolution mass spectrometer which is used "on-line" with high-resolution glass capillary gas chromatography. Outlines of the methodology as presently applied are presented in the following paragraphs.

General working procedures

General methods for analysis of a sample suspected to contain a chemical warfare (CW) agent or some other compound, which is likely to violate an eventual international agreement for the prohibition of development, production or stockpiling of chemical weapons, are presented in Figure 1. If it concerns an illegal use of such agent, it may be possible to detect it by the field detection methods as they are developed for military defence. Figure 2 presents an examination scheme for qualitative detection of nerve gases and mustards using chemical colour reactions for indication. Other methods that could be used are: enzymatic colour reactions, flame photometry, or animal tests. The time after the dissemination for getting an air sample is, however, very short. From stone, metal, glass or plastic surfaces it may be a little longer, but more probably the substance to be examined will be absorbed in the earth, water or other material in the environment, before the sample can be collected.

The situation is somewhat similar, when the production of a prohibited agent is to be investigated from waste water or other environmental samples containing traces originating from the chemical production plant. In those cases the particular compound must often be first separated from the environmental material. Extraction with a suitable solvent, followed by thin layer or column chromatography, are the most common methods which can be used also in modest local or mobile laboratories. In combination with gas chromatography or infra red spectroscopy, when these are available, they can give preliminary proof of the compound in question.

In cases, when the structure of the agent must be unambiguously proven or concerning a structure previously unknown, and where the sample is more complicated, perhaps containing mainly degradation products, more elaborate examination in a research laboratory is needed. With particular regards to the above, this paper deals in depth with the methods that can be employed there in the first place, and the application of modern instrumental methods to verification and identification (structure elucidation) of nerve gases. In this connexion the experimental work of the Finnish project is mainly directed towards the use of nuclear magnetic resonance spectrometry (NMR), the high resolution gas chromatography -- mass spectrometry combination (HRGC-MS) and infrared spectroscopy (IR). Some examples of results obtained with the NMR and HRGC-MS are presented below.

Preliminary tests

If no information of earlier test results are received it is advisable to begin with colour reaction tests according to the scheme in Figure 2. Spot tests can be done from the original sample if liquid. A solid sample must be extracted. A suitable procedure may be as follows: a sample of about 2 g is put into a chromatography column, and run with 5 ml diethyl ether, followed by a second extraction with chloroform or water for detecting the degradation products or metabolites not dissolved in ether.

For detection of a suspected nerve gas or other phosphorus containing compounds, the preferred first test may also be the noise decoupled ^{31}P NMR spectrum. The extract described above or, alternatively the original liquid sample can be used as such, and the tube can be closed after eventual addition of a locking solvent. From the spectrum important information can be rapidly obtained, as will be explained in detail in the paragraph concerning the NMR technique. The recording on the ^{19}F NMR spectrum will give the knowledge of the existence and nature of fluorine compounds.

Thin layer chromatography and gas chromatography can be useful preliminary methods, if reference standards are available. For gas chromatography the glass capillary columns have been proved to own the best resolution capability, and as universal detector the flame ionization detector (FID) is to be recommended. For phosphorus compounds, the flame photometric detector, and the thermionic or alkaline salt flame ionization detector (AFID) are remarkably more sensitive, but show some demands regarding the solvent used. The halogen compounds like chloroform can be disturbing for AFID and may suppress the sensitivity.

Extraction and cleanup of the samples

When applying the extraction methods commonly used (e.g. for pesticide control) to chemical agents, one has to keep in mind that the compounds in question are rather volatile and very poisonous substances. The concentration of extracts by evaporation must be avoided, and when distillation is necessary, the most rigorous trapping systems must be employed. Solvents with a low boiling point are preferred, e.g. diethyl ether or dichloromethane. More polar compounds can be extracted separately in a second treatment, e.g. with chloroform or water. For high resolution gas chromatography with FID dichloromethane is suitable; with AFID, acetone is preferable. Fortunately, ^{31}P NMR and ^{19}F NMR have no demands regarding the solvent, nor usually is any cleanup procedure required for these methods.

For infared spectroscopy (IR), ^{1}H and ^{13}C NMR and in some cases for mass spectrometry, purification of the extract is usually necessary and most often can be performed by a chromatographic technique. If the compound in question is not too volatile (e.g. degradation products of CW agents) small amounts of the extract can be purified by thin layer chromatography (TLC); this method is fast and does not require complicated instrumental systems. Column chromatography can be performed in closed systems. Special care must be taken that one or more of the compounds are not irreversibly absorbed or decomposed by the column material. High pressure liquid chromatography (HPLC) is an effective and fast separation and purification method for non-volatile compounds. Its application to different types of phosphorus compounds is insufficiently investigated, so far. Gas chromatography, the most effective chromatographic method for analysing the reasonably volatile compounds, can also be used preparatively for purification and separation of mixtures. Special caution must be adopted that some of the components are not lost with carrier gas or destroyed by the heat.

Nuclear magnetic resonance spectrometry

An overall scheme of application of NMR spectrometry to verification of CW agents is presented in Figure 3.

In nuclear magnetic resonance spectrometry there are four different nuclei, the resonance of which can be used for analyses of chemical warfare agents: ^{31}P, ^{19}F, ^{1}H, and ^{13}C. If the sample is suspected to contain a nerve gas, i.e. a phosphorus compound, it is preferable to begin with the ^{31}P resonance. The only presumption is, that a sample contains at least 100 μg of the compound to be detected (a CW agent, a degradation product of it, etc.) in a solution of about 0.5 ml. No purification or fractionation is usually needed, and the solvent need not be specified. E.g. a diethyl ether, dichloromethane or chloroform extract from a soil sample can be used as such.

From the noise decoupled ^{31}P spectrum the chemical shift, usually H_3PO_4 as an external reference, can be determined, and the value of it gives valuable information of the type of the phosphorus compound. From Table 1 and Figure 4 it can be seen that the phosphonate esters examined by us (all those which do not contain sulphur) have the resonance in the neighbourhood of 27-38 ppm, and there are only two other compounds among the 70 so far examined, which have signals in that region. In one case where the signals of two different compounds, namely di-isopropyl methylphosphonate and amiton, fell together, separation was achieved by using a shift reagent, EuDPM (Figure 5).

From the number of signals in the ^{31}P- (^{1}H) -spectrum, the number of different phosphorus atoms in the sample can be seen as well as the coupling with magnetic nuclei other than ^{1}H. When the magnitude of the coupling is known, e.g. ^{31}P-^{19}F 1000 Hz, the existence of fluorine in the molecule can also be found from the ^{31}P- (^{1}H) -spectrum (Figure 6)

Although the chemical shift of ^{31}P resonance often indicates the chemical category of phosphorus compounds to which the agent belongs and can also suggest the particular agent in question, the exact value of it depends on concentration, solvent, pH and other specific interactions in the sample. Thus, more information is needed for definite identification of the compound. Some information can be obtained from the correlation between the concentration and the chemical shift itself, as can be seen from Figure 7. In it one group of phosphonic acid derivatives containing one free -OH group shows distinct and linear correlation, while the corresponding completely esterified compounds show little dependance on concentration.

One method, which can also be used, is the measurement of the spin-lattice relaxation time T_1 of phosphorus. Figure 8 represents one example, where the two groups of phosphonate esters could not be distinguished on the basis of chemical shifts, while a remarkable difference between the relaxation times of these groups was observed.

However, if sufficient amount of the sample (about 1 mg of typical CW agents) is available, the undecoupled or normal ^{31}P NMR spectrum usually gives the best contribution to the analysis. In this spectrum the splitting of the ^{31}P signal affected by protons at a distance of 1-3 bonds from phosphorus can be seen, and hence the distribution of these protons in the molecule.

In Figure 9 the ^{31}P spectrum of sarin demonstrates the typical pattern of the ^{31}P resonance coupled with fluorine and with the protons of $-CH_3$ and -OCH groups directly bonded to phosphorus.

If no splitting of the ^{31}P resonance is observed, it most probably concerns an inorganic phosphorus compound. In cases where interactions with several nonequivalent protons split the signal into very complicated spectra, the selective ^{1}H decoupling can simplify the spectrum and contribute to its interpretation.

As mentioned earlier, the existence of fluorine in the molecule in the vicinity of phosphorus, can be observed in the ^{31}P spectrum from the typical coupling. The ^{19}F spectrum, however, gives the definite evidence of fluorine also in the molecules without phosphorus. In addition, the sensitivity of the ^{19}F nucleus is about 83 per cent and the sensitivity of the ^{31}P only 6.6 per cent of equimolar amounts of hydrogen. For further information of the neighbourhood of the fluorine atom, the normal and selectively decoupled ^{19}F spectra can be recorded.

The ^{1}H NMR resonance is the most commonly used and the most sensitive of the four resonances mentioned, but the information it gives is not always as easily interpreted, and impurities in the sample often are so disturbing, that the sample must be purified or fractionated before the run. With the poisonous and volatile compounds this is all but desirable. However, as a supplement to the other techniques ^{1}H NMR can give the final proof for the structure elucidation.

The same is true with ^{13}C NMR, which can be most informative but unfortunately is the least sensitive of the resonances mentioned. Since the natural abundance of ^{13}C also is small, the sensitivity of ^{13}C NMR is only about 0.02 per cent of that of hydrogen. With the Fourier technique a sample of about 10 mg can give a reasonably good noise decoupled spectrum, where couplings to phosphorus or fluorine can be observed; for a normal ^{13}C spectrum about 50 mg and a run over night are needed.

Appendix 1 gives an example of the use of the pulse Fourier transform mode of NMR spectrometry for the detection of a small nerve gas impurity in a sample of a phosphonate ester.

<u>High resolution gas chromatography -- mass spectrometry</u>

Gas chromatography is a very useful tool for identification of nerve agents and related substances, especially when used in connexion with different selective detection systems. Its suitability depends mainly on the volatility and temperature stability of the substances in question. The application of the glass capillary technique increases the group of compounds that can be studied by GC because of the following favourable properties of glass capillary columns:

1. The analysis can be performed in a remarkably low temperature, often about 50°C lower than with conventional packed columns.
2. A suitably coated glass surface is quite inert and does not catalyze chemical changes during the GC run. By using an all-glass system (injector-column-detector) it is possible to analyse most of the known CW agents without preparing more volatile or more stable derivatives from them.
3. The time required for an analysis is short.

In addition, the glass capillary technique is more sensitive because of sharper peaks and less adsorption. Maximum sensitivity is achieved by using a direct injection technique and suitable temperature programming. About one order better resolution than with packed columns is also easily achieved. This gives more reliable identification based on the identity of retention times of unknown and model substances. When GC is used as inlet system for mass spectrometer, better separation of compounds makes also mass spectra easier to interpret.

Specific detectors that are used with packed columns are suited also for glass capillary work. Thermionic or alkali flame ionization detector (AFID) selective for phosphorus and/or nitrogen; flame photometric detector for phosphorus and/or sulphur and electron capture detector (EC) for halogen and/or sulphur, seem to be practical for analysing CW agents.

There are also some difficulties in glass capillary technique. Handling and use of glass capillaried demands more training and the technique is not yet available in every laboratory. The preparation of really high resolution columns is not easy either. However, there are already many laboratories working successfully in this field as can be seen from the wide literature concerning applications of glass capillary gas chromatography.

Application of use of glass capillary gas chromatography and mass spectrometry in verification analysis is schematically presented in Figure 10. In our experimental work the following procedure was found to be suitable for HRGC of most nerve gases, phosphorus pesticides and related compounds. The sample was extracted with dichloromethane, chloroform or diethyl ether depending upon its nature and the detector which was going to be used. If the sample is an organic liquid it can be used as such. For the first run a relatively short capillary column (e.g. 10 m x 0.3 mm inside diameter) connected to FID was used, and as liquid phase, OV 210. Direct injection was made at room temperature and after the solvent peak the temperature was increased 10-30°C/min until 250°C. For separating the occasionally overlapping peaks, analysis shall be repeated by using another liquid phase and maybe a longer column.

The sensitivity of FID for phosphonohalogenates is not very high because of the small carbon content. Anyway, the detection limit for example for sarin was in our experiments about 1 ng; for methylphosphonodichloridate over 10 ng was needed.

The next step in the analysis can be the exchange of the detector by AFID. Figure 11 shows the chromatogram of a nerve gas mixture. Using the same column and the same conditions as with FID, the retention times do not change too much. On the other hand the response of AFID is much higher for phosphorus-containing compounds than for other substances. The detection limit of AFID was about 10 pg for sarin, but it can be somewhat lower for a derivative not containing halogens. That methylation is not always needed was demonstrated by adding 0.2 ppm sarin to water and analysing it after one week. After extraction with a small amount of dichloromethane, one microliter of solution was injected into glass capillary columns connected to FID and AFID. An unhydrolyzed sarin peak could be clearly detected (Figure 12). If the FID chromatogram is complicated containing a great number of peaks, it will be normally simplified by AFID. The phosphorus compounds will appear as high-intensity signals whereas the other peaks will be greatly diminished or will disappear. So, combining the advantages of high resolution glass capillary GC and phosphor-selective detector, known nerve gases can be often preliminarily identified already at this stage of analysis.

Use of other types of selective detectors can be sometimes necessary, but most new information is no doubt obtained from mass spectrometry. A column, identical with the previously used one, is directly connected to the ion source of the mass spectrometer and at first the total ion current chromatogram is registered. This should resemble as much as possible the FID chromatogram (Figure 13), and it is a test of a separation of the components of the mixture. It may also be useful to record the mass chromatogram by a selective ion monitor if certain nerve gases are suspected. Mass fragmentography is profitable especially in the quantitative analysis of residues in picogram level.

The next step is the registration of a low resolution mass spectrum from the suspected peaks. At least 10 ng of component is normally needed. Comparing the spectra with model spectra can lead in many cases to quite reliable identification. If the CW agent detected is previously unknown in the analytical laboratory, it is possible to make a structure suggestion at this stage.

For the final stage in the combined GC-MS verification technique high resolution gas chromatography combined with high resolution photoplate mass spectrometry is best suited. Using this technique complete high resolution mass spectra can be normally registered from 1-10 ng of the sample. If the compound gives a molecular peak the molecular formula can be calculated manually or automatically by computer system. Also the fragment ion compositions can be determined from the spectra. This information will give very reliable identification for known CW agents or related substances. Also, the structure of previously unknown compounds can often be determined by using special methods for analysing high resolution mass spectra.

In order to understand the relative sensitivity of various methods the approximate detection limits are presented in Table 2.

Other activities

Synthesis of nerve agents and related phosphorus compounds has been continued. About 70 model compounds related to nerve gases have been synthetized and these as well as a number of pesticides have been analysed by the methods described above. Since thousands of compounds ought to be available and analysed for a fully competent international verification capability, this is a field where internationally co-ordinated efforts are clearly needed.

Studies on decomposition mechanisms of nerve agents and related phosphorus compounds have also been continued.

In addition, a modification of the enzymatic method to determine the anticholinesterase activity of a suspected sample using hen's cerebellum as a sensitive substrate has been further developed. This method is particularly valuable in analysis of biological materials such as blood or brains.

Detailed results of the project will be published in scientific journals. As before, the Finnish Government will keep the CCD informed about the future advancement of the project.

Instruments used in the examinations presented in the figures are:

JEOL JNM-PFT-100 NMR spectrometer

JEOL JMS-OISG-2 Mass spectrometer

CARLO ERBA Fractovap Linea 2100 Gas chromatograph.

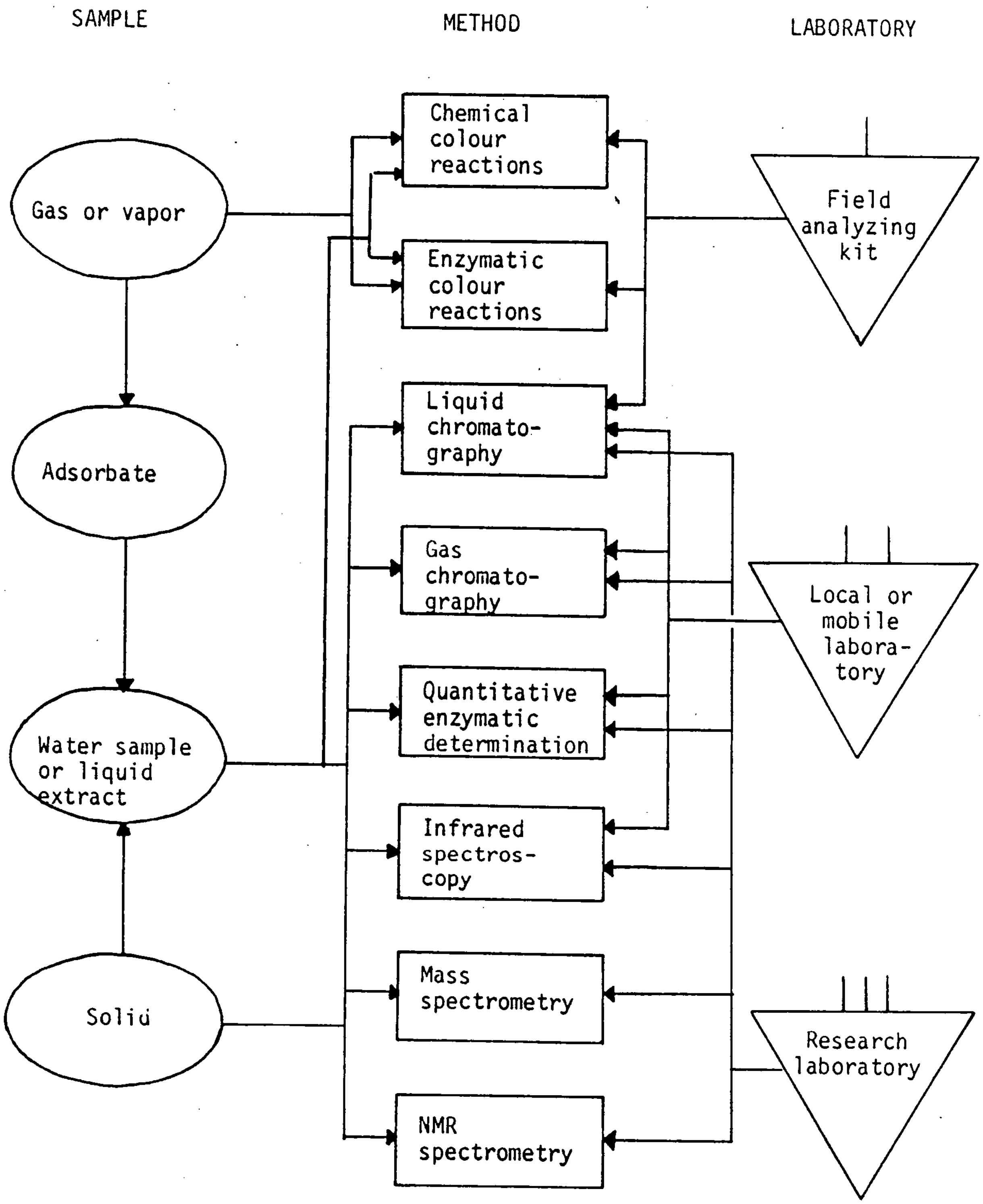


Fig. 1. GENERAL METHODS FOR ANALYSIS OF A SAMPLE FOR VERIFYING THE USE, STOCKPILING OR PRODUCTION OF A CW AGENT

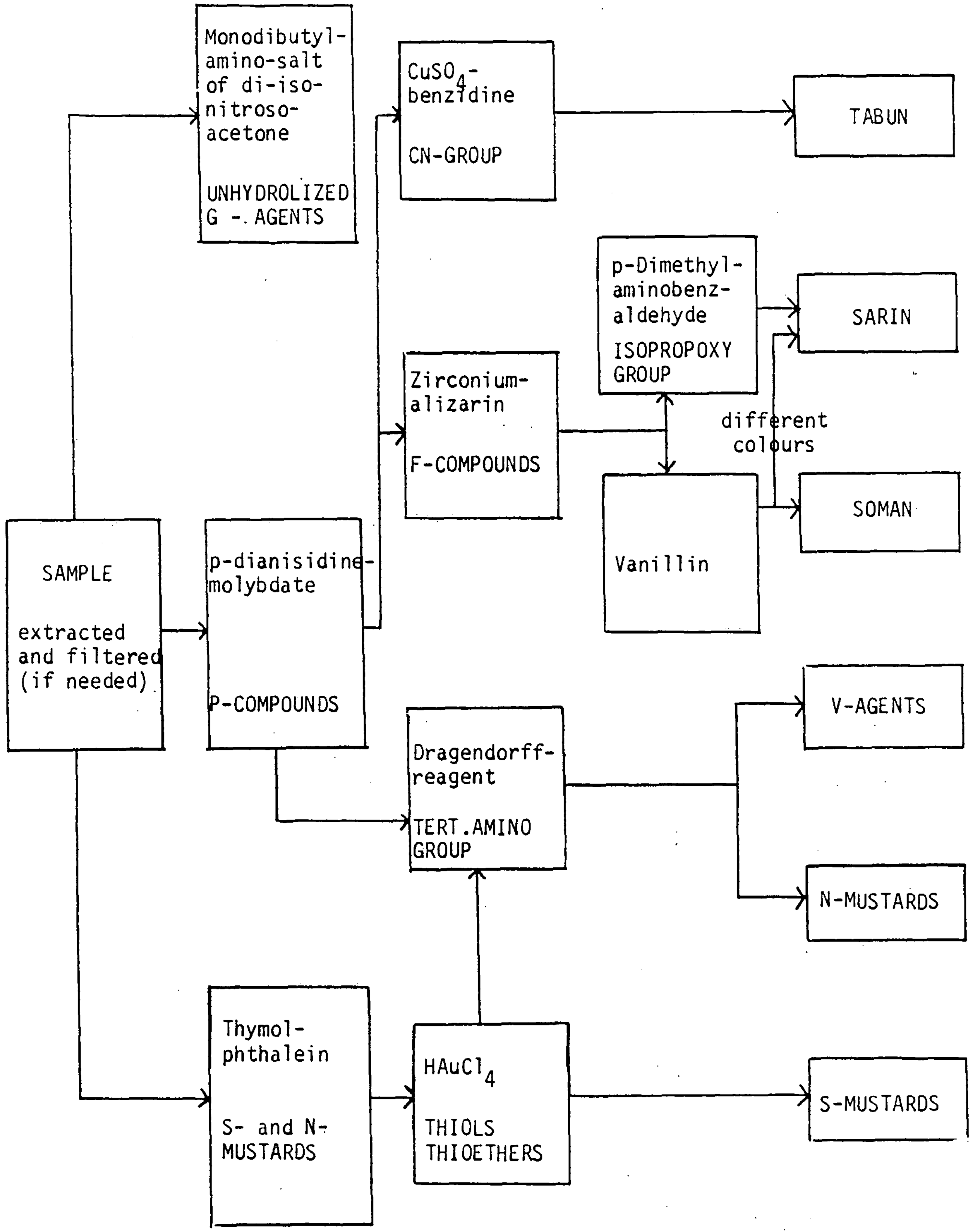


Fig. 2. SCHEME FOR QUALITATIVE FIELD DETECTION OF NERVE GASES AND MUSTARDS. In the squares the reagent used and the compounds indicated by a positive colour reaction are given.

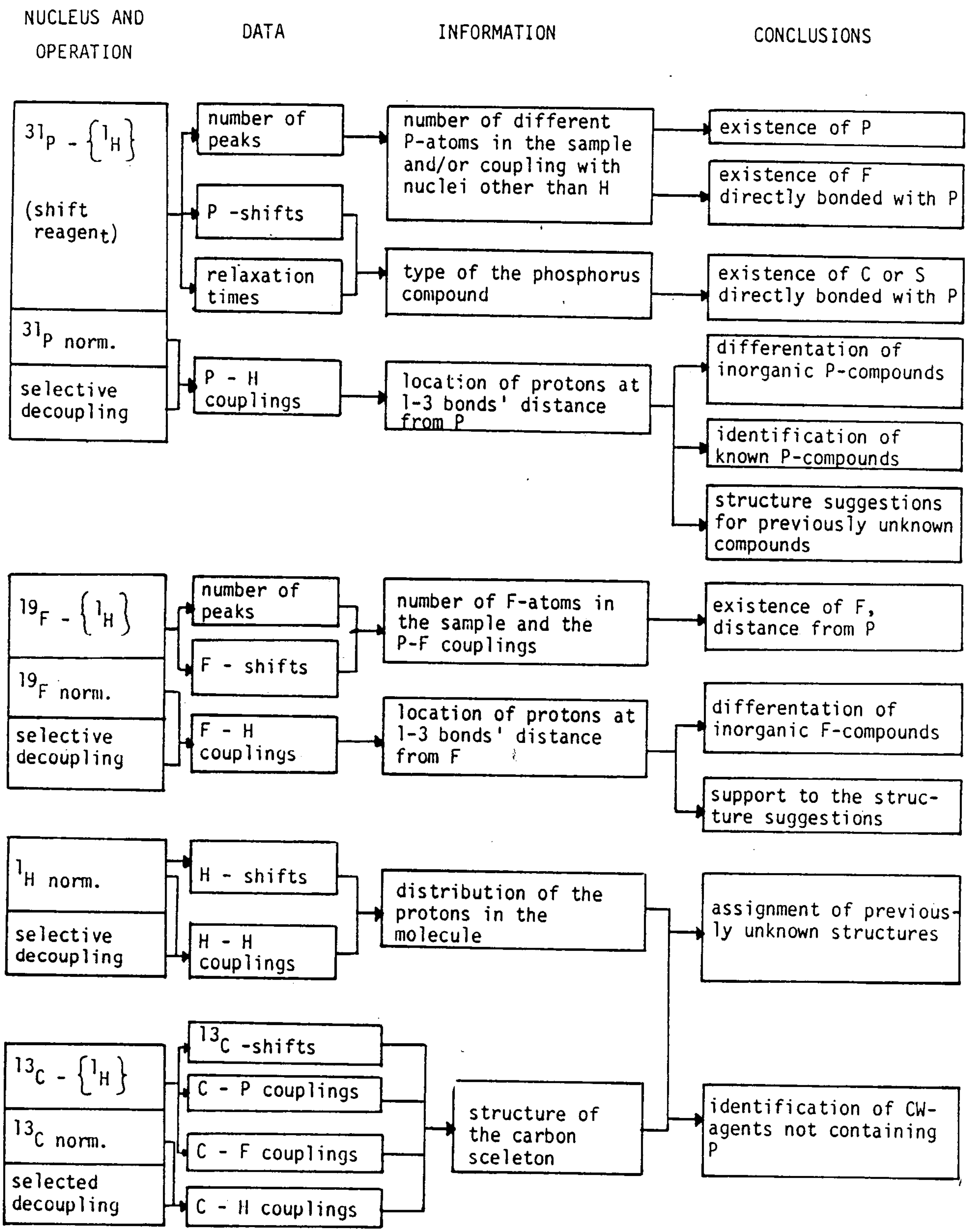


Fig. 3. APPLICATION OF NMR SPECTROMETRY TO VERIFICATION OF CW AGENTS

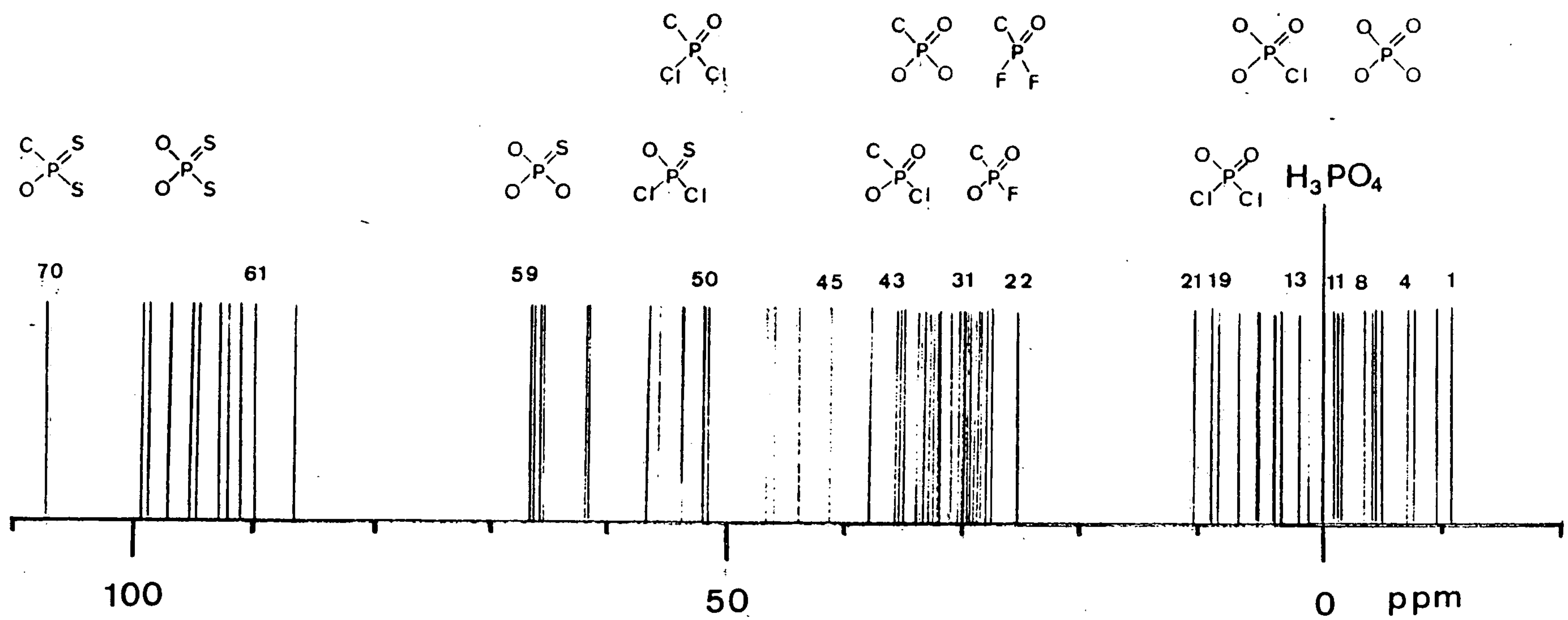


Fig. 4. DISTRIBUTION OF THE ^{31}P CHEMICAL SHIFTS OF 70 QUADRUPLY CONNECTED PHOSPHORUS COMPOUNDS (NERVE GASES, PESTICIDES AND RELATED COMPOUNDS).

The influence of atoms directly bonded to phosphorus on the chemical shift is shown along with formulas above the spectral area in question.

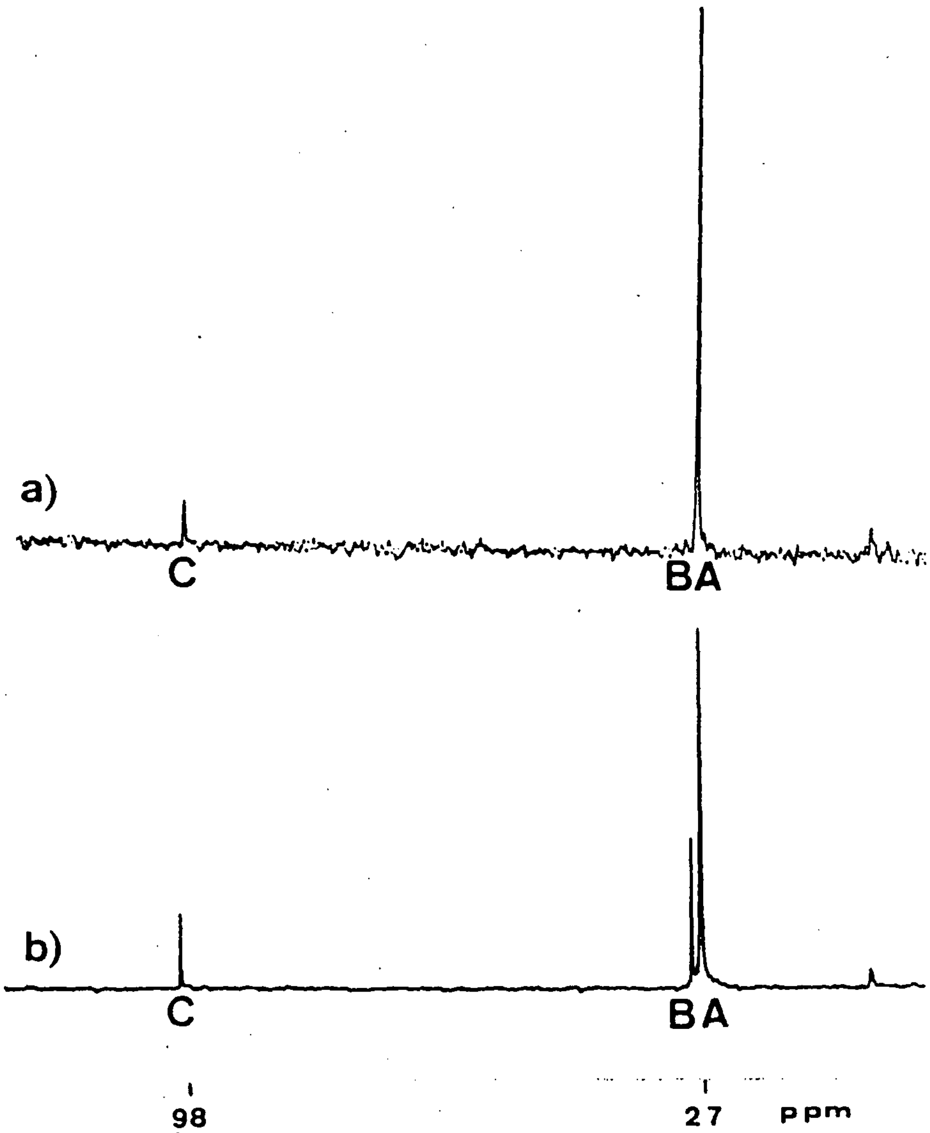


Fig. 5. THE EFFECT OF SHIFT REAGENT TO CHEMICAL SHIFTS OF SOME PHOSPHORUS COMPOUNDS.

The ^{31}P NMR spectrum of a mixture of amition (A), di-isopropyl methylphosphonate (B), and dimethoate (C) in chloroform with 10% of deuterochloroform, was recorded. In spectrum a) the signals of (A) and (B) fall together showing only one peak. Spectrum b) is recorded after the addition of EuDPM shift reagent; the signals of A and B are separated. The assignment of each signal is confirmed by recording the spectrum of each compound separately.

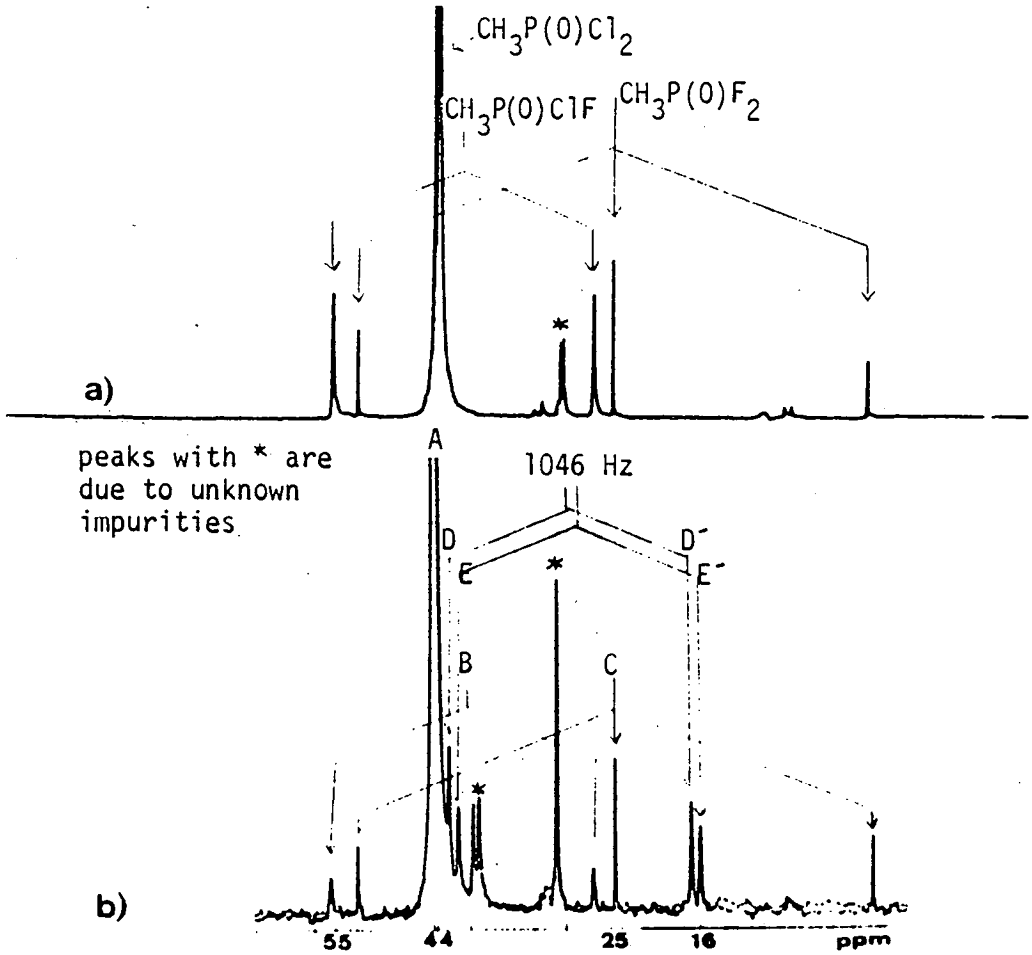


Fig. 6. SYNTHESIS OF SOMAN IN A NMR TUBE:

Spectrum a) shows the noise decoupled ^{31}P NMR spectrum of a mixture of $CH_3P(O)Cl_2$ (A), $CH_3P(O)ClF$ (B), and $CH_3P(O)F_2$ (C), produced in a synthesis with (A) as the main product. The spectrum shows the signal of (A) as one peak; the signal of (B) is split by fluorine in two peaks of equal intensity, with J_{PF}=1130 Hz and in (C) the two fluorine atoms split its signal into 1:2:1 triplet, with J_{PF}=1107 Hz.

Spectrum b) shows the noise decoupled ^{31}P NMR spectrum of the same sample four days after the addition of a few drops of pinacolyl alcohol. New peaks DD´and EE´ could be already observed in the spectrum after one hour, and increased continually. Each pair has a coupling constant of 1046±1,5 Hz, that is the same as the coupling of phosphorus to fluorine in sarin. This suggests that the signals (δ =28,4 and 29,4 ppm) represent the two diastereoisomers of soman, produced by the known reaction of pinacolyl-alcohol with methylphosphonofluoridates (b) and (C). The experiment also indicates that the reaction takes place in room temperature and more rapidly with (B) than with (C). The formation of soman was later confirmed with GC-MS (Figure 13).

UCD/501

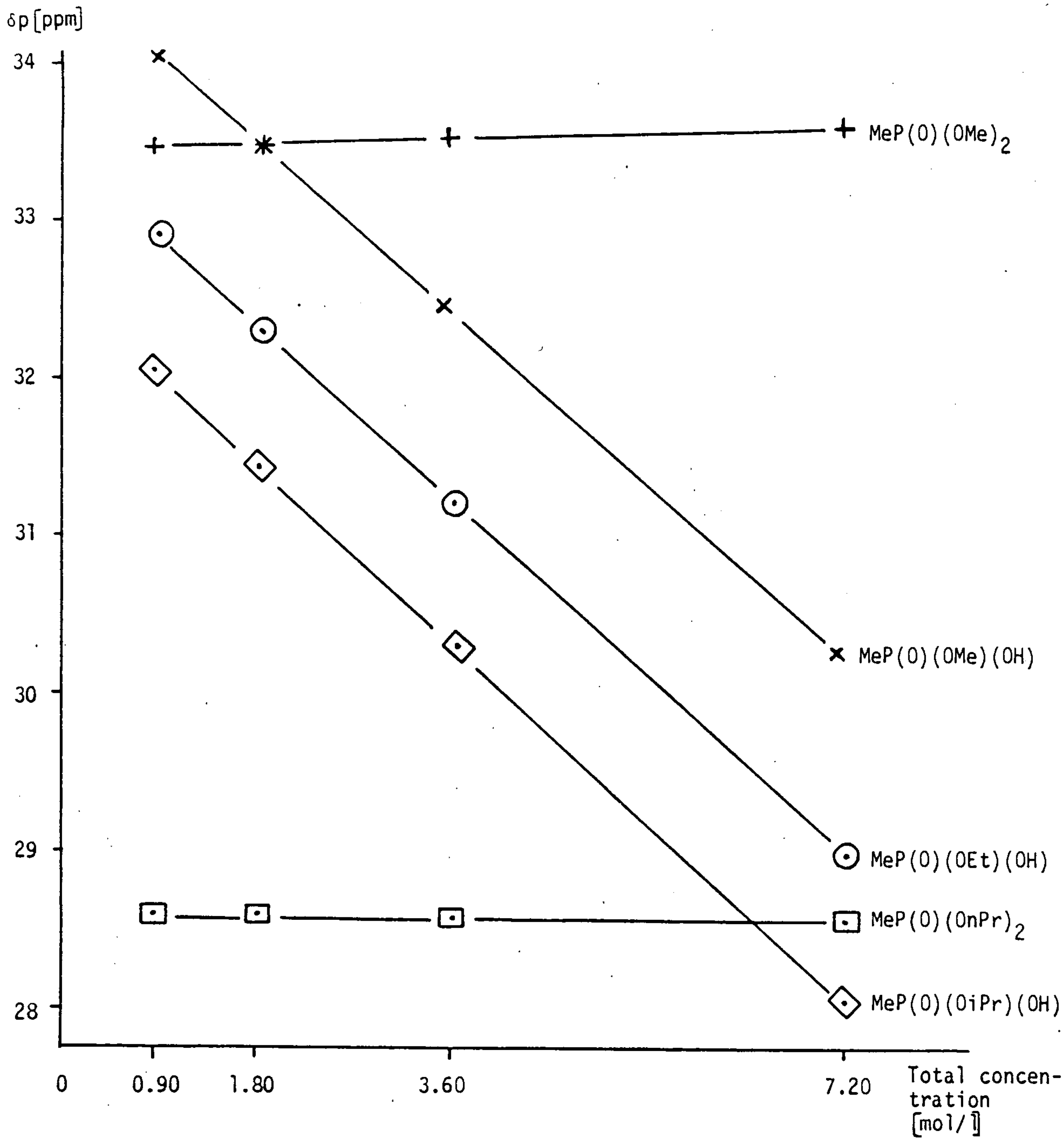


Fig. 7. THE INCLUENCE OF CONCENTRATION TO ^{31}P CHEMICAL SHIFT.
The chemical shifts are determined in four different concentrations of a mixture of two classes of phosphonate esters: monoalkyl methylphosphonates $[CH_3P(O)(OR)(OH)]$ and dialkyl methylphosphonates $[CH_3P(O)(OR)_2]$, and the values obtained are plotted against total concentration. A distinct and linear correlation can be observed for the compounds of the first group, but not for those of the second.

Compound	Concentration (mol/l)	T_1(s)
MeP(O)(OMe)(OH)	0.64	1.6
MeP(O)(OEt)(OH)	0.94	1.7
MeP(O)(OiPr)(OH)	0.75	2.0
$MeP(O)(OMe)_2$	0.67	8.6
$MeP(O)(OnPr)_2$	0.45	9.0
$EtP(O)(OMe)_2$	0.15	10.3

Fig. 8. ^{31}P spin-lattice relaxation times of mono- and dialkyl alkylphosphonates measured in a $CDCl_3$ solution at +25°C.

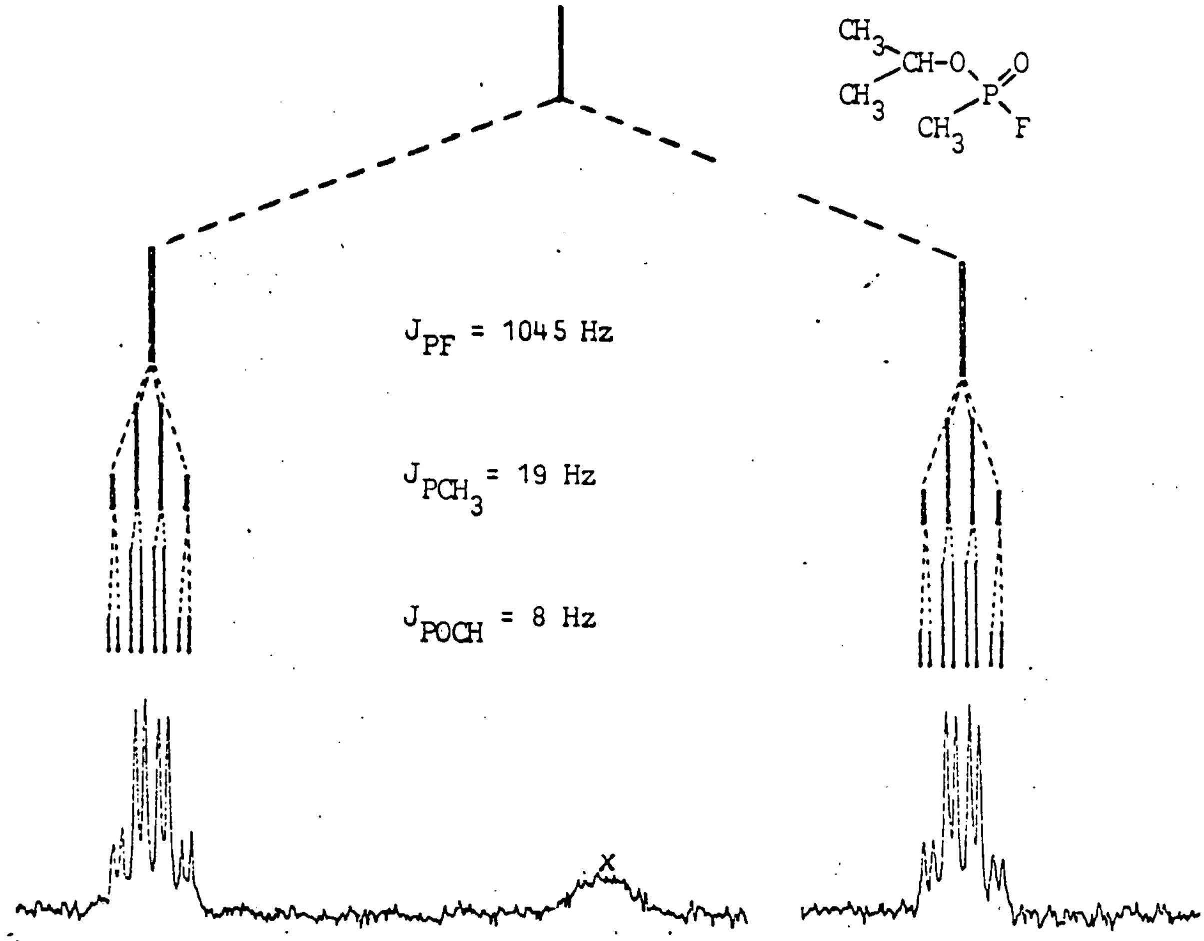


Fig. 9. NORMAL (UNDECOUPLED) ^{31}P NMR SPECTRUM OF SARIN IN DEUTEROCHLOROFORM.

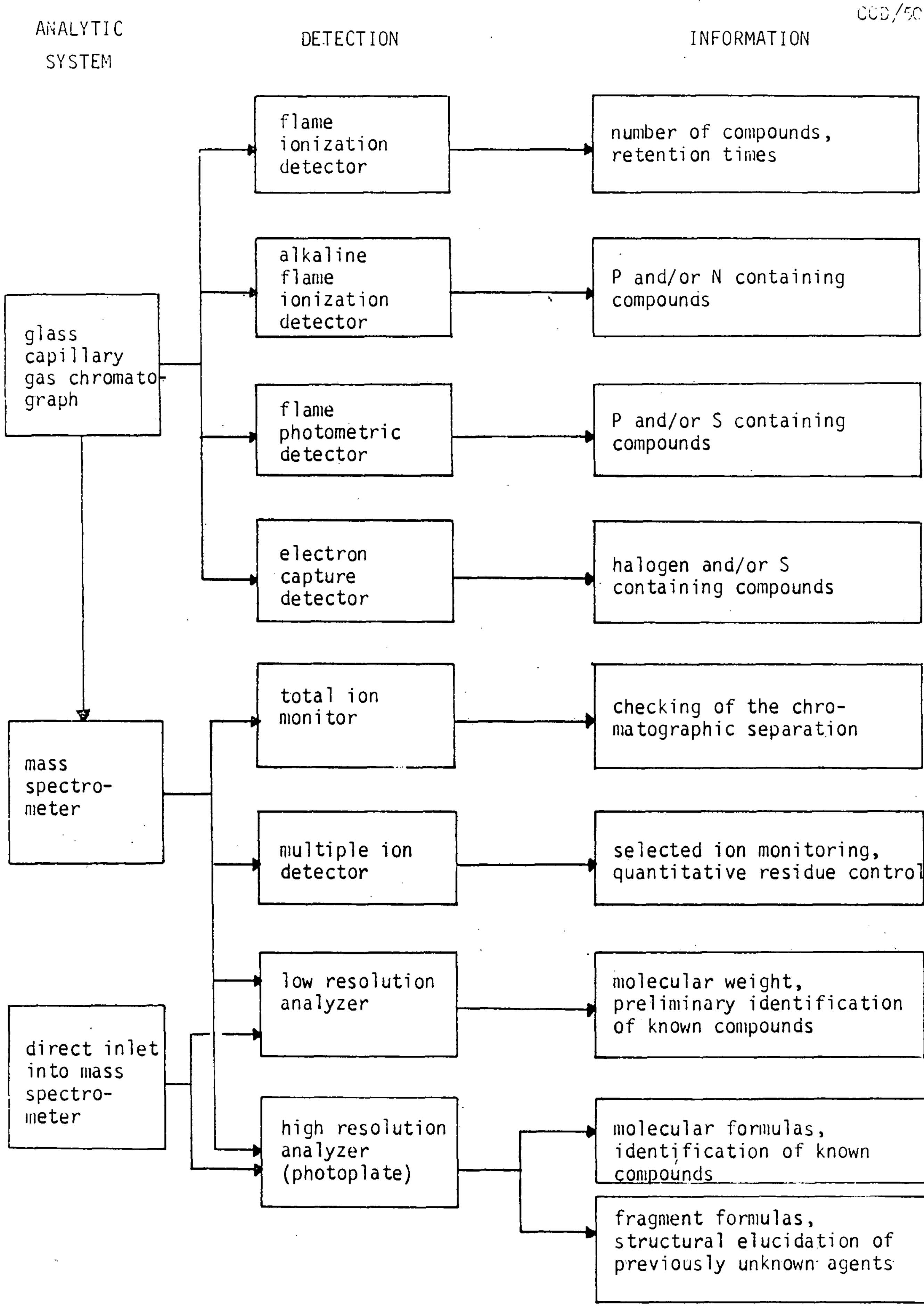


Fig. 10. HIGH RESOLUTION GAS CHROMATOGRAPHY - MASS SPECTROMETRY IN CW VERIFICATION

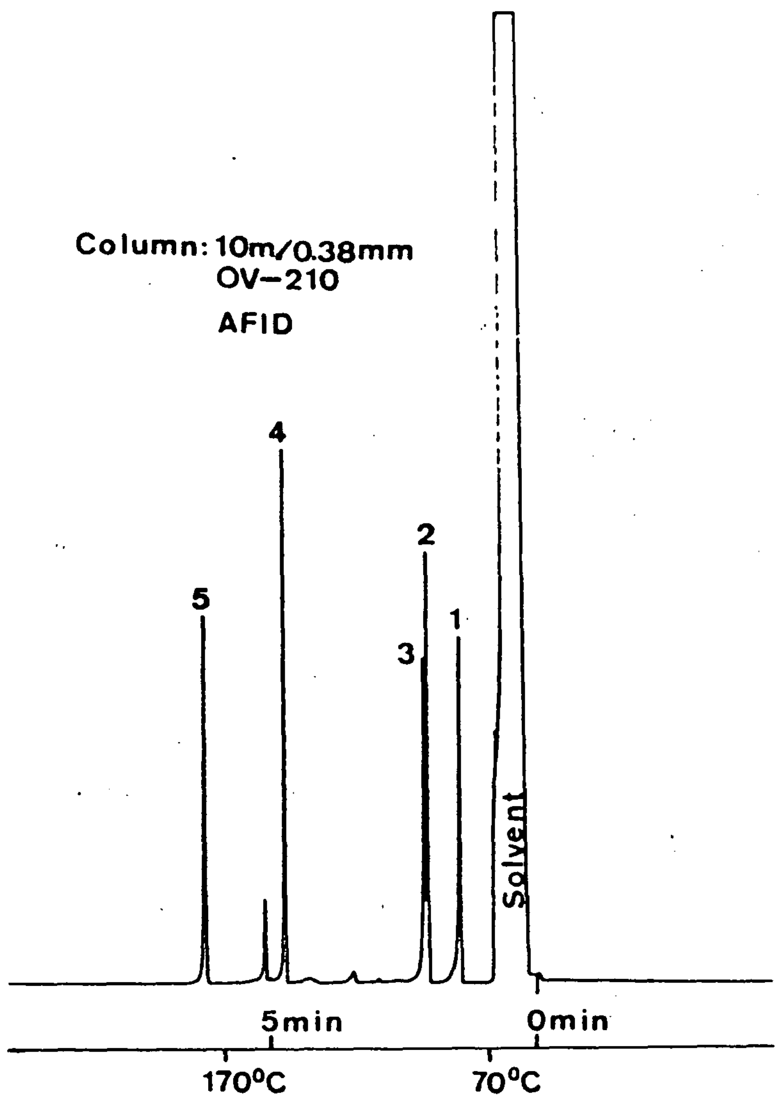


Fig. 11. GLASS CAPILLARY CHROMATOGRAM OF A NERVE GAS MIXTURE.
About 100 pg of sarin (1), soman (2 and 3, two diastereomeric forms), tabun (4) and amiton (5) in acetone solution were injected using splitless technique and detected with selective phosphor detector (AFID).

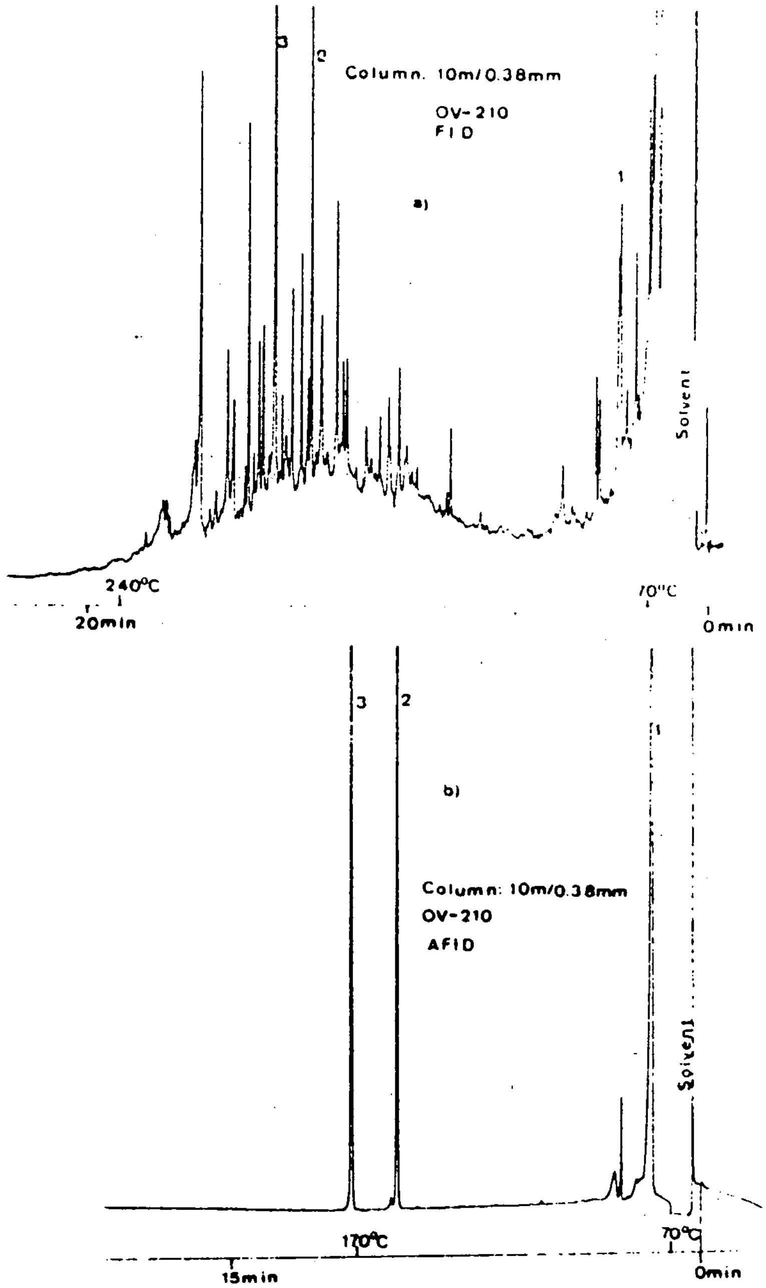


Fig. 12. GAS CHROMATOGRAMS FROM A POLLUTED LAKE WATER.
About 0.1 ppm of sarin and 0.5 ppm of two phosphorus pesticides were added to a water sample. After one week the water was extracted with dichloromethane and the extract was directly analyzed by GC. From the very complicated FID chromatogram (a), the peaks were not easy to identify. Using a phosphorus selective detector (AFID) (b) the added compounds are easily detected: peak 1) sarin, 2) thimet and 3) dyfonate.

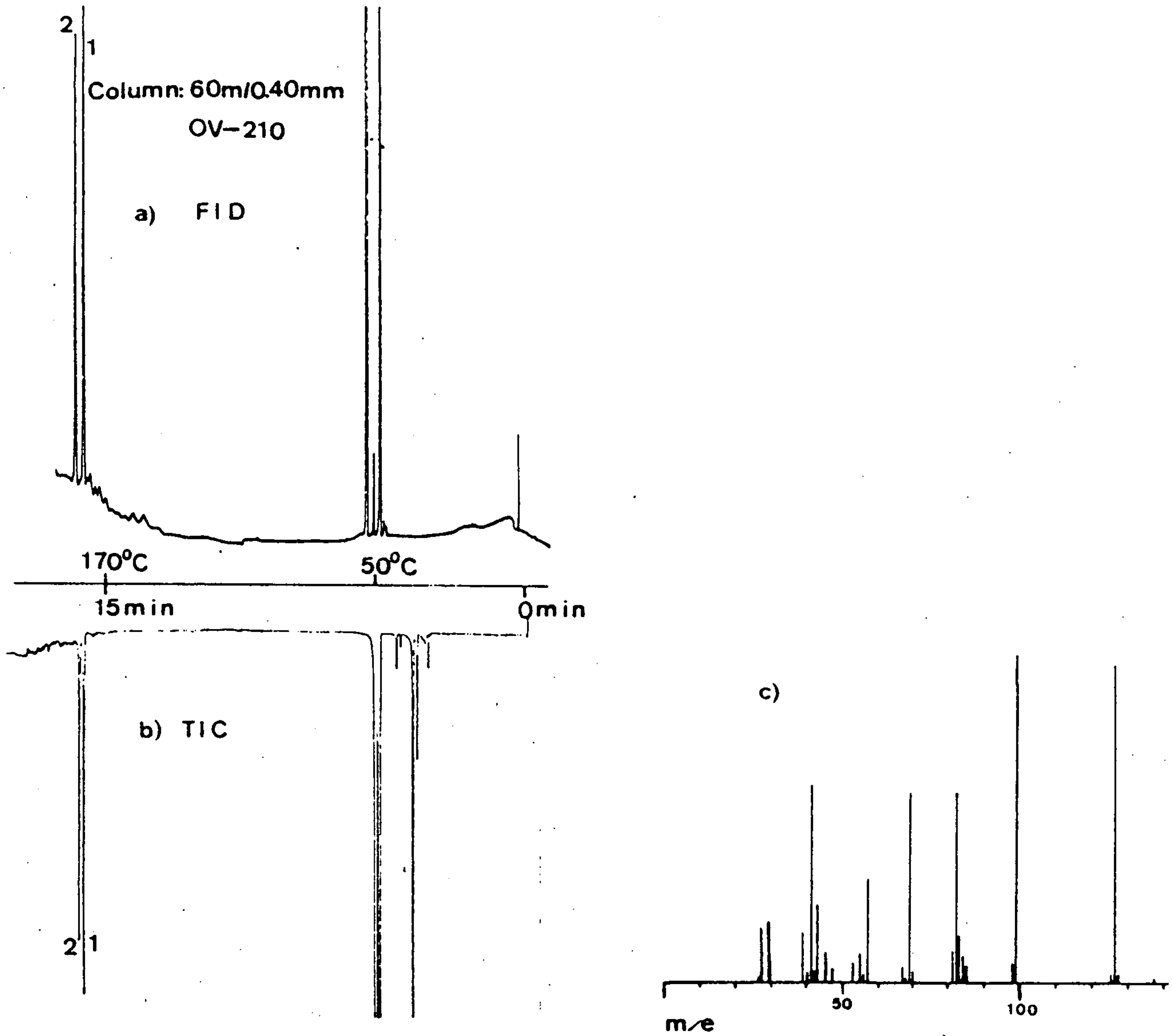


Fig. 13. GC-LOW RESOLUTION MS ANALYSIS OF THE SOMAN PREPARATION DESCRIBED IN FIGURE 6.

a) Chromatogram recorded by flame ionization detection (FID).

b) Total ion current chromatogram (TIC) detected by mass spectrometer.

c) Mass spectrum of peaks 1 and 2, identical with each other and with published spectrum of soman. These results confirm that the peaks are due to the diastereomeric forms of soman as suggested on the basis of NMR analysis (Figure 6).

Table 1. The chemical shifts of a number of quadruply connected phosphorus compounds, referenced to 85% H_3PO_4, low-field shifts being shown as positive values. Numbering corresponds to the spectra lines in Figure 4.

No.	Compound	Shift
1.	DFR (iPrO)$_2$P(O)F	-10.7
2.	TABUN	- 9.6
3.	PARAOXON	- 7.6
4.	CHLORFENVINPHO	- 7.3
5.	PHOSPHAMIDON	- 5.0
6.	DDVP	- 4.1
7.	(iPrO)$_3$P(O)	- 4.0
8.	NALED	- 3.6
9.	(EtO)$_3$P(O)	- 1.5
10.	(nPrO)$_3$P(O)	- 1.2
11.	(nBuO)$_3$P(O)	- 0.9
12.	(iPrO)$_2$P(O)Cl	1.4
13.	(MeO)$_3$P(O)	1.9
14.	(EtO)$_2$P(O)Cl	3.6
15.	(nPrO)$_2$P(O)Cl	4.2
16.	EtOP(O)Cl$_2$	5.3
17.	nPrOP(O)Cl$_2$	5.3
18.	(MeO)$_2$P(O)Cl	6.7
19.	GLYPHOSATE	8.5
20.	iPrOP(O)Cl$_2$	8.9
21.	HP(O)(OCH$_3$)$_2$	10.3
22.	MeP(O)F$_2$	25.0
23.	MeP(O)(OiPr)$_2$	27.5
24.	(EtO)$_2$P(O)SEt	27.6
25A	SOMAN (DIASTEREOMER A)	28.4
26.	SARIN	28.6
27.	AMITON	28.9
25B	SOMAN (DIASTEREOMER B)	29.4
28.	MeP(O)(Oet)F	29.5
29.	MeP(O)(OH)$_2$	29.8
30.	MeP(O)(OnPr)$_2$	29.9
31.	MeP(O)(OiPr)(OH)	30.0
32.	MeP(O)(OEt)$_2$	30.3
33.	EtP(O)(OiPr)$_2$	31.2
34.	MeP(O)(OMe)$_2$	32.6
35.	MeP(O)(OEt)(OH)	32.6
36.	MeP(O)(OnPr)(OH)	
37.	MeP(O)(OEt)Cl	32.7
38.	iPrP(O)(OiPr)$_2$	33.2
39.	EtP(O)(OnPr)$_2$	33.4
40.	MeP(O)(OMe)(OH)	33.8
41.	MeP(O)(OnPr)Cl	35.3
42.	EtP(O)(OMe)$_2$	35.4
43.	iPrP(O)(OEt)$_2$	35.8
44.	iPrP(O)(OMe)$_2$	37.9
45.	MeP(O)ClF	41.4
46.	MeP(O)Cl$_2$	44.4
47.	EtP(O)OEtCl	46.3
48.	EtP(O)(OnPr)Cl	46.8
49.	iPrP(O)(OEt)Cl	51.4
50.	SULFOTEPP	52.6
51.	EtP(O)Cl$_2$	53.7
52.	IprOP(S)Cl$_2$	55.6
53.	EtOP(S)Cl$_2$	56.9
54.	iPrP(O)Cl$_2$	61.8
55.	PARATHION	61.9
56.	METHYLPARATHION	65.5
57.	FENITROTHION	65.6
58.	BROMOPHOS	65.9
59.	FENTHION	66.2
60.	(iPrS)$_3$P(S)	86.8
61.	DIOXATHION	89.9
62.	ETHION	90.8
63.	TRITHION	91.8
64.	(PhS)$_3$P(S)	92.5
65.	DISULFOTON	94.8
66.	MALATHION	95.1
67.	METHYLTRITHION	97.1
68.	DIMETHOATE	98.9
69.	(MeS)$_3$P(S)	99.3
70.	DYFONATE	106.9

All spectra are recorded in $CDCl_3$ except no 19 and 28 in D_2O. Chemical shifts of certain compounds (see Fig. 7) are rather dependent on solvent and concentration of the sample.

Table 2. The sensitivity of various analytical methods is presented as detection limits for compounds of the nerve-gas type. The values mentioned are only approximate, because the detection is highly dependent on the compound in question, the complexity of the mixture and the instrumentation available, etc.

	approximate detection limit mg
Gas chromatography with glass capillary columns	
FID detection	10^{-6}-10^{-5}
AFID "	10^{-8}
Mass spectrometry	
Direct inlet low resolution	10^{-5}
" " high resolution	10^{-3}
GC - inlet low resolution	10^{-5}
high resolution	
Photoplate detection	10^{-6}-10^{-5}
Nuclear magnetic resonance spectrometry with Fourier transform	
^{1}H	10^{-2}
^{19}F, normal	
" noise decoupled	10^{-2}
^{31}P, normal	1
" noise decoupled	10^{-1}
^{13}C, normal	50
" noise decoupled	10
Infra red spectrometry	10^{-4}-10^{-3}

CCD/501
Appendix No 1

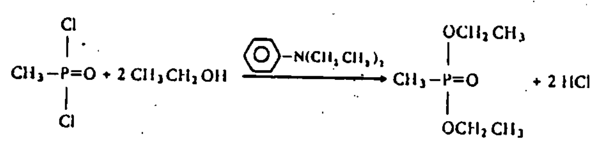
E. RAHKAMA, J. ENQUIST and L. PIRILA

Detection of a Highly Poisonous Impurity in a Sample of Phosphoric Acid Derivative

INTRODUCTION

In general, the nuclear magnetic resonance technique is not a very sensitive method for detecting trace impurities. However, in a positive case, it often gives enough information for the structure and amount of the unknown impurity to be determined.

We used pulse Fourier transform ^{31}P, ^{13}C, ^{19}F, and ^{1}H n.m.r. spectrometry in connection with a small nerve gas impurity in a relatively harmless organic phosphorus compound, diethyl methylphosphonate, which we received for routine analysis in the course of our work on n.m.r. spectrometry of phosphorus compounds. (The work is part of a research project to develop verification techniques of chemical warefare agents, financed by the Finnish Ministry of Foreign Affairs.) The diethyl methylphosphonate had been prepared according to reaction (1), and the sample consisted of about 2 ml of viscous colourless liquid.



(1)

The ^{1}H, ^{13}C, ^{19}F and ^{31}P n.m.r. spectra were recorded at 100, 25, 94 and 40 MHz, respectively, with a JEOL PFT-100 spectrometer. All spectra were obtained using the pulse Fourier transform mode at room temperature. The PFT-100 spectrometer was equipped with an EC-100 computer of 20 K memory.

^{31}P spectra

Analysis was begun with the recording of the $^{31}P-\{^{1}H\}$ noise decoupled spectrum. It showed one strong peak 30.3 ppm down-field from phosphoric acid reference in a capillary, and additionally two small peaks with approximately the same intensity at 42.5 and 16.6 ppm. In the normal ^{31}P n.m.r. spectrum, shown in Figure 1(a), the strong signal appears as a multiplet of 11 peaks as expected for diethyl methylphosphonate, whose spin–spin coupling constants $\mathcal{J}_{CH,OP} \approx \frac{1}{2}\mathcal{J}_{CH,P}$.[1] The weak signals appear as nine-peak multiplets with a splitting of 9.3 Hz. The separation between the centre peaks of multiplets was 1046 Hz. The $^{31}P-\{^{19}F\}$ decoupled spectrum showed a collapse of the small impurity multiplets into a multiplet on the high field side of the main signal, as shown in Figure 1(b). The ^{31}P spectra show that in the impurity there are protons and fluorine coupled to phosphorus. The nine-peak ^{31}P multiplets suggest that the protons should belong to CH_2 and CH_3 groups and the ratio of proton–phosphorus coupling constants should be approximately 1 : 2, as in the main compound.

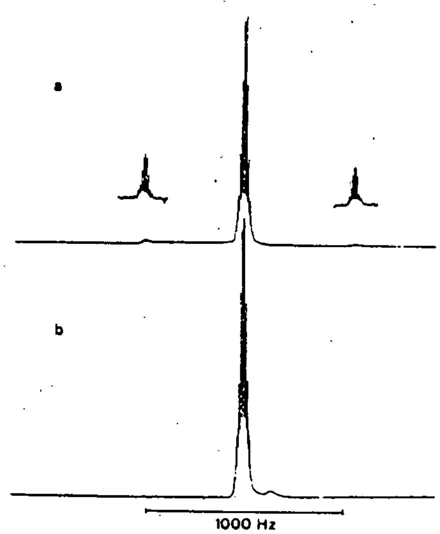


Figure 1. (a) ^{31}P n.m.r. spectrum of the diethyl methylphosphonate sample. The impurity peaks are shown with a gain factor of 10. (b) $^{31}P-\{^{19}F\}$ double resonance spectrum of the same sample.

^{19}F spectrum

The one bond coupling $^{1}\mathcal{J}_{PF} = 1046$ Hz appears in the ^{19}F n.m.r. spectrum shown in Figure 2 as a separation of two quadruplets. The large fluorine–phosphorus coupling constant is typical for monoalkoxy derivatives whose couplings $^{1}\mathcal{J}_{PF}$ are approximately 1050 Hz and clearly greater than for dialkoxy derivatives, where $^{1}\mathcal{J}_{PF}$ is typically 950 Hz.[2,3]

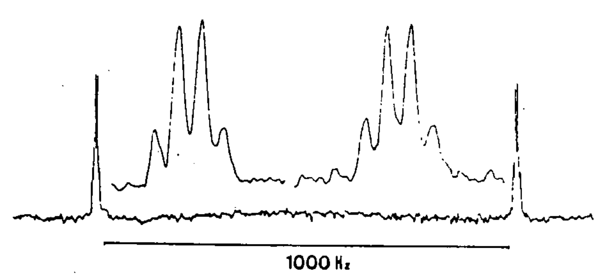


Figure 2. ^{19}F n.m.r. spectrum of the diethyl methylphosphonate sample. The upper part shows the quartets expanded 10 times.

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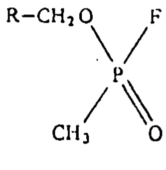
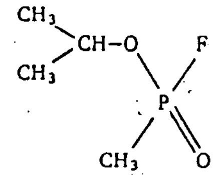
Using the chemical shift and coupling information obtained from the ^{31}P and ^{19}F spectra it is possible to deduce the structure (1) of the impurity. The ^{19}F spectrum indicates clearly that there is fluorine in one position only. The splitting of 5.5 Hz in the quadruplets corresponds well to the coupling $^{3}J_{FPCH_3} = 5.6$ Hz found in sarin (2),[1] and confirms thus the assumed structure 1 for the impurity containing phosphorus and fluorine.



1



2

^{13}C spectra

To get more information about the group R in the impurity the noise decoupled $^{13}C-\{^{1}H\}$ spectrum of Figure 3(a) was recorded for the sample. As expected it showed the signals of diethyl methylphosphonate as doublets arising from the carbon–phosphorus couplings. The several other strong peaks appearing in the ^{13}C spectrum (marked by x) belong to the *N,N*-diethylaniline[4] used in reaction (1) for removing the acid formed.

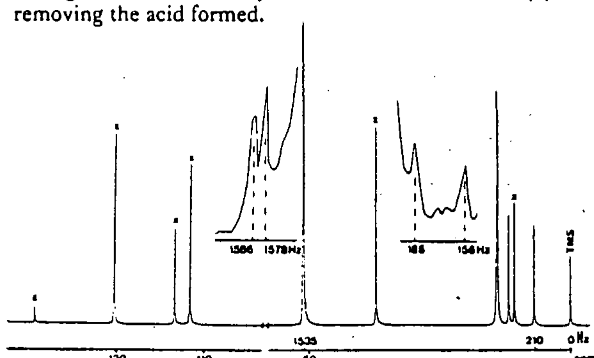


Figure 3. $^{13}C-\{^{1}H\}$ spectrum of the diethyl methylphosphonate sample. The upper part contains two spectral ranges recorded with a higher gain. The peaks due to *N,N*-diethylaniline are marked x.

The $^{13}C-\{^{1}H\}$ spectrum with higher sensitivity shown in the upper part of Figure 3 contains some weak signals as well. Comparison with the spectra of sarin and other related phosphorus compounds allowed us to assign some of them to the assumed structure 1 of the impurity. First, the ^{13}C in the F—P—CH_3 group is expected to appear as a doublet of doublets caused by couplings $^{1}J_{CP}$ and $^{2}J_{CPF}$. Actually the spectrum shows only the high field doublet at 170 Hz from TMS, showing a splitting of 29 Hz, which corresponds quite well to the coupling $^{2}J_{CPF} = 27.3$ Hz obtained for sarin.[5] Also the approximate chemical shift range of this methyl carbon corresponds to the range expected. There is also a doublet with a splitting of 18 Hz at 62.9 ppm from TMS. This is assigned to the $POCH_2$—R carbon. Table 1 displays ^{13}C chemical shifts of some compounds closely related to sarin. Comparison of the CH_3—C chemical shifts in this table leads to the conclusion that the corresponding ^{13}C signal from the impurity might be hidden by the other methylcarbon signals at 16 ppm.

Table 1. ^{13}C Chemical shifts of sarin and some related compounds[4]

	CH_3—C—O—P	C—CHR—O—P
$CH_3P(O)(OCH(CH_3)_2)Cl$	23.6 ppm	73.1 ppm
$CH_3P(O)(OCH(CH_3)_2)F$	23.9 ppm	72.8 ppm
$CH_3P(O)(OCH_2CH_3)Cl$	15.9 ppm	63.2 ppm
Impurity		62.9 ppm

^{1}H spectrum

The proton spectrum of the sample (Figure 4) showed only three peaks, at 157.0, 169.7 and 175.5 Hz from TMS, assignable to the impurity. All of them belong to the protons of the methyl group directly bonded to phosphorus. These lines show a splitting of 18.5 Hz ± 0.5 Hz, equal to the proton–phosphorus coupling as determined by the ^{31}P n.m.r. spectrum, and a splitting of 5.8 Hz ± 0.5 Hz, which corresponds to the proton–fluorine coupling found in the ^{19}F spectrum. These values and the chemical shift of 1.63 ppm agree very well with the values found for the methyl protons in sarin. The ^{1}H spectrum thus confirms structure 1 deduced from the ^{31}P and ^{19}F spectra.

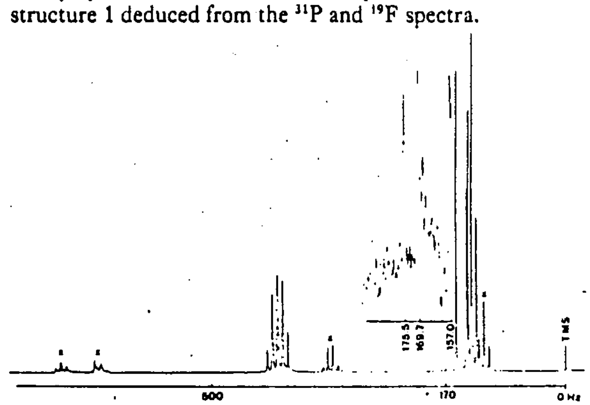
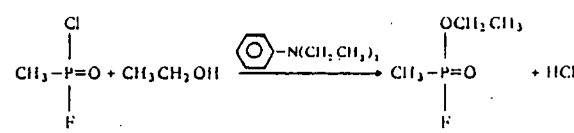


Figure 4. ^{1}H n.m.r. spectrum of the diethyl methylphosphonate sample. In the upper part the spectral range 157–193 Hz is expanded at a higher gain.

Careful integration using the ^{31}P and ^{1}H n.m.r. spectra gave 3.3 and 2.5% w/w, respectively, for the impurity in the main compound.

DISCUSSION

The proposed chemical structure of ethyl methylphosphonofluoridate for the impurity was confirmed when a small amount of methylphosphonic chloride fluoride was detected in the methylphosphonic dichloride used in reaction (1). The reaction producing the ethyl methylphosphonofluoridate may be (2).



(2)

The results indicate considerable potential for the use of multinuclear FT-n.m.r. in the detection and identification of a relatively small amount of impurity in a sample of a phosphonic ester. Such identification can be made without fractionation or other handling of the sample. Especially in cases where the sample is highly toxic, the carefully closed sample tube eliminates a great part of the danger involved in the handling of the sample material.

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CONFERENCE OF THE COMMITTEE ON DISARMAMENT

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2 July 1976

Original: ENGLISH

UNITED KINGDOM

Working Paper on the Feasibility of Extraterritorial Surveillance of Chemical Weapon Tests by Air Monitoring at the Border

INTRODUCTION

1. A major difficulty standing in the way of international agreement on disarmament and control of chemical agents and weapons is the problem of verification. Two possible ways of verifying that proscribed field tests of chemical weapons are being carried out would be:

(a) Surveillance by a satellite which monitored chosen areas of the earth's surface for the presence of chemicals of known military significance. This has already been discussed in UK Working Paper CCD/371;

(b) Surveillance, by ground stations sited outside national boundaries and equipped to detect the same chemicals, of air masses which had passed over areas where chemical weapons were thought to be produced or tested.

Once a reliable indication of an infringement of a Convention had been obtained by one of these surveillance techniques then a case for on-site inspection would be greatly strengthened. Techniques are already available that would enable evidence of the production or testing of chemical weapons to be obtained by examination of soil, water and vegetation taken either from the suspect site or from its immediate environs if the site itself was inaccessible.

2. The present paper presents a theoretical assessment of the probability that chemical weapon tests would be detected by atmospheric monitoring at a national boundary.

ANALYTICAL TECHNIQUES

3. In considering the problem of surveillance of chemical weapon tests by air monitoring at the border it has been assumed that both detection and identification of chemical agents are required.

4. Analytical methods which might be applied to monitoring vapour concentrations of particular chemicals in air masses crossing national borders are reviewed in Appendix A. Detection might be achieved either instantaneously in the air mass or by collecting and concentrating the material in a large volume of air and subsequently analysing the samples obtained. It is concluded that:

(a) The most sensitive system for instantaneous monitoring would be an infrared device similar to that proposed for a satellite. An infrared sensor may detect agent dispersed in a cloud if the incident beam has traversed a depth x of the cloud having a concentration y, so that the product xy mg/m^2 is equal to or greater than the limiting sensitivity of the sensor. With a path-length of 10km, a concentration of $10^{-10} g/m^3$ of nerve agent could be detected and identified using spectrum accumulation techniques;

(b) The most sensitive system for sample accumulation with subsequent analysis would combine the use of a high efficiency sampler with gas chromatographic analysis using a specific phosphorus detector. This would enable organophosphorus agent detection to be achieved on 10^{-11}g of sample. For unequivocal identification, gas chromatography would have to be combined with mass spectrometry and for this a sample size of 10^{-8}g of chemical agent would be required.

PUFF DISPERSION

5. Calculations in this paper have been based on the assumption that 10kg of organophosphorus agent is dispersed into the air, for example from a field test of a chemical-filled artillery shell or rocket, as an initial "puff" of vapour which subsequently disperses in the environment. Since this dispersion continues over very long distances (possibly 10^7m) before the puff reaches the national boundary, the dispersion model used in the satellite detection system will be invalid. Rule of thumb calculations have therefore been made to establish approximate values for puff dimensions and vapour concentration at the distant boundary.

6. Three sites are considered in this paper, viz Porton (UK), Dugway (USA) and Shikhany (USSR), and the meteorological factors appropriate to puff dispersion in general and to these sites in particular are discussed in Appendix B.

7. It is considered that of the three locations, the Shikhany site represents the most difficult case because of the great distances to the national boundaries. If a puff travelled from Shikhany (40°E) to the Pacific coastline of the USSR (140°E), with a prevailing West wind, a distance of approximately 10,000km would be traversed. If it is assumed to diffuse horizontally and vertically under Neutral meteorological conditions, the initial 10kg of material would eventually be distributed in a cylinder of air of diameter 2,000km (1/5 of the travel distance assumed for the Neutral category) and height of 10km (vertical diffusion being limited by an inversion lid). Assuming a uniform distribution, the vapour concentration would then be 0.3×10^{-12} g/m^3, and the whole of the material in the original puff would now take 6,700 minutes to cross the border at a windspeed of 5m/s.

8. It should be noted that because of the long distance and times of puff travel, factors such as chemical decomposition of the vapour, wash-out by rain and deposition on the terrain, may well be important, but for the purposes of the present study these factors have had to be ignored in the absence of experimental data on which estimates of their magnitude could be based.

CONTINUOUS INSTANTANEOUS MONITORING

9. The probability of success by Continuous Instantaneous Monitoring, Pb, may be expressed as the product of four probability terms as follows:

$$Pb = Pv \times Pa \times Pt \times Pd$$

Where,

Pv is the probability of adequate 'surface' visibility

Pa is the probability that the sensor will scan the puff area

Pt is the probability that the scan will occur at the right time

Pd is the probability that the product (concentration x path length) for the puff will meet the sensor sensitivity requirements

10. It was concluded in Appendix A that the most sensitive infrared detection techniques could probably achieve a limiting sensitivity of approximately 10^{-6}g/m^2. Thus if the vapour concentration in the puff is 0.3×10^{-12}g/m^3 (as calculated in para 6 above), a path length of approximately 3,300km is required for detection; this path length is considerably greater than the estimated puff diameter (2,000km, para 7) and is likely to be considerably greater than the distance of clear visibility. Alternatively if a realistic path length of 10km is assumed, it may be calculated that the lowest detection concentration would be 10^{-10}g/m^3, and this concentration is much higher than that estimated for the puff.

11. While Pa and Pt will have values approaching unity, Pv and Pd are thus likely to have values approaching zero and it is therefore concluded that the most sensitive system for continuous instantaneous monitoring (infrared spectrophotometry) would be unlikely to detect or identify agent vapours released from small chemical munitions when the distance between the release of the puff and the detector is as large as 10^7m (10,000km). In fact the lowest detectable concentration of 10^{-10}g/m^3 would be found at a range of not more than 500km from the initial puff, assuming that the 10kg of material was distributed in a cylinder of 100km diameter (one-fifth$_4$of the range) and 10km height.

(Concentration = $\dfrac{10^4}{\pi(5 \times 10^4)^2 \times 10^4}$ = g/m^3 = 1.27×10^{-10}g/m^3).

MONITORING BY SAMPLE ACCUMULATION

12. The probability of success by sample accumulation, Pb*, may be expressed as the product of two probability terms as follows:

$$Pb^* = Pa^* \times Pd^*$$

Where,

Pa* is the probability that the sampler will be in the right position to intercept the puff as it crosses the national boundary

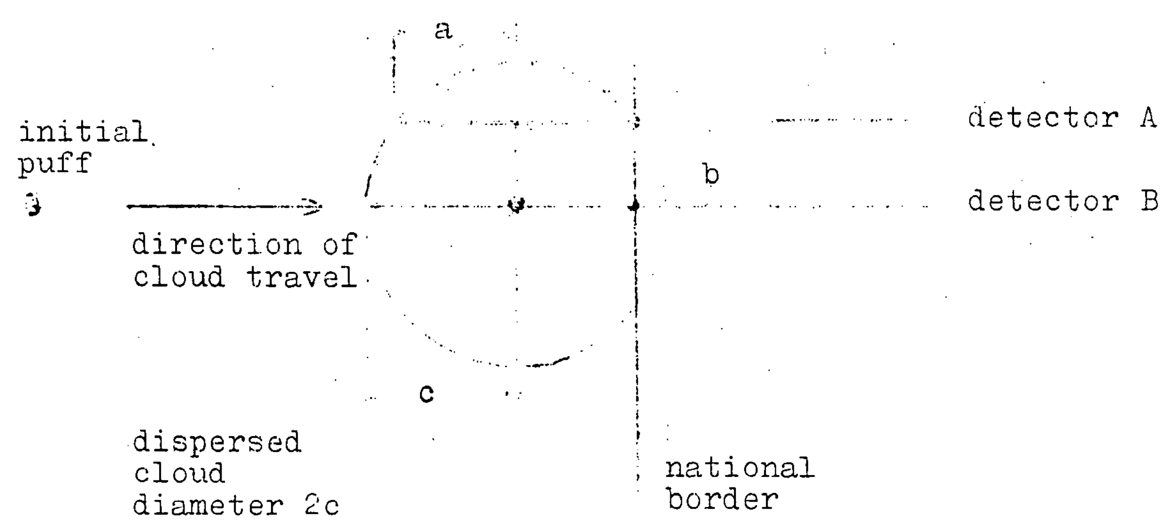
Pd* is the probability that the dosage at the sampler will enable collection of a detectable sample

13. Information related to Pd* is obtained as follows, on the basis of the values given in paragraph 4(b), ie that 10^{-11}g of nerve agent would be required for detection and 10^{-8}g for identification. Since,

Sample = Concentration x Sampling Rate x Sampling Time
(g) (g/m^3) (m^3/min) (min)

then, if a sampling rate of 1m^3/min is maintained and the concentration in the puff is $0.3 \times 10^{-12} g/m^3$, it would be necessary to sample for 30 minutes to achieve detection and for 30,000 minutes to achieve identification. Thirty minute sampling times are feasible but 30,000 minutes is much greater than the transit time of the puff (see para 7). It is concluded that Pd* = 1 if the sampler is correctly sited.

14. Values of Pa* for various sampler spacings at a national border may be calculated as follows:



With a cloud diameter of 2,000 km taking 6,700 min to cross the national boundary at the maximum, the requirement for 30 min sampling for detection requires a sampling depth of $\frac{30}{6,700} \times 200 = 8.95$km, ie. 2a at detector A = 8.95km.

The available sampling width for detection is $2b = 2\sqrt{(c^2 - a^2)} = 2\sqrt{(1000^2 - (\frac{8.95}{2})^2)} = \sim 2000$ km.

If the sampling points are spaced at distances nc, where n>2, then the probabilities Pa* are given by: $Pa^* = \frac{2b}{nc}$

n	Spacing (nc) km	Probabilities Pa*
2	2000	1.00
3	3000	0.66
4	4000	0.50
5	5000	0.40

15. Since it has already been shown (para 13) that Pd* = 1, (ie that the dosage at the sampler will enable collection of a detectable sample) the values in the above table also give the overall probabilities of detection, since Pb* = Pa* x Pd*.

IDENTIFICATION

16. As noted earlier, a sample sufficient for identification can not be achieved since this would require a sampling time at the defined concentration exceeding that of the passage of the cloud, even at detector B, in order to collect sufficient material. Unfortunately, detection without identification would not be acceptable since the analytical system, comprising a sampler and a gas chromatograph fitted with a specific phosphorus detector, would also respond to organophosphorus insecticides.

CONCLUSIONS

17. From the analysis carried out it is concluded that:

(a) Detection of a field test by instantaneous monitoring of the air at a national boundary is not feasible at a distance of 10,000km from the source and could probably not be achieved beyond a distance of 500 km;

(b) A sample accumulation system positioned on a national boundary might theoretically detect an organophosphorus compound in a puff released 10,000km upwind. However to establish the feasibility of this, experimental data are required on the degradation of puff concentration, during long-distance travel, by deposition, decomposition and wash-out;

(c) Identification of organophosphorus agents by the system described will not be possible and in view of the risk of false alarms, resulting from the detection of commercial organophosphorus compounds, this system is considered not to warrant further investigation until identification can be achieved using 10^{-11}g of sample.

SENSORS FOR BORDER SURVEILLANCE

1. GENERAL REQUIREMENT

Detection of a nerve agent at the border of a country may be achieved either by instantaneous monitoring of the atmosphere or by collecting a quantity of the chemical in a sample (sample accumulation) to enable subsequent detection or identification. The known feasible techniques are listed below:

Technique	Sensitivity Requirements	
	Detection	Identification
Infra-red (IR)	10^{-8} g/m^3	10^{-8} g/m^3
IR (Fourier transform)	10^{-10} g/m^3	10^{-10} g/m^3
Gas Chromatography	10^{-11} g	-
Plasma Chromatography	10^{-14} g	-
Mass Spectrometry	10^{-8} g	10^{-8} g
Organic Semiconductors	10^{-8} tc 10^{-10} g	

2. DISCUSSION ON TECHNIQUES

Infra-red Spectrophotometry. An instrument with limiting sensitivity of 10^{-4} g/m^2 and a path length of 10km could monitor at a concentration of 10^{-8} g/m^3. The instrument would be inoperative under conditions of low visibility since the IR range is effectively the same as the visible range. Since the transit time of a widely dispersed puff will be long, multiple scanning methods (Fourier transform spectrometry) may be applied to overcome the limitations imposed by atmospheric shimmer. This would improve the limiting sensitivity to 10^{-6} g/m^2 and with a path length of 10km (10^4m) a concentration sensitivity of 10^{-10} g/m^3 should be attainable.

Gas Chromatography. A measure of identification may be achieved by measurement of retention times together with relative response to several selective detectors. The following detector sensitivities are attainable:

Detector type	Element detected	Sensitivity
Thermionic	P	10^{-11}g agent
Flame photometric	P, S	10^{-11}g, 10^{-9}g
Electron capture	Halogen	10^{-12}g
Microconductimetric	N	10^{-9}g
Microcoulometric	Cl, S, N	10^{-9}g

Using a 10ml injection of the atmosphere the lowest detectable concentration would be 10^{-6}g/m^3 of nerve agent. If an entire puff were sampled at 1m^3/min* the lowest detectable dosage would be 10^{-11}g min/m^3.

Plasma chromatography. Organic molecules in the atmosphere are converted into ion-molecule complexes which are separated and detected in an ion draft spectrometer. Repetitive testing in real time is feasible and detection sensitivities of 10^{-14}g (equivalent to an atmospheric concentration of 10^{-5}g/m^3) have been claimed. The technique is thus unsuitable for continuous monitoring but could be used with a sample accumulator.

Mass spectrometry. After Fourier infra-red spectroscopy, mass spectrometry is the next most sensitive technique for unequivocal identification, requiring a sample of 10^{-8}g for a gas chromatograph/mass spectrometer combination. This sensitivity can be increased, if only a single fragment ion, characteristic of a chosen family of compounds, is monitored. The use of the 3-dimensional quadrupole as a storage device (QUISTOR) offers the possibility of greatly extending the sensitivity but no figures are yet available to indicate how great an increase is practicable.

Organic Semiconductors. It is claimed that 10% coverage of the

*Environmental Research Corporation MSI Sampler Model 3100 samples at up to 1.2m^3/min.

surface of a semiconductor by a monolayer of adsorbed molecules can be detected; this indicates a limiting weight sensitivity of 10^{-8} g/cm^2. This device might be used as an integrating detector by prolonged exposure to a very low concentration of chemical, provided that the adsorption process was irreversible. While detection and identification might both be feasible, the integration sensitivity would still not exceed that of other sample accumulation techniques.

3. CONCLUSIONS

(a) The most sensitive method of instantaneous monitoring, with a capability for identification, is the Fourier infra-red technique requiring an atmospheric concentration of 10^{-10} g/m^3 (with a path length of 10km);

(b) If sample accumulation techniques were used, for example, prolonged sampling onto an adsorbent or into a solvent, 10^{-11} g of nerve agent would be required for detection using a specific phosphorus detector; or 10^{-8} g of any chemical for identification.

APPENDIX B

METEOROLOGICAL FACTORS

1. METEOROLOGY CATEGORY

Three categories are recognised - Lapse, Neutral and Inversion, describing the vertical temperature gradient in the atmosphere relative to the adiabatic lapse rate. This gradient determines the vigour of thermal turbulence which, in combination with frictional turbulence, controls the dispersion of vapours released into the atmosphere. Vertical dispersion is limited by an inversion lid which is typically at 3,000 metres but which may rise to 10,000 metres under strong Lapse conditions; conversely the lid can descend almost to ground level under Inversion conditions. The altitude of the lid has particular importance with regard to long distance travel since it can hold the puff in contact with the ground and strongly influence the rate of change of vapour concentration.

2. WIND STRENGTH AND DIRECTION

The direction of travel, speed and dispersion of a puff of chemical agent, are strongly influenced by the wind. Because of surface roughness effects, the surface wind (measured at ground level) is less than the geostrophic wind (measured at 100m), the approximate ratio being 0.7, 0.5 or 0.3 under Lapse, Neutral and Inversion conditions respectively. Continental air circulation will determine the feasibility of border surveillance.

3. INFLUENCE ON BORDER SURVEILLANCE

The effect of continental air circulatory patterns on the feasibility of border surveillance will be considered separately for three locations - Porton, Dugway Proving Ground and Shikhany. The generalisations drawn here are based on synoptic pressure charts (sea level) for the northern hemisphere, charts of the upper wind over the world (700 mb contour lines) and 700 mb wind roses.

(a) Porton (UK), presents the simplest case since the national borders are closer to the test area than are those of the USA and the USSR: the prevailing winds at SW'ly, there is a high frequency of occurrence of neutral meteorological conditions, and surveillance along the E Coast should allow an acceptable probability of success;

(b) Dugway (USA) presents a more complex wind pattern and the distances to the national borders can be great. Throughout the year the surface flow is predominantly NE, whereas the 700 mb flow is consistently W though very slack in mid-summer. With the probable 'lid' during the winter months, there could be some filtering through the valleys to the west aided by the surface NE'ly, and vapour might reach the Pacific coastline. However, in view of the marked westerly wind at 700 mb, some vapours could equally well travel to the Atlantic coast. During the remainder of the year, the rise in surface temperature and the prevailing upper westerly wind would probably result in vapours travelling to the Atlantic coast, these conditions would also give rise to maximum dispersion of the puff;

(c) Shikhany (USSR) is likely to offer the lowest probability for successful border surveillance. Distances to the national boundaries are great, the continental wind flow is variable and there are also considerable changes in meteorological category. The typical summer condition is one of moderate lapse with the 'lid' above 3,000 m, while the typical winter condition is one of strong inversion with the lid practically at ground level. During the winter the surface wind flow suggests surveillance in the Arctic Ocean whereas the 700 mb flow suggests the Sea of Japan; in view of the strong inversion the Arctic is considered to be the more likely surveillance area. During the remainder of the year it is likely that the prevailing westerlies at 700 mb would carry vapours to the Sea of Japan.

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

CCD/503
5 July 1976
Original: English

YUGOSLAVIA

Medical protection against nerve gases poisoning

(Present situation and future possibilities)

It is often said that countries or armies with good chemical defence and high-level medical protection are not very vulnerable to an attack by chemical weapons.

The scope of our working paper is to show that in case of massive application of nerve gases, the problem of medical protection against these poisons is still unsolved.

Chemical weapons have the singular characteristic that in theory, if not yet in practice, nearly perfect protection against their effects can be provided to individuals. If this ideal could be achieved, chemical weapons, however sophisticated they might become, would be of no use to an attacker. But unfortunately the reality is quite different.

Today, in practice there are three basic lines of defence against chemical warfare agents (CWA):

- physical countermeasures,
- chemical countermeasures,
- medical countermeasures.

Even in well equipped armies, the level of protection provided for ground troops is vulnerable to some form of CW attack, and no army yet has the capability of keeping its soldiers in a state of continuous physical protection while on combat duty. Although physical means of protection against chemical warfare, as well as chemical decontamination methods have been developed to a high level of sophistication, a number of problems still remain.

This paper is not intended to discuss success or failures of physical and chemical countermeasures in relation to CW attack (which is also a matter of rather conflicting issues and possibilities), but it is aimed at presentation of some data concerning the problems of medical protection.

Mode of Action

Nerve gases are irreversible inhibitors of cholinesterases and may exert their effects locally and generally. Signs and symptoms of such poisoning may be traditionally classified into muscarine-like (parasympathetic), nicotin-like (sympathetic and motor) and central nervous system manifestations according to the site of action of accumulated acetylcholine. This division has also some importance in understanding the treatment of poisoning caused by nerve gases.

The symptoms may appear from seconds to hours after the exposure to nerve gases, depending upon the way of penetration and the kind of poison.

Treatment

The treatment of acute poisoning by nerve gases should be started without waiting and consists of combinations of antidotal therapy and general measures:

1. Decontamination

Generally speaking, a wide range of chemicals could be used as decontaminants, the choice depending upon the particular agent which has to be neutralized, the type of surface that needs to be treated, the extent of contamination and the amount of the time available. In any case the termination of exposure by removal of the patient or application of a protective mask will be necessary if the atmosphere is contaminated.

a) Skin- nerve gases by which skin was contaminated can be destroyed and removed by using different substances and solutions. By removal of contaminated clothing further contamination is also terminated.
b) Eyes - if nerve gases have splashed into the eyes, they should be immediately irrigated with water or with physiological saline, or sodium bicarbonate if at hand.

2. Antidotal therapy

. Atropine

Before oximes became known as useful antidotes to nerve gases atropine and atropine-like substances were the only effective substances available for this purpose.

Atropine - in sufficient dosage antagonizes very effectively the muscarinic-like manifestations of poisoning at periphery and to a moderate extent the central respiratory paralysis and other central actions. It is comparatively ineffective against the autonomic ganglionic actions and it has virtually no effect against the peripheral neuromuscular paralysis.

Atropine should be given in "heroic" doses until signs of mild atropinization.

Cholinesterase reactivators (Oximes) - the therapeutic action of reactivator substances exists in reactivation of inhibited cholinesterase which allows the enzyme to perform its physiological (primary) function of destroying the accumulated acetylcholine and are thus extremely valuable adjuncts to the symptomatic atropine therapy.

For the last 25 years a continuous search has been going on for specific antidotes to organophosphate (OP) poisoning. Most of the antidotes belong to the groups of aliphatic, aromatic, and heterocyclic mono- and bis-pyridinium oximes. The therapeutic effects of oximes have been studied under both experimental and clinical conditions in cases of poisoning by "nerve gases" (Sarin, Soman, and V-compounds).

According to present experimental and clinical experience treatment with atropine in combination with oximes represents the choice in therapy of OP poisoning. Out of hundreds of oximes that have been synthesized and tested. only three have found a place in medical practice: pralidoxime, trimedoxime, and obidoxime.

Obidoxime and trimedoxime are in many respects superior to pralidoxime as antidotes to OP compounds in animals. However, the two former have not yet replaced pralidoxime as a basic antidote in practice.

A point in favour of pralidoxime as compared to trimedoxime and obidoxime is the risk that the latter, although they are better reactivators of inhibited cholinesterase, in cases of Soman poisoning aggravate the symptoms of poisoning.

For various reasons there is, however, no general agreement on which to prefer. In the U.S., for example, pralidoxime chloride, in some European countries obidoxime and trimedoxime are the preferred substances, whereas in Great Britain and Canada the methanesulfonate salt of pralidoxime is the most commonly used one.

One of the reasons for these differing choices may be the different nature of the threat of chemical-warfare attack as perceived in different countries.

Although the therapeutic principles used in nerve gases poisoning are largely accepted, several questions remain to be answered, mainly concerning oxime therapy. In some cases of poisoning, oximes have been found to cause reactivation of inhibited cholinesterase (ChE), whereas such an effect has been absent in other cases (soman).

The reactivation of ChE by oximes is most pronounced early after the inhibition has taken place; consequently only one or two injections in the early stages of intoxication should be given. Further injections should have minute effects only. Thus, if oximes are ineffective in the early stages of OP poisoning therapy, they obviously remain ineffective.

In some situations it would be desirable to administer antidotes orally but, unfortunately, all the pyridinium oximes that are effective as antidotes show poor absorption behaviour when taken by mouth, which means that enormous amounts have to be taken in order to achieve an effective concentration in the blood.

Finally, opinions on the therapeutic efficiency or inefficiency of oximes in the treatment of poisoning differ depending on the way of penetration of the poison in the body, time of application of the oxime after poisoning and the kind of organophosphorus compounds which should be treated.

However, therapy may be considerably more difficult in practice: there is a vast difference between treating a poisoned individual in peaceful conditions as compared to the mass-casualty situations that would result from a chemical-warfare attack. In such cases, probably the only feasible form of treatment would be the administration of antidotes in the field, and the administration of drugs with an autoinjector is preferable to injection with a conventional needle and syringe.

Special autoinjectors filled with atropine alone or atropine-oxime mixture, ready for intramuscular injection, have been developed for this purpose, and are in standard issue in the armed forces of a number of countries. They can easily be used by laymen, even by the poisoned individuals themselves.

3. Maintenance of patient airway should be applied according to the degree of poisoning but the victim obviously cannot perform all necessary activities without outside help.

4. Other general measures.

In cases with convulsions a short action barbiturate (e.g. thiopenthal sodium) may be administered intravenously, or after intubation d-tubo-curarine. Morphine, aminophylline and phenothiazines are specifically contraindicated.

Other measures of non-specific therapy should be also undertaken depending on the course of intoxication.

Future Development

The main problems that would be encountered in treating organophosphorus poisoning in mass-casualty situations, are that with existing methods of treatment:

(a) There is a limit to the size of the exposure to organophosphorus compounds that can be treated successfully. Under battlefield conditions the administration of atropine and oximes from an autoinjector would probably not be effective against a dose of more than about 5 LD_{50} of an organophosphorus nerve agent, even if the drugs were injected within 30 seconds of the exposure;

(b) There are no ways of giving artificial respiration in the field to large numbers of people; and

(c) For some compounds, such as soman, there is no effective treatment at all.

In practical terms, this means that, although atropine and the oximes are the best forms of treatment presently available, in the case of chemical-warfare attack with organophosphorus nerve agents, adequate medical protection of troops on the battlefield would, to say the least, be extremely difficult, and such protection of civilian populations would certainly be extremely difficult if not impossible.

Until a new antidotal therapy can be developed, further investigations of pralidoxime, trimedoxime and obidoxime should be performed, aiming at, for example, increasing their antidotal effect by introducing new galenic forms capable of influencing properties such as the rates of absorption and elimination. Such forms might also lead to new ways of administration (e.g. by aerosols), and thus enhance the antidotal effect.

It would not be realistic to expect that it will become possible to develop a "universal" antidote to all existing and potential "nerve gases". The efforts should be concentrated towards providing protection against Sarin, Soman and Vx-compounds poisoning. An antidote effective against all three poisons is therefore highly desirable. It is very likely that such a compound, if it were found, would be effective also against other nerve gases.

Therefore, the future possibilities for oxime therapy will remain limited, unless a universally active, extremely potent oxime of low toxicity is found that penetrates the blood-brain barrier better than the existing oximes. According to the recently published results it seems that this problem has a good chance to be solved. However, even if equipped with such a"dream" oxime, the victim should receive it within seconds after intoxication to be sure of success.

Another possible way to increase the effectiveness of therapy is to add to the standard drug treatment other drugs that might in some way enable atropine and the oximes to act more effectively. Recently published experimental work has shown that the veratrine-like compounds are able to prevent the respiratory paralysis resulting from intoxication by soman and sarin. This could be extremely valuable in that it would provide the time needed to move a victim to a medical facility where artificial respiration could be given. If such a treatment is developed to the point where it is effective and efficient in humans, one of the major problems of organophosphorus intoxication and its treatment, namely restoring breathing in victims without using artificial respiration, may be in sight of being solved. When one examines these advances in the context of mass-casualties, and if such drugs could find place in military autoinjectors, all that can realistically be said of the new methods of treatment is that they could provide more time to move victims to medical units.

The best medical protection would be obtained with antidotes which could inactivate organophosphate in the body before inhibition of the acetylcholinesterase could take place. So a search for effective preventive antidotal measures is extremely important, taking into consideration that very large doses of the presently available oximes are needed to attain and maintain a sufficiently high concentration of them in blood and other body liquids, and that prolonged oxime administration may be dangerous.

Another possible means of prophylaxis would be to protect the enzyme against organophosphates by shielding it with certain compounds. Enzymatic induction of ChE would be very attractive since it would provide the much desired "universal protection". This will not become possible, however, until our knowledge of the real nature and function of cholinesterase has been considerably advanced.

A further promising possibility in the prophylaxis against nerve gases poisoning would be immunization both active and passive. Work along this line seems to progress rapidly; vaccines based on OP compounds as haptenic antigens are under development. It is not realistic, however, to expect that a universal method for immunization against nerve gases compounds will be realized in the near future; the problem is by far more complicated than appears at the first look.

Concluding remarks

There is today an enormous discrepancy between the efficiency of "nerve gases" and the efficiency of available defensive counter-measures(first aid and therapy by specific and nonspecific antidotes). However, it is probably not unrealistic to conclude that if the research currently under way is continued, reasonably effective medical protection may become feasible in the not too distant future.

It is our opinion that the present unsatisfactory situation could be relieved by international co-ordination of scientific research on prophylaxis and therapy in nerve gases poisoning.

Scientists working on these problems should be able to communicate their results to each other, and for this communication to be optimally effective, an agreed set of standardized procedures for measuring, calculating and quoting results would be extremely useful.

The other area in which international co-operation would be useful is the dissemination of information through a central data bank that could collect and distribute information relating to the problem of organophosphorus poisoning and therapy.

We also believe that increased knowledge of medical countermeasures against nerve gases poisoning would promote the endeavours to bring about an international ban on the use of CW.

CONFÉRENCE DU COMITÉ DU DÉSARMEMENT

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FRANCAIS
Original : ANGLAIS

YOUGOSLAVIE

Une méthode de classement des composés chimiques du point de vue de la technologie binaire

Les armes chimiques binaires (Binary chemical weapons - BCW) sont aujourd'hui une réalité dont il faut tenir compte dans tous les aspects de l'interdiction de la mise au point, de la fabrication et du stockage ainsi que dans ceux de la destruction des armes chimiques.

L'un des problèmes importants dans le contexte de l'interdiction des armes chimiques, particulièrement dans une approche progressive à ce problème, est celui du classement.

Comme le montre le document de travail présenté par la Suède (CCD/427), tous les composés chimiques peuvent être répartis entre les groupes suivants en fonction de leur utilisation possible en tant qu'armes chimiques :

a. CWA = agents de guerre chimique (chemical warfare agents)

b. DPWA = agents de guerre à double fin (dual purpose warfare agents)

c. PCC = composés chimiques ayant des utilisations pacifiques (chemical compounds for peaceful use)

Ce document suédois souligne également le besoin d'un classement des composants binaires dans des armes chimiques non mentionnées dans les propositions précédentes.

A notre avis, le caractère essentiel des armes chimiques binaires ne réside pas dans les propriétés chimiques et toxiques des composants binaires individuels, mais dans le produit final de leur réaction. Par conséquent, le classement des composants binaires individuels dans des armes chimiques binaires devrait être considéré exclusivement du point de vue du produit final.

D'après la définition de travail des agents de guerre chimique donnée dans le rapport du Secrétaire général intitulé "Les armes chimiques et bactériologiques (biologiques) et les effets de leur utilisation éventuelle", Nations Unies, New York, 1969, et qui est utilisée dans le document de travail suédois CCD/427, "par agents de guerre chimique on entend en l'occurrence les substances chimiques, qu'elles soient gazeuses, liquides ou solides, susceptibles d'être employées en raison de leurs effets toxiques directs sur l'homme, les animaux et les plantes".

Sans examiner pour le moment l'essence de cette définition des agents de guerre chimique (voir documents de travail yougoslaves CCD/375 du 5 juillet 1972 et CCD/505), lorsqu'on considère les composants binaires des armes chimiques binaires, il y a lieu de tenir compte des possibilités suivantes de leur classement :

A) Composants binaires, dont aucun n'a d'application pacifique (2CWBC) (composants binaires de guerre chimique);

B) Composants binaires dont l'un peut avoir également une application pacifique (CWBC+DPBC) (composant binaire de guerre chimique plus composant binaire à double fin);

C) Les deux composants binaires peuvent avoir également une application pacifique (2BPBC) (composants binaires à double fin).

Dans ce contexte, les agents de guerre chimique et les agents de guerre à double fin, pris dans le sens du classement suédois, devraient également inclure tous les composés chimiques à l'état liquide, solide et gazeux qui produisent des agents de guerre chimique par réaction chimique avec d'autres composés un peu avant d'atteindre l'objectif.

Cette addition est indispensable car il est peu probable que des composants binaires contiennent des substances qui seraient par elles-mêmes classées comme étant des agents de guerre chimique.

La présente analyse ne porte pas atteinte au fond de la proposition suédoise de classement des agents de guerre chimique (CCD/427), mais l'étend également aux agents binaires de guerre chimique. En procédant de cette façon, les considérations liées soit à l'interdiction progressive, soit à l'interdiction complète des armes chimiques seraient plus claires et plus précises.

Comme la technologie binaire offre la possibilité d'élargir la gamme des armes chimiques, il est évident qu'il faut étendre le contrôle à un nombre plus grand de composés chimiques appartenant au groupe des composés chimiques ayant des utilisations pacifiques. Ceci pourrait influer sur la liste des composés chimiques mentionnés dans le document de travail japonais CCD/483 du 8 avril 1976. Il nous paraîtrait acceptable d'inclure un plus grand nombre de composés chimiques, de façon à réduire au minimum les chances de leur emploi abusif. Ceci n'exclut pas la possibilité de rectifications, tant dans le sens des additions que des retranchements.

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

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YUGOSLAVIA

Working paper on the definition of chemical warfare agents (CWA)

In view of the development of new chemical weapons such as binary chemical weapons (BCW) and Multi-Purpose Chemical Weapons (MPCW) it is our desire to provide in this working paper a definition which would include the existing chemical warfare agents (CWA) and compounds in BCW and MPCW.

We consider the MPCW to be such weapons which, in addition to their mechanical and thermal effects, act in the manner characteristic of CW effects.

The Geneva Protocol of 17 July 1925, forbids inter alia, also "the use in war of asphyxiating, poisonous or other gases and of all analogous liquids, materials or devices", and according to United Nations General Assembly resolution 2603 A of 16 December 1969, "any chemical agents of warfare-chemical substances, whether gaseous, liquid or solid which might be employed because of their direct toxic effects on man, animals or plants" is contrary to the generally recognized rules of international law.

There exists also a working definition of CWA given in the Report of a WHO Group of Consultants in "Health Aspects of Chemical and Biological Weapons", WHO, Geneva 1970:

"Chemical agents of warfare include all substances employed for their toxic effects on man, animals and plants."

This definition was intended to exclude chemicals employed in warfare such as high explosives, smokes and incendiary substances (e.g. napalm, magnesium and white phosphorus) that exert their primary effects through physical force, fire air-deprivation or reduced visibility.

The above mentioned definitions of CWA proceeded from the point of view of application and covered chemical compounds only which have direct but not also indirect toxic effects on man, animals and plants.

Binary technology, for its part, also points to the deficiencies of such an approach. Through binary technology it is possible under certain conditions to generate the existing CWA from relatively low toxic components which are not covered by the mentioned definitions. In addition, binary technology also makes possible the use of so highly toxic substances which due to their tactical properties (such as stability) could not be used as CWA.

In this connexion, it seems to us that it would be necessary to re-evaluate the criteria from the very interesting working paper of the Federal Republic of Germany (CCD/458).

Since the last informal meeting with the experts in Geneva (1974), when inter alia, also the definition of CWA was discussed, information was published about the use of a new type of weapon, the classification of which, as far as we know, the CCD has not discussed as yet. The weapon involved is a "fuel air explosive" bomb intended for the preparation of helicopter-landing sites. The application of this weapon in the field produces massive death casualties due to its "ultra-lethal" asphyxiating effect. This asphyxiating effect is based on the reaction of ethylene oxide (the basic bomb component) and oxygen from the environmental air. When exploding, ethylene oxide instantly consumes the surrounding oxygen and thereby causes its shortage in the air. This results in sudden death due to asphyxiation.

Bearing in mind asphyxiation as the cause of death, which, in addition to mechanical and thermal effects, is one of the consequences of employment of this weapon, we are of the opinion that also this type of weapon should be classified, perhaps as "multi-purpose chemical weapons" (MPCW) or under some other name. It is quite clear that due to the effect of this weapon disturbances of physiological functions (anoxy and suffocation) is caused, being the result of the chemical reaction taking place between ethylene oxide and oxygen from the atmosphere.

In our view, this type of weapon differs from the other weapons which are not classified as CW (such as high explosives, smokes and incendiary weapons) because one of its main effects is death caused by immediate suffocation.

The Geneva Protocol is quite specific as far as this bomb is concerned because it prohibits "agents liable to cause asphyxiation", while United Nations General Assembly resolution 2603 A leaves possibility for discussion on account of the expression "direct toxic effect".

In order to reduce in the future any ambiguity to the minimum, we have tried to modify to some extent the existing proposal for the definition of the CWA in the working paper of the Yugoslav delegation of July 1972:

> "All chemical compounds intentionally used in quantities which directly or indirectly, immediately or after some time, can produce physiological disturbances or cessation of physiological functions in man and animals, should be considered as chemical agents."

The new definition should be sufficiently comprehensive and should provide for further elaboration of the definition of chemical warfare agents in a more explicit manner as for example:

(a) Classification of the CWA according to application and their poisonous intensity grades,

(b) Differentiation between single-purpose and dual-purpose agents,

(c) Differential treatment of intermediaries in a synthesis and the binary components in munitions,

(d) Inclusion in the chemical weapons also of those with "mixed" effects, one of them being also toxic (direct or indirect), so as to cover also such weapons as the above mentioned bombs.

In view of the aforementioned it seems to us appropriate to propose the following definition:

> "All chemical oompounds <u>intentionally</u> used in quantities and <u>manner</u> which directly or indirectly, immediately or after some time, can produce physiological disturbances or cessation of physiological functions in man, animals and plants, should be considered as chemical warfare agents."

We hope that this proposal of the definition contains relevant elements which might serve as a useful basis of the formulation of the final text of the definition.

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

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GERMAN DEMOCRATIC REPUBLIC

The catalytic detoxification of organophosphorus CW agents

I. Introduction

The questions of banning the development, production and stockpiling of CW agents are closely related to the problem of detoxification of available stockpiles of CW agents. This problem has both scientific and technological implications.

From the scientific standpoint as well as from the technological one there exist quite different possibilities for the variety of CW agents to be converted into compounds of lower toxicity, or into completely non-toxic substances harmless to man and to the environment.

The problems have more intensively been studied for vesicants of the yperite type. Much experience relating to this type of CW agent has already been gathered because after World War I and II considerable quantities of these CW agents had been destroyed, detoxified or burned. But as to our informations catalytic processes for detoxification had so far not been applied to these CW agents.

II. The detoxification of organophosphorus CW-agents by non-catalytic methods

However, the experience gained so far with organophosphorus CW agents is rather limited in regard to finding the most convenient method for detoxification on a technical scale.

The literature regarding both the military and chemical problems of detoxifying or destroying organophosphorus CW agents describes only those methods and processes which are suitable for either laboratory or special field use.

As to the destruction, or elimination of large stockpiles, or overstocked stockpiles of organophosphorus CW agents we have only press information on the United States action of submerging Sarin-filled shells in the Atlantic Ocean as well as on the burning of serveral thousand tons of "G-agents" (Tabun/Sarin/Soman-group). However, there were no additional technical details available worth generalizing.

Regarding the chemically possible reactions for detoxifying organophosphorus CW agents of the G- and V-type the splitting of esters in aqueous-alcoholic media by means of alkalies appears technically to be the most convenient method (apart from burning).

Apparatus and equipment as well as chemicals required for detoxification are technically available although there remain some problems of corrosion and labour safety.

From the aspect of materials and resources it would be worth considering whether or not the use of many thousand tons of detoxicants, solvents and other chemicals required for neutralization reactions and other follow-up processes could be drastically reduced. Therefore, it is obvious to take into consideration catalytic processes of detoxification more than ever before.

III. Detoxifications of organophosphorus warfare agents by catalytic methods

It would be especially advisable to use catalytic reactions for the organophosphorus CW agents of the G- and V-type because all these CW agents are esters. Ester splitting is in general a catalytically easily influenced chemical reaction. In case of toxic organophosphorus esters the process of ester splitting is tantamount to their almost complete detoxification since the decomposition products show only slight, in some cases no biological effects.

Among the theoretically possible methods of catalytic ester splitting there are three reactions which are essentially applicable to organophosphorus CW agents.

1. Hydroperoxide-catalysis

The ester splitting of these organophosphorus CW agents catalyzed by hydroperoxide proceeds some 50 times faster compared with the alkaline hydrolysis of these compounds. The final products obtained through this reaction are only slightly toxic. The reaction is almost quantitative. However, the hydroperoxide catalysis implies the need as a homogenous catalysis, for an aqueous, or aqueous-alcoholic, or with water mixable organic reaction media, as an essential condition. The direct reaction of the concentrated CW agent is possible only in a 10 per cent hydrogen peroxide solution or less, or adequate hydroperoxide compounds solutions. Special equipments would be necessary to guarantee the required dilution and the best mixing conditions so that this process would need more technical research.

Nevertheless the catalytic splitting of organophosphorus CW agents by hydroperoxide constitutes a technically suitable reaction to destroy such CW-agents.

2. Hypochlorite catalysis

The splitting of organophosphorus CW agents catalyzed by hypochlorite is suitable for a number of detoxification processes provided these processes can proceed in diluted aqueous solutions. From the literature it is well known that this method is already tested in detoxification of corrosion-resistant objects through washing and in detoxifying small quantities of organophosphorus CW agents in drinking and non-potable water. The use of hypochlorite for the detoxification of highly concentrated solutions of CW agents, or of undiluted CW agents necessitate more work in technical safety and adequate basic research.

3. <u>Metal-catalyzed decomposition</u>

The catalytic splitting of organophosphorus esters especially by heavy-metals has been known for some 20 years. The first observations were made in connexion with the loss of effect of phosphoric ester preparations in cupriferous containers. Apart from it, biochemical studies have shown that organophosphorus esters are catalytically splittable by a number of metals, e.g. even by lanthanides. Especially the hydroxy-aquo complex as well as the amminohydroxo and alkylamino complexes of copper have shown to be extraordinarily effective for splitting acyl-substituted phosphoric and phosphonic esters.

In this field the highly effective tetraalkyldiamino-copper complexes are practically important.

It is suggested by the rapidity and completeness of catalytic ester splitting achieved by these copper complexes, because the solubility of such complexes and the possibility of fixing these compounds to carriers should promote investigations of detoxification for concentrated CW agents of the G- and V-type.

IV. <u>Final remarks</u>

It should not and cannot be recommended here which of the mentioned catalytic detoxification methods of highly toxic organophosphorus CW agents would be especially convenient technically and economically.

However, in assessing the measures for CW disarmament required, the catalytic processes of detoxification deserve at any rate greater attention than the so far employed processes using an excessive surplus of detoxicants.

Upon concluding it should be stressed that the possibilities of catalytic splitting exemplified by organophosphorus CW agents can also be extended to other groups of CW agents. Research into this direction, in our view, could have promising prospects for obtaining technically usable results.

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CZECHOSLOVAKIA

Some medical aspects of the CW problem and its perspectives

Much effort has been undertaken to elaborate an exact definition of CW agents.

There are two possible approaches to this question: first, the chemical and toxicological one; and second, the medical one.

Military calculations are, in fact, based on chemical and toxicological characteristics. However, it should be emphasized that any chemical substance becomes a chemical warfare agent only after it has been incorporated into a chemical weapons system. We understand the tendency to make the definition as exact as possible. In spite of this, the purpose criterion has a principal significance and cannot be omitted.

In the course of the last expert meeting in the CCD, in July 1974, one of the most discussed questions was the possibility of using the acute lethal dose (LD_{50}) as a complementary criterion which could facilitate a more exact definition of CW agents. We criticized the overestimation of this criterion. LD_{50} is, no doubt, important for toxicology, and it is an objective laboratory value. Our point is, however, that the acute toxicity of a substance, irrespective of purely methodological problems, does not express the real danger of this substance for the population, which is a target of a chemical attack. It is evident that less toxic agents may be used in larger quantities; that they may be used repeatedly; and that their effects may combine with other effects of war - wounds, stress, malnutrition, etc.

There are still other important points. One of them is the availability of medical aid. The effective treatment of an acute poisoning is always a medical emergency: the antidotes must be given immediately, and in many cases they must be supported by artificial respiration, and still other medical treatment. However, it is impossible to do this in the field in mass-casualty situations. These questions are in great detail analysed in the Yugoslav working paper CCD/503, distributed on 6 July 1976. Thus, the availability of medical aid may be more important for the effect of a chemical attack than the type of the chemical agent applied.

Other extremely important aspects are the side and the delayed effects of CW agents. We mentioned this very briefly in our discussion here in 1974. In the meantime, the significance of the problem was emphasized by the new monograph published by SIPRI and prepared by Professor Lohs of the GDR. The questions of the delayed effects of the enormously large-scale use and consumption of many chemical substances represents a major problem of modern medicine and of all biological sciences. Carcinogenic, embryotoxic and teratogenic effects are being discovered with increasing frequency in substances, which have no or at least very low acute toxicity, and which were supposed to be practically harmless. It is generally known that this was the case with some new medical drugs in several countries.

Thirty years ago, when the information about new chemical agents, such as tabun, soman, sarin, etc. was published, their extremely high toxicity was what impressed the public most. At that time, however, very little was known about the carcinogenicity and teratogenicity of substances, and the enormous expansion of modern chemical industry was only at its beginning. Only much later, people began to realize the immense hazard of mass exposure to chemicals. We feel that to disregard this aspect of the CW problem would amount to a dangerous mistake.

A chemical war creates completely new dimensions in the use of chemical substances which, in turn, considerably change the importance of interrelations between individual factors. The herbicides and defoliants, used in the Vietnam war, are substances commonly applied in agriculture. In civilian life, their task is to destroy weeds in as selective way as possible and are, therefore, applied highly diluted and accompanied by a number of protective measures. Nevertheless, it is becoming more and more clear that even this careful mode of application represents serious ecological risks. The same substances, when used for military purpose, are designed to destroy all vegetation in a given area with utmost efficiency and speed. The actually used doses were ten-and more- times higher than those for agricultural purposes and the total amount per hectar was about 30-times higher. The same is valid for other agents. As Perry Robinson recently mentioned, "during the height of the Vietnam war, the daily American consumption of CS as a harassing incapacitant exceeded all the CS that has yet been used in Northern Ireland". This experience only confirms to what extent the military approach increases potential risks of the use of these substances.

One ought to be also aware that we still have very incomplete information of the basic mechanism of damages to the genetic apparatus, namely, the carcinogenic and/or teratogenic effects. The laboratory methods of testing are rather complicated and their results are only approximate. Besides, the delayed effects are always multifactorial. It means that the effect does not depend solely on the chemical characteristics of the chemical agent, but also on other additional factors, influencing the metabolic degradation of the agent in the human organism. It is well known that there are differences in the metabolism in humans and in animals; this is one of the reasons of the extreme difficulties in studying these problems in the laboratory. In addition to this, the metabolism of each individual is influenced by a number of specific factors: there are for instance hundreds of thousands of people, for whom sugar is identical with a poison, because their insulin system activity is impaired and this substance cannot be "normally" digested and utilized. These are the reasons why it is extremely difficult, and often simply impossible, to detect in time the delayed effects of a chemical substance.

These examples were intended to demonstrate that - in addition to acute toxicity - the chemical warfare agents have also other characteristics, which might become extremely important. One ought also to be aware that there is no correlation between toxicity and delayed effects. There is no doubt, however, that the organophosphorous CW agents and also herbicides and incapacitating agents all belong to the category of chemical substances with a great risk of carcinogenic and teratogenic activities.

We intended to focus attention on the fact that the problem of CW has still other aspects of increasing importance. There are, in fact, many identical features in CW problems and in the problems of the misuse of new scientific developments for military purposes. These great problems need adequate solutions.

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

CCD/512
6 August 1976

Original: ENGLISH

THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

Draft convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction

The States Parties to this Convention

Agreeing that the existence of chemical weapons represents a threat to mankind, and that chemical discoveries should be used only for the benefit of humanity,

Concerned that advances in science and technology may lead to the development of new generations of chemical weapons,

Convinced that the prohibition of the development, production and stockpiling of chemical weapons and their elimination, through effective measures, is a necessary step towards the achievement of general and complete disarmament under strict and effective international control,

Recognizing the important significance of the Geneva Protocol of 17 June 1925 for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, and conscious of the contribution which the said Protocol has already made, and continues to make, to mitigating the horrors of war,

Reaffirming their adherence to the principles and objectives of that Protocol and calling upon all States to comply strictly with them,

Recalling that each State Party to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on

Their Destruction, in Article IX of that Convention, affirmed the recognized objectives of effective prohibition of chemical weapons and, to this end, undertook to continue negotiations in good faith with a view to reaching early agreement on effective measures for the prohibition of their development, production and stockpiling and for their destruction, and on appropriate measures concerning equipment and means of delivery specifically designed for the production or use of chemical weapon agents,

Desiring to contribute to the strengthening of confidence between peoples and the general improvement of the international atmosphere,

Have agreed as follows:

ARTICLE I

Each State Party to this Convention undertakes never, in any circumstances, to develop, produce, or otherwise acquire, or use:

a. lethal chemical agents and other toxic chemicals agents (of a nature and intended primarily to cause long-term physiological harm to human beings), of types and in quantities that have no justification for protective or other peaceful purposes;

b. munitions, equipment or systems designed to deliver such agents for hostile purposes or in armed conflict.

ARTICLE II

1. Notwithstanding the provisions of Article XVI, each signatory or acceding State undertakes on signature or accession to the Convention, whether or not it has entered into force:

a. to declare whether or not it is in possession of the agents, munitions, equipment and systems specified in Article I;

b. to supply information about the type and quantity of the agents specified in Article I in its possession;

c. to supply information regarding all production facilities on its territory capable of producing the agents, munitions, equipment and systems specified in Article I;

d. to supply information about the type and quantity of the agents specified in Article I which it produces for protective or other peaceful purposes and the location of the factories producing these agents and thereafter to render an annual return of similar information;

e. to supply information as to which national organisation or authority is charged with collecting the information referred to in sub-paragraphs b.c. and d. of this paragraph and ensuring in accordance with Article V that public and private agencies and factories comply with the Convention from its entry into force.

2. The declaration and information referred to in sub-paragraphs a. to e. of paragraph 1 shall be communicated to the /Depositary/ until the Consultative Committee is established in accordance with Article VIII and thereafter to that Committee. The /Depositary/ or the Committee as the case may be shall promptly circulate the declaration and information to /all signatory and acceding States/ /all States entitled to become party to the Convention/.

ARTICLE III

Each signatory or acceding State undertakes on signature or accession to this Convention, whether or not it has entered into force:

a. to close down, dismantle or convert to peaceful purposes any factories producing the agents specified in Article I;

b. not to convert from production for peaceful purposes any of the factories listed in response to Article II, 1,d,;

c. not to construct any new factories for the production of the agents specified in Article I of types and in quantities other than those required for peaceful purposes;

d. to close down, dismantle or convert to conventional purposes factories or facilities producing or filling those munitions, equipment or systems specified in Article I.

ARTICLE IV

The undertakings accepted by Signatories upon signature shall cease to apply if this Convention does not enter into force within .... years of the date when the Convention was opened for signature.

ARTICLE V

Each State Party to this Convention shall, in accordance with its constitutional processes, take any necessary measures to prohibit and prevent the development, production, stockpiling, acquisition or retention of the agents and munitions equipment and systems, specified in Article I of the Convention within the territory of such state under its jurisdiction or under its control anywhere.

ARTICLE VI

Each State Party to this Convention undertakes not to transfer to any recipient whatsoever directly or indirectly and not in any way to assist, encourage or induce any State, group of States or international organisation to manufacture or otherwise acquire any of the agents, munitions equipment or systems specified in Article I of the Convention.

ARTICLE VII

Each State Party to this Convention possessing agents specified in Article I undertakes to destroy or convert them to peaceful uses under international observation as provided for in Article IX d. according to a phased programme agreed by the Consultative Committee. Each State Party to this Convention possessing stockpiles of munitions equipment or systems specified in Article I undertakes to convert them to conventional use or to destroy them.

ARTICLE VIII

States Parties to the Convention undertake to establish a Consultative Committee from among themselves to oversee the working of this Convention. The functions of the Committee shall include the following:

a. to analyse and evaluate periodic reports and statistical and other information submitted by each State Party in accordance with the provisions of Article II, 1, b., c. and d.

b. to call for such supplementary information under Article II, 1, d. as they consider necessary;

c. to request information and conduct enquiries if asked to do so by a State Party;

d. to verify the destruction of stockpiles and to conduct other inspections in accordance with Articles VII, IX and X;

e. to send notification and reports to all States Parties following verification procedures;

f. to consult and co-operate with the national organisation or authority referred to in Article II, 1, e.

ARTICLE IX

Each State Party to this Convention undertakes to accept:

a. inspection within six months of the entry into force of the Convention by persons appointed by the Consultative Committee of any factory formerly producing the agents specified in Article I, to ensure that it had ceased such production; such personnel to be allowed access into the buildings and to take samples from the environment;

b. the employment and periodic inspection of tamper indicating seals on the doors, control panels and other designated locations of former military chemical agent factories which have not been demolished or converted to peaceful uses and former chemical munitions factories which have not been demolished or converted to conventional uses;

c. /up to ten/ /a number of/ on-site inspections each year by the persons appointed by the Consultative Committee of chemical factories to be selected from those listed under Article II. The factories shall be examined to ensure that they are not producing agents specified in Article I. The inspectors shall be given such access to the factories as is necessary to perform their tasks and be allowed to take such samples as the Consultative Committee has agreed are necessary;

d. in the case of States possessing agents, munitions, equipment and systems specified in Article I inspection by persons appointed by the Consultative Committee who shall be given such access to the destruction process as the Consultative Committee agree is necessary for the task of verification.

ARTICLE X

1.- States Parties to this Convention undertake to consult one another directly or through the Consultative Committee and to co-operate in solving any problems which may arise in relation to the objective of, or in the application of, the provisions of the Convention. Any State Party which suspects that any other State Party is acting in breach of obligations deriving from the provisions of the Convention may request directly or through the Consultative Committee that State Party to provide explanation. The complaining Party may also call for a special investigation which may involve on-site inspection to be carried out by the Consultative Committee or by persons appointed by it. Each State Party agrees to accept such on-site inspection which the Consultative Committee may consider necessary.

2. Nothing in this Article shall detract from the right of any State Party to lodge a complaint with the Security Council of the United Nations.

ARTICLE XI

Nothing in this Convention shall be interpreted as in any way limiting or detracting from the obligations assumed by any State under the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases and of Bacteriological Methods of Warfare, signed at Geneva on 17 June 1925 or under the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons opened for signature on 10 April 1972.

ARTICLE XII

1. Each State Party to this Convention undertakes to facilitate and has the right to participate in the fullest possible exchange of equipment, materials and scientific and technological information for the use of chemical agents for peaceful purposes. Parties to the Convention in a position to do so shall also co-operate in contributing individually or together with other States or international organisations in the further development and application of scientific discoveries in the field of chemistry for peaceful purposes and for therapy and prophylaxis against chemcial agents.

2. This Convention shall be implemented in a manner designed to avoid hampering the economic or technological development of States Parties to the Convention or international co-operation in the field of peaceful chemical activities.

ARTICLE XIII

Any State Party may propose amendments to this Convention. Amendments shall enter into force for each State Party accepting the amendments upon their acceptance by a majority of the States Parties to the Convention and thereafter for each remaining State on the date of acceptance by it of the amendments.

ARTICLE XIV

Five years after the entry into force of this Convention, or earlier if it is requested by a majority of Parties to the Convention by submitting a proposal to this effect to the /Depositary/, a conference of States Parties to the Convention shall be held at Geneva, Switzerland, to review the operation of the Convention with a view to ensuring that the purposes of the preamble and the provisions of the Convention are being realised. Such review shall take into account any new scientific and technological developments relevant to the Convention.

ARTICLE XV

1. This Convention shall be of unlimited duration.

2. Each State Party to this Convention shall in exercising its national sovereignty have the right to withdraw from the Convention if it decides that extraordinary events, related to the subject matter of the Convention, have jeopardised the supreme interests of its country. It shall give notice of such withdrawal to all other States Parties to the Convention and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardised its supreme interests.

ARTICLE XVI

1. This Convention shall be open to all States for signature. Any State which does not sign the Convention before its entry into force in accordance with paragraph 3 of this Article may accede to it at any time.

2. This Convention shall be subject to ratification by the signatory States. Instruments of ratification and instruments of accession shall be deposited with the /Depositary/.

3. This Convention shall enter into force after the deposit of instruments of ratification by .... governments.

4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Convention, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The /Depositary/ shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification or of accession and the date of the entry into force of this Convention, and of the receipt of other notices.

6. This Convention shall be registered by the /Depositary/ pursuant to Article 102 of the Charter of the United Nations.

ARTICLE XVII

This Convention, the English, Russian, French, Spanish, Arabic and Chinese texts of which are equally authentic, shall be deposited in the archives of the /Depositary/. Duly certified copies of the Convention shall be transmitted by the /Depositary/ to the governments of the signatory and acceding States.

CONFERENCE OF THE COMMITTEE ON DISARMAMENT
CCD/515
17 August 1976
Original: ENGLISH

JAPAN

Working Paper: Draft of one form of LD50 spectrum

The Japanese Delegation submits this outline of a toxicity spectrum, with a view to furthering our discussions with regard to the scope of the CWAs to be prohibited.

1. Need for an LD50 spectrum

The CCD has been and is endeavouring to reach agreement on the comprehensive prohibition of the development, production and stockpiling of all chemical weapons and the indication is that it will come to discharging its task in stages. It is, however, difficult to get a clear picture of the whole range of CWAs, because there are so many CWAs and other chemical substances which could be employed as CWAs. This is one of the factors impeding progress in our negotiations.

It is necessary, as a first step, to have a tangible and objective standard of judgement in order to accomplish our task. Therefore, in view of the fact that it is the toxicity of CWAs which makes it possible to use those substances as weapons, we suggest that a toxicity spectrum (the LD50 spectrum) be drawn up as an objective criterion to define the scope of the prohibition.

2. What is the LD50 spectrum?

As relevant characteristics of chemical weapons, several factors, such as toxicity, shelf life, perceptibility, volatility, explosion, stability, etc., can be cited, as presented in the working paper submitted by the Federal Republic of Germany (CCD/458). Obviously, the most important characteristic of CWAs is their toxicity; the chemical weapon has, after all, traditionally been known as "poison gas". The toxicity of chemicals differs qualitatively and quantitatively from one another. However, each chemical substance has its lethal dose as a measurable and reliable indicator of toxicity. The lethal dose, expressed numerically, enables us to recognize quantitatively the differences in toxicity among substances. Thus we can draw up a toxicity list for chemical substances in the order of the numerical value of their lethal doses. This list would be called the "spectrum", and it seems adequate to use the lethal dose 50% (LD50)[*1] as the toxicity indicator. This is the LD50 spectrum which the Japanese delegation suggested in the plenary meeting on 6 July (CCD/PV.702).

3. Content of the spectrum

The LD50 spectrum should include first of all the chemical names of substances and their LD50 value. In addition, it is desirable to include substances' generic names, code names, abbreviations, chemical structural formulae, species of animal used for experiments application route, bibliography, etc.

The United States delegation presented mouse toxicity data in Table IV of their working paper in 1974 (CCD/435). We presented toxicity data for certain chemical substances in documents CCD/374 (1972) and CCD/466 (1975). The Japanese delegation shows in Appendix I of the present document one example of a spectrum, a draft of a possible LD50 spectrum arrangement, using the chemical substances and data included in the above-mentioned United States and Japanese working papers. Needless to say, this example merely gives us an idea of what a spectrum would look like and what data should be included.

4. How to draw up the LD50 spectrum

(1) We think it appropriate that, in principle, already published scientific articles and other available data should first be used to draw up a spectrum, and then, if the available data is found to be inadequate or there is any question as regards the data, further experiments should be carried out and a universally accepted LD50 value obtained.

(2) Although the same chemical substance may have different LD50 values, depending on the route of application, i.e. oral, subcutaneous, intraperitoneal, intravenous injection, respiratory and percutaneous, the spectrum should be drawn up in the order of the lowest value of LD50 in the published or otherwise available data for each substance, regardless of its application route, since we should play safe when assessing the toxicity and effects of each substance when used against human beings on the basis of data obtained from animal experiments. Data and values obtained for other application routes should, however, also be included as reference material.

(3) With regard to animals used for experiments, it is desirable to include also data obtained from animals other than rodents, if such information exists.

(4) The upper limit of LD50 of chemical substances listed in the spectrum should be 30 mg/kg, as such substances may safely be disregarded. 30 mg/kg is the upper

limit of toxicity as regards the oral route (P.O.) laid down in the Poison and Deleterious Substances Control Law of Japan. The upper limit in Table IV in the United States working paper referred to (CCD/435) is approximately this value.

Further details are given in the "Draft Terms of Reference for the Drawing up of the LD50 Spectrum", Appendix II.

As regards the actual work of drawing up a spectrum, we suggest that this be entrusted to a third-party research organization, such as the WHO or SIPRI, which would be assisted by a drafting group composed of experts provided by CCD Member States.

Conclusion

We believe that drawing up an LD50 spectrum would make deliberations on the scope of prohibition easier and more concrete, and thus our negotiations would make greater progress. Therefore our delegation suggests that the CCD begin the formulation of an LD50 spectrum, completing and perfecting the draft spectrum of Appendix I and the terms of reference (Appendix II) which are attached herewith. After completion of the LD50 spectrum, the CCD could make use of it as a means of determining which CWAs should be prohibited and of establishing a threshold value.

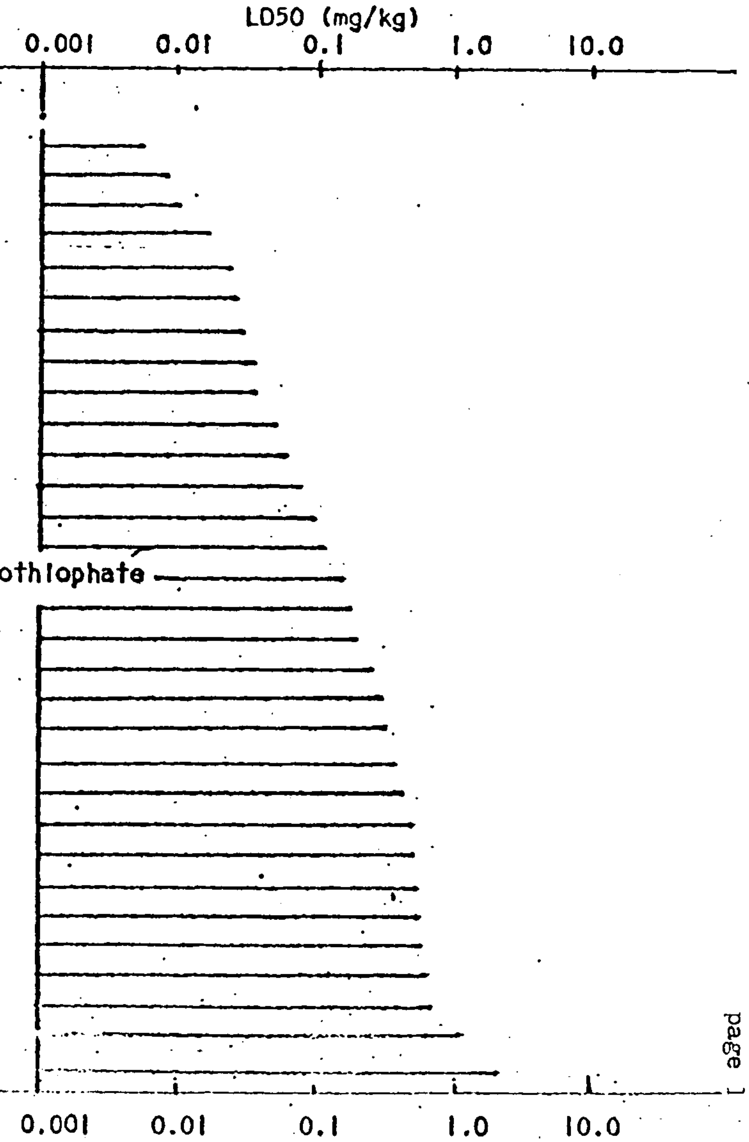
(Footnote)

*1. When a certain chemical substance is administered to groups of a species of animal, with the dosage being successively increased, the mortality in each group increases in proportion to the increase in the dosage. The LD50 of a substance is defined as the dosage sufficient to cause a mortality rate of 50%, or in other words, a dosage (mg/kg) which kills one half of a given test group. And, this is employed as the criterion of the lethal dose. As this LD50 can be used as an indicator of the relative toxicity of chemical substances, it enables us to obtain an approximate idea of the toxicity of a substance when used against human beings.

Draft Form of LD50 Spectrum

Appendix - I

No.	Name
1	Botulinum toxin A
2	3152 CT
3	Trimethylammonium-1-methylethyl methylphosphonofluoridate iodide
4	Trimethylammoniumethyl methylphosphonofluodidate iodide
5	Isopropoxy methylphosphonofluodidate, Sarin, GB
6	O,Ethyl S-(2-diisopropylaminoethyl) methylphosphonothiolate, VX
7	O,Ethyl S-(2-diethylaminoethyl) ethylphosphonothiolate, VE
8	O,ethyl S-trimethylammoniumethyl methylphosphonothioate iodide
9	O,Ethyl S-(2-diethylaminoethyl) methylphosphonothiolate, Edemo, VM
10	O,Ethyl S-(2-diisopropylaminoethyl) ethylphosphonothiolate, VS
11	Trimethylammoniumpropyl methylphosphonofluoridate iodide
12	Ethyl N,N-dimethyl phosphoramidocyanidate, Tabun, GA
13	Pinacolyl-methylphosphonofluoridate, Soman, GD
14	Methylfluorophosphorylcarbocholine
15	Cyclohexyl methylphosphonofluoridate, GF
16	O,O Diethyl S-(2-trimethylammoniumethyl) phosphorothioate iodide, Echothiophate
17	O,O Diethyl S-(2-diethylaminoethyl) phosphorothioate, Amiton, VG
18	O,O Diethyl S-(2-triethylammoniumethyl) thiophosphate iodide
19	O,O Diethyl S-ethylthiomethyl phosphorothioate
20	Diisopropylfluorophosphate, DFP
21	Isopropyl ethylphosphonofluoridate, Ethyl Sarin, GE
22	O,O Diethyl S-(2-dimethylaminoethyl) phosphorothioate
23	Neostigmine
24	Isopropyl-N,N-dimethyl phosphoramidocyanidate
25	O,O Diethyl S-ethylsulfonylmethyl phosphorothioate
26	Neostigmine methylsulfate
27	Neostigmine iodide
28	Diethyl 4-nitrophenyl phosphate, Paraoxon
29	Tetraethylpyrophosphate, TEEP
30	Tetraethyl monothionopyrophosphate
31	Nitrogen mustard, HN-1
32	Physostigmine salicylate



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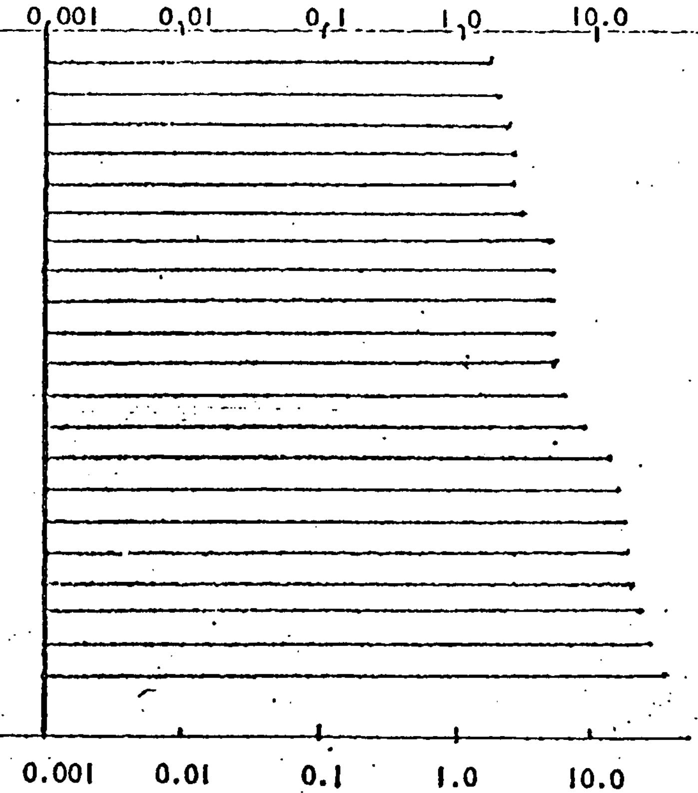
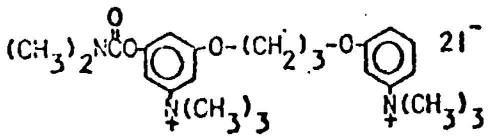
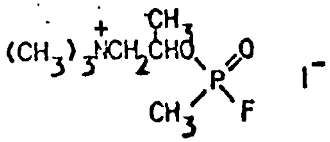
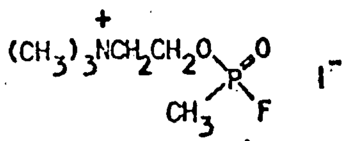
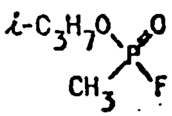
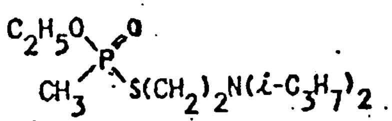
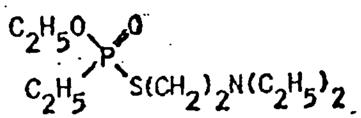
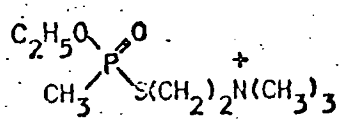
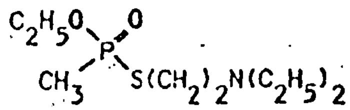
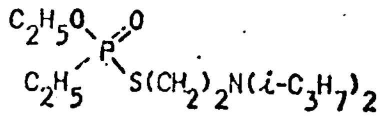
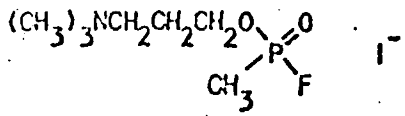
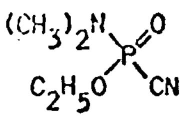
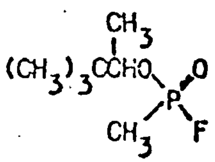
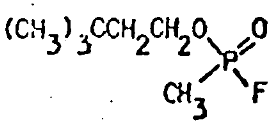
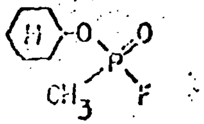
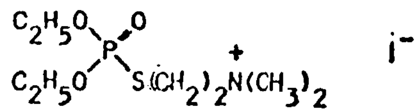
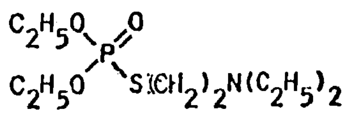
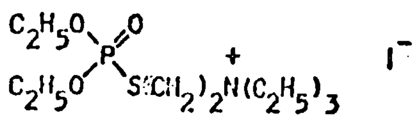
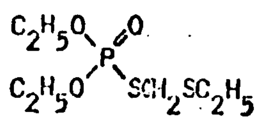
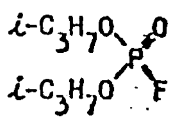
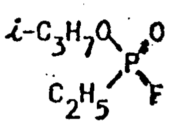
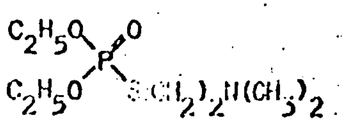
33 Paraoxon-ME
34 HN-3
35 Colchicine
36 Dimethyl 4-nitrophenyl thiophosphate, Methylparathion
37 Metasystox, Methyldemeton
38 Potassium cyanide
39 Mechlorethamine, HN-2, MBA
40 Diethyl S-(ethylthioethyl) dithiophosphate
41 Methylfluoroacetic acid
42 Diethyl 4-nitrophenyl thiophosphate, Parathion
43 Octamethyl pyrophosphortetramide, OMPA
44 Dimethyl diethylamide-1-chlorocrotonyl phosphate
45 Tetraethyl dithionopyrophosphate, Sulfotepp
46 Methyl cyclohexyl 4-chlorophenyl thiophosphate
47 Diethyl 4-methylsulfinylphenyl thiophosphate
48 Methyl phosphonic difluoride
49 Ethyl N-(diethyl-dithiophosphorylacetyl) N-methylcarbamate
50 Dimethyl ethylmercaptoethyl thiophosphate
51 Mustard gas, H
52 Diethyl 4-dimethylaminosulfonylphenyl thiophosphate
53 Dimethyl 2,2-dichlorovinyl phosphate

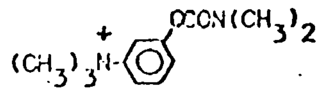
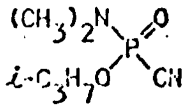
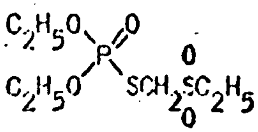
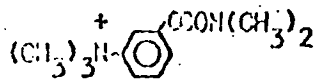
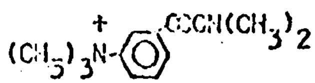
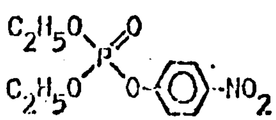
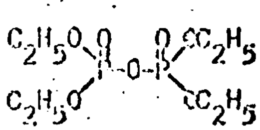
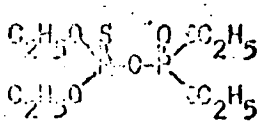


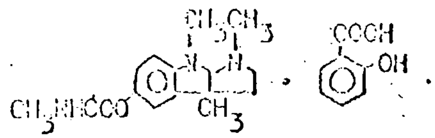
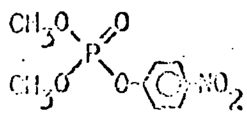
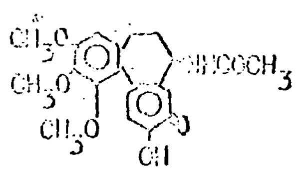
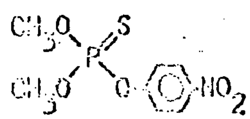
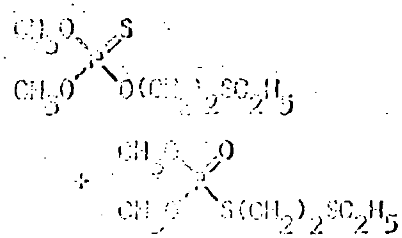
Additional table for Appendix - 1

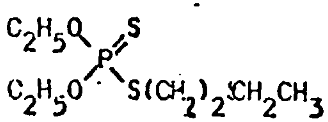
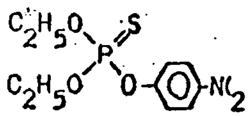
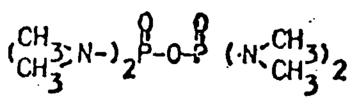
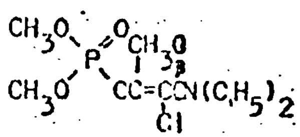
No.	Chemical formula	LD50 (mg/kg)	Animal	Route	Reference	LCt50 $(mg/m^3) \times min$
1		0.001			U.Thant's report, 1969.	
2		0.005	dog	i.v.	Funke *et al*, 1952 CCD/435	
3		0.008	rabbit	i.v.	*	
4		0.010	rabbit	i.v.	*	
5		0.016	rabbit	i.v.	CCD/374	mouse 250, monkey 150, rat 300 *
6		0.022	mouse	s.c.	U.S.Army, CCD/435	
7		0.025	mouse	s.c.	U.S.Army, CCD/435	
8		0.03	mouse	i.p.	*	

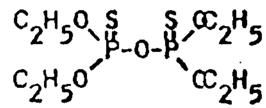
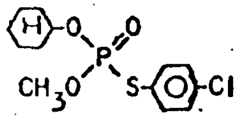
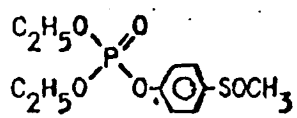
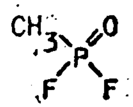
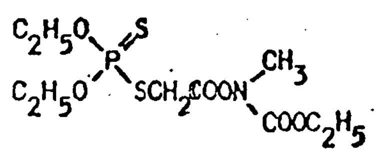
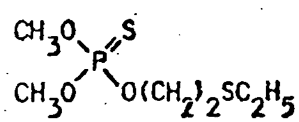
9		0.035	mouse	s.c.	U.S.Army, CCD/435				
10		0.035	mouse	s.c.	U.S.Army, CCD/435				
11		0.05	mouse	i.p.	*				
12		0.06	rat	i.v.	K. P. DuBois, 1963	mouse 380	monkey 250	rat 300	*
13		0.0752	mouse	i.v.	D.H. McKay, 1971				
14		0.100	rabbit	i.v.	*				
15		0.11	mouse	s.c.	U.S.Army, CCD/435				

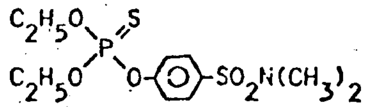
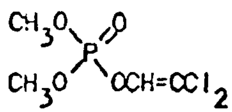
						mouse	monkey	rat	
16		0.14	mouse	i.p.	*				
17		0.155	mouse(♂)	s.c.	U.S.Army, CCD/435				
18		0.17	mouse	i.p.	*				
19		0.25	rat	p.o.	*				
20		0.28	monkey	i.v.	Merck Index	5,900	800	2,800	*
21		0.301	mouse	s.c.	U.S.Army, CCD/435	330	200	200	*
22		0.41	mouse	i.p.	*				

23	 Br⁻	0.42	mouse	s.c.	U.S.Army, CCD/435
24		0.5	mouse	i.p.	*
25		0.5	rat	p.o.	*
26	 $[CH_3SO_4]^-$	0.51	mouse	s.c.	Brown <u>et al</u>, 1950
27	 I^-	0.55	mouse	s.c.	Brown <u>et al</u>, 1950
28		0.6-0.8	mouse	s.c.	*
29		0.65	rat(♂)	i.p.	*
30		0.7	mouse	i.p.	*

31	$C_2H_5N(CH_2CH_2Cl)_2$	1.1-2.05	mouse	s.c.	U.S.Army, CCD/435
32		1.24	mouse	s.c.	Brown _et al_, 1950
33		1.4	mouse	s.c.	*
34	$N(CH_2CH_2Cl)_3 \cdot HCl$	2.01	mouse	s.c.	U.S.Army, CCD/435
35		2.3-3.8	mouse	s.c.	U.S.Army, CCD/435
36		2.8	rat(♀)	i.p.	*
37		2.9-3.3	mouse	s.c.	CCD/374

38	KCN	2.9-6.0	mouse	s.c.	U.S.Army, CCD/435
39	$CH_3N(CH_2CH_2Cl)_2$	4.5	mouse	s.c.	U.S.Army, CCD/435
40		5	rat	p.o.	*
41	FCH_2CH_2COOH	5-19	mouse	s.c.	U.S.Army, CCD/435
42		5	rat	p.o.	Merck Index
43		5	rat	p.o.	Toxic Substance List, U.S. Dept. of HEW, 1972
44		6.2	mouse	s.c.	CCD/466

45		8	mouse	s.c.	*
46		13	mouse	s.c.	CCD/466
47		13.2	mouse	p.o.	CCD/466
48		14	rat	i.v.	Toxic Substance List, U.S. Dept. of HEW, 1972
49		15	rat	p.o.	CCD/466
50		16.7	rat	p.o.	CCD/466
51	$(CH_2CH_2Cl)_2S$	20-30	mouse	s.c.	U.S.Army, CCD/435

52		23.1	mouse	p.o.	CCD/466
53		29	mouso	i.p.	CCD/466

* Indicates Handbuch der experimentellen Pharmakologie, xv , 1963 as reference.

Appendix II

Draft Terms of Reference for the Drawing up of the LD50 spectrum

The terms of reference to be used in formulating the LD50 spectrum of chemical substances are as follows:

1. All data [*1] for LD50 shall, in principle, be taken from documents or theses and articles already published or available.

2. In arranging data to give a spectrum, the lowest value of LD50 of each chemical substance shall be used, regardless of application route, oral, subcutaneous, intraperitoneal, intravenous injection, inhalation, percutaneous, etc. The yardstick for the LD50 shall be mg/kg [*2] and each value shall contain two significant figures.

3. Any available data for animals used for experiments other than rodents shall be included for reference.

4. The form of the spectrum shall be that chosen by the CCD.

5. The research organization entrusted with work on the spectrum shall carry out its task of formulating the spectrum from a scientific standpoint.

6. On completing its work, the organization shall send the draft of the spectrum to the CCD, which will ask for the views of the Member States.

7. The CCD shall request the United Nations to provide the necessary funds.

(Footnotes)

*1. Should different values exist for the same chemical substance, one of the values might properly be selected as the spectrum value after due consideration of the different experimental conditions, but in principle the lowest value shall be adopted. However, the data for the other values should be included for reference.

*2. In consideration of the fact that CWAs would be used mainly in the open, data obtained using other yardsticks, such as mg min/m^3 (LCT50) or PPm should be included for reference.

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JAPAN

Some thoughts on the international control of chemical weapons

Introduction

The purpose of this working paper is to make some suggestions on the problem of chemical warfare agents to be prohibited. A number of suggestions have been made on the subject but so far have not gone beyond general remarks and have been somewhat lacking in specific substance.

1. Recent trends in the deliberations on the question of banning chemical weapons

Reflecting the positive efforts made up to that time, a communiqué issued at the summit talks between the USSR and the United States of America in July 1974 stated that "the United States and the Soviet Union will take a joint initiative on banning the most dangerous, lethal means of chemical warfare". This gave us hope for the early completion of a treaty banning chemical warfare, but that hope has not yet come to fruition. As more and more people came to deplore the delay in the deliberations on the subject, the United States expressed its views at the spring session of 1976 (CCD/PV.702); an informal expert meeting suggested by the Federal Republic of Germany was held in the summer session; and the British draft convention was submitted in the last stage of that session. During the Committee's deliberations over this period, the problems of "chemical warfare agents to be prohibited" and "control of chemical weapons" were treated as follows.

(1) Chemical warfare agents to be prohibited

A number of suggestions were made on the definition, category and scope of chemical warfare agents to be prohibited. The prevailing view which emerges from these suggestions is that we should prohibit all lethal chemical agents by adopting criteria of purpose; that we should adopt a criterion of toxicity as one of the criteria for determining the individual agents to be prohibited; and that chemical warfare agents should be divided into two categories, namely, single-purpose agents to be used only for warfare, and dual-purpose agents to be used for both peaceful and warlike purposes.

GE.77-83157

(2) Control of chemical weapons

The problem of verification is at the core of the deliberations. Among the Western and non-aligned countries, the prevailing view is that international verification is necessary; among the Eastern countries, the prevailing view is that national means are in principle enough. In spite of a number of suggestions, a clue to agreement has not yet been found.

However, the following views have been recognized: it is necessary that we should conduct on-site inspections in order to ensure that specific acts such as the destruction of stockpiled agents are carried out; and it is possible that national means should be supplemented without unjustifiable interference, by on-site inspections under international control, including some form of seal, the use of the camera and so on, in order to control production. These views do not go beyond the conceptual stage; they need to be further explored and made more concrete.

2. Our thoughts and suggestions on international control of chemical weapons

With the aim of contributing to the solution of the problems described above we investigated to see whether or not there was some effective treaty now in force which could serve our purpose. We have found that the system of agents to be regulated in a treaty on the control of narcotic drugs and psychotropic drugs has many similarities to a chemical-warfare ban treaty — which is also concerned with controlling chemical substances — and can be useful for our purpose. This is the Single Convention on Narcotic Drugs, 1961, as amended (hereinafter referred to as the Narcotic Drugs Convention), to which, as of 1 March 1977, 109 countries, including most members of the CCD, are Parties. Referring to this Convention, we would like to suggest the following:

(1) Chemical warfare agents

There are a variety of chemical warfare agents to be prohibited, and hence it is virtually impossible, in the brief wording of a treaty, to provide specifically for their definition, category and scope. Therefore, in addition to criteria of purpose, which have received almost unanimous support, we suggest the compilation of some tables of the chemical warfare agents to be prohibited. We should throw the net of a comprehensive ban over (i) chemical warfare agents and chemical weapons or munitions, equipment and means of delivery, and (ii) activities connected with their development, production, stockpiling, acquisition, etc. We should list in the tables those chemical warfare agents over which control by treaty is at present considered desirable.

Chemical warfare agents as a whole would be divided into categories in the following three tables:

Table I: single-purpose agents and their highly toxic derivatives;

Table II: dual-purpose agents and their highly toxic derivatives;

Table III: chemical substances with a high potential for use as chemical warfare agents, other than those listed in tables I and II.

First of all, we should list in table I chemical agents used only for warlike purposes and their highly toxic derivatives, and we should place them under a total prohibition (for example, nerve agents VX including their derivatives VE, VM, VG and so on; mustards including their derivatives HN-1, HN-3 and so on). We should list in table II dual-purpose agents for warlike and peaceful purposes and their highly toxic derivatives; we should place them under separate control. We are then left with those chemical agents which are listed neither in table I nor in table II. We should list them in table III in view of their high potentiality for use as chemical warfare agents. Though the chemical substances to be listed in table III cannot be used directly for warlike purposes, we should prevent any State party to the treaty from transforming those substances into chemical weapons by imposing an obligation of notification on any State which is about to perform such activities as production, stockpiling, development, etc. In doing so, we can modify article I, sub-paragraphs (a) and (b), of the British draft to read as follows:

"(a) chemical agents listed in the annexed tables I-III, of types and in quantities that have no justification for protective or other peaceful purposes;

"(b) munitions, equipment or systems designed to fill up, instal1/ or deliver agents specified in the preceding sub-paragraph (a) or chemical substances2/ which are intended to produce the same effect as agents specified in sub-paragraph (a) when fired munitions reach the target."

Thus we can define the subject-matter simply and concretely, make the scope of the treaty clear, and classify chemical warfare agents in tables I, II and III.

1/ The word "instal" is inserted because some munitions, such as chemical mines, do not require to be delivered.

2/ The words "chemical substances" are inserted because binary chemical weapons should be prohibited.

From the standpoint of control over these chemical weapons, we believe it quite effective to classify chemical warfare agents in tables I, II and III. This line of thought stems from the formula employed in the Narcotic Drugs Convention, from the draft treaty, and from our previous thoughts as embodied in the working papers submitted by the Japanese delegation in the past (CCD/430, 466, 483 and 515).

(2) Working procedure for completion of the tables

The following procedure is suggested for the work:

(i) All toxic chemical agents whose toxicity is above the agreed level should be listed using the LD50 spectrum. A method of drawing up the lists has already been suggested by Japan in its "Working Paper: Draft of one form of LD50 spectrum" (CCD/515). The preparation of lists of toxic chemical agents is already under way as an IRPTC project of UNEP and may be very useful to us.

(ii) Chemical agents which are clearly not used at present and chemical substances which, to judge from their characteristics as chemical weapons (for example shelf-life, perceptibility, volatility, explosion stability and so on; see the working paper of the Federal Republic of Germany, CCD/458), are of low potential for use as chemical warfare agents should be deleted from the list referred to in paragraph (i).

(iii) Chemical agents whose toxicity is below the agreed level but which are clearly used as chemical weapons should be added.

(iv) From the above list, single-purpose agents should be listed in table I, dual-purpose agents in table II and the remaining agents in table III. An important point in this process is that the listing work can be done objectively by experts on the basis of a criterion of toxicity and other criteria. The tasks of deleting, adding, and classifying chemical agents should be undertaken by an informal expert meeting or an informal working group composed of qualified experts from CCD member and non-member countries, in accordance with a procedure to be agreed upon by the State parties to the treaty. The various criteria other than purpose criteria are all supplementary means of carrying out this work.

(3) Contribution to the control of chemical weapons

This method, by which we can determine concretely the chemical agents to be controlled by the treaty, will be useful, as explained below, from the standpoint of controlling chemical weapons in order to ensure compliance with the treaty.

(a) In the event that the chemical agents listed in table I are to be destroyed on a phased basis, the method makes it easier to work out a programme for their destruction; to establish procedures for destruction according to the characteristics of individual chemical agents, and for on-site inspections; and to ascertain the amount of destruction accomplished.

(b) If the agents listed in table II are to be brought under control, the method will be useful in preparing annual reports on the actual quantities of production, imports, stocks and so on needed for peaceful purposes, and in submitting estimates of requirements (the reader is referred to the procedure described in article 19 of the Narcotic Drugs Convention).

(c) The method will facilitate periodic review of the tables. In particular, if it becomes clear that chemical substances of recognized potential for use as chemical warfare agents are in use for weapons, the method will make it easier to transfer those substances to table I or II.

To sum up, the purpose of this working paper has been to present some suggestions concerning a number of proposals already submitted, as mentioned in the introduction, and also a suggestion on item (ii) of the scheme suggested by the distinguished delegate of the United Kingdom at the 737th plenary meeting on 17 March 1977, entitled "Means of defining agents to be banned". We have also referred to item (iii) of that scheme, entitled "Verification problems (... destruction of stockpiles, data to be collected and exchanged by national verification systems)".

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

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28 March 1977
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UNITED STATES OF AMERICA

Working paper concerning incapacitating chemical warfare agents

Introduction

In addition to chemicals that kill or permanently disable, chemicals which have temporary, incapacitating effects are potential chemical warfare agents. For this reason, it is appropriate to consider their inclusion in a future CW arms control measure. The draft Conventions presented by the Socialist countries (CCD/361), Japan (CCD/420), and the United Kingdom (CCD/512), all appear to place restrictions upon incapacitants, as well as on other agents. In addition, the 10-nation memorandum on CW (CCD/400) would seem to advocate prohibition of incapacitants.

While the view that incapacitating agents should be subject to constraints appears to be widely held, little information has been presented at the CCD on this category of agent. The only working paper dealing explicitly with incapacitating agents was presented by Canada in 1974 (CCD/433). That paper examined the problem of defining compounds having significance as irritating or incapacitating agents. The purpose of this paper is to present additional background material.

What are incapacitating agents?

As pointed out in Canadian working paper CCD/433, "incapaciting means having physiological or mental effects which will render individuals incapable of normal concerted physical or mental effort or both for a significant period of time after exposure". The effects are intended to be temporary, resulting in no permanent damage. Such effects may last for hours (or for days in extreme situations) after removal from exposure.

In order to be effective militarily, incapacitating agents must fill the basic requirements common to all chemical agents: reasonable cost of manufacture from readily available materials; a high degree of stability in storage as well as during and after dissemination; capability of being disseminated efficiently and a relatively short time interval between exposure to the agent and the onset of desired effects. In addition, the difference between the effective and lethal doses of an agent must be wide enough to permit the spontaneous recovery of most victims with no permanent after effects.

GE.77-83176

The most important types of incapacitating agents are found in the following categories:

(1) Psychochemicals. These compounds (usually indole, tryptamine, or piperidine derivatives) may be described as psychotropic, psychotogenic, psychotomimetic, or hallucinogenic. The effects produced may include visual and aural hallucinations; a sense of unreality; and changes in mood, behaviour, performance, memory, attitude, concentration, perception, and thought processes. Representative agents of this group are 3-Quinuclidinyl Benzilate and Lysergic Acid Diethylamide.

(2) Paralysants. Agents that interrupt nerve impulse transmission at the skeletal neuromuscular junction (for example, curare) and those that block transmission in autonomic ganglia (for example, hexamethonium) are found in this group.

(3) Pain producers. Physical irritants which have a persistent effect can be considered incapacitating agents. Representative of this group are urushiol (one of the active principles of poison ivy) and bufotenine (a compound which is secreted by the common toad and causes intensive itching).

Effective dose and other definitional criteria

Toxicity thresholds based on median lethal dose are generally agreed to be a useful supplement to the general purpose criterion for defining which chemicals are potential lethal CW agents. In the Canadian paper CCD/414 this general approach was extended to potential incapacitating CW agents. It was suggested that: "A chemical compound or element can be considered as a potential agent of war if it has a median incapacitating or irritating dosage of less than 500 mg. min/M^3".

While determination of median lethal dosage is relatively straightforward, measurement of median effective dosage is much more complex. The experimental procedure used will depend on the type of effect expected. Separate methods would be needed to determine effective dosage for each class of agents. One method for measuring human mental performance, called the Number Facility Test (NF), employs a series of addition problems, each consisting of three randomly selected 1- or 2-digit numbers. The score is the number correctly added within a 3-minute period. Other tests have been developed to measure eye-hand co-ordination and dexterity. The types of tests used for animal testing are often based on conditioned reflex responses, physical endurance and visual discrimination.

Criteria based on chemical structure or physical properties, analogous to those suggested for lethal agents, would appear to have little utility. Potential incapacitating agents are so diverse that it does not appear possible to find any simple definitional formula. In view of the lack of suitable technical criteria, consideration might be given to relying solely on the general purpose criterion.

Verification considerations

Generally speaking, the findings reached on verification of restrictions on lethal agents will also apply to incapacitating agents. In other words, the ability to verify restrictions on development, production or stockpiling will be no better or worse for incapacitating agents than for lethal agents.

Military role of incapacitating agents

While the potential military role for incapacitating agents has been discussed for decades, such agents do not appear to have become a major component of CW stockpiles. A key factor has undoubtedly been the unsuitability of currently known agents for military purposes. If incapacitating agents were not eventually covered in a CW agreement, however, increased effort might well be devoted to overcoming these shortcomings.

Conclusions

1. The view that limitations should be placed on incapacitating agents, as well as on lethal agents is widely shared.

2. In view of the lack of suitable technical criteria for defining potential incapacitating agents, consideration might be given to relying solely on the general purpose criterion.

3. Limitations on incapacitating agents do not appear to pose any novel verification problems.

4. At present incapacitating agents do not appear to have become a major component of CW stockpiles. Their role could increase, however, if they were not covered in a CW agreement.

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

CCD/533
22 April 1977
Original: ENGLISH

THE NETHERLANDS

Working paper concerning the verification of the presence of nerve agents, their decomposition products or starting materials downstream of chemical production plants

1.1. A NON-INTRUSIVE METHOD TO VERIFY A BAN ON THE PRODUCTION OF NERVE AGENTS

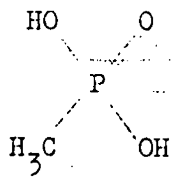
One of the functions of an effective verification system with respect to a ban on the development, production and stockpiling of chemical weapons is to deter the production of chemical weapons, in particular the very dangerous nerve agents. To achieve adequate deterrence, procedures are necessary to ensure that a sufficient chance exists that clandestine production of nerve agents will be detected. On the other hand, one always strives for verification methods which are as non-intrusive as possible.

As a contribution to solve part of the problems involved, a highly sensitive method will be described to analyse waste water downstream of chemical production plants and to compare this with an upstream sample with the purpose of detecting the presence therein of nerve agents, their decomposition products or starting materials. The analytical procedure may be carried out in every laboratory equipped with a gas chromotograph and the method is sufficiently sensitive to give a positive indication even after extensive water purification.

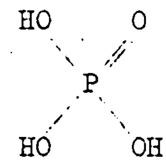
From the results it may be concluded that the reported procedure gives a practically unambiguous and simple yes or no answer to the question whether nerve agents, their decomposition products or starting materials are present or not. After a positive detection — which would only make the plant suspected — a visit to the plant could be made to reveal the identity of the product manufactured.

1.2. BASIS OF THE METHOD

The nerve agents are organophosphorus compounds and structurally related to pesticides. Generally both types of compounds may be prepared in similar production plants. However, an important structural difference between both types of compounds exists. The majority of the nerve agents is related to methylphosphonic acid (I), whereas most of the commercially available organophosphorus pesticides have phosphoric acid (II) as their basic structure apart from a few pesticides based on I which generally have an experimental status[3-5].



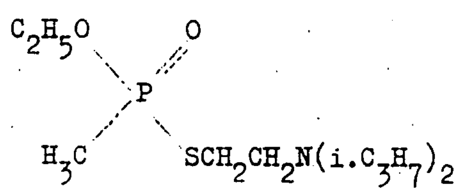
I



II

The Japanese delegation to the Conference of the Committee on Disarmament drew attention to the fact that the phosphurus-carbon bond is not cleaved under mild decomposing conditions. Besides gas chromatography in combination with a specific detection was mentioned as a suitable method to detect organophosphorus compounds at very low concentrations.[6]

A verification procedure, based on the above-mentioned considerations, is presented in this report. Samples from the Rhine and Meuse, both considered as heavily polluted rivers, were used as models for substantially diluted waste water downstream of chemical production plants. As such the procedure provides a rather non-intrusive inspection method. Ethyl S-2-di-isopropylaminoethyl methylphosphonotioate (VX).



was used as a representative of the nerve agents.

After a discussion of the investigations concerning the different aspects of the procedure in part 2 the ultimate procedure is described in part 3. Part 4 comprises some results obtained on application of the ultimate verification procedure on Rhine and Meuse river water samples. Some directions for future work conclude the report as part 5.

2. EVALUATION OF THE VERIFICATION PROCEDURE

2.1. Materials

Rhine river water samples were collected from the Lek at Bergambacht and analysed by the Dune Water Works of the Hague. The Meuse river was sampled at Keizerzveer and analysed by the Drinking Water Works of Rotterdam. The samples were stored in a refrigerating room. The chemical analyses of the water samples are listed in Table 1.

Table 1

Chemical analyses of Rhine and Meuse river samples

component		Rhine						Meuse
		12-12-'73	12-8-'74	20-11-'74	8-1-'75	25-8-'75	3-3-'76	23-2-'76
chloride	(mg/1)	230	175	168	83	140	196	37
sulphate	"	89	86	85	59	70	94	54
bicarbonate	"	140	146	156	146	149	193	134
nitrate	"	11.5	10.8	12.2	14.0	12.7	17.6	17.0
Kjeldahl nitrogen	"	4.4	1.7	2.2	1.5	1.0	2.6	1.9
orthophosphate		0.62	0.55	0.75	0.41	0.98	0.97	0.73
unfiltered	"	1.95	1.27	1.70	1.10	1.61	1.92	1.4
total organic carbon	"	6.2	7.8	5.9	8.0	5.5	8.2	6.9
silt	"	64	10	19	46	33	23	26
cholinesterase inhibition in parathion eq.	(µg/1)	0.17	0.25	0.24	0.04	0.08	0.13	-
pH		7.55	7.60	7.50	7.65	7.70	7.50	7.6
flow	(m^3/sec)	2572*	1648*	2870*	3497*	1964*	1329*	350**

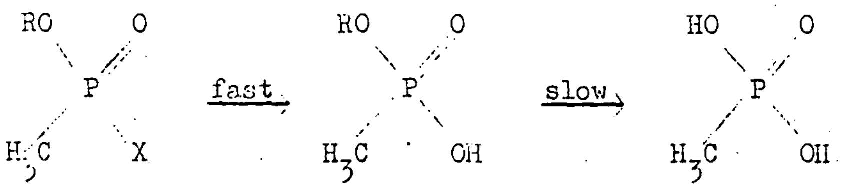
* Lobith.
** Lith.

For each experiment new glassware was used to preclude cross-contamination.

^{32}P-labelled methylphosphonic acid (specific activity 1 mCi/g) and ^{32}P-labelled VX (specific activity 20 mCi/g) as well as the corresponding unlabelled compounds were synthesized in this laboratory. Diazomethane was prepared and used in diethyl ether solution[7].

2.2. Hydrolysis

As stated in Chapter 1 gas chromatography in combination with a specific phosphorus detection is a suitable technique for the tracing of nerve agents in water at very low concentrations. To make the gas chromatographic picture as simple as possible (section 2.6) a complete hydrolysis should be carried out after which most phosphorus-containing nerve agents will present themselves as methylphosphonic acid (equation 1), whereas organophosphorus pesticides will give rise to phosphoric acid (equation 2).

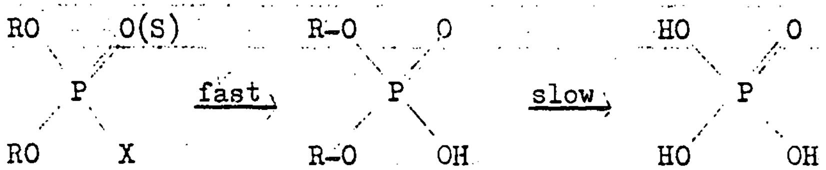


(1)

III IV I

Example of III: VX, in which R = C_2H_5 and X = $SCH_2CH_2N(i.C_3H_7)_2$

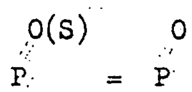
Sarin, in which R = $i.C_3H_7$ and X = F.



(2)

V VI II

Example of V: Parathion, in which R = C_2H_5, and X = $OC_6H_4NO_2$-p and

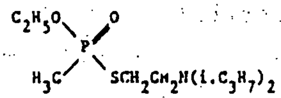
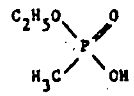
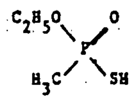
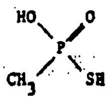
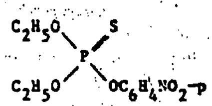
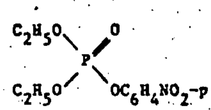
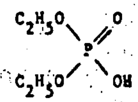
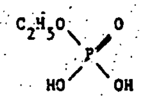
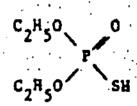
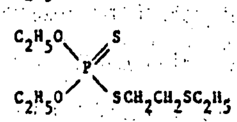
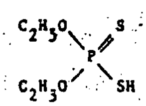
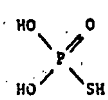
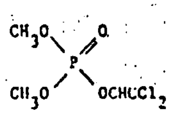
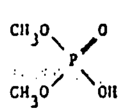
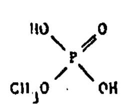


A strong acidic medium is a prerequisite to ensure a complete hydrolysis of both chemical warfare agents and pesticides with chemical formulae represented in equations 1 and 2 respectively. Moreover the process of hydrolysis should take place in a reasonable period of time. In order to establish optimum conditions, hydrolytic data of a number of organophosphorus compounds were collected.

In addition to some hydrolytic half-life values derived from literature a number of model compounds has been selected to determine their rates of hydrolysis. Experiments were carried out in 1 ml sealed glass ampoules containing 0.5 ml of 0.05 M sodium citrate/citric acid buffer at pH 3. The concentration of the different model compounds was 0.02 M. The ampoules were heated in an oil-bath at 130°C. From the quantitative analysis of the reaction mixture using high-voltage paper electrophoresis, paper chromatography, gas chromatography and ultraviolet spectroscopy the respective hydrolytic half-life values were determined[8]. Table 2 comprises hydrolytic data of a representative of the nerve agents (VX), of some pesticides (Parathion, Disyston and DDVP) and of intermediates that might appear during hydrolysis. To motivate the presence of some of these intermediates it is to be remarked that in the acid hydrolysis of nerve agents (equation 1) and pesticides (equation 2) to I and II respectively, the

Table 2

Hydrolytic half-life values of some compounds related to phosphorus-containing nerve agents and pesticides at pH 3

	compound	systematic or trivial name	hydrolysis temp. (°C)	$t_{\frac{1}{2}}$ (h)	ref.
1		VX	130	0.24	-
2		ethyl hydrogen methylphosphonate	130	10	-
3		ethyl hydrogen methylthiophosphonate	130	9.8	-
4		methylphosphonothioic acid	130	0.36	-
5		Parathion	70	21	13
6		Paraoxon	70	23*	13
7		diethyl hydrogen phosphate	130	82	-
8		ethyl dihydrogen phosphate	130	1.42	-
9		diethyl hydrogen phosphorothioate	130	61	-
10		Disyston	70	62*	13
11		diethyl S-hydrogen phosphorodithioate	130	0.97	-
12		monothiophosphoric acid	52.8	1.2	14
13		DDVP	70	3.4*	13
14		dimethyl hydrogen phosphate	100	110	15
15		methyl dihydrogen phosphate	100	0.25	9

*Value refers to the first leaving group.

hydrolysis of the intermediately formed alkyl hydrogen methylphosphonate (IV) and dialkyl hydrogen phosphate (VI) is the rate determining step. Therefore hydrolytic data on these compounds are included.

The rates of hydrolysis of phosphates and phosphonates are known to be pH-dependent. The hydrolysis of alkyl dihydrogen phosphates[9] generally shows a maximum rate at pH 4; the hydrolysis rates of dialkyl hydrogen phosphates[10] and phosphonates[11] rise progressively when lowering the pH-value. Thiophosphates[12] show a maximum rate at pH 3. As a compromise and for practical reasons a pH 3 was selected for all hydrolysis experiments: acidic solutions below pH 3 may affect the performances (e.g. the capacity) of the anion-exchange column in the second step of the procedure (section 2.3).

A temperature of 130°C was selected to obtain measurable rates of hydrolysis in a four-days period.

From Table 2 it may be concluded that nerve agents, pesticides and their decomposition products hydrolyse to I and II respectively in a reasonable period of time at pH 3 and 130°C. In the ultimate procedure the temperature was increased to 160°C to obtain a complete hydrolysis of organophosphorus esters in 24 hours.

2.3. Isolation and concentration

After the hydrolysis the water samples of the Rhine and the Meuse river are passed through glass-fibre papers to remove solid particles (silt) preceding the use of the anion-exchange column. In this way the resin could be reused by means of a regeneration process*/ and a possible disturbance of the sample flow through the column was excluded. The adsorption of I onto the solid particles in the river samples is negligible as was determined by means of ^{32}P-labelled I. After filtration through the filter paper ng quantities of I were recovered quantitatively in the eluate.

A strong anion-exchange resin [type ϕ-$N(CH_3)_3^{(+)}$] is used to adsorb the methylphosphonate anion from the hydrolysed water samples. A simultaneous adsorption of other anions occurs e.g. chloride, sulphate and phosphate, which are generally present in excess when compared with the amount of compound I. The bicarbonate ion and other anions or weak acids are not adsorbed. A 2-3 fold excess in adsorption capacity of the anion-exchange column is used which is based on the average amount (3.5 meq.) of anions present in 0.5 litre of Rhine water in addition to the methylphosphonate ion and the added amount (about 3 meq.) of hydrochloric acid used to adjust the pH to 3. The first experiments were carried out with the commercially available anion-exchange resin

*/ According to BIO-RAD: (step 1) resin-$Cl^{(-)}$ + NaOH → resin-$OH^{(-)}$; (step 2) resin-$OH^{(-)}$ + formic acid → resin-formate$^{(-)}$.

Amberlite IRA-400 in the chloride (Cl^-) form. On a column packed with this resin a quantity of 0.1 meq. of the methylphosphonate anion proved to be adsorbed incompletely from one litre of the water sample. 50-60 per cent of the added amount of I was not retained on the column. A quantitative adsorption of I was obtained when the resin was converted into the formate ($HCOO^-$) form. Afterwards a commercially available resin, type BIO-RAD AG 1-X8 $HCOO^{(-)}$ was used. By means of a breakthrough chromatogram using a 0.5 litre sample containing 815 mg of chloride or 1200 mg of sulphate and 225 μg of ^{32}P-labelled I it was found that during the isolation I moved as a narrow band on the column in front of the chloride and the sulphate ions. Compound I eluted from the column only when the anion-content in the water sample surpassed the anion-exchange capacity of the column.

After the passage of the water sample the resin is washed with methanol to remove the interstitial water together with some neutral and basic compounds present in the original water sample. It is important that the hydrochloric acid-methanol solution, which is then used to elute the methylphosphonate anion, is dry because the subsequent evaporation of this solution in the presence of water gives rise to considerable losses of compound I.

A recovery of compound I amounting to 75-100 per cent was found after evaporation as was checked by experiments with ^{32}P-labelled I.

2.4. Derivatization

Compound I itself cannot be gas chromatographed but has to be converted into a volatile derivative to achieve a sensitive gas chromatographic detection and separation. The compound was transformed into dimethyl methylphosphonate using diazomethane in diethyl ether solution[7]. The yield of the esterification was nearly quantitative (95 per cent) as determined by gas chromatography (Chapter 3). Other acids such as phosphoric acid and sulphuric acid are methylated simultaneously. These acids may be present in the ion-exchange column eluate coming from the original water sample and trapped on the resin together with compound I.

2.5. Clean-up

This part of the complete verification procedure was introduced to obtain a proper gas chromatographic analysis of dimethyl methylphosphonate as outlined in section 2.6.

Ether as well as methanol are removed from the esterified sample (section 2.4) by means of boiling under reflux in a Vigreux column until a residual volume of 3-4 ml persists. This concentration step was checked by means of a number of experiments with mixtures containing 10 ml of benzene, 10 ml of ether, 1 ml of methanol and 3 μg of dimethyl methylphosphonate. A recovery of 90-100 per cent of the phosphonate was found as determined by gas chromatographic analysis.

The procedure according to reference 16 using a small silica gel column removes the majority of trimethyl phosphate and dimethyl sulphate from the methylated sample solution. Details of the gas chromatographic interferences of dimethyl sulphate are given in section 4. The silica gel column is successively eluted with benzene, ethyl acetate, and methanol. It was found that the benzene fraction contains mainly dimethyl sulphate, the ethyl acetate fraction trimethyl phosphate and the first ml of the methanol fraction about 80 per cent of the added amount of dimethyl methylphosphonate.

2.6. Gas chromatographic analysis

For the separation of dimethyl methylphosphonate and trimethyl phosphate the performances (e.g. resolution and peak symmetry) of a number of different stationary phases such as SE-30, QF-1, FFAP, OV-225, DEGS and Triton X-305 were evaluated. Triton X-305 turned out to be the best.

The optimum column temperature was found to be 140-150°C. Due to an increased column bleeding at higher temperatures the column-life decreased considerably whereas an increase in detector noise and detector contamination occurred.

Besides the use of diazomethane for the esterification of methylphosphonic acid and phosphoric acid it is possible to use other diazoalkanes. The resolution of the resulting trialkyl phosphates and dialkyl methylphosphonates may be expressed by:

$$R_s = 2\,\frac{t_r(\text{trialkyl phosphate})-t_r(\text{dialkyl methylphosphonate})}{y\,(\text{trialkyl phosphate})+y(\text{dialkyl methylphosphonate})} \qquad (3)$$

where R_s stands for the resolution, t_r for the retention time and y for the peak width at the base. The results together with the retention time relative to dimethyl methylphosphonate are given in Table 3.

Table 3
Resolution and retention times relative to dimethyl methylphosphonate*/ of a number of methylphosphonates and phosphates

$(RO)_2P(O)CH_3$ R =	relative retention	$(RO)_3P(O)$ R =	relative retention	resolution
CH_3	1.00	CH_3	1.33	2.1
C_2H_5	1.29	C_2H_5	2.07	4.0
$n.C_3H_7$	2.57	$n.C_3H_7$	5.53	4.1
$i.C_3H_7$	1.09**/	$i.C_3H_7$	1.58	2.8

*/ Retention time is 200 sec, column temperature 140°C, for further gas chromatographic conditions see Chapter 3.

**/ Tailing peak.

From the results given in Table 3 it might be concluded that it is advisable to prepare either the ethyl or the n.propyl esters instead of the methyl esters. Nevertheless the use of the methyl esters is to be preferred for the following reasons:

(a) Dimethyl methylphosphonate is detected at least two times more sensitive than diethyl methylphosphonate and dipropyl methylphosphonate.

(b) When using the ethyl esters or n. propyl esters the analysis time will be increased two or four times respectively in comparison with that needed for the methyl esters.

(c) Methanol is used as a main component of the eluent system to desorb methylphosphonic acid from the anion-exchange column. In that case the use of diazomethane[17] is recommended.

Owing to its specificity for organophosphorus compounds the thermionic detector was the detector of choice. The mean lowest detectable amount of dimethyl methylphosphonate proved to be 0.23 ng (range 0.15-0.30 ng). The maximum injection volume was found to be 5 μl. More solvent volume caused an extinction of the detector flame.

Dimethyl methylphosphonate can be identified by means of its retention index according to Kovàts[18]. The index amounts to 1427 when determined at 170°C on Triton X-305 as a stationary phase. Under these conditions trimethyl phosphate, which will be detected as well, has a retention index of 1483.

To prove unambiguously that the peak ascribed to dimethyl methylphosphonate is not due to the presence of a non-phosphorus compound in relatively high concentration, the thermionic detector was used in combination with a flame ionization detector. In case of a non-phosphorus compound the last mentioned detector will give a relatively high pressure

3. DESCRIPTION OF THE VERIFICATION PROCEDURE

From the results outlined in the preceding Chapter the following method was selected to verify the presence of nerve agents or their decomposition products in waste water.

Hydrolysis: The hydrolysis is carried out in sealed 750 ml Carius tubes containing 500 ml water samples adjusted to pH 3 using 0.5 N hydrochloric acid. The tubes are heated in an oil-bath at 160°C during 24 hours.

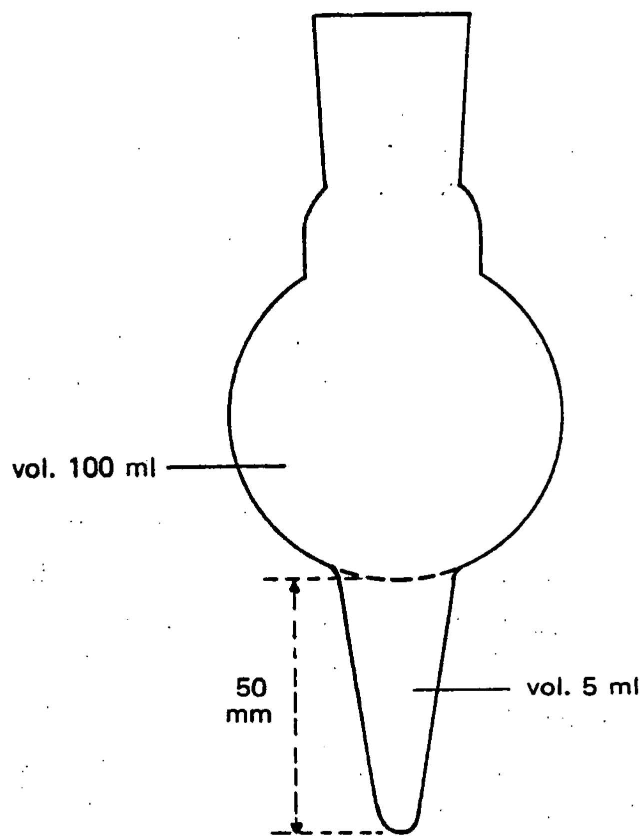


Figure 1. Pear-shaped flask to concentrate the column eluate.

Isolation and concentration: After filtration through glass-fibre paper (Whatman, GF/A) the hydrolyzed sample is passed through an anion-exchange column (length 20 cm, i.d. 11 mm) packed with AG 1-X8 (formate form, BIO-RAD) at a flow rate of 1-2 ml/min. After the passage of the sample the exchange column is washed with 30 ml of methanol. Methylphosphonic acid and other acids adsorbed on the resin are eluted at a flow rate of 0.5-1 ml/min with 20 ml of acidified (with gaseous hydrochloric acid up to 3N) methanol. The eluate, collected in a pear-shaped flask (Fig. 1), is concentrated to a volume of less than 1 ml by evaporation in a water-bath maintained at 50°C, using a gentle stream of air.
Derivatization: A solution of diazomethane, generated from N-methyl-N-nitroso-p-toluenesulphonamide and potassium hydroxide(7), in ether is added to the residue of the eluate until a yellow colour persists. The mixture is allowed to stand for 15-20 minutes. The excess of diazomethane is removed by means of a few droplets of acetic acid.
Clean-up procedure: After the addition of 10 ml of benzene the methylated solution is concentrated by boiling under reflux using a Vigreux column (length 19 cm, i.d. 11 mm) until a residual volume of 3-4 ml. To prevent bumping of the boiling liquid use is made of a device consisting of a glass bar bent in a U-form(7). During boiling the pear-shaped part of the reaction flask (Fig. 1) is immersed in an oil-bath, which is gently heated from room temperature up to 160°C in the course of 45 minutes.

Silica gel, after pretreatment by heating for 48 hours at 135°C, is partially deactivated by shaking with 3 per cent (w/w) distilled water. After four hours the gel is ready for use. To a column (length 19 cm, i.d. 8 mm) plugged with glass wool 1 g of the silica gel is added, followed by 2 g of anhydrous sodium sulphate(16). The column is prewashed with 10 ml of hexane. The sample solution is transferred to the silica gel column which is successively rinsed with 16 ml of benzene, 24 ml of ethyl acetate and 8 ml of methanol at a flow rate of 0.2-0.4 ml/min. The eluates of benzene, ethyl acetate and the initial 1 ml of methanol are collected separately. The methanol fraction is set aside for further use.
Gas chromatography: The gas chromatographic analyses are carried out on a Becker gas chromatograph, type 409, equipped with a thermionic detector (TID), type 712. The coiled glass column (length 2 m, i.d. 1.5 mm) is packed with Chromosorb W-AW/DMCS 80-100 mesh coated with Triton X-305 (25 per cent w/w) after sieving in the particle range from 149-177 μm. The column, injector and detector are maintained at 150, 200 and 200°C respectively. Gas flow rates are 40 ml/min for nitrogen, 65 ml/min for hydrogen and 250 ml/min for air. Because of the use of a splitter at the end of the column [ratio (3:1)] only 20 ml of nitrogen pro minute reached the TID detector. The remaining part is led to a flame ionization detector. Maximum sample volumes of 5 μl can be injected. Reference samples of comparable concentration are used for quantitative measurements.

4. APPLICATION AND DISCUSSION

Once developed the complete verification procedure was checked by adding varying quantities (0.1 µg - 1 mg) of VX to 1 litre of demineralized water and Rhine river water. Based on dimethyl methylphosphonate a mean recovery of 73 ± 11 per cent was obtained in demineralized water. The clean-up part of the procedure was omitted in this case. Considerable concentrations of phosphoric acid (approximately 0.2 mg/litre) were found which were detected as trimethyl phosphate by gas chromatography. Phosphoric acid is probably released from the wall of the glassware during hydrolysis.

Samples obtained after the addition of a relatively high quantity (1 mg) of VX to 1 litre of Rhine river water were analysed similarly. A clean-up of the sample before the gas chromatographic analysis proved to be unnecessary because no interfering substances were present at that concentration level and the comparable amounts of dimethyl methylphosphonate and trimethyl phosphate could be sufficiently separated by gas chromatography. Based on dimethyl methylphosphonate a recovery of 78 ± 10% (n=6) was obtained.

In the analytical procedure carried out with small quantities of VX (0.1-1 µg) added to 1 litre of Rhine river water the clean-up method had to be introduced because of interferences in the gas chromatographic analysis. First of all separation of small amounts of dimethyl methylphosphonate from a 1000 fold excess of trimethyl phosphate proved to be insufficient because of overlapping of the peaks. Moreover dimethyl sulphate interfered seriously in the detection of dimethyl methylphosphonate. Depending on the hydrogen flow the thermionic detector gave negative or positive peaks for dimethyl sulphate which influenced the response of dimethyl methylphosphonate, because of peak overlap. Dimethyl sulphate was identified by the combination of gas chromatography and mass spectrometry (type JEOL JMS-01-SG). It is most probably formed by methylation of sulphuric acid present in the Rhine river samples (concentration level of sulphate ≃ 80 mg/litre). The interferences of excess trimethyl phosphate and dimethyl sulphate could be overcome when using a clean-up of the methylated sample before the gas chromatographic analysis. In this way it proved to be possible to analyse concentrations of VX added to Rhine river water samples down to 250 ng/litre. Based on dimethyl methylphosphonate a recovery of 80-90 per cent was found in Rhine river samples taken 25 August 1975.

These recoveries were corrected for an amount of dimethyl methylphosphonate (0.7-0.8 µg/litre) detected in the same Rhine river samples to which no VX was added. The identity of this compound was approved by mass fragmentography on a Finnigan quadrupole gas chromatograph-mass spectrometer, type 3100-003D. The peak was scanned at three characteristic m/e values: 79, 94 and 109 which correspond with $(CH_3O)P(O)H^{\cdot +}$, $(CH_3O)P(O)H(CH_3)^{\cdot +}$ and $(CH_3)_2P(O)^{\cdot +}$. The peak intensity ratio was 6:4.4:1 which equals the result obtained with a reference sample of dimethyl methylphosphonate. Owing to the small amount the intensity of the molecular ion was too small for scanning.

Later on the same compound was detected in the Rhine river samples of 3 March 1976 (conc. 760 ng/litre) and in the Meuse river sample of 23 F bruary 1976 (180 ng/litre). Obviously one or more emission sources in or at both rivers give rise to the presence of a compound containing a PCH_3 group in the molecule. Literature gives no indication that such compounds occur in nature. It is known that a number of insecticides containing a P-C bond are commercially available e.g. Dyfonate (ethyl S-phenyl ethylphosphonodithioate). As a result of the described analytical procedure dimethyl ethylphosphonate will result. According to its retention index (1468) this compound will not interfere in the gas chromatographic analysis of dimethyl methylphosphonate (retention index 1427, see section 2.6). However, Mecarphon[5] to our knowledge the only commercially available pesticide containing a PCH_3 group will give rise to dimethyl methylphosphonate on application of the analytical procedure and will thus interfere in the verification process.

As stated in section 2.6 the mean lowest amount of dimethyl methylphosphonate detectable by gas chromatography (section 2.6) is 0.23 ng of dimethyl methylphosphonate or 250 ng of VX per litre of water, being corrected for a mean recovery of 80 per cent and an original water sample volume of 0.5 litre, which was concentrated to a volume of 1 ml. This means that if a plant carries off at least 5 kg of VX or an equivalent quantity of its decomposition products or starting materials in 24 hours into a river with a flow of 250 m^3/sec it will be detected. A survey of advanced waste treatment technology has revealed that carbon adsorption processes would be capable of reducing a concentration of 1 mg/litre of phosphorus containing insecticides in a waste stream to less than 1 μg/litre[4]. This concentration lies well above the detection limit of the procedure described.

As to the possible presence of PCH_3-containing compounds may also be due to a natural or industrial background a reference sample upstream of the chemical production plant has to be analysed in addition to a downstream sample.

5. FUTURE WORK

Further research is needed to get acquainted with the natural or industrial occurrence of compounds which will deliver dimethyl methylphosphonate after application of the described procedure.

Experiments will be carried out to investigate the applicability of the procedure in case of binary nerve agent systems in which the nerve agent is formed by mixing two compounds during the delivery of the projectile to its target.

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CONFERENCE OF THE COMMITTEE ON DISARMAMENT

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HUNGARY

A possible method of defining toxic chemical agents

Numerous working papers have been submitted to the Conference of the Committee on Disarmament, which are based primarily on the "step by step" approach, and in addition to the "general purpose criterion" use some other specific criteria in their attempts at defining the chemical agents to be covered by the prohibition.

A number of definitions have been offered for "chemical agents .... which .... have the highest lethal effects" (CCD/346), "supertoxic chemical warfare agents" (CCD/PV.631) or "most dangerous lethal means of chemical warfare" (CCD/PV.642 and 643). However, such definitions are in practice subject to various interpretations.

Several suggestions have been made to list the chemical agents to be included in the prohibition, and some of the working papers already contain such lists in annexes (CCD/335, 365, 414, 430, 515, 529). Such lists, however, can be valid or can serve as examples only at a given moment.

Suggestions have also been made to define the chemical agents to be prohibited by reference to chemical structures or formulae (CCD/320, 365, 374, 383). However, this approach is possible only with identical groups of agents, but toxic chemical warfare agents do not all belong to the same group.

Besides the "general purpose criterion", a great number of working papers have proposed the use of the toxicity level. Most of them have proposed using the LD_{50} and LCt_{50} levels, and have also suggested certain thresholds.

The following thresholds, for example, have been suggested for LD_{50}:

- 0.5 mg/kilogram (CCD/320, 335 and 374)
- 1 mg/kilogram (CCD/322 and 373)
- 30 mg/kilogram (CCD/515).

GE.77-88810

For LCt_{50} the following thresholds have been suggested:

- 35,000 $mg.min/_{m}3$ (CCD/430)
- 3,000 $mg.min/_{m}3$ (CCD/473)
- 2,350 $mg.min/_{m}3$ (CCD/372)
- 500 $mg.min/_{m}3$ (CCD/414).

We believe that in the case of a "step by step" approach it is sufficient and may be unequivocal to use a joint definition of the "general purpose criterion" together with the toxicity value.

Thus the scope of the prohibition should be worded as follows:

"(1) Chemical agents of a toxicity value under LD_{50} = = x mg/kilogram or LCt_{50} = y $mg.min/_{m}3$, and in quantities that have no justification for peaceful purposes."

This definition, where the values of "x" and "y" are properly chosen, would provide the following possibilities:

(a) Taking LD_{50} = 200 mg/kilogram or LCt_{50} = = 200,000 $mg.min/m^3$, the ban would cover all toxic chemical warfare agents, including a significant part of irritants and psychotoxic agents. (See agents below line (a) in Annex I)

(b) Taking LD_{50} = 10 mg/kilogram or LCt_{50} = = 50,000 $mg.min/_{m}3$, the ban would cover practically all lethal chemical warfare agents but would exclude irritants, psychotoxic agents and defoliants. (See agents below line (b) in Annex I)

(c) Taking LD_{50} = 3 mg/kilogram or LCt_{50} = = 3,000 $mg.min/_{m}3$, the ban would cover supertoxic agents, first of all nerve gases and supertoxic solids. (See agents below line (c) in Annex I)

A further possibility of simplification lies in the fact that, when the value of LCt_{50} is measured and when the body-weight of the test animal and the amount of air the animal breathes per minute are known, the value of LCt_{50} can be converted to LD_{50} by the following formula:

$$LD_{50}\text{ (inhaled)} = \frac{(LCt_{50}\text{ value}) \cdot (\text{inhaled air})}{\text{body-weight}}$$

The LCt_{50} value should be given in $mg.min/_{m}3$, the amount of inhaled air in m^3/min and the body-weight in kg.

In this case the prohibition may be worded as follows:

"(1) Chemical agents of a toxicity value under LD_{50} = = x mg/kilogram (inhaled or subcutaneous), and in quantities that have no justification for peaceful purposes."

This definition, when the value of "x" is properly chosen, would provide the following possibilities:

(a) Taking LD_{50} = 200 mg/kilogram, the ban would cover all toxic chemical warfare agents, including irritants and psychotoxic agents. (See agents below line (a) in Annex II)

(b) Taking LD_{50} = 30 mg/kilogram, the ban would cover all lethal chemical warfare agents. (See agents below line (b) in Annex II)

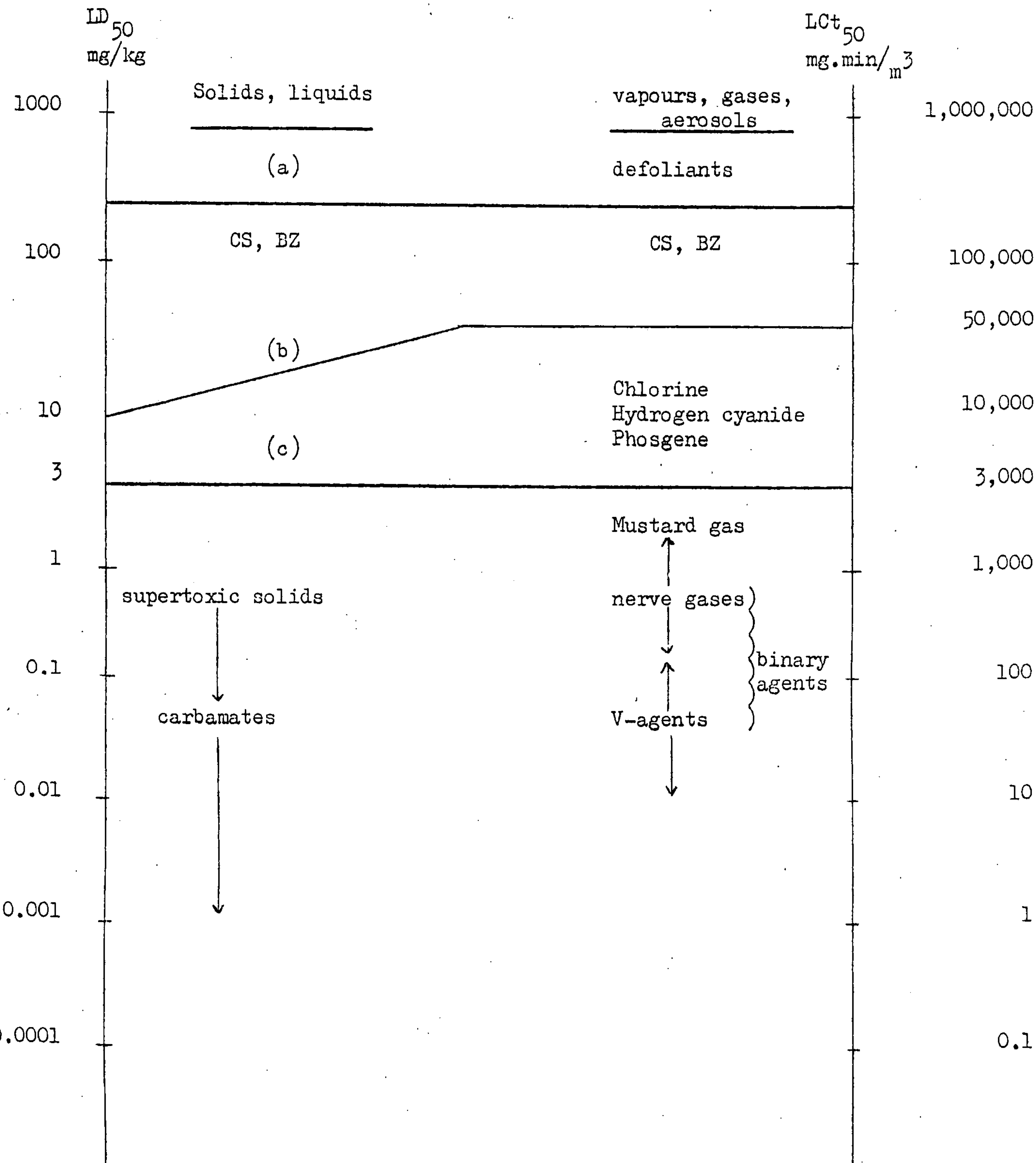
(c) Taking LD_{50} = 3 mg/kilogram, the ban would cover supertoxic agents. (See agents below line (c) in Annex II)

Conclusion

Though we continue to advocate a total ban on all chemical warfare agents, like the other co-sponsors of draft convention CCD/361 and most other countries, we believe that in drafting a possible partial ban the use of the LD_{50} value is feasible, and it would make much more concrete the scope of the prohibition, covering also binary and multicomponent weapons.

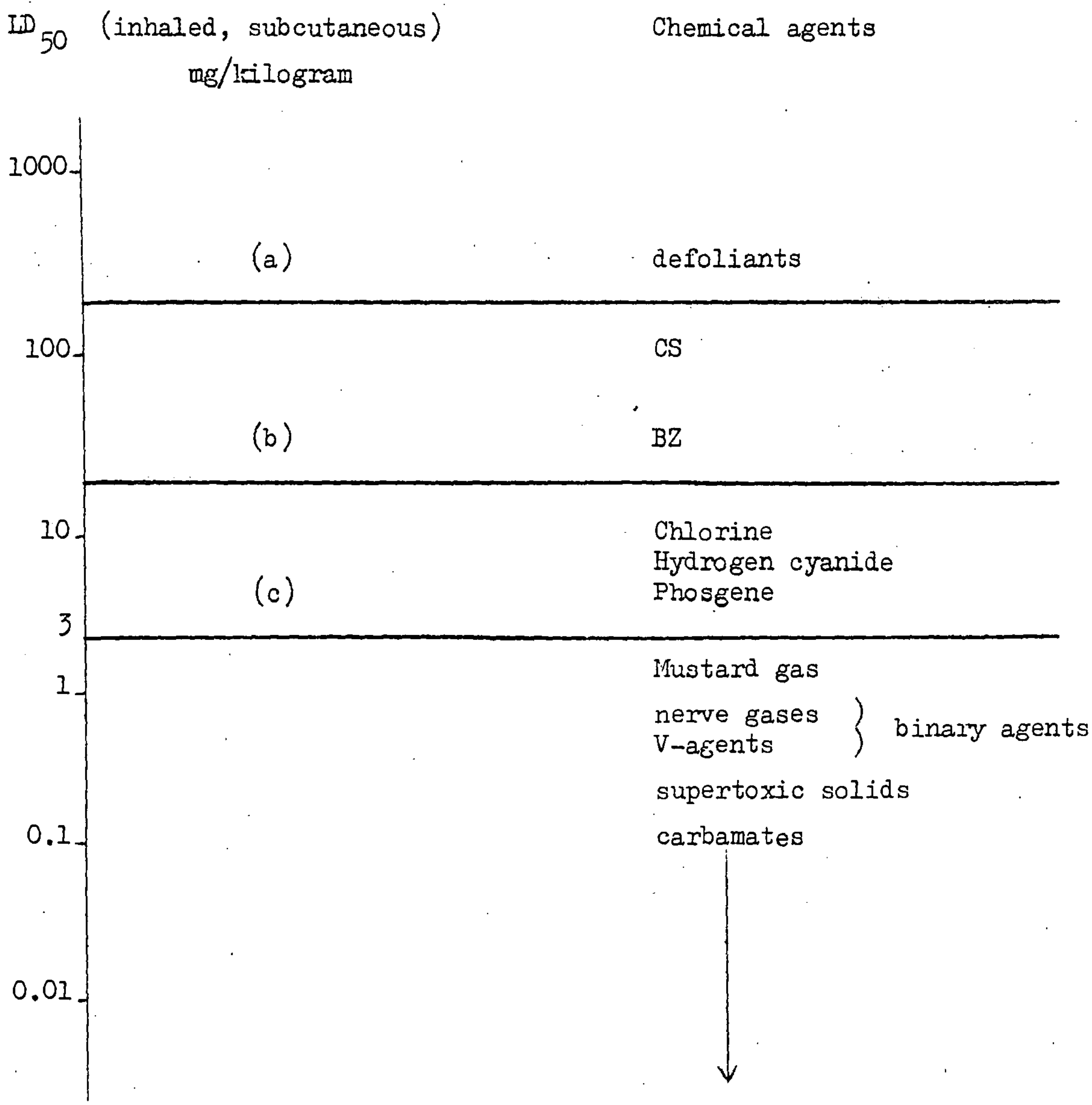
ANNEX I

The LD_{50} and LCt_{50} values of some chemical agents and their possible thresholds



ANNEX II

The LD_{50} values of some chemical agents and possible thresholds



CONFERENCE OF THE COMMITTEE ON DISARMAMENT

CCD/538
3 August 1977

ENGLISH
Original: RUSSIAN

UNION OF SOVIET SOCIALIST REPUBLICS

Some methods of monitoring compliance with an agreement on the prohibition of chemical weapons

From the technical standpoint there are two possible methods of verifying compliance with an agreement on the prohibition of chemical weapons: intraterritorial monitoring and extraterritorial monitoring. Intraterritorial monitoring is performed in the territory of the State in which the installation to be monitored is situated or the activity to be monitored is carried on. Intraterritorial monitoring can be subdivided into international and national monitoring. The means of extraterritorial monitoring are situated outside the territory, air space and territorial waters of the monitored State.

In this connexion the question arises of the possible use of various methods of monitoring for each of the above purposes: laboratory (after sampling); remote; indirect (analysis of statistics and other information); and conservative (sealing up installations, telemetric or radiometric surveillance).

All these methods are fully applicable for purposes of intraterritorial national monitoring. Some of the organizational forms of national monitoring were examined, in particular, in the socialist countries' working paper CCD/403. However, the use of those methods in international monitoring is, as we know, inevitably associated with the disclosure of military, industrial and commercial secrets, and consequently cannot be justified from the standpoint of assuring the security and economic interests of the States parties to a future agreement. The present paper therefore takes as its starting point the need to assess the applicability of the above methods to extraterritorial monitoring.

Since any agreement on the prohibition and destruction of chemical weapons will contain provisions banning the development, production and stockpiling of chemical weapons and providing for the elimination of stockpiles of such weapons, it is also desirable to analyse the possibilities of extraterritorial monitoring with due attention to certain special features of monitoring compliance with each of those provisions.

GE.77-88753

Development (including testing) of chemical weapons

The development of new chemical weapon systems includes the discovery of new chemical agents and/or devising new techniques for using chemical agents for military purposes. The most characteristic signs that chemical weapons are being developed are the following:

(1) The presence of research centres (or systems of such centres) where interrelated solutions are found to chemical, biological and medical problems;

(2) The presence of testing centres in active operation;

(3) The presence of specific systems of scientific and technical planning and financing.

If it is known with sufficient certainty that any of the above signs exist, there are serious grounds for assuming that one or other State is developing chemical weapons. A judgement on the facts concerning the development of chemical weapons can also be formed from published patents and scientific and technical materials which indirectly reflect the interests of specialized chemists taking part in the development work.

Such analysis will form the basis of indirect extraterritorial monitoring. Undeclared tests of chemical weapons can be monitored only by applying remote techniques and modern instrumentation.

Production of chemical weapons

The volume of production of chemical weapons is limited mainly by the production of chemical agents, which in turn is determined by the level of technological development and the availability of well-developed production facilities. The characteristic feature of the production of chemical agents is, above all, its close connexion with the production of initial, intermediate, assimilable and similar substances, of which the vast majority are not agents used for military purposes. For this reason, plants and shops which produce chemical agents may be located at a large number of industrial works belonging to various firms, departments and ministries throughout the territory of the State and even in other countries. In cases where chemical agents are being produced in secrecy, monitoring can be carried on by recording and analysing the various emissions into the atmosphere and hydrosphere by remote techniques and with the aid of the latest instrumentation. Great prospects for extraterritorial monitoring of the production of chemical agents are held out by indirect methods and, in particular, statistical analysis based on estimates of the consumption of initial and intermediate substances used in the production of chemical agents.

Stockpiling of chemical weapons

The stockpiling of chemical weapons, irrespective of the method used — be it production or acquisition from other States — consists of stockpiling chemical agents proper and stockpiling the means of delivery or other equipment designed to use chemical agents for military purposes. Stockpiles of chemical weapons may be located in a large number of storage places in different geographical parts of a particular State and even in the territory of other States. In cases where chemical weapons are stockpiled secretly, the stockpiles are virtually impossible to detect by extraterritorial methods. Detection by remote methods of secret transport operations may be the only indirect indication that chemical weapons are being stockpiled.

Indirect methods may be of some importance: in particular, statistical analysis of inter-State monetary and financial transactions.

Destruction of stockpiles of chemical weapons

The destruction of chemical weapons inevitably entails the destruction of chemical agents proper and sometimes disarming the means of delivery or other equipment designed to use chemical agents for military purposes.

Extraterritorial monitoring of the destruction of stockpiles of chemical weapons can be performed by a remote and an indirect method. The basis of the remote method is the recording with sensitive instruments of specific gaseous substances which may be discharged into the atmosphere when certain methods of destruction are used. Indirect monitoring, which in this case can play only a minor role, is feasible only where destruction entails making material preparations (building up stocks of degassing substances, transporting chemical agents and degassers, etc.). In this case it should also be borne in mind that the destruction of combat chemical agents entails substantial expenditure which may be reflected in the budgets of the appropriate departments.

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Our examination of the question of the applicability of various methods for monitoring compliance with the provisions of a future agreement leads to the following conclusions:

1. The basis of a monitoring system which will furnish a comprehensive and effective solution to the problem must be national means used for the purpose of intraterritorial national and extraterritorial monitoring.

2. Laboratory, remote, indirect and conservative methods can be used in intraterritorial national monitoring in all cases.

3. Extraterritorial monitoring can be performed chiefly by remote and indirect methods.

Remote methods of monitoring

Remote methods for use in both intraterritorial and extraterritorial monitoring must be based mainly on instrumentation. In principle it is possible to develop remote methods for use in the following two cases:

(1) Where a sample for monitoring is delivered "naturally" in a current of air or water (by the wind or a watercourse), thus making it possible to use any laboratory methods thereafter;

(2) Where the analysis is based on remote appraisal of some optical (spectral) characteristics of the monitored sample, which may now be performed with the aid of artificial earth satellites.

In the first case, the feasibility of monitoring depends to a great degree on natural conditions and phenomena. In the second case — that of remote appraisal by artificial earth satellite — the results of monitoring will be more reliable. Hence this method is of special interest in organizing remote extraterritorial monitoring. It has already been discussed in the Committee on Disarmament; in particular, working paper CCD/371 submitted by the United Kingdom on 27 June 1972 examined the feasibility of remote detection of field tests of chemical weapons.

The working paper comes to the conclusion that by using satellite-mounted sensors it is technically possible to detect field tests with a sensitivity of 10^{-1} mg/m^2 and a probability of 0.3 and 0.75 in winter and summer respectively; when the analysed layer is 100 metres thick, detection sensitivity is 10^{-3} mg/m^3.

At the present stage of development of science and technology, a photoconductive detector such as the cadmium-mercury-tellurium (CdHgTe) described in working paper CCD/371 is not the most sensitive. Considerably greater sensitivity is attainable with monolithic detectors based on impure crystals at ultra-low temperatures (a condition easily attainable in outer space) coupled with an advanced system of primary processing.

Other ways to achieve a high detection sensitivity involve the use of the induced and resonance combination scattering (Shorygin) effect. Here the best results are obtained with modulated lasers, which make it possible to operate in "windows" of atmospheric transparency. This will give access to a very high limit of sensitivity (five or more orders higher than that of ordinary combination scattering).

Cybernetic methods of identifying chemical structures and statistical methods of data analysis which are not covered in working paper CCD/371 make it possible to expand considerably the potentialities of extraterritorial monitoring methods in terms of increasing sensitivity and effectiveness in the identification of structures. Characteristics of the structures of chemical agents can be identified by mathematical methods.

Substances can be identified from infrared spectra and spectra of the combination scattering of light. In this case the spectral characteristics of the substances analysed should be fed into computer memories at the centres processing the results.

Special interest attaches to the use of satellites in geostationary orbit because in this case noise can be averaged over time, thus providing an effective means of eliminating noise disturbances generated by atmospheric fluctuations. By this method, the sensitivity of the system can be increased proportionally to the square root of the number of scans.

The technical solutions described above can be applied through the use of a combined system in which one satellite is positioned in geostationary orbit while others revolve in low circular orbits at an altitude of about 250 km.

It follows from the foregoing that, by improving technical means for the remote detection of chemical agents and using a system of certified earth satellites, it will be possible to increase the effectiveness of the method considerably, to record with a high degree of reliability the presence in the atmosphere of very low concentrations of chemical agents, and consequently to detect the production of chemical weapons and field tests of such weapons. Therefore the application of remote method making use of artificial earth satellites is quite sufficient for effective monitoring of compliance with many of the provisions of a future convention on the prohibition of chemical weapons.

Indirect methods of monitoring

Indirect methods can be particularly effective for purposes of extraterritorial monitoring when based on analytical processing of a wide range of information accessible to the general public and covering the development, production and stockpiling of chemical agents. In addition, use may be made of the national information centres already in existence in various countries which analyse for commercial purposes the activities of various foreign research centres, factories, firms and departments and the progress made by individual scientists and specialists employed there. Since such national systems for selecting and evaluating information in all fields of science and technology exist in the majority of large and technically developed States, it is virtually impossible that any of them should be able to outstrip the others for a long period and on a large scale in any branch of fundamental military technology, including chemical weapons.

Individual questions connected with the use of statistical analysis in production have already been discussed in, for instance, the working papers submitted by the United States of America (CCD/283) and Japan (CCD/344 and to some extent CCD/430).

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Thus the sum total of remote and indirect methods of monitoring afford adequate scope for extraterritorial monitoring by national means. By combining those methods with the specific methods of intraterritorial national monitoring (laboratory, conservative and other methods), a comprehensive and effective solution can be found for the entire problem of monitoring compliance with an agreement on the prohibition of chemical weapons.

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

CCD/539
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ENGLISH
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UNION OF SOVIET SOCIALIST REPUBLICS

Verification of the destruction of declared stocks of chemical weapons

Working paper CCD/497 of 29 June 1976, submitted by the United States, considered problems of monitoring the destruction of declared stocks of chemical weapons. The paper notes, in particular, that "the basic purpose of on-site monitoring would be to confirm information provided as to the type and quantity of agent destroyed".

The main purpose of monitoring the destruction of declared stocks of chemical weapons should be to establish (a) the fact of the destruction of an agent of a certain type, (b) the quantity of the agent destroyed and (c) the quality of this agent, and to produce appropriately documented results of the verification.

The present paper describes one of the methods of attaining this objective.

Taking as a basis the principle of national control over the destruction of chemical agents, it is necessary to bear in mind that:

(a) chemical agents are destroyed by incineration or detoxification;

(b) the planning of the destruction of chemical agents, as well as their removal from containers or warheads and collection in special receptacles, are regarded as preparatory operations which are undertaken without the participation of controllers;

(c) chemical agents are transported to the place of destruction in special receptacles.

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The quantity of chemical agents brought for destruction is determined by weighing them or by measuring their volume. Where the volume is measured, the weight of liquid substance is calculated by the following formula:

$$Q = V \cdot \rho$$

where V = the volume, in m^3,

ρ = the density of the substance, in g/cm^3 or t/m^3, and

Q = the quantity of the substance brought for destruction.

The density of the chemical agent is determined in the laboratory. For measuring the density, use may be made of known densitometers (float-type, pycnometric, piezometric and radioactive) which are likely to prove most suitable for work with these substances.

The quantity of solid chemical agent can be measured in a similar manner, with minor differences only in the measurement of density or bulk weight.

On completion of the process of the destruction of the chemical agent, the quantity of the agent remaining in the receptacle -- Q_{rem} -- is measured.

The quality of the chemical agent brought for destruction is determined by the content, in per cent, of the basic substance in the agent - q(%). The method of measuring this can be illustrated by the examples of quality testing for sarin and yperite.

For quality testing for sarin, for example, it is possible to use the technique based on its ability to hydrolyze in an alkaline medium. The control is effected by monitoring the consumption of alkali, and the sarin content is calculated by the following formula:

$$q\% = \frac{7.005(a.K_{NaOH} - b.K_{HCl}) \cdot 100}{A}$$

where a = the quantity 0,1 N of NaOH solution consumed for titration, in ml,

b = the quantity 0,1 N of HCl solution consumed for reverse titration, in ml, and

A = dose by weight, in mg.

Another possible technique is based on the reaction of sarin with hydrogen peroxide in an alkaline medium, with iodometric monitoring of the consumption of hydrogen peroxide.

The sarin content is calculated by the following formula:

$$q\% = \frac{3.502(a-b).K_{Na_2S_2O_3} \cdot 5.100}{A}$$

where a = the quantity 0,1 N of $Na_2S_2O_3$ solution consumed for titration of the control sample, in ml,

b = the quantity 0,1 N of $Na_2S_2O_3$ solution consumed for titration of the substance tested, in ml.

In quality testing for yperite, it is possible to make use of its reaction with an aqueous solution of chloramine T. The control is effected by monitoring the consumption of chloramine by the iodometric method. The yperite content is determined by calibration curves, obtained by titration of standard yperite solutions.

In terms of the main substance, the true quantity of the agent destroyed in one cycle is as follows:

$$Q_{tr} = (Q - Q_{rem}) \frac{q}{100}; \quad (m).$$

It is impossible to rule out the possibility that the chemical agent brought for destruction may be non-homogeneous in quality. In this case, when the substance is removed from the receptacle for destruction, it is necessary to analyse at least three samples -- one at the beginning of the destruction process, one in the middle and one at the end.

The samples can be taken either directly from the receptacle with a sampler from different layers of the chemical agent, or from the flow by "the flow method" technique when the substance is being fed to the destruction facility.

Each sample is used for determining the content of the basic substance and the density. From the values for the content of the basic substance and for the density, it is possible to calculate their mean values $\bar{q}$ and $\bar{\rho}$ as follows:

$$\bar{q} = \frac{q_1 + q_2 + q_n}{n}$$

where q_1, q_2, and q_n are the content, in per cent, of the basic substance in the first, second and n-th samples; and n is the number of samples taken.

In this case the quantity of the chemical agent destroyed, in terms of the basic substance, would be:

$$Q_{tr} = (Q - Q_{rem}) \frac{q}{100}; \quad (m).$$

Quantitative data on the destruction of declared stocks of chemical weapons should be recorded in a ledger. The ledger might have, for example, the following entries:

Date	Type of chemical agent to be destroyed	Quantity of chemical agent on arrival (tons) Q	Quantity of chemical agent remaining (tons) Q_{rem}	Mean value of the content of the basic substance $\bar{q}$ (%)	Quantity of basic substance destroyed (tons) Q_{tr}	Remarks
1	2	3	4	5	6	7
Total (tons)	-			-		-

The final stage of laboratory chemical analysis should be the analysis of the extent of decomposition of the chemical agents destroyed.

From the ledgers recording the quantities of substances destroyed at each facility, it is possible to determine whether the quantity of the stocks of chemical weapons actually destroyed corresponds to the declared stocks.

It would seem that stocks of chemical weapons declared for destruction should be expressed in terms of the quantity by weight of the basic substance. This will make it possible to exclude from the destruction records non-toxic elements present in the composition of chemical agents destroyed.

Conclusion:

Effective monitoring of the destruction of declared stocks of chemical weapons is feasible provided that preparatory work and chemical analyses are undertaken, and that statistical records are kept -- in terms of the basic substance -- of the quantity and quality of chemical agents destroyed.

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

CCD/541
5 August 1977
Original: ENGLISH

UNITED KINGDOM

Prophylaxis against nerve agent poisoning

The administration of drugs to prevent casualties from nerve agent poisoning as a prophylactic measure and after poisoning in the therapy of the effects of absorbed agents, has been under study for many years. In many countries, the results of such studies have been published in the medical and scientific literature and have contributed to the saving of life from poisoning by insecticides related in their mode of action to the chemical warfare nerve agents. The United Kingdom has consistently followed this practice of open publication, and the present study reported in this paper is in the nature of a progress report. The general status of medical protection against nerve agent poisoning was reviewed in a recent Yugoslav working paper (CCD/503).

It was reported some 30 years ago that cats could be protected against the lethal effects of the organophosphorus compound DFP (diisopropyl phosphorofluoridate) by pretreatment with the carbamate physostigmine. Subsequent work in the United Kingdom and elsewhere led to the development of oximes for treatment of organophosphorus poisoning. These act by reversing the combination between the organophosphorus compound and the enzyme cholinesterase, but in the particular case of poisoning by soman (1,2,2-trimethylpropyl methylphosphonofluoridate) the oximes are relatively ineffective because the combination becomes irreversible. A British report published in 1970 showed that preadministration of physostigmine and atropine gave appreciable protection against poisoning by soman and that certain other carbamates were effective in protecting guinea pigs against soman poisoning whereas a number of competitive anticholinesterases were inactive.

This work has been followed up and after a preliminary screening test for protection against soman, four carbamates have been studied for their ability to protect against a number of nerve agents in a range of experimental animals: rats, rabbits and guinea pigs. Supporting pretreatment was also given with the oxime P2S (pralidoxime mesylate), which was also given therapeutically (i.e. after nerve agent poisoning) along with atropine. The carbamates studied were pyridostigmine, mobam, physostigmine and decarbofuran, and nerve agents used were soman, sarin (isopropyl methylphosphonofluoridate), tabun (ethyl dimethylphosphoramidocyanidate) and VX (ethyl S-2-diisopropylaminoethyl methylphosphonothiolate).

Estimation of maximum sign-free dose of carbamate

Pairs of animals were given intramuscular carbamate in serial doses, differing by a factor of 2, and were observed for a period of 3 hours. The times of occurrence of unmistakable signs of anticholinesterase poisoning (tremors, muscular fasciculations, unsteadiness, inco-ordination or salivation) were noted. When two consecutive doses were found such that signs were evident at the upper but not at the lower dose an additional test was carried out using a dose three quarters of the higher dose. If that dose caused no signs it was accepted as the maximum sign-free dose; otherwise the dose immediately below it was used. The time taken for a minimally toxic dose to produce signs of poisoning was used in protection experiments as the appropriate time interval between pretreatment and the administration of the organophosphate ("pretreatment interval").

Safety ratio of carbamates

Acute toxicities were determined in guinea pigs for the four carbamates and the safety ratio expressed as follows:

$$\text{Safety ratio} = \frac{\text{LD50}}{\text{Maximum sign-free dose}}$$

Protection experiments

Animals were injected intramuscularly with a carbamate, with or without P2S (15 mg/kg). After the appropriate pretreatment interval the organophosphate was given subcutaneously followed one minute later (or at signs of poisoning if they appeared earlier) by therapy with 17.4 mg/kg atropine sulphate usually mixed with 15 mg/kg P2S (im). (In experiments in which carbamate was given without prophylactic P2S, the therapeutic dose of the oxime was 30 mg/kg.) LD50 values, based on 24 hour mortalities, were calculated by the method of moving averages. The results of the protection experiments are expressed as the

$$\text{Protective ratio} = \frac{\text{LD50 organophosphate in treated animals}}{\text{LD50 organophosphate in untreated animals}}$$

RESULTS

Comparison of carbamates

Of the four carbamates, three (pyridostigmine, mobam and decarbofuran) appeared to be slightly superior to physostigmine in protecting guinea pigs against soman poisoning, as shown in Table 1. The safety ratios of the effective carbamates varied widely, from 7.5 (physostigmine) to more than 100 (mobam), indicating that the effective protective dose of a carbamate is not a fixed proportion of the lethal dose. Carbamate pretreatment did not prevent the occurrence of signs of anticholinesterase poisoning although the response to soman was variable. With physostigmine, pyridostigmine and mobam signs of poisoning began to occur two to three minutes after poisoning with doses of soman below 4LD50: recovery was quickest with physostigmine pretreatment (the animals were markedly less affected by two hours) and slowest with mobam. Recovery in pyridostigmine-treated animals was not so smooth as in animals pretreated with other carbamates: there were recurring short periods (five to ten minutes) during which the animals relapsed and showed more severe signs of poisoning. In decarbofuran pretreated guinea pigs, the signs of poisoning appeared more slowly (up to 20 minutes) and lasted for a shorter time.

With higher doses of soman (6LD50 or more) the carbamate pretreated animals became prostrate, with irregular breathing, within five to ten minutes and this state lasted for several hours. With decarbofuran the animals, although severely affected, did not show the same degree of inertia. With all the carbamates, the surviving animals were usually recovered, or very much improved, by 24 hours after soman poisoning.

Variation in the dose of carbamate

The protection afforded against soman poisoning decreased, by a variable amount, as the dose of carbamate was reduced from the maximum sign-free (Table 1). Nevertheless, all four carbamates gave significant protection (Protective ratio >4) at one quarter of the sign-free dose. Raising the pretreatment dose had only a slight but variable effect: the protection afforded by pyridostigmine was raised slightly whereas that by mobam was reduced. However, the signs of soman poisoning were more severe and prolonged.

Duration of carbamate protection

The time course of the protection depended on the carbamate. Pyridostigmine and mobam gave maximum protection one hour after injection and physostigmine and decarbofuran 30 minutes after. Pyridostigmine had the longest duration action (about four hours) and decarbofuran the shortest (two to three hours).

Variation in supporting treatment

The effectiveness of carbamates in the treatment of animals poisoned by soman depends upon supporting treatment with atropine. It may be expected that inclusion of an oxime in the treatment would not influence the protection afforded against soman poisoning but would reinforce the protective action against poisoning by "oxime responsive" organophosphate anticholinesterases. The effect of varying the supporting treatment on the protection afforded to carbamate-treated guinea pigs was determined against poisoning by sarin and VX ("oxime responsive"), tabun (poisoning by which is not resistant to oximes generally but only to P2S), and soman.

Pyridostigmine, in the absence of any supporting treatment, did not afford protection against poisoning by any of the organophosphates but neither did it sensitize the guinea pigs to their lethal effects. In combination with atropine therapy, protection was given against tabun or soman poisoning and only marginal protection against sarin or VX, although the latter was raised considerably by incorporation of P2S into the therapy. Dividing the P2S treatment into prophylaxis and therapy gave increased protection against soman and VX poisoning but not against sarin. The result for tabun was anomalous in that dividing dose of P2S markedly reduced the protection.

Species differences in protection

The protection afforded to rats, guinea pigs and rabbits by carbamates pretreatment supported by atropine/P2S therapy against organophosphate poisoning is summarized in Table 2. The drug treatment was most effective in guinea pigs and, with the exception of sarin, less effective in the rabbit. In was ineffective in the rat apart from providing some protection against VX poisoning.

The maximum sign-free dose and the appropriate pretreatment time interval were determined for each carbamate in each of the species as described earlier.

DISCUSSION

The protective action of carbamates against organophosphate poisoning no doubt depends primarily upon the ability of the carbamate to inhibit acetylcholinesterase, forming a semi-stable carbamylated enzyme which can spontaneously break down to liberate the enzyme. The fraction of the enzyme in the tissues that was carbamylated would be protected against phosphonylation by organophosphate. The gradual decarbamylation of the enzyme in parallel with the relatively rapid removal or destruction of the organophosphate would release sufficient acetylcholinesterase to maintain life.

The usual treatment for organophosphate poisoning is a combination of atropine and oxime. This is not effective against poisoning by soman or (as far as P2S is concerned) tabun. The present study has shown that additional pretreatment with a suitable carbamate gives protection against poisoning by either of these oxime-resistant organophosphate without reducing the effectiveness of the atropine-P2S treatment against poisoning by the oxime sensitive organophosphates, sarin and VX. It is thus possible that a combination of pretreatment with a carbamate with oxime-atropine therapy could form the basis of a treatment that would be effective against poisoning by any organophosphate antiacetylcholinesterase, including all of the chemical warfare nerve agents.

TABLE 1

The Protection of Guinea Pigs against Soman Poisoning by Pretreatment with Different Doses of Carbamates

Carbamate	Pretreatment Interval (min)	Dose Multiple of Maximum Sign-Free Dose	Protective Ratio (95% limits)	Safety Ratio of Dose of Carbamate
Physostigmine	10	1	6.5 (4.7- 9.0)	7.5
		0.5	7.5 (5.4-10.3)	15
		0.25	6.0 (4.3- 8.5)	30
Pyridostigmine	30	4	10.1 (6.4-15.1)	13.8
		2	10.1 (8.0-13.3)	27.5
		1	8.0 (6.6- 9.6)	55
		0.5	5.8 (3.7- 9.2)	110
		0.25	4.0 (2.9- 5.6)	220
Mobam	20	4	6.9 (4.6-10.5)	>29
		2	7.3 (4.2-17.3)	>58
		1	8.0 (5.9-10.9)	>117
		0.5	7.5 (5.8- 9.8)	>234
		0.25	4.7 (3.4- 6.2)	>468
Decarbofuran	10	1	7.5 (5.6-10.0)	23
		0.5	6.2 (4.4- 8.9)	46
		0.25	4.6 (2.7- 5.1)	92

Conditions: P2S (15 mg/kg) and carbamate were given (i.m.) at the pretreatment interval before soman (s.c.). P2S (15 mg/kg) and atropine sulphate (17.4 mg/kg) were given (i.m.) 1 min. after soman.

$$\text{Protective Ratio} = \frac{\text{LD50 Soman in treated animals}}{\text{LD50 Soman in untreated animals}} \qquad \text{Carbamate Safety Ratio} = \frac{\text{LD50}}{\text{Maximum Sign-Free Dose}}$$

TABLE 2

Response of Different Species to Carbamate Prophylaxis Against Organophosphorus Poisoning

Species	Carbamate (Dose)	Prophylactic Time Interval (min)	Protective ratio (95% limits)			
			Tabun	Sarin	Soman	VX
Guinea Pig	Pyridostigmine (0.1 mg/kg)	30	22.0 (16.1-29.9)	21.5 (15.6-32.9)	5.3 (3.9-7.1)	17.9 (12.6-25.4)
	Mobam (2.5 mg/kg)	20	6.3 (5.5- 7.3)	23.0 (9.8-54.0)	5.0 (3.6-6.9)	23.6 (16.2-34.7)
Rabbit	Pyridostigmine (0.1 mg/kg)	30	4.6 (3.3- 6.5)	27.0 (19.6-37.6)	2.7 (1.8-4.1)	5.0 (2.9- 8.7)
	Mobam (2.5 mg/kg)	20	6.9 (4.5-10.5)	38.0 (22.5-45.7)	6.0 (4.5-8.0)	9.4 (6.4-14.3)
Rat	Pyridostigmine (0.075 mg/kg)	20	1.2 (0.9- 1.7)	1.5 (1.1- 2.1)	1.7 (1.3-2.2)	5.0 (2.6- 9.7)

Conditions: P2S (30 mg/kg) and atropine sulphate (17.4 mg/kg) (i.m.) given therapeutically 1 min. after the organophosphate (s.c.)

CCD/544*
19 August 1977

ENGLISH ONLY

LETTER DATED 19 AUGUST 1977 FROM THE COUNSELLOR OF THE PERMANENT MISSION OF FINLAND TO THE UNITED NATIONS OFFICE AT GENEVA ADDRESSED TO THE SPECIAL REPRESENTATIVE OF THE SECRETARY-GENERAL TO THE CONFERENCE OF THE COMMITTEE ON DISARMAMENT CONCERNING CHEMICAL AND INSTRUMENTAL VERIFICATION OF ORGANOPHOSPHORUS WARFARE AGENTS

Upon instructions from my Government, I have the honour to forward to you herewith a booklet "Chemical and Instrumental Verification of Organophosphorus Warfare Agents" prepared for the Ministry for Foreign Affairs of Finland by the Advisory Board for Disarmament. I would be most grateful, if you could take appropriate steps to have the booklet distributed in the Conference of the Committee on Disarmament as an official document.

(Signed) Juhani Muhonen
Counsellor

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* A limited distribution of this document has been made to the members of the Conference of the Committee on Disarmament. Additional copies are available from the Foreign Ministry of Finland in Helsinki.

1978

CONFERENCE OF THE COMMITTEE ON DISARMAMENT

CCD/569
24 April 1978
Original: ENGLISH

SWEDEN

Working paper on a methodological investigation for computerized scanning of chemical literature

Introduction

A disarmament treaty prohibiting development, production and stockpiling of chemical weapons will need provisions for verification as well as other methods for strengthening confidence between the parties to the treaty. Different methods have been discussed in the CCD. The former leader of the Swedish delegation to the CCD, Minister of State, Mrs. Alva Myrdal, pointed out the potential value of collecting, systematizing and disseminating information contained in scientific and technical literature (ENCD/PV.391, 20 August 1968). This method has also been discussed at informal meetings with chemical experts at the Conference of the Committee on Disarmament.

Manual scanning of relevant literature is a time-consuming task. Work of this kind demands a wide coverage of journals and other open sources. However, there is today an increasingly large number of abstract publications which facilitate access to the world literature within a special subject. Many of these abstract publications appear also on magnetic tapes and are available for direct computer scanning. Thi: facilitates further the following of the literature within a desired field. It therefore seemed worthwhile to investigate suitable means and methods for utilizing such databased abstract publications and evaluate their possible applicability in connexion with a chemical weapons treaty.

Aims

The method for the computerized literature search should ideally catch only relevant items from the immense amount of papers and articles that are published.

When weighing manual versus computerized retrieval of literature, one must observe that computerized retrieval is advantageous when many combined concepts shall be watched. It is possible to look out, "manually", for material under the heading of one keyword, but to follow combinations of keywords requires a much larger effort. An evaluation of the size and usefulness of different databases has made it clear that the most comprehensive coverage will be obtained when several databases are searched simultaneously. However, this has not been applied in the study reported on in this working paper.

Investigation

1. In this study the computer-readable version of Chemical Abstracts (CA) was used, i.e. Chemical Abstracts Condensates (CAC). This data-base provides access to chemical information included in more than 10,000 serial publications, printed all over the world. In 1977 Chemical Abstracts contained references to ca 410,000 papers, patents, reports and books. Chemical Abstract Condensates, which is issued weekly, contains the bibliographic description of every item abstracted in the Chemical Abstracts, plus the keywords used for the issue index. The bibliographic description includes, e.g. source document, bibliographic citations, document titles, names of chemical substances. The keyword index is produced by specialists in various subject areas.

The study consists of two parts. First a preparatory study was carried out on a material from five issues of Chemical Abstract Condensates within the subject field of biochemistry and organic chemistry. This material consisted of 26,488 references and was manually searched, read and analysed in order to find all relevant references.

The five issues of the printed version of Chemical Abstract Condensates used were read through by two chemists experienced in questions related to chemical warfare problems. References were selected by the readers according to the "most interesting subject" in the paper and with regard mainly to the degree of toxicity. The selected references were then reclassified by a highly qualified scientist in order to take into consideration also the concepts "novelty" and "military" interest.

Different kinds of search strategies were formulated and tested on the "known" material in order to find the most successful one, i.e. the search strategy which would retrieve the relevant references. This "known" material was also to be used as a standard for comparison with the output from the subsequent computerized search.

Secondly, in the main study the selected search strategies obtained in the preparatory study were applied to 20 subsequently published issues of Chemical Abstract Condensates, containing 128,740 references. The output, i.e. the lists of references, obtained by means of the applied search strategies, was treated in the same way as the material in the preparatory study, i.e. they were scanned by the two chemists and selected references classified by the scientist.

Formulation of search strategies

Two search strategies were formulated in the following way in order to retrieve the largest number of relevant references. Keywords were selected and compiled into different groups, and combined into the search strategies, which were tested. Two sets of combinations of these groups formed the search strategies finally used, Alfa and Beta respectively.

The groups and examples of pertinent keywords are briefly described in table 1.

Table 1. Description of keyword groups used in the search strategies

Description	Example of pertinent keywords	Number of keywords in the group
General expressions of toxicity	TOXIN	4
General expressions of warning or danger	DANGER	21
Substances with effects on skin and mucous membrane	MUSTA1/	3
Organs, i.e. lung	PULMON1/	9
Cholinesterase inhibitors	CARBAM1/	7
Cholinergic system	CHOLINEST1/	4
Organs and functions	RESPIRAT1/	6
Chemical structures	FLUOR	6
Chemical warfare agents	SARIN	27
Laboratory methods	ISOLAR1/	6
Gases and aerosols	GAS1/	5
Toxic effects	VOMIT1/	32
Delimitating or inhibiting effects	BLOCK1/	7
Total number of keywords		137

1/ Parts of words can be used as keywords.

Alfa was intended to retrieve the largest possible number of relevant references within a reasonable amount of the references resulting from the computer output, i.e. recall should be as high as possible. Beta should result in a still more reduced output as compared to Alfa without losing too many relevant references, and thereby resulting in giving a higher precision.

The measures used to evaluate the search strategies were expressed as follows:

$$\text{Recall} = \frac{\text{Number of retrieved relevant references}}{\text{Number of all relevant references in the database}}$$

$$\text{Precision} = \frac{\text{Number of retrieved relevant references}}{\text{Number of all retrieved references}}$$

$$\text{Size of reduced database (per cent)} = \frac{\text{number of retrieved references}}{\text{total number of references in the database}} \times 100$$

Results

Some of the results of the study are presented in table 2.

Table 2. Results obtained by the search strategies, Alfa and Beta, preparatory and main studies

	Search Profile	Size of reduced database		No. of retrieved relevant references	Recall	Precision
		Total No. of retrieved references (output)	% of original database			
Preparatory study	Manual search	-	-	35	-	-
	Alfa	1 138	4.3	31	0.89	0.03
	Beta	260	1.0	22	0.63	0.09
Main study	Alfa	5 019	3.9	88	-	0.02
	Beta	1 139	0.88	60	-	0.05

It is impossible to give recall in the main study because of the lack of knowledge of the total number of relevant references in the material.

It was calculated that the probability of retrieving new information relevant to the chemical warfare-subject by the described method is fairly high ($p > 0.8$), assuming that such information appears in at least two or more different abstracted references.

Conclusions

The present methodological investigation has shown it is possible to formulate effective search strategies for computerized searching of databased literature references for information concerning chemical warfare agents. The method makes it possible to substantially diminish the amount of work needed for searching manually the corresponding amount of literature. The results imply that with search strategies of the types used it is possible to reduce the database (in this investigation Chemical Abstracts Condensates) to 1-4 per cent of its original size, while still retaining 63-89 per cent of relevant references in the material.

It seems possible to improve the method and also to apply it to several more databases.

1979

COMMITTEE ON DISARMAMENT

CD/5
6 February 1979
Original: ENGLISH

ITALY

Working Paper on Chemical Disarmament Negotiations

1. During the past decade the problem of the prohibition of chemical weapons has been one of the crucial topics of disarmament debates.

Virtually all the participants in the negotiations undertaken at the Conference of the Committee on Disarmament (CCD) and in the discussions held at the General Assembly of the United Nations have repeatedly voiced their commitment to achieve, as a matter of priority, comprehensive chemical disarmament. A number of constructive working proposals and three draft conventions have been submitted to this effect, over the years, to the negotiating forum by different countries.

In a communiqué of 3 July 1974, the Governments of the United States of America and the USSR announced that they had agreed to consider a joint initiative "with respect to the conclusion, as a first step, of an international convention dealing with the most dangerous, lethal means of chemical warfare". Such an initiative however, despite protracted bilateral negotiations, has failed up to now to materialize.

More recently, the special session of the General Assembly of the United Nations devoted to disarmament solemnly reaffirmed that the complete and effective prohibition of the development, production and stockpiling of all chemical weapons and their destruction represents one of the most urgent measures of disarmament.

Finally, the General Assembly of the United Nations, at its thirty-third session, recalling its previous pertinent resolutions, formally requested the Committee on Disarmament, to undertake, as a matter of high priority, at the beginning of its 1979 session, negotiations with a view to elaborating an agreement on effective measures for the prohibition of the development, production and stockpiling of all chemical weapons and their destruction, taking into account all existing proposals and future initiatives.

2. Bearing in mind the recommendations of the General Assembly, and in the light of the growing concern of public opinion at the accumulation of large stockpiles of chemical weapons and the danger of possible development of new generations of such weapons, Italy believes that new and concrete efforts should be promptly pursued within the Committee on Disarmament with a view to the early conclusion of a multilateral convention on the prohibition of chemical warfare.

The multilateral negotiations within the Committee on Disarmament, without hindering current bilateral consultations between the United States of America and the USSR, should, as a first step, review existing proposals and options in order to recognize areas of agreement and disagreement and to identify issues and problems requiring further investigation and clarification, both from a technical and from a legal point of view.

The "Compilation of material on chemical weapons from CCD working papers and statements 1972-76" circulated by the Secretariat of CCD on 11 March 1977 would provide a useful starting point for such negotiations, which should begin, without delay, immediately after the adoption of the agenda and the rules of procedure of the Committee on Disarmament.

Later during the current session — i.e. during the week following the "workshops" on the verification of a chemical convention which are to be held in the Federal Republic of Germany and in the United Kingdom — a series of informal meetings with the participation of experts might also be of some value for the purpose of evaluating the outcome of the "workshops".

The results of these negotiations could be reflected in a position paper to be prepared by the Committee, with the assistance of the Secretariat, before the end of the first session.

3. Not later than the beginning of the summer session the Committee should establish an Ad hoc Working Group, open to the participation of all Member States and, upon invitation, of other interested States for an in-depth consideration of the unresolved problems standing in the way of an agreement.

The terms of reference of the Ad hoc Working Group, which would be assisted by experts whenever appropriate, should be established by the Committee.

In the opinion of the Italian delegation the following controversial issues might be included in the terms of reference:

(a) Format and scope of the agreement;

(b) Destruction, under adequate control, of chemical weapons stockpiles and possible redeployment of research, production and storage facilities.

(c) Verification:

- organizational structure and functions of an international verification system.
- co-ordination and interaction between international and national verification techniques.

(d) Possibility of international co-operative measures, with a view to early detection of potential CW agents.

4. At a further stage, and taking into consideration all the elements resulting from multilateral as well as, hopefully, bilateral negotiations, the <u>Ad hoc</u> Working Group should be entrusted with the task of developing a common understanding of substantive provisions to be agreed upon and then preparing a draft convention universally acceptable.

5. In the view of the Italian delegation, the plan of action outlined above, without hampering progress in discussions proceeding on a bilateral basis, could provide a useful background for such discussions, could contribute to earlier achievement of an effective comprehensive agreement, and give to the international community evidence of specific and fresh activity within the new Committee on Disarmament.

COMMITTEE ON DISARMAMENT

CD/6
6 February 1979

Original: ENGLISH

THE NETHERLANDS

Some Procedural Suggestions with respect to the Development Of a Ban on Chemical Weapons

As the Representative of the Netherlands indicated in his statement[1] on 26 January 1979, it is deemed important that the Committee on Disarmament as a whole should reactivate its discussions on a possible ban on chemical weapons. In this paper some suggestions are made on the possible procedure for such discussions.

In the CCD, a substantial amount of work was accomplished with respect to the chemical weapons question. Besides the presentation of numerous working papers and statements, as well as the holding of informal meetings with experts, several draft treaties were tabled. A substantial amount of background material is therefore available. Most of this material was synthesized in an important informal paper by the Secretariat: "Compilation of Material on Chemical Weapons from CCD Working Papers and Statements, 1972-1976" of 11 March 1977. From this paper it appeared that on many issues the views of the members of the CCD were not far apart, while on others there were differences of view. In this connexion, reference is made to the statement by the Representative of the Netherlands on 2 August 1977[2].

In particular, in the draft treaty presented by the delegation of the United Kingdom[3], different views were amalgamated. However, for some reason the draft did not become the basis for negotiations, inter alia because the bilateral talks between the USA and USSR had just started and because of objections by some members to certain parts of the draft. A fresh approach to our discussions is therefore perhaps useful.

As was indicated, on several issues there did seem to be a common view. However, these common elements for a future treaty never were formalized. The suggestion of the Netherlands delegation is to develop in a number of steps the basis for a convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction.

As a first step, the Committee could try to develop a rather general paper, indicating the areas of agreement and areas where disagreement still exists. As an example, attention is drawn to an earlier working paper by ten members of the group of 15 of the CCD, document CCD/400. Without pronouncing any opinion on the substance of this paper, it may be pointed out that it provides some broad principles

1/ CD/PV.6
2/ CCD/PV.758
3/ CCD/512

GE.79-60147

for a chemical weapons ban. To start serious discussions in the Committee on CW, the development of such a general paper by the Committee during its spring session seems useful. Such a process would make the Committee aware of problem areas and could be of important "educational" value. It would also point to gaps in knowledge concerning particular questions.

The Netherlands delegation has an open mind as to whether it is useful to set up a formal working group for this purpose or whether two or three weeks - for example at the end of March or in April - would be sufficient for informal discussions of the Committee on this subject. These discussions could possibly be prepared by informal contacts made before that time.

After the development of a general paper, the Committee could decide on further steps. It could publish the paper or it could keep it as an informal working document. It could decide to set up technical and/or non-technical groups to further refine particular issues etc. If possible, at the end of the session in August, a more refined paper could be agreed upon, which could then be presented to the United Nations General Assembly. This would allow non-members of the Committee to express views on the paper which could be taken into account next year when the Committee continues its consideration of the issue. The text of a treaty itself would probably follow without too many problems out of a detailed paper which lays down the principles of an agreement.

In the opinion of the Netherlands delegation these discussions in the Committee would not hamper or hinder in any way the bilateral talks between the USA and USSR on chemical weapons. On the contrary, they could be of great assistance to these talks, since the views of the other states could be better taken into account. In the discussions in the Committee, the two powers could, individually or together, express views which would undoubtedly weigh heavily. The two powers could also decide that they do not have to work out a complete agreement between themselves but concentrate on particular problem areas. This would, in its turn, assist the Committee in reaching agreement. The bilateral talks and talks within the Committee as well as other contacts between states and experts to clarify particular issues, such as the "workshops" in the Federal Republic of Germany and the United Kingdom could very fruitfully proceed concurrently.

The procedure outlined would have the advantage - compared with earlier discussions with experts in the CCD, that a basis is laid in a more systematic way for an agreement, which is then refined step by step until a treaty is within reach.

The Netherlands delegation has presented these views in this early stage of our work to make it possible to think them over before the Committee takes up the consideration of its detailed programme of work for this session. Any comments would be highly appreciated.

COMMITTEE ON DISARMAMENT

CD/11
9 April 1979
Original: ENGLISH

GROUP OF 21

Working paper on negotiations on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction

The use of chemical and biological weapons is prohibited in the Geneva Protocol of 1925. Negotiations in the CCD resulted, 1972, in a convention on the prohibition of the development, production and stockpiling of bacteriological (biological) and toxin weapons and on their destruction. The convention entered into force in 1975. Pursuant to article IX of the convention each State Party to it undertakes to continue negotiations in good faith with a view to reaching early agreement on effective measures for the prohibition of the development, production and stockpiling of chemical weapons and for their destruction, and on appropriate measures concerning equipment and means of delivery specifically designed for the production or use of chemical agents for weapons purposes. Since 1972 three draft conventions on chemical weapons have been presented in the CCD by a group of socialist States, Japan, and the United Kingdom respectively. In 1974 the United States and the Soviet Union announced their intention to present to the CCD a joint initiative on the subject of chemical weapons. Since 1976 these two States have held bilateral talks for this purpose. In the CCD a substantial amount of work was accomplished with regard to the chemical weapons question. In that respect a group of non-aligned and neutral countries members of the CCD stated their position in a working paper (CCD 400).

A considerable amount of background material is available. Most of this material was synthesized in an informal paper entitled "Compilation of Material on Chemical Weapons from CCD Working Papers and Statements, 1972-1976", dated 11 March, 1977.

The United Nations General Assembly has in various resolutions repeatedly emphasized the importance of the chemical weapons issue.

The Final Document of the first special session devoted to disarmament underlined that the complete and effective prohibition of the development, production and stockpiling of all chemical weapons and their destruction represent one of the most urgent measures of disarmament.

The thirty-third session of the United Nations General Assembly adopted two resolutions with regard to the chemical weapons question.

In resolution 33/59A the Assembly requests the Committee on Disarmament, as a matter of high priority, to undertake, at the beginning of its 1979 session, negotiations with a view to elaborating an agreement on effective measures for the prohibition of the development, production and stockpiling of all chemical weapons and for their destruction, taking into account all existing proposals and future initiatives.

In the same resolution the Committee is requested to report on the results of its negotiations to the General Assembly at its thirty-fourth session.

In resolution 33/71 the Committee is requested to undertake on a priority basis, at its first session in January 1979, negotiations concerning a treaty or convention on the complete and effective prohibition of the development, production and stockpiling of all types of chemical weapons and on their destruction.

As regards the bilateral talks the Soviet Union and the United States are urged (resolution 33/59) to submit their joint initiative to theCommittee in order to assist it in achieving early agreement on the subject. From the wording of both resolutions it is clear that negotiations in the Committee do not have to be preceded by the conclusion of the bilateral talks. In other words the negotiations in the Committee may proceed parallel with the bilateral talks. It is the firm belief of the Group of 21 that the negotiations in the Committee would not hamper or hinder the bilateral talks. Quite the contrary, the parallel negotiations would be of assistance to each other.

In view of the above and taking into account that multilateral negotiations have not yet started the Group of 21 is convinced of the urgent need to establish an Ad Hoc Working Group, open to the participation of all Member States of the Committee, with a view to elaborating a draft convention on the prohibition of the development, production and stockpiling of all chemical weapons and their destruction. States not members of the Committee would be entitled to submit to the Ad Hoc Working Group written proposals or working documents and to participate in the consideration of the subject-matter of such proposals and working documents.

In discharging its responsability the Ad Hoc Working Group would have as basic texts for its work the draft treaties, proposals and working papers on a convention on chemical weapons presented to the Committee and its predecessors as well as the draft treaties, proposals and working papers submitted to it during the course of its work by both members and non-members of the Committee.

In order to enable the Ad Hoc Working Group to accomplish its task the Committee would request the States participating in the bilateral negotiations on chemical weapons fully to inform the Ad Hoc Working Group on the state of negotiations indicating areas in which agreement has been reached as well as issues which still are outstanding.

In the process of elaborating the draft convention the Ad Hoc Working Group would inter alia identify areas of agreement and possible new elements of importance for the formulation of the scope and verification of a chemical weapons convention.

COMMITTEE ON DISARMAMENT

CD/15
24 April 1979
Original: ENGLISH

UNITED KINGDOM OF GREAT BRITAIN & NORTHERN IRELAND

Visit to Britain by Chemical Weapons Experts (14-16 March 1979)

Nineteen governments were represented on the visit which consisted of two parts: the first an inspection of a former nerve agent plant in the process of demolition at Nancekuke in Cornwall and the second a tour of a civil chemical factory near Birmingham. Notes on certain points connected with the visit are given below.

I. Participation

The following governments sent representatives to take part in the visit:

Australia	Japan
Belgium	Netherlands
Canada	Norway
Egypt	Pakistan
France	Romania
Germany, Federal Republic of	Sweden
Greece	Turkey
Indonesia	United States of America
Republic of Ireland	Yugoslavia
Italy	

II. Chemical Defence Establishment, Nancekuke

Note on some problems connected with dismantling a Nerve Agent Plant:

1. The GB pilot plant at Nancekuke was closed down as a toxic facility in the mid 1950s. At that time, the whole plant was washed out with sodium hydroxide solution as a decontaminant. A small part of the plant was dismantled in the 1960s to enable part of the building to be used for other work. The majority of the equipment was not dismantled until 1978/79.

GE.79-61394

2. On the basis of British experience at Nancekuke, the major tasks involved can be summarized as follows:

(a) Re-establish special medical control of staff.

(b) Re-establish full safety precautions.

(c) Install a detection monitoring system.

(d) Dismantle item by item, working from the highest point.

(e) Further decontaminate each plant item removed.

(f) Recover valuable materials of construction.

(g) Dismantle cubicles and ventilation equipment.

(h) Maintain control of decontamination effluent.

3. Medical control of staff required that the blood cholinesterase norm for every person be established before working in the toxic facility. During the dismantling period this cholinesterase level was checked regularly and also measured immediately if any symptoms of poisoning were observed. A medical officer was based in the plant area in direct voice contact with the scientist in charge and each person was medically examined for symptoms of poisoning before leaving work each day. Arrangements were also made for medical treatment to be readily available after working hours, should any symptoms develop then.

4. The safety precautions necessary for work in a toxic environment are that:

(a) All personnel change completely into works clothing.

(b) Access to the work area is limited to authorized personnel only, with entry and exit being recorded.

(c) Entry into toxic cubicles is controlled and recorded.

(d) Full protective clothing and respirators are to be worn by personnel entering a toxic cubicle.

(e) There is an alarm system to warn of an emergency.

(f) All personnel in the immediate area of the plant carry a respirator.

(g) There are adequate facilities for decontamination of personnel and equipment.

5. The dismantling of the plant must be done by a team of experts who are fully acquainted with all parts of the plant and experienced in toxic engineering techniques. It requires meticulous attention to detail and a painstaking approach to establish that every possible trace of liquid which could either be decontaminant liquor or trapped agent is removed before dismantling of a particular item commences. A systematic and planned procedure is necessary and as each joint is broken, whether in a vessel or in a pipeline, the ends are wrapped with neoprene sheet to prevent drips of material from contaminating other areas.

6. The likely areas of contamination are in jointing materials and glands of moving parts, e.g. agitators and valves. Although the original "wash-through" with decontaminant would serve to destroy the majority of toxic chemical, some will remain trapped by airlocks and absorbed on jointing and packing material. As each item of plant is removed it much therefore be totally immersed in sodium hydroxide solution to ensure complete decontamination.

7. The primary material of construction used in the UK plant was silver, and this was recovered by smelting at high temperature and casting into ingots for re-use as a base metal. If other materials of construction were used (e.g. stainless steel or nickel alloys) it is likely that the equipment could be re-used for other purposes. However, if the equipment were homogeneously lined, say with enamel or lead, the lining would have to be stripped out to ensure complete decontamination as pin-hole leaks may have allowed toxic material to be trapped between the lining and the base metal.

8. Following the removal of all plant the cubicles and ventilation systems would be dismantled and finally the effluent treatment and control systems demolished.

9. On-site inspection of the type demonstrated in the UK visit can establish that plant has been removed and in the case of Nancekuke that theequipment was actually destroyed by melting. It can also show that a facility has been completely immobilized through removal or dismantling of the essential ancillary element of a toxic plant, namely the means of totally enclosing the plant (cubiclisation) and the systems for ventilating the exhaust air through cleaning/ detoxification equipment. It should however be emphasized that the comments made apply to the final toxic stage of a pilot plant process to produce a nerve agent.

III. Albright and Wilson Ltd., Oldbury, near Birmingham

Civil chemical works covering twenty hectares and including about thirty-five separate units. Areas visited on 16 March were:

(a) Phosphorus receipt and distribution; phosphoric acid; phosphorus chlorides.

(b) Other phosphorus-using processes; phosphorus pentasulphide, alkali phosphates.

(c) Organic phosphorus compounds (phosphites, phosphates); general organics; malathion building.

(d) Support facilities; research and technical service laboratories; works laboratory; medical centre, effluent treatment plant.

COMMITTEE ON DISARMAMENT

CD/21
20 June 1979
Original: ENGLISH

POLAND

Prohibition of the development, production and stockpiling of all chemical weapons and their destruction: working paper

As the Committee on Disarmament is about to proceed at its current session with the consideration of the substantive matters on its agenda, the question of the prohibition of the development, production and stockpiling of all chemical weapons and their destruction stands out as one of the pressing issues.

Indeed, the problem of the total elimination of these weapons from the arsenals of States has been under active consideration for well over a decade. The comprehensive discussions in the General Assembly of the United Nations and in the Conference of the Committee on Disarmament, often with the benefit of expert advice, have helped to identify some of the crucial problems involved. They also served to clarify the positions of individual States and of the community of nations at large with respect to chemical disarmament. Over the years, these positions have found their reflection in three draft agreements tabled by the socialist countries,[1/] by Japan[2/] and by the United Kingdom[3/] as well as in countless working documents and General Assembly resolutions.

More recently, the views of States with respect to the prohibition of chemical weapons, have been put together by the Secretariat in a useful informal paper of 11 March 1977: "Compilation of Materials on Chemical Weapons from CCD Working Papers and Statements, 1972-1976".

It is a matter of record that Poland and other socialist States, spared no effort, in the General Assembly of the United Nations and in the CCD, to bring closer the conclusion of an agreement on the complete elimination of chemical weapons, i.e. indiscriminate weapons of mass annihilation which, if ever used, would have most devastating effects upon innocent and unprepared civilians. There was also the concern that unless a comprehensive ban on all chemical weapons is

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1/ CCD/361.

2/ CCD/420.

3/ CCD/512.

agreed upon, the technological progress in the field of chemical warfare could lead to unpredictable further breakthrough, posing even greater threat to man and to his environment.

The Government of Poland shared in the widespread gratification at the opening and pursuit of intensive bilateral negotiations between the Soviet Union and the United States seeking to elaborate a joint initiative on the prohibition of chemical weapons for its subsequent presentation to and finalization in a treaty form by the CCD. Accordingly, the announcement of the negotiating parties earlier last year that in their negotiations large measure of agreement emerged on a number of issues while several important questions remained to be resolved in the time ahead, particularly in the area of verification, was welcomed in Poland with satisfaction and anticipation.

At the same time, while believing that a political framework agreement between the USSR and the United States offered the most realistic approach to the multilateral effort aimed at an effective CW ban, Poland considered that the CCD should continue giving its close attention to the question of the total elimination of chemical weapons.

That basic view has been reaffirmed in paragraphs 45 and 75 of the Final Document of the Tenth Special Session of the General Assembly devoted to disarmament as well as in operative paragraph 2 and 3 of resolution 33/59 of the General Assembly.

The interesting working papers contained in documents CD/5, CD/6 and CD/11, which address the Committee's responsibility in the field of CW, deserve attention in the first place as manifestations of the determination of their authors and co-sponsors to contribute to the elimination of the threat posed by the ever growing inventories of chemical weapons.

Bearing in mind the differences of views with regard to the substance of the question of prohibiting chemical weapons reflected, as they are, in the three draft agreements as well as in other documents submitted in the Committee and taking into account the various proposals concerning the method of pursuing discussions within the framework of the Committee on that subject, the Polish delegation suggests to establish, as a modest first step, an open ended and informal contact group. Its objective should be to seek to define further the most appropriate methods and forms of the Committee's work and to harmonize them with the bilateral efforts in order to accelerate progress towards early agreement on the prohibition of chemical weapons.

To accomplish its tasks, the contact group could hold consultations with the authors of the existing documents as well as with the representatives of the States participating in the bilateral negotiations. The group should subsequently submit its suggestions for their consideration at a later stage of the current session of the Committee on Disarmament.

COMMITTEE ON DISARMAMENT

CD/26
1 July 1979
Original: ENGLISH

Compilation of Material on Chemical Weapons from the Conference of the Committee on Disarmament and the Committee on Disarmament Working Papers and Statements, 1972-1979

(prepared by the Secretariat at the request of the Committee on Disarmament)

Editorial Remarks

The Conference of the Committee on Disarmament (CCD), on 3 September 1976, requested the Secretariat "to undertake, if possible before the beginning of the Committee's 1977 session, a compilation of appropriate material from working papers and statements on the question of chemical weapons presented to the Committee in recent years" (CCD/PV.727).

On 11 March, the Secretariat distributed an unofficial paper entitled, "Compilation of Material on Chemical Weapons from CCD Working Papers and Statements, 1972-1976." The paper consisted of (i) an outline listing the areas covered in the compilation, (ii) the body of the compilation, and (iii) a list of references.

In carrying out its task, the Secretariat adopted the following criteria:

(a) As requested, the compilation referred only to statements and working papers of the CCD.

(b) The compilation covered the material of the years 1972 to 1976, that is, the period following the conclusion of the Convention on Biological Weapons. Only occasional references were made to earlier CCD sources.

(c) The compilation consisted of a summary description of the main points covered in that material.

(d) In the text of the compilation views were not attributed to any particular member of the CCD. However, as mentioned above, a list of references to sources was provided.

(e) No attempt was made to try to identify possible trends towards a consensus on any of the various aspects of the question of chemical weapons. Also, no attempt was made in the text of the compilation to refer to or summarize statements as supporting or questioning specific suggestions.

(f) While detailed technical information regarding chemical properties, toxicities, operation of verification methods, etc., was not summarized, that information could be easily identified by means of the list of references.

(g) No references were made to informal meetings with experts, since no official records existed for them. However, if material relating to informal meetings with experts was subsequently issued in official CCD documents, it was covered in the compilation.

(h) The material of the compilation was arranged under headings that roughly followed the provisions of the draft agreements submitted to the CCD.

At its 31st plenary meeting, on 27 April 1979, the Committee on Disarmament requested the Secretariat to bring up to date the informal document of 11 March 1977 and to circulate it as an official document of the Committee (CD/PV.31, p.53).

Pursuant to that request, the Secretariat has prepared this document, which follows the same criteria adopted for the original paper, as described above. The updated document includes in the compilation material from working papers and statements presented to the Conference of the Committee on Disarmament during its 1977 and 1978 sessions as well as those working papers and statements presented to the Committee on Disarmament during the first part of its 1979 session.

Outline

1. Introduction

In 1971, the CCD started negotiations on a ban on biological weapons separately from negotiations on chemical weapons, but with the understanding that the final objective remained the prohibition and elimination of chemical weapons as well. It was also agreed that toxins would be included in the ban, thus significantly broadening its scope.

The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction was concluded by the CCD in 1971. It was commended by the General Assembly in resolution 2826 (XXVI) and entered into force on 26 March 1975.

In the Preamble of the Convention the States Parties recognized that an agreement on the prohibition of biological and toxin weapons represented a first possible step towards the achievement of agreement on effective measures also for the prohibition of the development, production and stockpiling of chemical weapons. Moreover, in Article IX of the Convention, each State Party affirmed the recognized objective of effective prohibition of chemical weapons and, to that end, undertook to continue negotiations in good faith with a view to reaching early agreement on effective measures for the prohibition of their development, production and stockpiling and for their destruction, and on appropriate measures concerning equipment and means of delivery specifically designed for the production or use of chemical agents for weapons purposes. Article VIII of the Convention also provided that nothing in the Convention should be interpreted as in any way limiting, or detracting from the obligations assumed by any State under the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous and Other Gases, and on Bacteriological Methods of Warfare, signed at Geneva on 17 June 1925.

Beginning with its twenty-sixth session in 1971, and at its subsequent sessions the General Assembly adopted a number of resolutions*/ by which it requested the CCD and subsequently the CD to continue negotiations as a matter of high priority with a view to reaching early agreement on effective measures for the prohibition of the development, production and stockpiling of chemical weapons and for their

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*/ Resolutions 2827A (XXVI), 2933 (XXVII), 3077 (XXVIII), 3256 (XXIX), 3465(XXX), 31/65, 32/77, S-10/2, 33/59A and 33/71H.

destruction. It also invited all States that had not yet done so to accede to the 1925 Geneva Protocol and called for the strict observance by all States of the Objectives contained therein.

From 1972 to 1979 the CCD and the CD devoted intense efforts to the question of chemical weapons. It considered in detail all the main aspects of the question, including the scope of a ban, verification, complaints procedures and other related matters.

The main points considered by the CCD and the CD in this context are referred to below under the relevant sections.

2. Scope of ban

With respect to the scope of a ban on chemical weapons, two main approaches have been discussed: a comprehensive ban in one step and a step-by-step approach.

2.1 Comprehensive ban

The following suggestions have been made in connexion with the question of a comprehensive ban:

Development, production, stockpiling, acquisition or retention of chemical warfare agents and of chemical weapons should be prohibited (1) as well as their use (2). These activities should also be prohibited with regard to munitions, equipment and means of delivery (3). Chemical warfare agents, chemical weapons, equipment and means of delivery should be destroyed or diverted to peaceful use (4). Various kinds of military activities, such as offensive military training, should be prohibited (5).

Parties to any convention banning chemical weapons, in addition to assuming the obligations as determined by the scope of the convention, should undertake not to transfer to any recipient whatsoever and not in any way assist any State or international organization to manufacture or acquire any of the agents, weapons, equipment or means of delivery to be banned under the convention (6).

A convention should not hinder measures for acquiring protection against chemical warfare (7), including assistance (8), prophylaxis and medical treatment (9).

In order not to encourage the development of chemical warfare agents, it should be prohibited to issue patents for chemical warfare agents and presently existing patents should be voided (10).

The convention should provide for adequate verification (11) or a system of guarantees to ensure that all parties are complying with the obligations (12).

Adequate verification should be based on a combination of national and international arrangements, including the creation of a consultative committee (13).

Upon signing or adhering to a convention (14), or when a convention enters into force (15), parties should declare their possession of chemical weapons, agents and production facilities (16).

Any such convention should be implemented in a manner designed to avoid hampering the economic or technological development in the field of peaceful chemical activities (17).

In a convention banning chemical weapons nothing should be interpreted as in any way limiting or detracting from the obligations under the Geneva Protocol of 1925 as well as under the Biological Weapons Convention (18).

The need for a further general position paper with a broad covering of the subject has been expressed (19).

2.2 Step-by-step approach

Various suggestions, as indicated below, have been made in connexion with this approach, on the assumption that a comprehensive ban could not be attained in one step. What these suggestions have in common is that they define initial, limited steps which would help achieve a comprehensive ban at a later stage (20). The view has been expressed that a partial approach introduces new technical elements and may stimulate military interest in sectors not covered by a partial agreement. Binding obligations to continue negotiations would then be needed (21).

One suggestion is that a moratorium would be declared on the development, production and stockpiling of the most lethal chemical warfare agents, pending agreement on the prohibition of such weapons (22).

According to another proposal, the first stage would consist of a ban on the development, production and stockpiling of supertoxic chemical warfare agents, together with the destruction of such agents (23).

Another formula envisages, as a first step, the conclusion of a convention dealing with the most dangerous, lethal means of chemical warfare (24).

The prohibition of all lethal chemical warfare agents, with or without a phased destruction of stockpiles, has also been envisaged (25).

Another proposal covers lethal chemical agents and other toxic chemical agents intended primarily to cause long-term physiological harm to human beings, with phased destruction of such agents (26).

Verifiability of production of chemical warfare agents (see 2.4.2 below) has been proposed as another possible criterion (27). This criterion might be applicable to the production of nerve gases, belonging to the so-called organophosphorus chemical compounds, which include many compounds having peaceful uses (28).

Some comments have been made regarding the delimitation of weapons, equipment and delivery systems to be banned (29). In one instance reference was made to munitions instead of weapons, with a view to covering binary chemical weapons (30).

With regard to activities to be prohibited, a first step might comprise a ban on production without destruction of stockpiles (31). On the other hand, stockpiles might be destroyed, while production facilities would be kept "moth-balled" (32).

A phased approach with regard to gradual destruction of stocks but within a comprehensive scope has also been suggested (33).

A comprehensive ban might be reached in steps by bringing under the ban, at appropriate times, items which had been left out (34). The scope of a convention should not be such as to be discriminatory against certain countries (35). The use of chemical weapons may be more probable in regional conflicts than in a major war (36). Regional agreements might prove to be useful supplements to a convention and could increase the prospect that the international community accept a chemical weapons ban (37).

Principles for delimiting the scope might be set out in a protocol to the convention or drafted and finalized outside the text of the basic agreement (38).

A method of delimiting the scope would be to list the chemical warfare agents to be covered by a convention (39). In this connexion it has been suggested that the warfare agents which the parties agreed to ban should be listed in an annex to the convention. As an alternative, one might list those agents which were to be exempted from a ban (40). One could also exempt for some time activities to be prohibited rather than agents (41).

The principle of delimitation would also apply with respect to the distinction between activities and agents related exclusively to warfare use, referred to as "single-purpose", and those which might also have a peaceful use, referred to as "dual-purpose" (42). A way of dealing with this problem might be to make a prohibition of single-purpose activities and agents unconditional, while the prohibition would be conditional with regard to the dual-purpose activities and agents (43). The so-called "purpose criterion" (see 2.4.1 below) could also be used in dealing with this problem (44).

2.3 Definitions regarding scope

2.3.1 Activities

With respect to the scope of activities which might be banned, three main categories of activities have been considered, namely, development, production and stockpiling, covering agents as well as weapons. Also planning, organization and training for offensive purposes have been mentioned.

In connexion with a phased agreement, the question has been raised whether such an agreement should initially encompass all activities affecting only certain CW agents, certain activities affecting all agents, or certain agents as well as certain activities (45).

Possible new elements of importance for the formulation of the scope of a convention may be identified in the process of the elaboration of the draft convention (46).

Reference has been made repeatedly to the fact that peaceful activities must not be hindered or interfered with (47).

With regard to development, production and stockpiling, it has been proposed that the general purpose criterion should apply (48). It has been suggested to examine the possibility that new types and new systems of chemical weapons be covered by an agreement on new types and new systems of weapons of mass destruction (49).

2.3.2 Chemical weapons

Chemical weapons have been described as combinations of the effective component -- the chemical warfare agent -- and the means and organizational structures for their military use (50).

Binary chemical weapons have been described as chemical weapons in which two less toxic chemical agents react to form a highly toxic agent on the way to the target (51).

Chemical weapons are considered to be weapons of mass destruction (52). It has been pointed out that there is a real danger that chemical weapons may be gradually assimilated and accepted as conventional weapons, if no agreement is reached to ban them (53).

It has also been suggested that "multi-purpose chemical weapons" causing pysiological as well as mechanic and thermal effects should be treated as chemical weapons (54). The possible effect of chemical weapons on civilian populations and their sources of food and water make them detrimental to national and international security (55).

2.3.3 Chemical warfare agents

Chemical warfare agents are chemical substances which might be used in war because of their toxic properties (56). Effects on animals and plants should also be considered (57). Chemicals used in war for other purposes as, for instance, explosives, gun powder, fuel, smoke-generating chemicals, lubricators and napalm, etc., (58) have effects which are physical in their nature and do not belong to the category of chemical warfare agents.

Those chemicals which are precursors to the active agents in binary chemical weapons are in a special position (59). The purpose criterion might apply to them as well as to incapacitating agents (60).

A detailed definition of chemical warfare agents, including binary components, might be provided for in a protocol to a convention (61).

Several criteria have been suggested to describe the toxic properties of chemical warfare agents. They refer to the different toxic effects with regard to men, animals and plants (62). They are related to the various types of toxic effects (63) and penetration routes depending on the toxic agents involved (64). The degree of toxicity has been suggested as a criterion for determining the delimitation of single and dual purpose chemicals from each other, and from those with only peaceful use, as well as for delimiting super-toxic substances from less toxic ones (65).

Not only toxicity but also other properties have to be taken into account when evaluating a chemical as a possible chemical warfare agent (66). Relationship with respect to chemical structure has been mentioned as one delimitation criterion (67). One should also consider that the absence of protection and medical treatment facilities against chemical warfare may make less toxic agents suitable as chemical warfare agents in an attack against a country (68). Some of these criteria have been discussed (69) and their relationships for delimitation purposes have been analysed (70).

Toxins are already covered in the BW Convention, but since they have been characterized as lethal chemical substances (71), and in order to avoid ambiguities in interpretation, it has been suggested that they should be explicitly mentioned also in any future CW convention (72). Corresponding views have been expressed with respect to herbicides and defoliants about which it has been noted that certain restrictions apply to their use under the Enmod Convention and the new Protocols to the Geneva Conventions on Humanitarian Law in Armed Conflicts (73).

Recently, consideration has been given to some chemical agents with respect to their particular effects, such as those resulting from delivery of non-toxic or low-toxic agents to the target area, where they, either by reacting with components in the target or making it possible for components in the target to react with each other, result in some detrimental effects which directly or in the long run may cause harm to human beings (74).

2.4 Delimitation criteria

2.4.1 Purpose and quantity criteria

One important way to distinguish between activities and weapons (including agents) which are to be prohibited and those which are not to be prohibited, is to look for the underlying purpose, i.e. the general purpose criterion (75). Accordingly, all single-purpose activities and agents having use only for war should be unconditionally prohibited. The purpose criterion might also cover incapacitating agents as well as agents which may be developed in the future (76). Dual-purpose agents might be only conditionally prohibited, i.e. allowed as long as no warfare use was intended (77). The presence or absence of such intentions might be judged from the amounts of possible warfare agents and equipment involved. This quantity criterion is closely connected with the purpose criterion (78). With regard to the basis for justification of the quantities produced, which may vary considerably from thousands of tons to just a few kilograms a year (79), suggestions have been put forward aiming at national analysis of open-production statistics by the parties to a convention (80) (see 3.2.3.2 below), or reporting or declarations of production to some international body for further analyses (81).

2.4.2 Verifiability criteria

There exists an inter-relationship between attainable prohibitions and the potential of various approaches to verification (82).

One criterion for deciding whether production of a potential chemical warfare agent shall be banned or not is the verifiability of the production (83). The application of this criterion to at least the organophosphorus compounds has been considered to be possible (84), as these compounds have a relatively homogenous basis in the consumption of certain types of phosphorus and certain derivatives of that element.

(Verification issues are dealt with in detail in section 3.2 below).

2.4.3 Effect criteria

The main property that makes a chemical substance a chemical warfare agent is its toxic effect. One definition of "toxic" that has been suggested is "poisonous in the sense of causing physiological injury to a human; this includes blistering, blindness and death" (85). The expression "long-term physiological harm to human beings" has also been used in this connexion (86). Accordingly, a system to determine toxicities of chemical substances was suggested early during the deliberations on chemical weapons (87). This system has been regarded as a possible tool for determining the scope of a ban with respect to chemical warfare agents (88). One might, for instance, differentiate super-toxic, single-purpose agents from less toxic, dual-purpose agents (89). Two different toxicity limits might be used to delimit such less toxic dual-purpose agents from super-toxic agents and from other chemical substances which cannot be used as warfare agents (90). A step-by-step approach might utilize the purpose criterion, supplemented by the toxicity criterion (91).

Delimitation might be facilitated by combining structure and toxicity criteria, at least with regard to super-toxic, organophosphorus compounds (92).

Some of the technical discussions in the CCD have been devoted to suggestions on actual numerical values of suitable toxicity limits (93). With regard to suitable limits for super-toxic agents, several figures have been suggested, which are all within the same order of magnitude (94). These differences, nevertheless, imply that potentially important chemical warfare agents may or may not be delimited as super-toxic agents, among them binary and multicomponent weapons (95). Methods to establish the limits as well as the degree of confidence that may be placed in the different approaches have been discussed (96). The need for evaluating and agreeing on standardized procedures for toxicity determination have been stressed (97).

Somewhat different methods must be used to determine the toxic effects -- other than lethal -- of harassing and incapacitating agents (98).

2.4.4 Chemical structure

The scientific system for describing the chemical structure of chemical compounds allows prediction of the structure even of compounds which may not yet have been synthesized. Thus it is theoretically conceivable to describe entire groups of toxic, chemically related compounds and suggest that such groups should be subject to prohibition under a convention. Therefore, one should, in theory, be able to cover in a convention even compounds similar to existing chemical warfare agents but not yet synthesized (99). Examples of groups of chemical agents which might be delimited in this way are the super-toxic organophosphorus compounds, which include the nerve agents, and also certain binary weapons components, mustard-type agents and arsines (100).

2.4.5 Other properties

Chemical substances may be very toxic, but, for a number of reasons, may be unsuitable for use in chemical weapons. By evaluating to which extent the properties of a chemical substance fulfil certain requirements, one could develop a method to determine whether a chemical substance can be considered to fall under the prohibitions of a CW ban (101). Such properties comprise, among others, shelf-life, volatility and explosion stability. By giving properties weighted numbers, a combination of such scales could provide an index or "evaluation number" that could help determine whether chemical substances can be classified as chemical warfare agents (102).

A way to establish whether known chemical agents fall under a ban is to list them (103). Combinations of criteria like toxicity and structural properties have been suggested in order to reduce the number of substances which might be necessary to list (104).

Lists, both of banned and exempted agents, might appear in one annex to a convention, implying that agents not mentioned in either of them would be covered by the purpose criterion of the convention which, in effect, would be comprehensive (105). Such lists could be reviewed and updated from time to time. This dynamic character of the scope of the convention should be the subject of closer analysis, with a view to determining whether this might provide for an effective step-by-step procedure towards a comprehensive agreement (106).

Using the (amended) single Convention on Narcotic Drugs of 1961 as a model other types of lists of CW agents could be constructed with a special view to the desirability of different types of verification. For this purpose the UNEP International Register of Particularly Toxic Compounds may be useful (107).

3. Compliance

With respect to the question of compliance, the following aspects have been considered.

3.1 Confidence-building measures

It has been suggested that confidence-building measures might occur both before and under a convention (108).

Countries should declare their CW policies and those possessing chemical weapons should declare their stocks (109). Parties could declare their possession of chemical weapons and production facilities either upon signing the treaty (110), when ratifying it (111), or upon its entry into force (112). With respect to requests for information the principle of equal security has been evoked (113). Other confidence-building measures, prior to the conclusion of a convention, might be to invite other countries to observe destruction of declared stocks (114) or to arrange technical exchange visits to selected facilities (115). Invitations to technical visits were discussed in the Committee on Disarmament and results from the visits have been described (116). Exchange of information on protection activities might also serve as a confidence-building measure (117). Partial agreements might themselves be confidence-building with respect to reaching a comprehensive ban (118). It has been pointed out that confidence-building and verification are different concepts that should be separated (119). Further consideration of confidence-building measures might be valuable (120).

3.2 Verification measures

3.2.1 National verification measures

One basic approach to the problem of verification is that the convention should to some degree be an expression of trust among countries (121). A nation's continued assurance that a convention is complied with should be based on utilizing national means of verification in combination with some international measures (122). This might imply setting up particular national verification organizations or control committees. Members of the committees might be representatives of governmental agencies, public organizations and experts. Their task should be to monitor that no violations against the convention take place within a country. A national verification organization might also exchange and analyse nationally and internationally available information (123). National means of extraterritorial control could utilize a combination of remote monitoring, including the use of satellites, and indirect monitoring by means of statistical data analysis (124). Such an organization should put forward suggestions regarding necessary national legislation for compliance with the treaty (125). One task might be to report information about national activities to an international verification agency (126). Countries which lack national technical facilities for establishing verification measures on their own might be put at a disadvantage if a convention only provided for national means of verification (127). In order to work out standardized programmes for national verification agencies, it might be useful to arrange international expert conferences or establish basic principles internationally (128). The possibility of using supervision procedures in addition to national means may be investigated. (129)

3.2.2 International verification measures

The view has been expressed that a country in possession of a chemical weapons capability gives up a significant military option if it becomes party to an agreement banning such weapons (130) and that it would renounce the possibility of "retaliation in kind" if it were attacked with chemical weapons. It would also lose the deterrent effect such a capability might have (131). For the sake of its own security, a country may wish to include in the agreement verification provisions designed to prevent other parties to the convention from secretly preparing or maintaining a chemical weapons capability (132). Such provisions have been suggested specifically to comprise international verification measures, including on-site inspections (133). Regularity of inspections would enhance confidence-building (134). These measures should be sufficiently effective to actually deter parties from possible violations (135). The verification measures need not be 100 per cent effective (136). States armed forces should be exempted from international verification (137). In addition to its deterring effects, an international verification system would provide continuous reassurance to the parties that no violations were occurring (138). A country having been subject to on-site verification can share its experience with other countries (139). International verification measures can be supplemented by national ones (140). Concerning the degree of intrusiveness of methods, on-site inspection has been considered to be too intrusive (141). However, different degrees of intrusiveness can apply also to on-site verification activities (142). Different international verification methods, applied together, will reinforce each other (143). Non-intrusive international verification measures may observe certain activities and involve analysis of the observations, in order to obtain indications of possible violations as a basis for further verification and complaints procedures (144).

3.2.2.1 Organizational aspects

International verification activities could be conceived of as taking place on a voluntary basis in co-operation with national control committees (145). Consultative committees could also be established from among the parties themselves as a result of a formal agreement (146).

The agreed type of information prepared by national verification committees, or otherwise available, could be circulated, studied and analysed for consistency either by particular expert groups called upon by the Parties to the Convention (147), by a consultative body or committee (148), or by a verification agency (149). The Secretariat of the United Nations might be assisted by experts in considering verification problems (150). A comprehensive scheme would comprise an international body authorized to carry out verification, when so requested by a party or on its own (151). Such a body could also be entrusted to carry out on-site inspections (152). Preparation of technical material, for use in the implementation of a chemical weapons ban, for instance in the form of an "analytical handbook" for chemical analyses, is already being undertaken at this stage (153).

With regard to international verification agencies, different suggestions regarding their names and functions have been put forward (154). Some suggestions also consider the specific need for international verification of a chemical ban together with the question of international verification of a disarmament agreement in general (155).

Existing international organizations with technical resources, like WHO and UNEP, might suitably take on certain monitoring activities to ensure compliance with a treaty (156). They could, for instance, collect technical information on properties of chemical substances and methods of chemical analyses and also provide experts (157).

Costs and manpower requirements for any international verification activities and organizations should be kept as low as possible (158). There is a risk that international verification measures may lead to unwanted and illegal disclosures of a nation's military, technical and industrial secrets to other nations (159) and some measures to avoid such risks have been suggested (160). Information on chemical agents listed in annexed lists to a convention could contribute to verification measures (161).

3.2.3 Verification for specific activities

3.2.3.1 Development*/

Much development in the field of chemical weapons has originated from research and development for peaceful purpose, sometimes far in advance of the actual weapons development (162). One way of getting an early indication on potential chemical weapons applications is a systematic, computerized search of internationally available scientific and technical literature on a routine basis (163). Open reporting and internationalization of information has been called for (164). Suggestions on voluntary exchange of information have taken into account results of scientific research and developments for peaceful purposes (165).

One activity that is related to the development of chemical weapons is field testing. Field tests might be detected and monitored by so-called remote sensing methods (166). What is usually meant by remote sensing is the use of analytical equipment that can provide information on phenomena at a distance from the analysing equipment or the observer (167). The possibility of detecting field tests with nerve agents by means of satellite based spectrophotometric instruments (infra-red sensitive) have been analysed (168). An analysis has also been carried out regarding the capacity of similar instruments, as well as of others based on different principles, on the assumption that such instruments would be placed on earth but outside the borders of countries to be monitored. Geographical and meteorological conditions are found to influence all the methods discussed (169).

3.2.3.2 Production

Verification of non-production of chemical weapons presents the basic difficulty of proving the negative (170). Control measures can be carried out in production facilities resulting in assurance of non-production of chemical warfare agents, without disclosure of production secrets. Such measures could include regular on-site inspections, arranged by an international control agency (171).

Verification problems relating to the production of chemical agents, munition and equipment for delivery, and of facilities for filling the munition have been considered (172). Parties to a convention should declare means of production of chemical munitions and chemicals covered by the convention. (173) The difficulties of obtaining access to military installations for verification purposes have been mentioned (174). Confirmation by some method that production for chemical weapons

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*/ Some of the methods mentioned in this section might be applicable also to monitoring air, earth and water around production and destruction facilities and be considered also in the next three sections.

does not occur may be relevant only with respect to that particular verification activity and not necessarily prove that a violation had not occurred (175). Even if verification methods by means of which violations of a production ban can be devised, their practical application would be difficult due to the magnitude and diversity of the chemical industry (176).

Providing information on pertinent production activities for analysis by concerned parties constitutes one way of providing material for verification activities (177). Historically known chemical warfare agents might be continually listed as a basis for information on chemical production facilities (178). Reference has been made to the use of production statistics, transportation data, etc., as a means to follow the production of relevant chemical substances in different countries (179). As an illustrative example of such an accounting method, a verification system relating to the production of organophosphorus compounds, to which the nerve agents belong, has been worked out in some detail and a number of limitations, including possible evasions, have been described. That system envisages that both national and international organizations would operate. The system requires that information be available from independent sources. Verification personnel should be allowed to visit production sites and would require basic information from different production levels to check the overall balance of the system, when warranted by analyses of statistical material (180). Verification measures should encompass also other chemical warfare agents than those of organophosphorus origin (181).

With regard to proposals for verification of a ban on production of dual-purpose agents for warfare use, it has been indicated that the production of dangerous chemical agents is being increasingly brought under both national and international regulations (182).

Several methods to control the actual production of chemical warfare agents have been suggested. On-site inspection has been requested for verifying that proscribed chemicals are not produced in facilities for similar substances (183). It has been debated whether photographing from satellites or airplanes, or mere ocular observation from the outside of a production plant might provide useful information (184). Remote sensing methods for monitoring outlets and surroundings of chemical plants are conceivable under certain conditions (185). Highly sensitive chemical analysis of actual samples from such areas is also conceivable (186). Attempts may be made to detect those products that may develop when CW agents, as well as other chemical substances involved in their production, leak out into the surroundings. Also, the presence of certain binary weapons precursors could be demonstrated (187). Also, it may be possible to analyse and follow chemical traces in the environment for some time after a release, or in connexion with an alleged use (188).

One prerequisite for resorting to such methods is either to get access to the place from which the material to be analysed can be obtained, or to ensure that unmanned analytical equipment can function undisturbed at the place. The possibility of sampling of material by means of unmanned "black boxes" for actual chemical analysis in situ or elsewhere, as well as the usefulness of these methods, should be investigated (189).

In this connexion, several technical devices characterized as "on-site but non-intrusive" have been presented with the aim of ensuring that, after an agreement has been reached, relevant equipment or areas are not tampered with. These might include production facilities which, in accordance with the agreement, would cease production and remain "moth-balled" without on-site inspection -- a technique that has also been developed to safeguard nuclear facilities. Monitoring of compliance of that agreement might then take place by means of a country's "own national means of verification" (190). Non-intrusive verification methods of "moth-balled" production facilities could not substitute for destruction or conversion to civilian uses of the facilities (191). Absence of safety measures in a production plant may be a sign that no CW agents are produced there, even if in some instances production of substances with low acute, but high chronic toxicity exist (192).

Possibilities for "familiarization exchange" of information, as discussed in connexion with other arms control treaties, have been suggested (193).

It has been suggested that by utilizing a proposed system for delimitation of potential chemical warfare agents by means of a combination of evaluations relating to the different properties of a substance (194), one might find a means of directing the activities of a verification agency with regard to development or production of chemical substances for potential warfare use (195).

It is considered that verification of production of chemical weapons must reflect the fact that this production has more in common with biological weapons than nuclear weapons (196).

3.2.3.3 Stockpiling

Discussion on this subject has dealt with munitions and bulk storage of chemical agents (197). Reference has been made to the problem of how to verify that chemical munition is not stored together with ordinary munition (198). Remote monitoring of munition transports may be the only way of finding secret stockpiles (199). A comprehensive ban might facilitate verification of munition stockpiles, since no chemical munitions at all would be allowed (200). The difficulty of finding hidden stockpiles has been mentioned (201). Declaration of stocks before the conclusion of a convention, or upon its entry into force, could inspire confidence among parties concerned (202), and facilitate planning of a destruction programme (203). A convention should contain provisions for declaration of stockpiles (204).

Monitoring the state of known stockpiles by air or satellite reconnaissance seems to have only limited possibilities (205). On-site visits to known stockpiles may confirm the nature of the stockpile, if admittance to the storage facilities is allowed. Possibilities would exist to find out whether stockpiles contain chemical weapons and what type of agent they contain, if measurements were allowed immediately outside the actual site (206). When stored over a long time, munition and bulk storages may begin to leak and deteriorate, necessitating adequate arrangements for taking care of such situations. Such measures may or may not be observable depending on whether particular precautions had been taken (207).

3.2.3.4 Destruction of stockpiles

Various technical aspects of destruction of stockpiles and the possible means of verifying such destruction have been discussed in a number of working papers (208). It has been suggested that the possibility of using additional supervision procedures for verifying destruction of stockpiles might be discussed (209).

It is conceivable that also undeclared stocks may be destroyed: for instance, in the case of the need to destroy "obsolete" munition (210). The possibility of verifying such destruction is, however, related to the problem of finding the stocks in the first place (211). The information contained in some working papers indicates that destruction of stockpiles is a protracted process involving, inter alia, hazards for the environment, and that rigorous procedures must be followed in carrying out such operations, which under some conditions might be observed (212). The consequences of a possible long destruction period on the formulation of a convention have to be taken into consideration (213).

Monitoring of destruction of stockpiles should account for the particular agent that is destroyed, and the quantity and quality of the destroyed agent, considering also weight and volume of other components in the stockpiles (214).

If on-site access to a stockpile destruction is not permitted, the activity cannot be verified by any presently known methods (215). Extraterritorial monitoring may be of some use (216).

Different suggestions have been given to find as non-intrusive verification methods for stockpile destruction as possible. One suggestion is that a country may choose a destruction site where on-site access would be acceptable (217). The destruction could be checked <u>in situ</u> by observers, as distinguished from inspectors (218). In this connexion, the possibility has been mentioned for the "familiarization" of other parties with the site of an activity through information exchange, a technique which has also been discussed in connexion with other arms control measures (219). Observation of destruction of stockpiles would not need to be looked upon as a recurrent on-site inspection measure, since a stockpile can be destroyed or converted to peaceful uses, and thus inspected once only (220).

The degree of disclosure related to the technical verification methods referred to above ranges from total disclosure of the destruction process of the agent, and the quantity being destroyed, to only an assurance that some toxic substance is being destroyed or converted into a less toxic one (221).

Ways of evading effective verification have been described (222).

The verification process should not result in unwarranted disclosure of military information leading to proliferation of chemical weapons or in disclosure of industrial secrets (223).

In connexion with suggestions for arranging technical exchange visits during ongoing negotiations, the usefulness of visiting also working facilities for destruction of chemical weapons has been mentioned (224). International co-operation in this field might be useful (225).

3.2.3.5 <u>Other military activities</u>

A chemical warfare capacity comprises not only development, production and stockpiling of chemical agents and weapons but also other activities like planning and training of personnel (226).

A comprehensive ban on chemical weapons might, perhaps, lead to observable changes in military doctrine, training, organization and equipment, and thus serve verification purposes (227).

The difficulty of distinguishing between defensive and offensive measures has been noted (228).

A convention should cover adequately the situation when a country has on its territory chemical weapons belonging to, and under the control of, another country (229).

As previously mentioned, it has been suggested that protective measures against chemical warfare should not be banned (230). In this connexion, it has been suggested that international co-operation regarding protection against chemical warfare might take the form of regular meetings of experts, or exchange of information, especially relating to organophosphorus poisoning, therapy and profylaxis (231). It has also been proposed that a convention should ensure that support and assistance be rendered to a country victim of a chemical weapon attack (232).

3.3 Complaints and clarification procedures

A complaints procedure must be based on a number of interrelated measures to be appropriately included in any CW agreement (233).

The procedure for submitting a complaint to the Security Council under the provisions of the Charter could be spelled out in a convention (234). Due to the political nature of the decisions of the Council, it might be desirable to resort to international investigation and fact-finding procedures before a complaint is lodged with the Security Council (235).

Parties to a convention could undertake to consult with each other (236). Consultations could also take place within the multilateral framework of a consultative body (237), a consultative committee (238) or a verification organization (239).

Consultations might be arranged so that requests for clarification do not need to appear as formal complaints or allegations of violations with ensuing political difficulties (240).

A party to a convention which wanted to allay suspicions or respond to the provisions of the convention might take initiatives for verification by invitation (241). Verification might be an obligation under a convention providing for co-operation by a party when challenged by other parties (242). If such challenges were met with negative replies, they could lead to suspicion (243).

When consultations fail or if actual complaints are filed with a competent body, further measures might be taken requiring additional information, fact-finding investigations or inspections (244). With regard to fact-finding measures being taken as a result of complaints, adequate expertise for assistance (e.g. for chemical analyses and toxicity determinations) should be available either within the competent body itself or through experts or expert groups (245) available nationally or in international organizations (246).

It has been emphasized that possible conclusions by an international organization with respect to results from technical analyses and fact-finding should be expressed in language that can be easily grasped by agencies and personnel in developing countries and accordingly be useful when making complaints accompanied by evidence (247).

4. Other provisions

4.1 Review conferences and amendments

Review conferences should be held periodically (248). Review conferences should serve to ensure that the preamble and the provisions of the convention are complied with (249). Review conferences should take into account new technological and scientific developments relevant to the convention (250).

Parties should have a right to suggest amendments to the convention. Various systems for accepting such amendments have been envisaged (251).

4.2 Technical assistance and use of disarmament savings

Scientific and technical development in the field of chemistry should benefit peaceful activities and to this end, exchange of information and equipment for peaceful purposes should be facilitated (252).

The principle that a substantive part of savings derived from disarmament measures should be used to promote economic and social development, particularly in developing countries, must be recognized (253).

4.3 Duration and withdrawal

The convention could be either of unlimited (254) or limited duration (255). When the supreme interests of States are threatened, parties should be able to withdraw from the treaty after prior notification (256).

4.4 Adherence, entry into force, depositary agent

Different provisions for signature, ratification and entry into force of the convention have been suggested (257). Governments could act as depositaries (258) or, as a result of discussions within the framework of the United Nations, another depositary could be designated (259).

4.5 Protocols and annexes

Some provisions and procedures of an agreement might be contained in protocols, annexes or "agreed interpretations". They might include principles for delimiting different kinds of chemical warfare agents (260), definitions, lists of agents, reporting procedures (261), and stipulations for a possible consultative committee (262), or verification organization (263).

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123. USSR, PV.567, p.19; Socialist Working Paper CCD/403, p.1; USA, PV.702, p.13; USSR, PV.704, p.16.

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237. USA, CCD/360, p.10; USA, PV.702, p.16.

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Working Paper on some aspects of international verification of non-production of chemical weapons: Experience gained in the Federal Republic of Germany

1. In the negotiations on a convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction the most difficult problem is that of verification. Adequate verification of a CW-ban must cover the following areas in particular:

   (a) destruction of existing stocks of chemical weapons,

   (b) destruction or shut-down of existing production facilities for such weapons,

   (c) control of current production of sensitive chemical agents to the extent necessary for the observance of a production ban.

2. This working paper is a contribution to the discussion of the item referred to under (c). Part I describes practices and principles of effective and economically unharmful control in the light of the Federal Republic of Germany's experience with the surveillance of its undertaking not to manufacture chemical weapons. Part II is a summary of the results of the international workshop on the verification of the non-production of chemical weapons held in the Federal Republic of Germany from 12 to 14 March 1979. Part III puts forward for discussion ensuing principles for verifying a chemical weapons production ban.

I

The Federal Republic of Germany, already a party to the Geneva Protocol of 1925, which prohibits the use of biological and chemical weapons in war, undertook as early as 23 October 1954 not to manufacture nuclear, biological and chemical weapons and thereby agreed to controls by the Armaments Control Agency of the Western European Union to ensure that this undertaking was being observed.

The Armaments Control Agency established by the revised Brussels Treaty of 23 October 1954, has been monitoring the non-production of chemical weapons in the Federal Republic of Germany since 1957/58. Controls consist of the evaluation of written information, supplied upon request, of visits and on-site inspections. The experience which the Federal Republic of Germany has gained from WEU controls demonstrates that the practices outlined below could be useful in establishing effective and economically unharmful verification of a world-wide ban on the manufacture of chemical weapons.

Controls

1. Controls are extended to all substances specified in a list together with their chemical formulae. The list is continuously reviewed by experts and modified or supplemented as necessary.

2. Excluded from controls are all apparatus, parts, equipment, installations, substances and organisms which are used for civilian purposes or for scientific, medical and industrial research in the field of pure and applied science. This affects not only those chemical products used primarily for civilian purposes (e.g. hydrocyanic acid and cyanogen chloride) and intermediate and end-items not suited to military purposes, but also, for example, small and therefore militarily irrelevant quantities of substances which are recognized as warfare agents. Such minimal quantities are required for medical purposes and for the research, development and testing of chemical defence equipment and techniques.

3. Production controls are applied to end-items and not to manufacturing processes. Accordingly chemical factories as a whole are not subject to control but rather individual substances of military relevance.

4. Non-production controls are applied to substances with characteristics which have been defined as necessary for the production of chemical weapons. These "characteristic substances" are not chemical warfare agents but are deemed to be initial or key products without which prohibited warfare agents could not be manufactured. Depending on which other chemical substances are added to them, they are suitable for the production of end-items for civilian purposes or for the chemical warfare agents on a prohibited list. The aim of controls at production plants is therefore to ensure that such substances are not used for the production of the prohibited chemical warfare agents.

5. Controls are carried out in the decisive phase of reaction, the so-called controllable stage. The starting point for non-production control of chemical warfare agents is defined as follows:

> "Controls in factories regarding a chemical product (chemical weapons) on the list approved by the council, can take, as their starting point, the chemical reaction or reactions immediately preceding the possible creation of the product on the list, in whatever form it may be".

Thus the controllable stage starts with the phase of production which, during the full production process, immediately precedes the completion of the end-item. This is the only stage at which controls at production plants can be carried out.

6. Chemical substances which can be used for both military and civilian purposes are not deemed to be chemical warfare agents if the quantities produced do not exceed peaceful civilian requirements. The controls determine whether the quantities produced do in fact exceed those requirements.

7. The initiative for on-site inspections lies with the Armaments Control Agency of the WEU. The director of the agency appoints two to four officials of different nationality, one of them a national of the country in which the inspection is to be carried out. A representative of the competent national authority assists the agency in the execution of its controls.

During such controls the representatives of the agency enquire about the organization, operation and production programme of the plant.

The subsequent visit to the production plant covers only those departments dealing with the decisive phase of reaction. The inspectors are shown built-in measuring instruments so that they can verify the quantities of the pre-products employed in the production of a substance and the final output. If further clarification is required, the findings are compared with the factory's records or books.

8. The inspectors pay special attention to the factory's safety precautions. These are always clearly visible and cannot be concealed and together with the lack of special equipment and installations, provide the clearest possible indication that no chemical warfare agents are being produced in the plant.

9. In special cases sampling as a means of control is useful and effective for identifying specific substances and determining whether they are prohibited warfare agents. The high degree of toxicity of most of these substances poses the problem of liability in the case of accidents or damage caused or suffered by inspectors.

10. The inspection is carried out in stages in order to avoid, as far as possible, any interference with the civilian sector. As soon as the inspectors are satisfied that the non-production pledge is being kept, the control must cease. If the visit to the production plant, including the inspection of special safety precautions (first control measure), is not deemed to be sufficient, the control may be extended to the employment of initial and intermediate products in the controllable stage (second control measure). If there is still no certainty that chemical weapons are not being produced, the factory's records may be checked against the instrument readings (third control measure). Samples may be taken as the fourth and last measure.

11. After each on-site inspection the inspectors report orally to the director of the agency. They also prepare a written classified report which remains in the agency's files. It may not be brought to the notice of any person outside the agency. Neither the factory concerned nor the competent national authority is consulted in the preparation of the report.

The representative of the national authority who has taken part in the inspection also prepares a report so that the authority concerned may have its own documents available in the event of recurrent inspections. This report is transmitted to the management of the factory concerned.

12. The staff of the Armaments Control Agency are international officials. They must in no circumstances whatever reveal to third parties information obtained as the result of their official tasks. Special protection is accorded to industrial, economic, commercial and scientific information, whether classified or not.

13. The Armaments Control Agency submits annual reports to the Council of the Western European Union. These reports contain the number of controls, the names of the companies concerned, and the results, stating such difficulties or problems that may have occurred without, however, going into detail.

II

1. The workshop held in the Federal Republic of Germany from 12 to 14 March 1979 served the purpose of illustrating to an international audience of experts, by means of practical examples, the experience gained from WEU controls.

The objection occasionally raised to on-site inspections as a means of controlling current production in civilian chemical plants is that they would be intrusive and liable to harm the legitimate interests of the producers since they would involve the disclosure of classified information of a technological and economic nature.

The Federal Republic of Germany fully acknowledges the need to protect production secrets; being a country with a highly developed chemical industry it has itself an interest in such protection. It is, however, convinced that it is possible for on-site inspections to prove, without disclosing any classified information on the production process, that chemical warfare agents are not being produced. Warfare agents are distinguished from compounds for peaceful uses by their considerably higher degree of toxicity. Consequently, the production of highly toxic substances on a scale required for military use necessitates safety precautions which are visible in certain constructional features of the production facilities. The absence of such safety precautions is easily seen during the course of a plant inspection and provides evidence that no highly toxic compounds are being produced. Even where safety precautions are continually improved, as existing facilities are developed or new facilities established, they will fall far short of the protection technology required in factories producing warfare agents. Hence, this method of verification does not require the disclosure of any production secrets.

2. In the light of experience gained from this international verification, the purpose of the workshop held in the Federal Republic of Germany was therefore to show:

- that international on-site inspections of the current production of substances which, by their chemical structure are related to warfare agents, are an effective means of verification of a production ban and
- that such inspections can be carried out without any impairment of the factory's industrial processes and legitimate commercial interests.

This was the aim of the invitation Federal Chancellor Schmidt made to member States of the United Nations at the Special Session of the United Nations General Assembly devoted to disarmament in May 1978 to participate in a workshop in the Federal Republic of Germany. The State Secretary of the Federal Foreign Office, Herr van Well, renewed this invitation on 26 January 1979 at the opening session of the Committee on Disarmament. 55 experts took part in the workshop coming from Australia, Belgium, Canada, Denmark, Egypt, Finland, France, the Federal Republic of Germany, Greece, Indonesia, Iran, Italy, Japan, Kuwait, Mexico, the Netherlands, Pakistan, Romania, Spain, Sweden, Switzerland, the United Kingdom, United States of America and Yugoslavia. A representative of the United Nations Secretary-General also attended the workshop.

The programme, co-ordinated with the Federation of Chemical Industries offered the participants, after an introductory meeting in Bonn, the opportunity to visit the production plant of one of the three biggest chemical companies of their choice; either the hostathion and afugan production in the Knapsack plant of Hoechst A.G., or the parathion and azinphos production of Bayer, A.G. at their plant-protection factory in Dormagen, or the thion acide ester plant of BASF Aktiengesellschaft in Ludwigshafen, i.e. in each case, the production of insecticides on a phosphorous basis. Phosphorous insecticides are, in their chemical structure and reactions -- and in this aspect only -- related to warfare agents. Chemical plants

The participants had the opportunity to get acquainted with the practice of international on-site inspection. The main purpose of this exercise was to demonstrate that

- in the absence of safety precautions no supertoxic compounds can be manufactured in the production plants at present available to the chemical industry,
- the absence of such safety precautions is perceivable in the course of a plant inspection and thus to prove the non-production of warfare agents,

- a rapid conversion of available production plants into plants producing warfare agents is technically not possible, and that
- the chemical industry in the Federal Republic of Germany does not object to controls of its production plants with regard to the possible production of warfare agents or of characteristic pre-products of warfare agents.

The final discussion on the workshop showed that it served its purpose.

3. It became apparent that any effective verification of a chemical weapons ban must include the application of international control measures. Naturally they can and should be combined with national ones. Regular on-site inspections carried out by an international control authority should, however, be an indispensable component of any international control measures designed to ensure the non-production of chemical weapons as laid down in a convention. Other international control measures such as near-site inspections (emission analyses), satellite monitoring, statistical control of production figures, and the consumption of raw materials and basic chemicals do not suffice to replace on-site inspection, nor can off-site inspections and the opto-electronic sealing of shut-down factories be a satisfactory substitute.

III

For the practical verification of a world-wide ban on the production of chemical weapons, the following principles can be drawn from this experience:

- effective verification of a production ban necessitates adequate on-site inspections of current production,
- such inspections can be carried out without any impairment of the industrial processes and legitimate commercial interests of the plant concerned.

The necessary prerequisites are that

- chemical weapons be precisely defined, and existing lists be modified and/or supplemented,
- the fields of pure and applied research and of civilian use should be excluded from controls,
- information be furnished in reply to an annual request by a verification authority in respect of chemical weapons; this would ease the task of selecting those factories which were eligible for non-production controls,
- the controllable stages be defined; specific characteristic substances would have to be defined as initial products,
- principles should be worked out for the gradual implementation of non-production controls and that
- the civil peaceful requirements of specific (ambivalent) chemical substances on the prohibited list should be roughly estimated; they would have to be reported regularly each year.

COMMITTEE ON DISARMAMENT

CD/39*
16 July 1979

Original: ENGLISH

LETTER DATED 16 JULY 1979 FROM THE AMBASSADOR (POLITICAL AFFAIRS) OF THE PERMANENT MISSION OF FINLAND TO THE UNITED NATIONS OFFICE AT GENEVA ADDRESSED TO THE SECRETARY OF THE COMMITTEE ON DISARMAMENT AND PERSONAL REPRESENTATIVE OF THE SECRETARY-GENERAL OF THE UNITED NATIONS CONCERNING THE IDENTIFICATION OF POTENTIAL ORGANOPHOSPHORUS WARFARE AGENTS - AN APPROACH FOR THE STANDARDIZATION OF TECHNIQUES AND REFERENCE DATA

Upon the instructions of my Government, I have the honour to forward to you herewith a study entitled "Identification of Potential Organophosphorus Warfare Agents - An Approach for the Standardization of Techniques and Reference Data" prepared at the request of the Ministry for Foreign Affairs of Finland. I would be most grateful, if you could take appropriate steps to have this study distributed as an official document of the Committee on Disarmament.

(Signed) Esko Rajakoski
Ambassador

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* A limited distribution of this document in English has been made to the members of the Committee on Disarmament. Additional copies are available from the Foreign Ministry of Finland in Helsinki.

COMMITTEE ON DISARMAMENT

CD/41
25 July 1979

Original: ENGLISH

THE NETHERLANDS

Working paper containing questions relevant to a Convention prohibiting chemical weapons

Scope

1. Q: Can we agree that a CW-ban will be comprehensive, i.e. that it will cover the whole CW-problem and will therefore not imply a partial approach? (This is not withstanding the fact that the destruction of existing CW-stockpiles will take considerable time for technical reasons.)

2. Q: If the answer is yes, what will the ban exactly cover:
   - (a) banning the development of CW-agents and weapon systems?
   - (b) banning the production of all single-purpose agents, including single-purpose precursors?
   - (c) banning the production for CW-purposes of dual-purpose agents (including dual purpose precursors?)? Does it cover only lethal agents or also incapacitants? Tear gas? Herbicides and defoliants?
   - (d) the destruction of existing stockpiles of CW-agents and weapon systems? What is the time limit?
   - (e) the dismantling of existing CW-production facilities, or the "moth-balling" of CW-plants, or the conversion of existing facilities to those for peaceful use?
   - (f) banning the production of CW-munitions, equipment and means of delivery?
   - (g) banning planning, organization and training for offensive chemical warfare?
   - (h) not banning protection against C-warfare?
   - (i) banning the use? (relationship with Convention of 1925)
   - (j) banning the transfer and acquisition of CW?

3. Q: What are the exemptions on the production ban? (medical purposes, protection, military toxic materials which cannot be used for chemical warfare etc.)

4. Q: (a) Can it be concluded that the main elements for the definition of banned CW-agents are the general purpose criterion and toxicity?

(b) Can it also be concluded that other criteria play a role in the verification and licensing process, such as structural formulae and criteria for the usefulness of agents for C-warfare?

(c) Are complete lists of banned or allowed agents necessary or are examples sufficient?

Verification

5. Q: Can it be concluded that in the context of a CW-ban, parties need a national system of control (or at least parties with a chemical industry) for the implementation of internal legislation and as liaison for international verification procedures?

6. Q: Can it be assumed that part of the international verification measures will be based on the concept of "verification by challenge" while other international verification measures will be of a more systematic character?

7. Q: If the answer is yes, can it be assumed that systematic international verification measures will be concentrated on:

(a) The destruction of existing stockpiles of CW-agents (and munition?)?

(b) The dismantling of existing CW-production plants, or that "moth-balled" plants are not used, or that plants are converted to peaceful activities.

(c) The non-production of single-purpose highly toxic (mainly nerve) agents, including single-purpose precursors?

8. Q: What kind of structure does one need for the different international verification tasks? What kind of support could such a structure give to the national control agencies?

9. Q: Is it conceivable that, complementary to a world-wide ban, in certain regions countries may decide to accept more stringent regional verification measures?

Confidence building measures

10. Q: Would it be helpful if States would:

(a) declare their stocks and production facilities after signing but before entry into force of a convention? Before signing?

(b) organize technical exchange visits?

(c) co-operate in protection measures against C-warfare?

CD/44
26 July 1979
Original: ENGLISH

POLAND

Outline of a convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction: working paper

In the process of formal and informal consultations between members of the Committee with a view to defining the most appropriate methods and forms of its work in order to accelerate progress towards an early agreement on the prohibition of chemical weapons, a wide area of agreement has emerged as to the need for its harmonization with the ongoing bilateral efforts in that area.

Bearing in mind the objective of working out a draft international convention on the prohibition of chemical weapons and the urgent need to pass from procedural to substantive considerations in that respect, it has been broadly agreed that the most useful course of action for the Committee to follow in the remaining time of its current session would be to proceed forthwith to the drafting of an outline of a possible convention. It is felt that such an outline should be based on the proposals and suggestions contained in the documents submitted so far, or to be submitted, to the Committee, in particular on the three drafts of a convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction, contained in documents CCD/361, CCD/420 and CCD/512, as well as document CCD/400.

Having analysed the above documents and having studied the informal working paper circulated on 13 July 1979 by the delegation of the Netherlands, the Polish delegation believes that in elaborating the said outline of a convention on the prohibition of chemical weapons, the Committee on Disarmament should take into account the following framework provisions:

1. Preamble: objective of convention - effective prohibition of chemical weapons contributing to (facilitating) achievement of general and complete disarmament, including, in particular, the prohibition of all types of weapons of mass destruction. Important significance of the Geneva Protocol of 1925, Convention on Prohibition of Bacteriological (Biological) Weapons and Convention on Prohibition of Military or any Other Hostile Use of Environmental Modification Techniques. The need of co-operation to contribute to easing international tension and to realization of purposes and principles of United Nations Charter.

2. Scope of prohibition: undertaking never in any circumstances to develop, produce, acquire, stockpile or retain agents of chemical warfare (chemical agents and munitions).

3. Prohibition of CW agents on the basis of purpose criterion (chemical agents of types and in quantities having no justification for technological, prophylactic, protective or other non-military purposes).

4. Additionally: purpose criterion supplemented with toxicity criterion.

5. Differentiation of chemical agents - levels of toxicity: highly toxic lethal chemical agents and lethal chemical agents.

6. Undertaking not to transfer to any State or organization CW agents and not to assist or encourage any State to pursue activities contrary to convention.

7. Declaring (after entry into force of convention) of stocks of CW agents and of CW agent production capacities.

8. Declaring of plans for destruction or conversion to peaceful purposes of declared stocks as well as plans for elimination or dismantling of production capacities. Specific time limits for execution of such undertakings.

9. Information about process of destruction of stocks of CW agents, about liquidation of CW agent production capacities as well as about completion of such processes.

10. Adoption of measures to protect civilians and environment during process of destruction of stocks of CW agents and the liquidation of their production capacities.

11. Provision for possibility of retention, production, acquisition and use of banned CW agents for legitimate technological, prophylactic or other peaceful purposes, including CW defense purposes. Procedures connected with limitation of types and quantities of such agents.

12. Adoption of internal measures to prohibit activities contrary to convention.

13. Control: Combination of national and international procedures.

14. Possibility of establishing national control organizations. Their functions. Undertaking not to interfere with use of national means of control.

15. Consultation and co-operation in solving problems arising from application of convention. Use of appropriate international procedures within the framework of United Nations as well as other international organizations.

16. Requests to other States Parties, in connexion with suspected violation of convention, for information or permission for on-site clarification of factual circumstances. Conditions and procedures of control.

17. Consultative Committee. Functions and procedures. Assistance in exchange of information, consultation and co-operation. Preparatory Committee (Commission).

18. Possibility of lodging complaints with United Nations Security Council. Co-operation in carrying out investigations.

19. Undertaking to provide and support assistance to any State Party threatened as a result of violation of convention.

20. Convention not to be interpreted as in any way limiting or detracting from obligations assumed under Geneva Protocol of 1925, Convention on Prohibition of Bacteriological (Biological) Weapons and Convention on Prohibition of Military or any Other Hostile Use of Environmental Modification Techniques.

21. Convention not to hamper economic and technological development of States Parties nor international co-operation.

22. Comprehensive character of convention. Participants.

23. Amendment procedure: convention review conference: withdrawal procedure: ratification: depositaries: entry into force: deposit of convention.

COMMITTEE ON DISARMAMENT

CD/48
7 August 1979

ENGLISH
Original: ENGLISH/RUSSIAN

LETTER DATED 7 AUGUST 1979 ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT FROM THE REPRESENTATIVES OF THE USSR AND THE UNITED STATES TO THE COMMITTEE ON DISARMAMENT

We have the honour to transmit and to request, for the information of the Committee on Disarmament, the circulation of the following document entitled "USSR-United States Joint Report on Progress in the Bilateral Negotiations on the Prohibition of Chemical Weapons".

(Signed) V.L. ISSRAELYAN
Representative of the USSR to the Committee on Disarmament

(Signed) A.S. FISHER
Representative of the United States to the Committee on Disarmament

JOINT USSR-UNITED STATES REPORT ON PROGRESS IN THE BILATERAL NEGOTIATIONS ON THE PROHIBITION OF CHEMICAL WEAPONS

During the Vienna meeting of the leaders of the United States and the USSR in June 1979, both sides affirmed the importance of a general, complete, and verifiable prohibition of chemical weapons and agreed to intensify their efforts to prepare an agreed joint proposal for presentation to the Committee on Disarmament. The USSR and United States delegations are guided by this provision at the 10th series of the bilateral negotiations, which began on 16 July 1979.

In the negotiations, the United States and USSR delegations take into account the fact that prohibition of chemical weapons is, as was stressed in the Final Document of the United Nations General Assembly Special Session on Disarmament, one of the most urgent and vital problems in the area of disarmament. They are also guided by the requirement that a convention on the prohibition of chemical weapons, as any other international agreement in the field of arms control and disarmament, should enhance rather than diminish the security of the parties.

The USSR and United States delegations, taking into consideration the interest expressed by many delegations in the Committee on Disarmament concerning the status of the bilateral negotiations on a prohibition of chemical weapons, present the following Joint Report:

1. The two sides believe that the scope of the prohibition should be determined on the basis of a general purpose criterion. Parties to the convention should assume the obligation never in any circumstances to develop, produce, stockpile, otherwise acquire or possess, or retain super-toxic lethal chemicals, other lethal or highly toxic chemicals or their precursors, with the exception of chemicals intended for permitted purposes of such types and in such quantities as are appropriate to these purposes, as well as chemical munitions or other means of chemical warfare. Negotiations are continuing on several issues relating to the scope of prohibition.

2. Permitted purposes are understood to mean non-hostile purposes (industrial, research, medical, or other peaceful purposes, law-enforcement purposes, and purposes of development and testing of means of protection against chemical weapons), as well as military purposes not related to chemical warfare.

3. In order to facilitate verification, it would be appropriate to use, in addition to the general purpose criterion, toxicity criteria and certain other provisions.

4. Agreement has been reached on the following approximate values for the additional criteria of toxicity mentioned above:

(a) LCt_{50} = 2,000 mg min/m^3 for inhalation and/or
LD_{50} = 0.5 mg/kg for subcutaneous injections;

(b) LCt_{50} = 20,000 mg min/m^3 for inhalation and/or
LD_{50} = 10 mg/kg for subcutaneous injections.

On the basis of these criteria, it will be possible to separate chemicals into appropriate categories, to each of which the general purpose criterion would be applied.

5. Different degrees of prohibition and limitation as well as differentiated methods of verification would be applied on the basis of these toxicity criteria and certain other provisions. These issues continue to be subjects of negotiations.

6. Negotiations are also continuing on definition of terms and several other issues.

7. The two sides have agreed that parties to the convention should assume an obligation not to transfer to anyone, whether directly or indirectly, the means of chemical warfare, and not in any way to assist, encourage, or induce any State, group of States, or any organization to carry out activities which parties would undertake not to engage in pursuant to the convention.

8. The two sides have come to an understanding regarding the necessity for States to declare, immediately after they become parties to the convention, both the volumes of acquired stocks of means of chemical warfare and the means of production of chemical munitions and chemicals covered by the convention. Plans for destruction of declared stocks of chemical weapons should also be declared. These declarations should contain information on the volume and timetables for destruction of such stocks. Plans for destruction or dismantling of relevant means of production should also be declared. In the course of the bilateral negotiations, the two sides are continuing to make efforts to agree on the specific content of the declarations concerning stocks of means of chemical warfare and concerning means of production. In this connexion, the basic concept of means of production is also a subject that remains to be resolved.

9. Agreement has been reached that stocks of means for chemical warfare should be destroyed or diverted for permitted purposes within ten years after a State becomes a party. Means of production should be shut down and eventually destroyed or dismantled. The destruction or dismantling of means of production should begin not later than eight years, and should be completed not later than ten years, after a State becomes a party.

10. In this connexion, the United States and the USSR believe that a future convention should contain provisions in accordance with which parties would periodically exchange statements and notifications concerning: the progress of the destruction of stocks of means of chemical warfare or their diversion for permitted purposes, the progress of the destruction or dismantling of means of production of chemical munitions and chemicals covered by the convention, and of the completion of these processes.

11. The USSR and the United States believe that the fulfilment of the obligations assumed under the future convention should be subject to the important requirement of adequate verification. They also believe that measures with respect to such verification should be based on a combination of national and international measures.

12. International verification measures should include the creation of a consultative committee. This committee could be convened as appropriate by the depositary of the convention, as well as upon request of any party.

13. The activities of the consultative committee in the interval between meetings should be carried out by a secretariat. The mandate of the secretariat is a subject of negotiations.

14. The participants should exchange, through the consultative committee or bilaterally, certain data on super-toxic lethal chemicals produced, acquired, accumulated, and used for permitted purposes, as well as on important lethal chemicals and the most important precursors used for permitted purposes. To this end, it is envisaged to compile lists of the relevant chemicals and precursors. The two sides have reached a significant degree of mutual understanding in developing agreed approaches to the compilation of such lists. The scope of the data to be presented remains to be agreed.

15. Additional functions for the consultative committee remain under discussion.

16. In order to ensure the possibility of beginning the work of the consultative committee immediately after entry into force of the convention, the United States and the USSR believe it appropriate to begin the creation of a preparatory committee upon signature of the convention.

17. A convention should include provisions in accordance with which any party should have the right on a bilateral basis, or through the consultative committee, to request from another party with respect to which suspicions have arisen that it is acting in violation of obligations under the convention, relevant information on the actual state of affairs, as well as to request investigation of the actual state of affairs on site, providing appropriate reasons in support of the necessity of such an investigation.

18. A party may agree to such an on-site investigation or decide otherwise, providing appropriate explanations.

19. It should also be provided that any party could turn to the Security Council with a complaint which would include appropriate rationale. In case of suspicion regarding compliance with the convention, the consultative committee, upon request of any party, or of the Security Council of the United Nations, could also take steps to establish the actual state of affairs.

20. The question of other international verification measures remains unresolved.

21. National measures would include the use of national technical means of verification in a manner consistent with generally accepted principles of international law. In this connexion, parties should not impede, including through the use of deliberate concealment measures, the national technical means of other parties in carrying out the aforementioned verification functions.

22. The USSR and the United States believe that a future convention should reflect the obligation of each party to take appropriate internal measures in accordance with its constitutional procedures to prohibit and prevent any activity contrary to the provisions of the convention anywhere under its jurisdiction or control.

23. Possibilities for confidence-building measures are being explored.

24. A future chemical weapons convention should include a withdrawal provision of the type included in other arms control and disarmament agreements.

25. The question of the conditions for entry into force of the convention remains unagreed.

26. The two sides believe that an effective prohibition of chemical weapons will require working out a large number of technical questions which would be dealt with in annexes to the convention and which are now being studied.

* * *

The United States and the Soviet Union note the great importance attached to the elaboration of a convention by the General Assembly of the United Nations and the Committee on Disarmament which manifested itself, in particular, in the identification of the question of the prohibition of chemical weapons as one of the priority items on the agenda adopted for the current session of the Committee on Disarmament. Both sides will exert their best efforts to complete the bilateral negotiations and present a joint initiative to the Committee on Disarmament on this most important and extremely complex problem as soon as possible.

COMMITTEE ON DISARMAMENT

CD/49
8 August 1979
Original: ENGLISH

THE NETHERLANDS

Chemical weapons

Answers to questionnaire contained in CD/41

Question 1: Can we agree that a CW-ban will be comprehensive, i.e. that it will cover the whole CW-problem and will therefore not imply a partial approach? (This notwithstanding the fact that the destruction of existing CW-stockpiles will take considerable time for technical reasons.)

The answer is definitely yes. Only a comprehensive approach will provide a treaty that will be as free as possible from misunderstandings due to differences in interpretation.

Question 2: If the answer is yes, what will the ban exactly cover:

(a) banning the development of CW-agents and weapon system?

The answer is clearly yes.

(b) banning the production of all single-purpose agents, including single-purpose precursors?

The answer is yes.

(c) banning the production for CW-purposes of dual purpose agents (including dual purpose precursors?)?

Does it cover only lethal agents or also incapacitants? Tear gas? Herbicides and defoliants?

Dual purpose agents that are produced with the intention to use them as CW-agents should be prohibited. However, it will be difficult to prove such production since these agents -- like phosgene and hydrocyanid acid -- are identical for military or for peaceful uses. Incapacitating agents should be prohibited. Tear gas and herbicides can be considered as dual purpose agents. Production for chemical warfare purposes should be prohibited. (This does not exclude some specific military uses which cannot be considered as chemical warfare (such as riot control, e.g. in prisoner of war camps or clearing excessive vegetation around bases),).

(d) the destruction of existing stockpiles of CW-agents and weapon systems? What is the time limit?

Here the answer is again yes. It would not be attractive to the majority of nations to allow chemical weapon States to keep their stockpiles. Natural decay is a very slow process. The timeframe of the destruction will mainly be determined by the great care that has to be taken regarding the safety of the personnel involved and the impact upon the environment. One of the latest estimates is that it will be of the order of ten years.

(e) the dismantling of existing CW-production facilities, or the "moth-balling" of CW-plants, or the conversion of existing facilities to those for peaceful use?

The preference should be in the order of dismantling -- moth balling -- conversion as the latter would add greatly to the burden of verification. Moreover, it does not seem attractive from an economic point of view.

(f) banning the production of CW-munitions, equipment and means of delivery?

The answer is yes, keeping in mind that some of these munitions could be used for the dissemination of smoke.

(g) banning planning, organization and training for offensive chemical warfare?

This is a very important item and the answer should be definitely yes.

(h) <u>not</u> banning protection against C-warfare?

The answer is yes as the availability of a reasonable amount of protection will be a powerful dissuasive measure regarding infringements of a treaty.

(i) banning the use? (Relationship with Convention of 1925).

The answer is yes, provided this does in no way interfere with existing treaties and international law.

(j) banning the transfer and acquisition of CW?

The answer is yes. This item should not only include hardware but also know-how.

Question 3: What are the exemptions on the production ban? (Medical purposes, protection, military toxic materials which cannot be used for chemical warfare, etc.).

The three items mentioned are not equivalent. The first two are the actual chemical warfare agents. The amounts of course will vary considerably between the nations which are involved in research and development of protective systems. For a country like The Netherlands most of the needs can be covered by quantities of the order of 1 kilogramme per year, in fact a rather small amount.

The third category is something completely different. Here for instance missile and torpedo fuels are meant; some of these have a certain toxicity. As it does not seem very likely that these will be produced with the primary intention of being used as CW-agents, they need not be covered by a convention.

Question 4: (a) Can it be concluded that the main elements for the definition of banned CW-agents are the general purpose criterion and toxicity?

The answer here is that the only important criterion is the general purpose criterion. Toxicity can never play an important role here.

(b) Can it also be concluded that other criteria play a role in the verification and licensing process, such as structural formulae and criteria for the usefulness of agents for C-warfare?

Yes, these criteria, together with the toxicity criterion -- which is very important here -- will play a role.

(c) Are complete lists of banned or allowed agents necessary or are examples sufficient?

As a complete list of banned agents will be impossible to compose, as such a list proves extremely difficult to change and as a list always gives the impression that something not on the list is not prohibited, these lists will probably do more harm than good. On the other hand, a list of agents temporarily exempted could be very useful.

Question 5: Can it be concluded that in the context of a CW-ban, parties need a national system of control (or at least parties with a chemical industry) for the implementation of internal legislation and as liaison for international verification procedures?

The answer is yes.

Question 6: Can it be assumed that part of the international verification measures will be based on the concept of "verification by challenge" while other international verification measures will be of a more systematic character?

The answer is yes.

Question 7: If the answer is yes, can it be assumed that systematic international verification measures will be concentrated on:

(a) the destruction of existing stockpiles of CW-agents (and munition?)?

(b) the dismantling of existing CW-production plants, or that "moth-balled" plants are not used, or that plants are converted to peaceful activities.

(c) the non-production of single-purpose highly toxic (mainly nerve) agents, including single-purpose precursors?

The answer is yes in all three cases. As mentioned before, in the second case conversion will give much greater problems than dismantling.

Question 8: What kind of structure does one need for the different international verification tasks? What kind of support could such a structure give to the national control agencies?

This will -- of course -- depend on the tasks of this group, will it only be concerned with chemical weapons or will it also be involved with verification of other arms control and disarmament matters. The staff should be small and should mainly occupy itself with information gathering. There should, however, be a "roster of experts" from which scientists with laboratory facilities can be drawn that could be involved in the problems of near site and on-site inspections. Moreover, this group could also be of assistance to nations who may have difficulties in manning and equipping their national verification agencies.

Question 9: Is it conceivable that, complementary to a world-wide ban, in certain regions countries may decide to accept more stringent regional verification measures?

If the convention is comprehensive and unambiguous, there would be no need for additional measures. If not, then regional measures could strengthen confidence between parties in a particular region.

Question 10: Would it be helpful if States would:

(a) declare their stocks and production facilities after signing but before entry into force of a convention? Before signing?

(b) organize technical exchange visits?

(c) co-operate in protection measures against C-warfare?

The last two items of the question can be answered definitely in a positive sense. The last year or so have shown that there are a great many possibilities here, all giving rise to confidence building. Concerning the first part we have to assume that nations might not be willing to declare their stocks and production facilities before a treaty has been concluded. But at a later stage such declarations -- together with declarations by nations that they do not possess chemical warfare agents nor have the intention to acquire them -- might be very useful to build mutual trust.

CD/52
13 August 1979
Original: ENGLISH

FRANCE, ITALY AND THE NETHERLANDS

Chemical Weapons

Evaluation of the discussion in the Committee on Disarmament in 1979 with respect to prohibition of chemical weapons

Discussions on issues relating to a prohibition of chemical weapons were held in the Committee on Disarmament from 16-27 July, 1979, as well as after the presentation on 31 July of a substantial joint statement by the USSR and United States of America on their bilateral negotiations with respect to an intended joint initiative on chemical weapons (CD/48).

An exploratory discussion took place with respect to some elements of a prohibition of chemical weapons, including an outline for a convention on this question, in which several delegations participated, including some non-CD members. On certain issues similar views were brought forward while on others differences of view were apparent. The discussion also revealed that many technical and detailed problems had to be dealt with in the future. Although no consensus could be reached at this stage, the following could be tentatively distilled from the discussion.

(a) Views seemed to coincide that the objective is the general, complete and verifiable prohibition of chemical weapons. The development, production, stockpiling, acquisition, retention and transfer of chemicals for chemical weapons purposes, and of chemical weapons would be prohibited. Although it was recognized that a prohibition of chemical weapons should not detract from the obligations assumed by states under the Geneva Protocol of 1925[1/], there were different views expressed whether the use of chemical weapons should also be covered in a ban.

(b) The scope of the Prohibition would be based on the general purpose criterion. Other additional criteria could be used, in particular toxicity. A distinction would have to be made between chemicals which are primarily useful for chemical weapons purposes and chemicals which have peaceful applications.

(c) Activities would be permitted for non-hostile purposes (industrial, research, medical, or other peaceful purposes, law-enforcement purposes and for the protection against chemical attack), as well as for military purposes not related to chemical warfare. Activities relating to offensive chemical warfare, including training, would not be permitted.

1/ Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare.

(d) In the context of a prohibition of chemical weapons, there would be provisions for the declaration and destruction of existing stockpiles of chemicals acquired for chemical weapons purposes and of chemical weapons within a specific period. There would also be provisions for the declaration, shutting-down and destruction or dismantling of production facilities within a specific period. A period of ten years has been mentioned in this respect.

(e) The fulfilment of obligations under a prohibition of chemical weapons should be adequately verified. Verification should be based on a combination of national and international measures.

(f) International measures could include the creation of a consultative committee of parties to a ban, with a permanent secretariat, to help solve problems arising from the application of the prohibition of chemical weapons.

(g) Views seemed to differ under which circumstances and for what purposes international verification procedures would be employed, including on-site inspections. Although it was recognized that on-site inspections by challenge could form part of the verification arrangements, views were expressed that mandatory on-site inspections would be necessary with respect to certain activities.

(h) Parties to a ban should not impede the national technical means of verification of other parties.

(i) It was understood that there would be a need for national arrangements for the implementation of the States' obligations under a chemical weapons ban.

(j) A prohibition of chemical weapons should not interfere with permitted activities, such as the industrial development and peaceful international co-operation in the chemical field.

(k) It was recognized that measures to strengthen confidence could help in the bringing about and application of a ban on chemical weapons.

1980

COMMITTEE ON DISARMAMENT

CD/68
28 February 1980
Original: ENGLISH

POLAND

Chemical weapons -- a possible procedural approach to the tasks facing the Committee on Disarmament: working paper

1. At the 1979 session of the Committee on Disarmament, virtually all its members referred to the urgency and importance of reaching early agreement on an international convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction. In the light of its discussions in 1979, the Committee recognized in its report to the thirty-fourth session of the General Assembly that "the prohibition of chemical weapons is one of the most urgent and vital problems in the area of disarmament". It stated moreover that it would proceed with negotiations in the field of chemical weapons at its session in 1980. That statement received important support in the General Assembly resolution 34/72.

2. In fact, the question of the prohibition of CW has been for many years under close and sustained scrutiny within the context of multilateral negotiating efforts, often with the assistance of experts. The extensive and wide-ranging exploration of the major issues involved in an effective ban on chemical weapons encouraged over the years the submission of scores of working papers and documents, including three formal drafts of a CW convention. However, perhaps the most productive and useful exchange of views in the Committee took place only in 1979, coinciding -- as it were -- with the simultaneous bilateral efforts. Indeed, the combined efforts in the field of CW last year helped to crystallize the identity or near-identity of views in certain specific fields of key importance to a future comprehensive and universally acceptable CW ban.

3. These efforts, apart from clarifying different aspects of an agreement on the prohibition of chemical weapons, led to the identification of those complex areas where more attention needs to be focused, with the view to resolving the outstanding issues, both substantive and technical. In this respect, it will be recalled that the Committee on Disarmament, welcoming with satisfaction the substantial joint statement of the USSR and the United States of America on their bilateral talks, which they submitted last year, noted their stated intention to exert best efforts to complete these talks and bring their results to the Committee as soon as possible.

4. While an encouraging advance was recorded in the substantive consideration of the CW issue in 1979, it regrettably proved impossible for the Committee on Disarmament to reach complete agreement as to the most practical and desirable procedural course of action conducive to effective work of this body with a view to the elaboration of a text of CW convention. In this respect, as the Representative of Poland indicated in his statement on 5 February 1980, Poland and other socialist States have been flexible all along. They were and still are prepared to consider with an open mind any constructive suggestion in that regard, including the possibility of referring the question of CW to a subsidiary body of the Committee. It was only the evident lack of consensus in 1979 as to the practicability of establishing an Ad Hoc working group which prompted the Polish delegation to seek to overcome the impasse by proposing that, as a first step, a general outline of a future CW convention be developed in the Committee.

5. The preliminary and exploratory discussions last year on the concept of such an outline and on other possible approaches, and also some private consultations with several delegations this year would seem to suggest that the concentration, in the first instance, on the elaboration of a definite outline, or a general framework, of a future CW convention would offer ample scope for an open-ended Ad Hoc working group. Supporting the earlier proposals to establish such an Ad Hoc working group, therefore, the Polish delegation feels that its specific task should be, in the first place, to work out an agreed general outline of a future convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction.

It is to be understood, of course, that the ultimate objective of such a working group would be the elaboration of a draft of such a multilateral juridical instrument.

COMMITTEE ON DISARMAMENT

CD/84
26 March 1980

ENGLISH
Original: ENGLISH

THE NETHERLANDS

Working Document

Draft Initial Work Programme of the Ad Hoc Working Group on Chemical Weapons

It is suggested that the *Ad Hoc* Working Group on Chemical Weapons might proceed as follows in the initial phases of its work:

(step 1) Examine working paper CD/41 of 25 July 1979, containing questions relevant to a Convention prohibiting Chemical Weapons and, on the basis thereof as well as of any other relevant material available, draw up an official Questionnaire of the CD on Chemical Weapons.

(step 2) As soon as this is accomplished, the Working Group should report this draft CD-Chemical Weapons Questionnaire to the Plenary for adoption and appropriate action, hopefully well before the end of the 1980 Spring Session.

(step 3) The CD-Plenary should take a formal decision bringing this CD-Chemical Weapons Questionnaire to the attention of Member Governments requesting those who wish to do so to submit their views on the questionnaire, preferably in a uniform manner, to the Secretariat of the CD before a certain date, e.g. the beginning of the Summer session of the CD.

(step 4) During the Summer session the Working Group, with the aid of the Secretariat and of qualified experts from capitals, should examine the answers received and draw up a report composed of the following four sections:

(a) the official CD-Chemical Weapons Questionnaire;

(b) a systematic compilation of the answers received;

(c) an analysis of or a commentary on those answers;

(d) an objective, factual, narrative account of the discussions that took place in the Working Group. x/

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x/ Working paper CD/52 of 13 August 1979, containing an "Evaluation of the discussion in the Committee on Disarmament in 1979 with respect to a prohibition of chemical weapons" (France, Italy and the Netherlands) could serve as a model.

(step 5) The report of the Working Group composed of abovementioned four documents together would form (the beginning of) an outline of the Convention, thus laying the basis for further work next year.

(step 6) In order to ensure that the work mentioned above under (4) can be accomplished with maximum efficiency it is desirable that a certain period of e.g. 2 - 3 weeks during the Summer session be agreed upon well in advance, so that experts from capitals can be available during that designated period.

CD/89
14 April 1980
Original: ENGLISH

TELEGRAM DATED 13 APRIL 1980 FROM THE DEPUTY MINISTER FOR FOREIGN AFFAIRS OF THE DEMOCRATIC REPUBLIC OF AFGHANISTAN ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT TRANSMITTING A "DECLARATION OF THE GOVERNMENT OF THE DEMOCRATIC REPUBLIC OF AFGHANISTAN ISSUED ON 11 APRIL 1980"

American and British imperialists, Chinese hegemonists, and their flunkeys are unceasingly carrying on their undeclared war against the people of Afghanistan, using the bases in the immediate neighbourhood of the country.

These forces, rallied around a reactionary axis, are resorting to any attempt for disrupting the normal peaceful life of our countrymen.

They shamelessly embarked on any indecent method to perpetuate their vicious aims and never renounce from any dirty act of destruction that is denounced by the United Nations and all democratic countries. The Democratic Republic of Afghanistan brings to the attention of all moslem people of Afghanistan, all states and nations, and entire national and progressive forces of the world that:

As facts and realities evidenced in the course of the recent events, the subversive bands used, in their fight against the democratic Afghanistan, the country which is an independent member of the United Nations, and a member of the non-aligned movement, lethal chemical weapons.

On March 25th this year in the province of Herat a military security patrol of the Democratic Republic of Afghanistan collided with a subversive band which had infiltrated the country from the outside. After wiping out the band they captured arms and weapons which were recognized as poisoning American-made chemical grenades, the lethal effects of which last for a long time in the atmosphere.

The Democratic Republic of Afghanistan government possesses irrefutable proofs that show the said grenades had been handed over to the subversive band from the outside of the country.

The government of Afghanistan expresses readiness to investigate and examine, along with competent international authorities, the use and the functioning of these American-made grenades and show how these exported mercenaries use them against the peaceful population. The government of the Democratic Republic of Afghanistan deems it necessary to remind that in spite of international protests these chemical weapons were used by the USA in the criminal war waged against Vietnam to eliminate the civilian population and inflict serious damages to the environment.

As is known, it is not incidental that a few days ago the US mass-media, which is under strict control of the CIA and the Pentagon, voiced out hues and cries about the use of poisoning products by the Democratic Republic of Afghanistan forces against subversive bands.

American and some West European press media even went further by saying that the limited contingents of the Soviet troops, requested for assistance by the Democratic Republic of Afghanistan in accordance with international law and the UN Charter, have used chemical weapons against the Afghan civilian population. These assertions can only be shameless lies and accusations if brought into the light of recent events and facts.

The government of the Democratic Republic of Afghanistan expresses its deep indignation and wrath over the training and organization of these mercenary formations and resolutely protest against the infiltration of armed bandits with chemical weapons, which is done with the help of international imperialism, regional reaction, and who resort to savage murder of the civilian population.

The government of the Democratic Republic of Afghanistan draws the attention of those neighbouring countries that put their soil at the disposal of mercenaries and subversive bands that they take the full responsibility of allowing American espionage organizations to operate chemical weapons by using their soil.

The government of the Democratic Republic of Afghanistan calls on all democratic states, national and progressive movements and the entire world community to condemn the criminal US imperialist activities and prevent them from their aggressive plans and schemes against Afghanistan.

I would like to request Your Excellency to have the above declaration published and circulated as an official document of the Committee on Disarmament.

(signed) A. Hadi Mokammel
Deputy Minister for Foreign Affairs
of the Democratic Republic of
Afghanistan

COMMITTEE ON DISARMAMENT

CD/94
18 April 1980

ENGLISH
Original: FRENCH

BELGIUM

Proposed definition of a chemical warfare agent and chemical munitions

I. Definition of a chemical warfare agent

In attempting to define the attributes which constitute a chemical warfare agent, one may apply a number of criteria, none of which, however, proves sufficient in itself. On the contrary, it appears essential to resort cumulatively to all these criteria in order to be able to delimit as precisely as possible the concept of a chemical agent.

(a) Criteria for efforts to establish a definition

1. General purpose.

In accordance with this criterion, a chemical warfare agent is any chemical substance used because of its toxic properties against man, animals or plants. This criterion therefore implies the intention to use for hostile purposes the toxic effects of certain specific chemical products. It thus clearly separates these chemical warfare agents from the other chemical products used in the course of hostilities, such as fuel for rockets or torpedoes, smoke-generating products, etc. The toxic properties, related to the intention to use them as such for a hostile purpose, are therefore necessary for a chemical warfare agent to exist.

2. The concept of toxicity.

This concept must be described in detail. Different approaches have already been attempted in the past in order to define it more precisely.

(a) The quantitative approach

This approach is based on the concept of lethality alone (LD_{50}, LCt_{50}), which, strictly speaking, is insufficient because toxicity, below a certain threshold, does not necessarily imply a lethal effect. Complementary criteria relating to incapacitating effects, both physical and mental, are therefore desirable.

(b) The qualitative approach

WHO has developed this approach by distinguishing three levels of toxicity in chemical substances according to the type and intensity of the effect sought:

Substances termed lethal because they are intended to cause death;

Incapacitating agents, which create a temporary physical or mental indisposition and whose incapacitating effects continue well beyond the period of exposure;

Tear gas, whose harassing effect lasts for little longer than the period of exposure.

It should be noted that these three types of effect are related to the doses received. Thus, for example, slight intoxication by nerve gas will have only an incapacitating effect without causing death. As can be seen, the borderlines between these three categories are relatively fluid. Here again complementary criteria are desirable.

(c) <u>The descriptive approach</u>

On the basis of general structural formulae, it is possible to determine the character of certain types of chemical warfare agent. This would be possible, <u>inter alia</u>, for the category of nerve gases, most of which are of organophosphorus origin.

(d) <u>The nominal approach</u>

In this case a non-restrictive list of names of relevant products is drawn up.

(e) <u>The approach based on suitability for military use</u>

Specific characteristics such as shelf-life, volatility and explosion stability are not always essential requirements for a toxic substance to be classified as a warfare agent because volatility is related to tactical use, explosion stability is not necessary in the case of aerial dissemination and shelf-life is not essential if the substance is produced <u>in situ</u>, as in the case of binary weapons.

(b) <u>Proposed definition</u>

1. General-purpose criterion must therefore be complemented by toxicity criteria based on both lethality and other properties, combined with a supplementary description of structural formulae and accompanied by a non-restrictive list of names.

2. Accordingly we may say: "<u>A chemical warfare agent is any chemical substance or any combination of chemical substances which is used by reason of its duly defined toxic properties, whether they are those of the substance itself or those of one of the final products of the combination</u>".

(c) <u>Application of the definition to binary weapons</u>

The introduction into this definition of the concept of the "final product" of a combination, in other words, the result of the final synthesis between two or more components, is made essential by the existence of binary weapons, whose characteristic is precisely that they release a toxicity which is based not on the substances themselves (components or precursors), but, rather on the final product which they generate.

Thus, the detection of a non-highly-toxic substance capable of being used as a precursor of a binary product would not constitute proof of the violation of a treaty unless the existence in sufficient quantity of other precursors, and hence of the combination giving rise to the final product, i.e. the chemical warfare agent created by the marriage of the binary elements, had been demonstrated.

The reference to the concept of a precursor contained in the joint USSR-United States statement of August 1979 is related to this difficulty, namely, that a given substance can hardly be considered to be a precursor as long as the final product is not known.

In the two cases, it is essential to compile a list of known (identified) precursors of chemical warfare agents, which cannot be used for other purposes.

All these questions, whose origin lies in the existence of binary weapons, prompt the conclusion that such weapons admittedly constitute a special case but do not represent a separate category. In the light of the general-purpose criterion, chemical agents for non-military purposes would ipso facto be covered by the prohibition established in a treaty as soon as they were associated with a precursor such that the combination resulting therefrom would have the effect of generating a toxic final product.

(d) Distinction between single-purpose agents and dual-purpose agents

(a) As regards single-purpose warfare agents, in other words, agents which can be used solely for military purposes, it is obvious that they should be prohibited, except in the quantities necessary for the study of protective measures and for research in general. These two activities require only minimal quantities which can in no circumstances be used for purposes other than those for which they are intended, i.e. essentially laboratory work. Thus, as far as Belgium is concerned, for example, a few hundred milligrams per annum per substance are ample.

(b) As regards dual-purpose agents, on the other hand, the question is obviously more delicate. Many such agents, particularly phosgene and cyanhydric acid, are widely used in the commercial sector. In the case of these agents, the treaty could be said to be violated only if an amount in excess of that authorized for the licit use of the product was stockpiled. If such a situation did occur, there would be a violation if a satisfactory economic explanation could not be given for the size of the stocks detected.

It should be noted that, because of special circumstances relating to production, situations might exist in which dual-purpose products were stored in quantities appreciably greater than could be accounted for on economic grounds. The discovery of situations of this type would inevitably give rise to interminable discussions and would unquestionably arouse distrust. It would seem that this could be averted only through the declaration of such stocks and their placement under the surveillance of a verification body.

(c) Consideration should also be given to the situation in which the chemical substance, instead of being stockpiled, was converted into chemical weapons and stored in this form.

II. Definition of chemical munitions

(a) Justification of efforts to establish such a definition:

1. Because of the problem posed by weapons which can be obtained in complete form or whose operation is based on new technological principles, it is impossible to limit oneself, in defining a chemical weapon, to its essential component, the chemical warfare agent.

2. The definition of a chemical weapon must be conceived in its most general sense in order to cover all chemical weapons.

3. The conversion of a chemical substance into a chemical weapon could constitute a loophole in verification, in particular of the stockpiling of chemical substances.

(b) Proposed definition

1. Chemical munitions are any munitions in which the conventional charge is replaced either by a chemical substance or by a combination of chemical substances and which are used by reason of their duly defined toxic properties, whether they are the properties of the chemical substance or those of the final product of the combination.

2. It is self-evident that this definition of chemical munitions covers any container whose purpose is to propagate or disseminate the chemical substances in question. Chemical munitions are not necessarily conventional in type. Dual-purpose chemical substances delivered in bulk, in other words, not in the form of conventional munitions, may be disseminated by other methods. In this connexion, one has in mind mainly aerial dissemination, possibly by the technique which enables thickened substances to be scattered from very high altitudes.

3. The poisoning of hectolitres of drinking water by a few grams of toxins also constitutes a form of dissemination.

4. It logically follows that any method of dissemination comprising a chemical charge whose characteristics conform to the definition of a chemical warfare agent should also be prohibited.

(c) Tear gas and grenades containing such gas

Although what is in fact involved is a chemical warfare agent stockpiled in the form of a complete chemical weapon, the situation of such agents is a special one. They constitute an exception when they are used in operations for the maintenance of order.

CD/96
22 April 1980

Original: ENGLISH

POLAND

Ad Hoc working group on CW - Initial Work Programme: Working Document

The Committee on Disarmament has agreed that the Ad Hoc working group on chemical weapons should seek to define, through substantive examination, issues to be dealt with in the negotiation of a multilateral convention on the complete and effective prohibition of the development, production and stockpiling of chemical weapons and on their destruction. To this end the group has been instructed to take into account all existing proposals and future initiatives.

Bearing in mind the fact that the group has been established for the duration of the Committee's 1980 session, it would seem desirable for the time factor to be reflected in a draft of the group's initial work programme. Accordingly, it would appear impracticable for the group to attempt, in the time available to it, to do more than to proceed to defining, through substantive analysis, the specific issues which need to be reflected in a CW convention as its key elements.

A close examination of some relevant documents recently tabled in the Committee, particularly CD/26, CD/44, CD/49 and CD/52 as well as re-examination of some of the views expressed in the Committee's chemical weapons debate will certainly support the conclusion that there are important areas where the USSR-United States Joint Report on progress in their bilateral CW negotiations corresponds to some extent to working document CD/44 in which the Polish delegation outlined a possible structure of a CW convention. It is felt, therefore, that in view of the time element as well as the proposed initial work programme, it would be appropriate for the Ad Hoc working group on chemical weapons to proceed first to a preliminary examination of the question of the scope of prohibition based upon purpose criterion. Specifically, the working group could consider a formula under which States Parties would assume a commitment never under any circumstances to develop, produce, stockpile or otherwise acquire, possess or retain supertoxic lethal chemical agents, other lethal or highly toxic chemical agents or their precursors, with the exception of chemical agents of types and in quantities having no justification for other than peaceful purposes as well as chemical munitions and other means of chemical warfare.

It is felt, furthermore, that the Ad Hoc working group could usefully seek to:

(a) prepare a differentiated list of CW agents to be banned, providing for the necessary exemptions on production, acquisition, stockpiling and use of specific types of CW agents for peaceful and other permissible purposes, including CW protection purposes;

(b) elaborate definitions of chemical agents falling into specific categories of permitted purposes, having in mind the possibility of resorting to such definitions in the process of consideration of the basic structural elements of a CW convention at further stages of the working group's activity, as appropriate.

The Polish delegation strongly believes that the positive results which the Ad Hoc working group on chemical weapons could secure in pursuing the initial work programme in 1980 would amount to a major breakthrough in discharging the Committee's responsibility for the negotiation and elaboration of a multilateral convention on the complete and effective prohibition of the development, production and stockpiling of chemical weapons and on their destruction.

Above all, such a progress would pave the way to elaborating a definitive structure or outline of a future CW convention and, subsequently, to addressing in a more substantive way other, more involved aspects of such a convention.

CD/97
24 April 1980
Original: ENGLISH

SWEDEN

Working Paper on the Prohibition of Chemical Warfare Capability

1. The ultimate objective of CD negotiations on chemical weapons is to prohibit the acquisition and retention of a chemical warfare capability. Existing facilities and means for maintaining a chemical warfare capability should be declared and destroyed or, if possible, converted to peaceful uses. To be effective a prohibition of a warfare capability must cover a number of activities, facilities and materials (including chemical weapons as such). The fulfilment of the obligations under the prohibition should be adequately verified.

2. The concept "chemical warfare capability" should include every activity, facility and material intended to utilize the toxic properties of chemical substances for hostile purposes in an armed conflict. Exceptions should be allowed for activities, facilities and materials intended for peaceful purposes, including some measures of a military nature and measures for protection against chemical warfare.

3. The prohibited activities, facilities and materials should be determined on the basis of a general purpose criterion. In addition other delimitation criteria should be used, i.a. regarding toxicity, quantity, verifiability and chemical structure.

4. Activities to be prohibited should include:

commercial activities, transfer development, including testing, production, stockpiling, planning, organization, training, dissemination of information, and other activities intended for a chemical warfare capability.

5. Facilities to be prohibited should include:

development and testing facilities, production facilities, resources for planning and organization, training facilities, including schools, information, and other facilities and resources intended for a chemical warfare capability.

6. Equipment and materials to be prohibited should include: chemical agents (in amounts larger than those required for protective or peaceful purposes), warheads and weapons systems intended for chemical warfare.

7. States parties to a Convention should co-operate and consult in order to solve any problem arising in relation to the Convention.

8. Compliance with the obligations under the prohibition should be monitored and verified through national and international means.

9. International means should include procedures for investigation, verification and confidence-building measures. On-site inspection should form part of the verification arrangements. There should be provisions i.a. for the establishment of a Consultative Committee with sufficient resources to monitor implementation of the Convention, including a permanent secretariat and technical expertise.

10. Detailed provisions regarding definitions, criteria, verification methods, Consultative Committee, etc., should be outlined in annexes to a Convention. These should constitute an integral part of the Convention and should have the same binding force.

GE.80-61093

COMMITTEE ON DISARMAMENT

CD/102
19 June 1980

ENGLISH
Original: ENGLISH/CHINESE

LETTER DATED 19 JUNE 1980 ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT FROM THE ACTING HEAD OF THE CHINESE DELEGATION TO THE COMMITTEE ON DISARMAMENT TRANSMITTING A WORKING PAPER ON THE "CHINESE DELEGATION'S PROPOSALS ON THE MAIN CONTENTS OF A CONVENTION ON THE PROHIBITION OF CHEMICAL WEAPONS"

I have the honour to forward to you the Working Paper of the "Chinese Delegation's Proposals on the Main Contents of a Convention on the Prohibition of Chemical Weapons". Please circulate it as an official document of the Committee on Disarmament.

(Signed) YU PEIWEN
Acting Head of the Chinese
Delegation to the Committee
on Disarmament

Working Paper

Chinese Delegation's Proposals on the Main Contents of a Convention on the Prohibition of Chemical Weapons

The use of chemical weapons has long been strongly denounced in the world. The Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, concluded in Geneva back in 1925, voiced the wishes of the people all over the world. However, because the Protocol only placed restrictions on, without providing for verification of, the use of chemical weapons, all kinds of chemical weapons have, since its conclusion, been developed, produced and stockpiled by some big powers, and were repeatedly used in wars. Particularly in the recent period, there have been numerous reports claiming that chemical weapons were used in Afghanistan, Laos and Kampuchea. All this constitute a grave threat to world peace and security and have aroused increasing concern among the States for a prohibition of chemical weapons. Facts prove that it is an urgent task of the Committee on Disarmament to conclude an international convention on the complete prohibition of the development, production, stockpiling, acquisition, transfer and use of chemical weapons and on their complete destruction.

Paragraph 2 of the operating section of Resolution No. 34/72 adopted by the General Assembly at its thirty-fourth Session reads: "Urges the Committee on Disarmament to undertake, at the beginning of its 1980 session, negotiations on an agreement on the complete and effective prohibition of the development, production and stockpiling of all chemical weapons and on their destruction, as a matter of high priority, taking into account all existing proposals and future initiatives."

Since taking part in the work of the Committee on Disarmament, the Chinese Delegation has studied the draft conventions, working papers and concrete proposals submitted by the member States or groups of the Committee and wishes to state its basic position on the conclusion of a convention on the prohibition of chemical weapons as follows:

1. The convention on the prohibition of chemical weapons should be comprehensive. The scope of prohibited activities in connexion with chemical weapons should include their development, production, stockpiling, acquisition, transfer and use; the scope of prohibited chemical weapons should include all chemicals determined by a general purpose criterion, i.e. whose types and quantities fail to justify the claim that they are intended for peaceful purposes, and weapons systems using these chemicals.

2. The existing stocks of chemical weapons should be completely destroyed, and the existing production facilities dismantled. Shutting down the facilities for the production of chemical weapons or converting them to peaceful production is not the best approach, for this will only increase the work load of verification and make it more difficult.

3. After entry into force of the convention, the Contracting Parties should, within a specified time, disclose information pertaining to the possession, stockpiling, and facilities for the manufacture of chemical weapons. Any Contracting Party having a stockpile and facilities for the production of chemical weapons should disclose their numbers and where these facilities are located as well as give a time table for the thorough destruction of the said weapons and the dismantling of the facilities within the shortest possible time.

4. There should be stringent and effective measures for international control and supervision to ensure the strict implementation of the provisions of the convention. An appropriate organ of international control should be set up for this purpose charged with the responsibility of verifying the destruction of chemical weapon stockpiles and the dismantling of facilities for their production. The organ should also be empowered to investigate charges on the use of chemical weapons and on any other violations of the convention.

5. Appropriate measures should be spelled out to deal with verified cases of violations of the convention with a view to bringing about their prompt cessation or providing strong assistance to imperilled Contracting Parties.

6. There should be included a clear understanding that no provision in this convention should be interpreted as limiting or detracting in any way the obligations undertaken by the Contracting Parties in accordance with the 1925 Geneva Protocol.

COMMITTEE ON DISARMAMENT

CD/103*
24 June 1980

Original: ENGLISH

LETTER DATED 24 JUNE 1980 FROM THE PERMANENT REPRESENTATIVE OF FINLAND TO THE UNITED NATIONS OFFICE AT GENEVA ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT TRANSMITTING A DOCUMENT ENTITLED "IDENTIFICATION OF DEGRADATION PRODUCTS OF POTENTIAL ORGANOPHOSPHORUS WARFARE AGENTS"

I have the honour to transmit to you a document entitled "Identification of Degradation Products of Potential Organophosphorus Warfare Agents". This study represents a further contribution of the Government of Finland to the work of the Committee on Disarmament on Chemical Weapons.

(Signed) Paavo Kaarlehto
Ambassador
Permanent Representative
of Finland

* A limited distribution of this document in English has been made to the members of the Committee on Disarmament. Additional copies are available from the Foreign Ministry of Finland in Helsinki.

GE.80-62824

COMMITTEE ON DISARMAMENT

CD/105
27 June 1980

ENGLISH
Original: FRENCH

FRANCE

Elements of a reply by the French delegation to the questionnaire relating to chemical weapons submitted by the Netherlands to the Committee on Disarmament (CD/41)

1. Scope of the convention

The use of chemical weapons is already prohibited by the Geneva Protocol, of which France is the depositary. The purpose of the future convention should be to ban the development, production and stockpiling of all chemical weapons and provide for the destruction of existing stockpiles and of production facilities. In this connexion, it should include strict and effective international verification procedures.

2. Areas to be covered by the convention

The convention should in particular:

Ban the development, production, stockpiling, acquisition, possession and transfer of chemical weapons and CW-agents, as well as the corresponding specific munitions, equipment and means of delivery necessary for their use;

Cover toxic and supertoxic lethal chemical agents as well as their specific precursors. France considers that it would be unrealistic to seek to ban the production of products used for both civilian and military purposes (subject to suitable control of quantities produced and their use), but that on the other hand there should be a complete ban on:

Toxic products for specific military use and their precursors;

Incapacitants and dangerous harassing agents (i.e., harassing agents whose safety coefficient - effective dosage/lethal dosage - does not exceed a given threshold);

Provide for a declaration of possession or non-possession, and for the destruction within a specific period (for example 10 years), of stockpiles of chemical agents used for military purposes and also of stockpiles of chemical weapons. One of the convention's provisions should stipulate that every signatory country should make known a detailed quantitative and qualitative inventory of the toxins in its possession as well as an estimated timetable for the destruction of the stockpiles. It would also be desirable for priority to be given to the destruction of weapons containing highly toxic products;

Provide for a declaration of possession or non-possession (location, capacity, etc.) and for the dismantling of CW-production facilities. They could be dismantled on the basis of an approved timetable through destruction or "moth-balling" of the facilities or the conversion of the plants to peaceful uses.

3. Licensed activities

The convention should, however, upon conditions to be defined, license the conduct of activities which involve the production of chemical agents normally banned:

1. Exclusively for scientific and medical research;

2. Exclusively for testing means of protection of the potential for defence against chemical weapons.

Periodic declarations should be made concerning the nature and quantity of such production.

4. Criteria

The general purpose criterion, on which the banning of the production of toxic products for military purposes is based, should be taken as the main criterion. It should be supplemented by more technical criteria, such as the toxicity threshold, adjusted to the specific characteristics of each toxin by means of an effectiveness threshold/lethal dosage safety coefficient, and/or the structure criterion.

It seems both difficult and self-defeating to draw up exhaustive and continuously updated lists of banned or licensed chemical agents. It would be more realistic to envisage the use of approved lists of chemical reference products.

5. The national system of control

Every State should set up a national system of control enabling it, within the framework of its own institutional arrangements, to ensure compliance with the provisions of the international convention.

6. International verification

France considers that it is essential to define the procedures for any international control of compliance with the provisions of the convention.

In this connexion, the convention should provide not only for non-interference with the national systems of control and for "verification by challenge" procedures, but also for the organization of international investigation and inquiry procedures. (National control measures should not hinder the international verification procedures, but rather support them; international control should take precedence over national measures.)

In both cases an important place should be given to on-site verification as well as to the most modern control methods.

7. Systematic international verification measures

International verification measures should involve, in accordance with approved procedures, regular on-site verification to ensure in particular:

Compliance with provisions governing the destruction of stockpiles;

Compliance with provisions governing the destruction, "moth-balling" or conversion to peaceful uses of facilities for the production of chemical agents and of weapons;

Compliance with provisions governing the non-production of toxic products for specific military purposes and single-purpose precursors;

Monitoring of facilities for the production of agents akin to organo-phosphorus compounds (pesticides, in particular);

The control of licensed laboratory production for basic research and for defence research.

8. International verification structure

The responsibility for on-site international verification should be entrusted to a committee open to all parties. The committee might include a permanent secretariat and a corps of inspectors responsible for verification. The services of a specialized laboratory should be envisaged.

9. Regional measures

None of the clauses of the future convention should restrict the right of States which so wish to accept regional measures which are stricter than those laid down by the convention itself.

10. Confidence-building measures

The convention should provide for confidence-building measures. Such measures might in particular take the form of a declaration of possession or non-possession of chemical weapons at the time of entry into force of the convention, as well as of exchanges of technical or information visits in the field of protective measures against chemical warfare.

COMMITTEE ON DISARMAMENT

CD/106
27 June 1980

ENGLISH
Original: FRENCH

FRANCE

Working paper

Control of the non-manufacture and non-possession of agents and weapons of chemical warfare

Many countries, including France, rightly consider that it would be more dangerous for the security of the countries affected to prohibit the manufacture and possession of chemical agents and weapons without providing means of verifying the strict application of the prohibition than to have no agreement whatsoever.

The prohibition of manufacture should be adapted to the category of chemical warfare agents covered: for single-purpose (super-toxic and incapacitating) agents, the prohibition would be total, while for dual-purpose agents and irritants, the manufacture only of amounts required to meet civilian needs would be authorized.

Control of non-manufacture would therefore cover exclusively the first category; in the case of dual-purpose agents, control would be confined to ensuring that the amounts produced do not exceed a certain level determined by the volume of civilian manufacture and, where they do, to checking that the surpluses are not used in chemical munitions or devices.

Single-purpose chemical warfare agents

1. Control and verification

Single-purpose agents obviously comprise the class of super-toxic substances and, within this class, the category of organophosphorus compounds, over which the greatest vigilance should be exercised.

Non-manufacture should be monitored at two levels:

By ascertaining that manufacturing plants specializing in the production of organophosphorus nerve agents have indeed been closed down or converted and have consequently ceased all military activity;

By ensuring that plants producing related compounds (pesticides) are not improperly converted into factories for the manufacture of nerve agents; such conversion would be possible in a few months.

The first step, without which all control would become difficult if not completely ineffective, would be the registration by countries possessing them of all installations producing or having produced organophosphorus nerve agents.

Presuming that this requirement is correctly applied, effective control can only be exercised through on-site inspection, whether periodic and unannounced, on request or on the complaint of a member country or international organization. There is no other method of ensuring for certain that a country which has committed itself to an agreement prohibiting manufacture is not violating the provisions of that agreement. Such on-site inspection must be thorough if it is to be effective; it is therefore not discreet, and some countries may be reluctant to accept it, fearing that it might involve a disclosure of military, industrial or trade secrets. In the case of super-toxic substances, this fear does not appear justified because, by definition, they are intended only for military purposes and, in the spirit of the agreement itself, there can be no military or industrial secrets in this area.

Because of the doubts to which the idea of thorough on-site inspections have given rise, efforts have been made in the Conference of the Committee on Disarmament to find methods which could be applied in both the above cases and would necessitate the presence of an observer or controller, not in the plant itself, but merely in the neighbourhood. These methods will be considered below for each of the two cases.

The suggestion that there should be remote sensing of indications of clandestine manufacture of nerve agents, eliminating even the need to enter the national territory of the country under inspection, however, goes much further. The suggested methods include:

Processing of statistical data provided by member countries;

Remote detection of chemical agents in gaseous effluents using ultra-sensitive detectors mounted on satellites or based on land outside the territory of the country being monitored.

All these methods have the same serious disadvantage: they are rather unreliable and the absence of any positive indications of clandestine manufacture does not ensure beyond doubt that there has been no violation of the terms of the agreement. It has, however, been suggested that the lack of reliability could, to some extent, be offset by using several of these methods, and that the mere fact of their announced application could play a dissuasive role and make any attempt to circumvent the terms of the agreement excessively complicated. Even if this was so, the installation of such a system would be too cumbersome and would not yield results that were certain.

2. <u>Analysis of statistical data</u>

It has been felt that the analysis of existing statistical data on the production, importation, exportation and use of raw materials and products involved in the manufacture of chemical warfare agents could reveal any undue change in the volume of products consumed that could imply clandestine manufacture of chemical agents.

This process would be applicable primarily to organophosphorus nerve agents, among which it has been suggested that the following products should be monitored: phosphorus; phosphorus trichloride; phosphorus pentachloride; phosphorus oxychloride; phosphorus pentasulphide; phosphites of dimethyl, trimethyl, diethyl and triethyl; pinacolic alcohol; dichloride and difluoride of methyl-phosphonic acid. All these products, except perhaps the last two, have industrial applications.

However, statistical data at present published on these products are usually very incomplete; the content and presentation vary in different countries. If they are to be utilized, therefore, they should be submitted in the same form by all countries and supplemented in order to cover all products selected as indicative.

This method should not give rise to exaggerated expectations, since:

There are considerable annual fluctuations in the statistics in question for reasons that have nothing to do with the production of chemical agents; these variations could lead to unjustified suspicion;

By contrast, in a highly industrialized country producing pesticides and consuming large amounts of raw materials, a small withdrawal of about 1 per cent, which would initially be imperceptible, could be used to manufacture hundreds of tonnes of nerve agents every year.

In this area, too, a great deal of technical work will have to be done before the method can be used with any chance of success. This work should be entrusted to a group of experts, the main task of which would be to harmonize data collection in member countries. In this sphere of statistical data collection and utilization, it could also study the legislation in force in each country and the possibilities of using United Nations studies on certain related subjects (environment, drugs, etc.).

3. Remote sensing

It has been suggested that it might be possible to detect the presence of super-toxic substances or intermediate products in gaseous effluents from a factory under suspicion from very great distances. Some 1/ consider that highly sensitive detectors, either mounted on satellites in geostationary orbit or based on earth outside the countries being monitored, would be able to detect concentrations of 10^{-1} mg/m^3 with a probability of 0.3 in winter and 0.75 in summer. Others 2/ believe that even greater sensitivity is obtainable with monolithic impure crystal detectors at the ultra-low temperatures found in outer space or by using the induced and resonance combination scattering (Shorygin) effect.

Identification of the substance could be based on the infra-red and Raman spectra.

1/ CCD/371, 502

2/ CCD/538

Although they are possible in theory, no experimental verification of these methods has yet been attempted and it may be doubted whether they are applicable in the near future, given the present level of technology in this sphere. 3/

4. Closure and surveillance of existing manufacturing plant

In addition to the dissemination by each member country of a list of factories which have manufactured chemical warfare agents (including super-toxic substances) and were scheduled for closure or conversion under the agreement, the agreement should lay down the procedure for ensuring that they have not recommenced operation.

It has been seen that only periodic and thorough on-site inspections could indicate with certainty that no illicit activity has been carried on in a factory that has been shut down. However, in order to avoid permanent, burdensome and encumbering surveillance, a method has been suggested which would not necessitate the continuous presence of observers or inspectors. It would consist in affixing virtually unbreakable sealing devices to the apertures and certain central components of the manufacturing equipment (controls, valves, etc.). In this way, valves could be enclosed in aluminized-glass cases with a number of channels incorporating optical-fibre cables. Since each of these cables has its own imprint, any attempt to use the valves would be easy to detect. The aluminization of the glass would enable any attempt to pierce a hole in the casing to be detected.

Other methods for detecting the fraudulent use of a factory that has been shut down -- seismic detectors, thermal detectors, closed-circuit television systems -- have been recommended, although their efficiency has not been verified.

All these measures require the presence on site, at least periodically, of inspectors.

5. Monitoring of plants manufacturing organophosphorus compounds and new plants

There should also be monitoring of plants manufacturing organophosphorus compound pesticides and of new plants which could, through certain changes in equipment, produce organophosphorus nerve agents. Thorough on-site inspection could involve the disclosure of industrial secrets in these cases.

Efforts have therefore been made to find methods of detecting whether a particular installation is manufacturing nerve agents without necessitating the indiscreet presence of inspectors in the factory itself.

The first method consists in reducing inspection to a brief and superficial visit aimed merely at evaluating the safety measures adopted, the scope of which can reveal whether chemical agents are being manufactured. The second is based on examination of the effluents leaving the plant.

3/ CCD/360

(a) Brief inspections

The sole purpose of such inspections, which would not go into production details, would be to detect signs of the unauthorized production of chemical warfare agents; particular attention would be paid to the nature and extent of the safety measures applied.

Buildings in which highly toxic products are manufactured are generally designed in such a way that production or processing units are airtight and are kept at less than atmospheric pressure in order to prevent any leaks. Since certain intermediates in nerve-agent production are pyrophoric, the presence of an inert gas in the vessels containing them could be detected; similarly, pipes could be equipped with an inert-gas rapid-purge system. As there are no leakproof pumps, liquids are often made to flow by gravity. In production areas, there will be an evident increase in remote controls and monitoring and alarm devices (cages of test animals, alarm detectors).

The staff will be equipped with masks and often dressed in special impermeable clothing. "Hot" spaces will be entered by locks fitted with sprinklers. Installations will be equipped with automatic sampling devices.

The factory itself will have its own plant for emergency air and power supply.

Finally, although medical supervision is the norm in many facilities producing organophosphorus pesticides, its nature and extent (frequency of blood cholinesterase doses, resuscitation, presence of specific antidotes) might constitute indicators.

One should not, however, entertain any illusions concerning the usefulness of such a brief inspection by itself; it can only serve as a complement enabling other indicators collected elsewhere to be confirmed. First of all, assessments of the level of safety needed vary from country to country. Moreover, safety measures of similar type are often applied during the final phase in the production of certain toxic pesticides in order to guard against the danger of a substantial quantity of the substance being accidentally discharged.

(b) Effluent analysis

This method is based on the fact that, in the manufacture of organophosphorus compounds, some of the products used in the final phase of the manufacturing process and the end-product itself are to be found in very low concentrations in liquid effluents and the surrounding atmosphere: even if these products have undergone some degradation during effluent treatment, the controlled hydrolysis of super-toxic organophosphorus compounds invariably produces methylphosphonic acid, which is readily identifiable by its phosphorus-methyl group: with a few exceptions, organophosphorus pesticides yield phosphoric acid in the same conditions.

When concentrated, samples of such effluents and of the air in the immediate vicinity of the suspected factory would enable the products concerned to be identified and analysed. There are various methods which can theoretically be applied for such analysis: gas chromatography, thin-layer chromatography, infrared spectrometry, emission spectrography, mass spectrometry, magnetic-resonance molecular spectrometry, paramagnetic electronic resonance, colorimetry and enzyme analysis.

These methods, which have proved themselves in the laboratory, have never been tried in the practical conditions of a check requiring a simple, rapid, accurate and practicable procedure with easily transportable and inexpensive equipment. Among the physical methods, gas chromatography, which is in common use, is the most readily applicable in the present circumstances: a chromatograph coupled with a thermionic flame detector would permit detection to 1×10^{-13} g. However, this method would need further refinement to be applied to effluents discharged into a watercourse, for experience has shown that some watercourses (for example, the Rhine) are normally polluted by interfering products which are detrimental to measurement reliability. 1/

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Dual-purpose chemical warfare agents

In the case of dual-purpose agents and precursors, the only available monitoring method is statistical data analysis aimed at detecting the manufacture of possible surpluses above civilian requirements.

Such monitoring can be done only at the level of the filling of munitions and devices, since it is not possible to prove that surplus stocks of such products are not intended for civilian purposes. Efforts should therefore be concentrated on the detection of filling facilities; such detection will doubtless be even more difficult than in the case of single-purpose chemical warfare agents.

* * *

Prohibition of production in the various draft conventions

Problem of verification

1. Prohibition of development, production and stockpiling

Three draft conventions have been submitted to CCD. The prohibition of the development and production of chemical warfare agents is dealt with in the following articles of the various drafts:

Draft of the socialist countries: articles IV and V;

Draft of Japan: articles V and VI;

Draft of the United Kingdom: articles III, V, VIII and IX.

1/ CCD/553.

The drafts of the socialist countries (article IV), Japan (article V) and the United Kingdom (article V) formulate in more or less the same terms the scope of the prohibition of the development, production or retention (stockpiling in the United Kingdom text) of agents, weapons (munitions in the United Kingdom text), equipment and means of delivery (systems in the United Kingdom text).

Article III of the United Kingdom proposal is far more precise regarding the scope of the prohibition. It embodies an undertaking:

To close down, dismantle or convert any factories producing chemical warfare agents;

Not to convert any existing factories or establish any new factories for the production of chemical warfare agents;

To close down, dismantle or convert filling facilities.

Article V of the socialist countries' draft merely stipulates that any problems which might arise shall be solved by consultation and co-operation between the States Parties, possibly through international procedures (unspecified).

The drafts of Japan and the United Kingdom are more comprehensive and make express provision for the procedures to be applied.

The Japanese draft calls for national verification organs which would supervise the national activities related to the subject matter of the Convention, report to an International Verification Agency, provide it with the necessary statistical data and co-operate with it.

The International Verification Agency would analyse and evaluate periodic reports and information from the national organs, request explanations and, if appropriate, send observers, participate in inquiries or inspections and, lastly, carry out decisions.

The United Kingdom draft provides for a Consultative Committee with functions similar to those of the International Verification Agency:

Analysis and evaluation of periodic reports and statistical and other information;

Requesting of information and conduct of inquiries and inspections;

Co-operation with the national organizations.

On the other hand, article IX of the United Kingdom draft gives a detailed description of the obligations of States Parties in this regard:

Acceptance of inspection within six months of the entry into force of the Convention, of any factory formerly producing chemical warfare agents, and taking of samples;

Acceptance of sealing and periodic inspection of factories formerly producing chemical agents and munitions;

Acceptance of a number of inspections of specified factories.

The Consultative Committee would ensure the performance of these tasks.

2. Complaints and investigations

Draft of the socialist countries: article VI;

Draft of Japan: articles VIII, IX, X;

Draft of the United Kingdom: articles IX and X.

The socialist countries' draft provides (article VI) that a State Party which finds that there has been a breach of the provisions of the Convention may lodge a complaint with the Security Council. The other States are required to assist in carrying out any investigation decided upon by the Security Council on the basis of that complaint.

The Japanese draft envisages a different procedure: a State which suspects that there has been a breach of the Convention may request an explanation, directly or through the International Verification Agency, and the Agency itself may take the initiative of requesting explanations. The suspected State co-operates in good faith: it may request an inquiry or an inspection to remove suspicion.

Only when the explanations requested are found to be inadequate will the International Verification Agency request an inspection which the suspected State shall make every effort to accept, unless it gives valid reasons for refusing such inspection.

The United Kingdom draft (article X) provides in the first part for a procedure similar to that of the Japanese draft: request for an explanation in the event of a breach, but also request for an investigation with an on-site inspection to be carried out by the Consultative Committee, which must be accepted by the suspected State. A complaint may also be lodged with the Security Council.

* * *

In conclusion, control of the non-production of chemical warfare agents raises two problems: monitoring and verification.

While a number of monitoring procedures have been proposed, there are two contrasting approaches in the matter of verification. One is that only on-site inspection under international supervision can permit effective verification of the non-production of chemical agents; this approach is reflected in the draft convention proposed by the United Kingdom. The other approach rejects this procedure and emphasizes national means of verification, international intervention being limited to the application of monitoring procedures whose reliability is open to question: the socialist countries have submitted a draft along these lines.

In the view of the French delegation, the first monitoring procedure to be developed should be statistical data analysis. It applies both to single-purpose and dual-purpose agents. Effectiveness requires that each of the Convention's signatory countries should undertake to supply the following information:

Nature, quantity and utilization of organophosphorus compounds, raw materials and intermediates used in their production, and precursors of such chemical warfare agents;

Nature, quantity and utilization of dual-purpose chemical agents produced;

Proposed activities of newly constructed chemicals factories.

The signatory countries should also undertake to submit periodic reports on their compliance with the provisions of the Convention, and these reports should be approved and transmitted at the governmental level.

Remote-detection monitoring procedures do not seem capable of providing information on the nature of the products manufactured.

As to the problems raised by verification, it must be acknowledged that only on-site inspection of an international character, possibly accompanied by the taking of samples, can afford fully adequate guarantees. Such arrangements are considered essential both for systematic verification and for a check resulting from a challenge procedure. If non-technical conditions were to lead to the acceptance of an agreement providing for national verification, such verification should at least be accompanied by international procedures for the monitoring of declared sites for the production of single-purpose and dual-purpose chemicals. The procedures introduced should permit both verification of the non-reactivation of "mothballed" factories and monitoring of the environment of operating factories. Observation satellites might be suitable for the former purpose and periodically read "black boxes" for the latter.

In all cases of a breach or a request for an inquiry, on-site inspection by an international body should be accepted by the suspected State.

The establishment of an international body -- for instance, a Consultative Committee -- is therefore essential.

The problems raised by "binary" weapons have not been dealt with. They warrant special study and examination of an extremely comprehensive nature.

COMMITTEE ON DISARMAMENT

CD/110
2 July 1980

Original: ENGLISH

YUGOSLAVIA

Working Paper on Medical Protection Against Nerve Gas Poisoning (Present Situation and Future Possibilities)

In July 1976 the Yugoslav delegation submitted the working paper CCD/503 to the CCD which contained a comprehensive review of the relevant data regarding the problem of medical protection against nerve gas poisoning.

This working paper, which bears the same title as the one submitted four years ago, endeavours to present the current situation in this field and some investigations that are in progress. Scientific and professional achievements of those countries that engage in active theoretical and practical research in this plane were considered.

1. MODE OF ACTION

Regarding the mode of action of nerve agents, nothing new or important (spectacular) has happened up to date that could alter the generally accepted knowledge.

2. DECONTAMINATION

Concerning decontamination, both personal and total, some armies have succeeded in finding highly efficient decontamination material. It, therefore, seems that the problem of decontamination does not exist any more in its previous form. However, the ingredients that are necessary for decontamination material are very expensive and, having in mind the required amounts, it would not be realistic to expect that -- with the exception of highly developed countries -- the greater part of the world could possess them in sufficient quantities, especially as part of a first-aid kit.

3. ANTIDOTAL THERAPY

Gas masks (or protective masks) and protective clothing can provide effective protection against nerve gas attacks. However, in battlefield conditions, antidotes must be used in the following situations:

- when the lapse of time between the attack and the fitting of the gas mask is more than ten seconds (it is sometimes even shorter when the initial concentration of nerve gas is extremely high);
- when protective equipment does not fit properly;
- when it has been damaged; and
- in cases when the sorptive capacity of the respirator filter or protective suit becomes saturated under conditions which do not permit immediate replacement.

3,1 Atropine still remains the drug of choice. Although some attempts have been made to utilize other compounds instead of atropine (dexetimide and others), none of them were proven to give better protection.

3.2 Oximes. Of the hundreds of oximes that have been synthesized and tested on experimental animals poisoned by nerve gas, only three have found a place in medical practice: pralidoxime (also known as variation P_2S), trimedoxime (known as dipiroxime) and obidoxime (known as toxogonine).

It seems that pralidoxime is losing its priority to obidoxime and trimedoxime because, for some armies, the combination of trimedoxime with atropine and benactyzine is at present the most attractive one. Nevertheless, even this combination does not offer satisfactory protection against one of the nerve agents, i.e. soman.

An important achievement in protection has been made by combining the different routes of oxime application (peroral and intramuscular) in order to maintain an effective concentration of antidotes in the blood for some hours.

3.3 In symptomatic therapy, it seems that diazepam is not in the experimental stage anymore but has become a standard supportive drug in the treatment of convulsions induced by nerve gas poisoning.

It has been calculated that in battlefield conditions an efficient protection against up to 5 LD_{50} of nerve gas poisoning could be offered by using antidotal mixtures that counteract upon the agent which has been used. In view of this, the best protection could be obtained in the case of VX poisoning while it is less effective in case of poisoning by sarin, and less still in case of poisoning by tabun and soman.

4. FURTHER INVESTIGATION

In recent years great efforts have been made in seeking compounds which would provide effective treatment against soman poisoning. Among a number of such compounds, the on coded HI-6 has proven ery effective on experimental animals poisoned by soman. However, the HI-6 compound is totally ineffective in case of tabun poisoning.

During the course of the past two years another group of antidotes coded as HGG compounds appears to be the first "universal" oximes, as their application in combination with atropine offers protection against all four standard nerve agents, i.e. sarin, soman, tabun and VX. It should be underlined that HGG compounds are still in the initial experimental stage, while HI-6 is in a more advanced one. It should also be pointed out that a serious setback of the HI-6 compounds is their low stability in water and buffered solutions. Until the stability problem is solved, they cannot replace pralidoxime, obidoxime and trimedoxime in autoinjectors intended for first aid and treatment. It looked as if the problem of oximes of low toxicity which could penetrate the blood brain barrier had a good chance to be solved in 1976. However, this opinion was proven excessively optimistic. The oxime propam was unstable and, what is perhaps even more important, reactivated brain acetylcholinesterase it did not have any remarkable protective advantage over standard oximes in experimental animals poisoned by nerve agents.

The attempt to increase the efficiency of therapy by adding other drugs to atropine - oxime mixture, with the exception of the aforementioned benactyzine, and the separate addition of diazepam, has failed so far. The veratrine-like compounds which seemed so promising in 1976, seem to have also been abandoned.

The United Kingdom delegation presented a paper in 1977 (CCD-541) about the possibility of using carbamates as prophylactic agents against nerve gas poisoning. As far as is known, this work is still in progress.

Another possibility was mentioned in 1976 regarding protection by "shielding" acetylicholinesterase in order to protect critical sites affected by nerve agents. However, no promising results have been obtained until the present.

The previously mentioned activities concerning active and passive immunization seem to be ineffective from the practical point of view.

It was stated in 1976 and should be repeated now, that the continued research in the field of medical protection against nerve gas poisoning is in steady progress, particularly during the last four years when it has made a remarkable step towards its goals.

It is with the greatest satisfaction that it can be said that the first steps in international co-operation of scientific research on prophylaxis and therapy for nerve gas poisoning have taken place. Numerous scientists from various countries met at the Pugwash meetings on Medical Protection against Organophosphorus Poisons Workshops, twice in Yugoslavia and once in Finland. They also met in the German Democratic Republic. On these occasions, they exchanged views, ideas, experiences and results achieved in this field.

As a direct result of the meeting held in 1978 in Yugoslavia (Dubrovnik) the Institut fur Aerobiologie, Grafschaft, Federal Republic of Germany, the Prins Mauritz Lab. TNO Rijswijk, Holland and the Institute for Organic Chemistry and Biochemistry from Zagreb, Yugoslavia organized a control experiment. The aforementioned substance HI-6 was synthetized in each of the three institutes and specimens of it exchanged. The comparing of results obtained in all three institutes including all three specimens showed that there was neither physico-chemical nor biological difference between them in vitro and in vivo experiments.

An increasing number of papers that deal with the protection of experimental animals against nerve agents, especially soman, appear in scientific literature. The most interesting information comes from the Federal Republic of Germany, the Netherlands, Canada, the United Kingdom, Poland and Yugoslavia. However, nothing new or interesting comes from some other countries which are known to have much experience in this field. Some promising publications of this kind are also coming from India, China and some other countries as well.

This brief review is an account of the efforts made by scientists in various countries in seeking the solution for protection against poisoning by nerve agents. Unfortunately, the results show that an efficient antidotal therapy against all four chemical agents mentioned here does not exist for humans.

These facts on how dangerous the use of nerve agents as chemical weapons could be for mass destruction speak for themselves. It is, therefore, the responsibility of all concerned to find the quickest and most effective way to ban chemical weapons.

COMMITTEE ON DISARMAMENT

CD/111
2 July 1980
Original: ENGLISH

YUGOSLAVIA

Working Paper on the Definition of Chemical Warfare Agents (CWA)

In 1976 the Yugoslav delegation submitted a working paper entitled "Definition of chemical warfare agents" (CCD/505 of 5 July) aimed at offering the bases for a definition that would be more comprehensive than all previous ones.

The proposed definition would read as follows:

> All chemical compounds intentionally used in quantities and manner, which directly or indirectly, immediately or after some time can produce physiological disturbances or cessation of physiological functions in man, animals and plants should be considered as chemical warfare agents.

As is evident, our draft definition encompasses the following in reduced form:

(a) intention of use

(b) the quantity used

(c) manner of utilization

(d) the direct or indirect toxic effect

(e) immediate or delayed toxic action

(f) the effect on all living structures

The following was borne in mind (with regard to items a - f):

- that the proposed definition expresses in a somewhat more precise manner that which was proposed as a definition in "Health Aspects of Chemical and Biological Weapons", the WHO, Geneva 1970, inasmuch as the term "employed" has been replaced by "intentionally used";

- the term "used in quantities" was intended to point out that one should not exclude the possibility of applying chemical compounds not classified as chemical agents in quantities (concentrations) not envisaged (necessary) for their usual utilization (pesticides, for instance, etc.) which also exists apart from the use of classified chemical agents;

- all weapons, regardless of their primary purpose, are to be classified as CW if they invariably cause injury or death during or after their utilization because of foreseeable and dominant toxic action;

- due to the chemical properties and toxicodynamics of a certain compound, symptoms of poisoning can manifest themselves immediately as well as after a shorter or longer time interval;

- as far as the direct and indirect action and the effect on all living structures is concerned, we are of the opinion that no additional comment is necessary.

All proposals for the definition that have appeared since 1976 until the present have not, in our opinion, offered the elements that would require substantial modifications or amendment of our definition of chemical warfare agents. We, therefore, thought it appropriate to pronounce it once again in the Committee on Disarmament.

CD/112
7 July 1980

Original: ENGLISH/
RUSSIAN

LETTER DATED 7 JULY 1980 ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT FROM THE REPRESENTATIVES OF THE USSR AND THE UNITED STATES TO THE COMMITTEE ON DISARMAMENT

We have the honour to transmit and to request, for the information of the Committee on Disarmament, the circulation of the following document entitled, "USSR-United States Joint Report on the Progress in the Bilateral Negotiations on the Prohibition of Chemical Weapons."

(Signed) V.L. ISSRAELYAN
Representative of the USSR
to the Committee on Disarmament

(Signed) CHARLES C. FLOWERREE
Representative of the United States
to the Committee on Disarmament

JOINT US-USSR REPORT ON PROGRESS IN THE BILATERAL NEGOTIATIONS ON THE PROHIBITION OF CHEMICAL WEAPONS

The Delegations of the US and the USSR, guided by the fact that prohibition of chemical weapons is, as was stressed in the Final Document of the United Nations General Assembly Special Session on Disarmament, one of the most urgent and vital problems in the area of disarmament, and considering the desire of many member states of the Committee on Disarmament to be informed about the state of affairs at the bilateral negotiations concerned with the preparation of a joint initiative on the prohibition of chemical weapons, have submitted to the Committee on Disarmament joint reports regarding progress at their negotiations. The Delegations of the US and the USSR submitted the last such report on 31 July, 1979 (Document CD/48).

Since that time, two more rounds of the bilateral negotiations on the prohibition of chemical weapons have been held, in the course of which the Delegations of the US and the USSR continued their efforts toward earliest development of a joint initiative on the prohibition of chemical weapons and its presentation for consideration by the Committee on Disarmament. Given the interrelationship between the various issues, the two sides will be able to report definitive agreement in any particular area only after they have completed their negotiations. The present report of the two delegations reflects, however, the current status of the negotiations.

1. The two sides proceed from the premise that the scope of the prohibition in the future convention would be determined on the basis of the general purpose criterion. They believe that the parties to a convention should assume the obligation never to develop, produce, otherwise acquire, stockpile or retain super-toxic lethal, other lethal or other harmful chemicals, or precursors of such chemicals; the obligation should not extend to those substances in these categories which are intended for nonhostile purposes or military purposes not involving the use of chemical weapons, provided their types and quantities are consistent with such purposes. The two sides also believe that the parties to a convention should undertake never to develop, produce, otherwise acquire, stockpile or retain munitions or devices specifically designed to cause death or other harm through the toxic properties of chemicals released as a result of the employment of these munitions or devices, or equipment specifically designed for use directly in connexion with the employment of such munitions or devices. No agreement has yet been reached in some specific aspects of these proposed undertakings, including the extent to which irritants, toxins and precursors should be covered, and the two sides are seeking to resolve their differences.

2. The two sides consider that a convention should include definitions for a number of basic terms which would be used in its provisions. They have developed a common understanding of the following terms:

(a) by "chemical weapons" ("means of chemical warfare") they mean chemicals, munitions, devices, or equipment that would be covered by the obligations outlined in paragraph 1 of this report;

(b) by "super-toxic lethal chemical" they mean any toxic chemical with a median lethal dose which is less than or equal to 0.5 mg/kg (subcutaneous administration) or 2,000 mg-min/m^3 (by inhalation), when measured by an agreed method;

(c) by "other lethal chemical" they mean any toxic chemical with a median lethal dose which is greater than 0.5 mg/kg (subcutaneous administration) or 2,000 mg-min/m^3 (by inhalation) and which is less than or equal to 10 mg/kg (subcutaneous administration) or 20,000 mg-min/m^3 (by inhalation), when measured by an agreed method;

(d) by "other harmful chemical" they mean any toxic chemical with a median lethal dose which is greater than 10 mg/kg (subcutaneous administration) or 20,000 mg-min/m^3 (by inhalation), when measured by an agreed method;

(e) by "nonhostile purposes" they mean industrial, agricultural, research, medical or other peaceful purposes, law-enforcement purposes, or purposes directly related to protection against chemical weapons.

The two sides are continuing work toward developing, for the purposes of a future convention, common understanding on the meaning of some additional terms.

3. The two sides believe that the use, in addition to the general purpose criterion, of the aforementioned toxicity criteria which serve as a basis for identifying super-toxic lethal, other lethal and other harmful chemicals, as well as of some other provisions, would facilitate verification. Different degrees of prohibition and limitation, as well as differentiated verification methods, would be applied on the basis of these toxicity criteria and some other provisions.

4. The two sides consider that the parties to a convention should assume the obligation not to transfer to anyone, directly or indirectly, any chemical weapons. The parties should also undertake not to transfer to anyone, directly or indirectly, except to another State party, any super-toxic lethal chemicals produced or otherwise acquired for permitted purposes, of types or in quantities which are suitable for chemical weapons purposes. In addition, the parties should undertake not to assist, encourage or induce, directly or indirectly, any person, organization, State, or group of States, to engage in activities they themselves would be obligated to refrain from under a convention.

5. The two sides consider that States should make declarations -- within 30 days after they become parties to the convention -- regarding both their stocks of chemical weapons and their means of production of such weapons. Plans for the destruction or, where appropriate, diversion for permitted purposes of declared stocks of chemical weapons should also be declared; such plans should specify the volume and timing of destruction. Plans for the destruction or dismantling of relevant means of production should be declared not later than one year prior to the beginning of the destruction or dismantling. The two sides are continuing negotiations regarding the time-limit for declaring plans for the destruction or diversion of chemical weapons stocks, as well as regarding the specific content of the declarations pertaining to stocks of chemical weapons and means of production. In this connexion, no common understanding has yet been reached of the basic concept of means of production.

6. Destruction or diversion of declared stocks should be completed not later than ten years after a State becomes party to the convention. No agreement has yet been reached on the question of the time for beginning the destruction or diversion of stocks and some other related issues.

7. The two sides believe that parties to a convention which possess chemical weapons should have the right to convert temporarily former chemical weapons production facilities for the purpose of destroying their stocks of such weapons. Some aspects of the possibility of establishing a specialized facility or facilities for the destruction of chemical weapons are under discussion.

8. Both sides remain of the opinion that the parties to a convention should shut down and eventually destroy or dismantle the means of production declared in accordance with the convention. Each State party having such means of production should initiate their destruction or dismantling not later than eight years, and complete it not later than ten years after it becomes a party to the convention. Other issues in this area are the subject of continuing negotiations.

9. The US and the USSR continue to believe it advisable that the future convention contain provisions in accordance with which the parties would periodically exchange statements and notifications concerning progress of the destruction of stocks of chemical weapons or their diversion for permitted purposes, the progress of the destruction or dismantling of means of production, and of the completion of these processes.

10. In the course of the negotiations, agreement has been reached that the aggregate quantity of super-toxic lethal chemicals for nonhostile military purposes, produced, diverted from stocks, and otherwise acquired annually, or possessed at any given time, should be minimal. The two sides believe that, in any event, that amount should not exceed one metric ton for any party. A party to the convention producing super-toxic lethal chemicals for nonhostile military purposes should carry out such production at a single specialized facility, the location of which should be declared and the capacity of which should not exceed a fixed limit. Details regarding such a limit are under discussion.

11. The US and the USSR believe that the fulfilment of the obligations assumed under the future convention must be subject to the important requirement of adequate verification. The two sides have continued to search for solutions of issues relating to verification of compliance with the obligations under a future convention. They are in agreement that measures with respect to such verification should be based on a combination of national and international measures. There are, however, important issues relating to international verification measures which remain unresolved.

12. As indicated in their report of 31 July 1979, the two sides believe that international verification measures should include the creation of a Consultative Committee. Specific aspects of the proposed functions of the Committee outlined in that report are the subject of further negotiations.

13. The US and the USSR continue to believe that any party to a convention should have the right on a bilateral basis, or through the Consultative Committee, to request from another party with respect to which suspicions have arisen that it is acting in violation of obligations under the convention, relevant information on the actual state of affairs, as well as to request investigation of the actual state of affairs on site, providing appropriate reasons in support of the necessity of such an investigation. A party may agree to such a request or decide otherwise, providing appropriate explanations.

14. The question of whether this type of on-site investigation, together with other verification measures, would constitute a verification system capable of providing adequate assurance regarding the implementation of a convention remains unresolved.

15. The two sides believe that it is n cessary to develop procedures for on-site investigation, including provisions regarding the rights and functions of the inspection personnel, and the rights and functions of the host side. Specific issues in this area are the subject of continuing negotiations.

16. The two sides continue to believe that it should also be provided that any party could turn to the United Nations Security Council with a complaint which would include appropriate rationale. In case of suspicion that the convention is not being complied with, the Consultative Committee, upon request of any party, or of the Security Council, could undertake an investigation of the actual state of affairs.

17. National measures of verification would include the use of national technical means of verification in a manner consistent with generally accepted principles of international law. In this connexion, parties should not impede, including through the use of deliberate concealment measures, the national technical means of other parties carrying out the aforementioned verification functions.

18. The US and the USSR remain of the view that it would be advisable to reflect in a future convention the obligation of each party to take appropriate internal measures in accordance with its constitutional procedures to prohibit and prevent, anywhere under its jurisdiction or control, any activity contrary to the provisions of the convention.

19. Possibilities for confidence-building measures continue to be explored.

20. The US and the USSR proceed from the premise that a future convention on chemical weapons would include a withdrawal provision similar to the relevant provisions contained in other arms control and disarmament agreements.

21. The question of the conditions for entry into force of a convention remains unagreed.

22. The two sides believe that inasmuch as an effective prohibition of chemical weapons requires working out a large number of technical questions it is advisable to deal with them in annexes to a convention. This matter remains a subject of discussion.

* * *

The United States and the Soviet Union wish to inform the member States of the Committee on Disarmament of their earnest intention to continue their persistent efforts to find mutually acceptable solutions to the extremely complex unresolved issues relating to a general, complete and verifiable prohibition of chemical weapons, with a view to completing successfully the bilateral US-Soviet negotiations and presenting a joint initiative to the Committee on Disarmament at the earliest possible time.

COMMITTEE ON DISARMAMENT

CD/113
8 July 1980

Original: ENGLISH

CANADA

Organization and Control of Verification Within a Chemical Weapons Convention

Chemical weapons would be quite useful for warfare under many circumstances and it is necessary that adequate verification measures be available and that international control of these measures be sufficient to ensure the security of all States. It has often been suggested and in fact agreed, as it appears in the 1970 joint report from the United States of America and USSR, that a Consultative Committee supported by a secretariat should be available to monitor verification and compliance.

Due to the complex nature of chemical weapons, the numbers of toxic chemicals which are suitable for this role, and the variety of activities which must be monitored, it is unlikely that a Consultative Committee alone will adequately provide this service and the nature of its supporting elements requires further definition.

For example, one could contemplate the establishment of an international verification control agency for this purpose. It would be directed by an executive officer such as a Director General, and would contain a secretariat to provide for co-ordination of the necessary services and dissemination of information. It could also include inspection teams and other technical personnel to provide for the processing of economic information and various scientific data including the analysis of chemical samples. The agency would report to the Consultative Committee as well as to the United Nations. The Consultative Committee would meet regularly to review events and at other times in response to a challenge or other request by one or more signatory States.

Each Member State would be expected, as it has been suggested, to establish a national verification agency as well, to review national activities under the treaty and to report results and provide technical and other verification information to the international agency. It would also act as contacts and hosts for any international inspection teams which were required to enter the country and it would provide candidates for the international secretariat and its technical staff. National Agency

The monitoring of national activities such as stockpile destruction, agent production plant demolition, research and development activities for peaceful and defensive purposes, the non-~~transfer of agents,~~ information and weapons to other nations, and eventually the non-production of new chemical weapons will require some on-site inspection. National agencies would have a role in carrying out this control but this should be done in conjunction with international arrangements, particularly at critical phases of some activities and in challenge situations.

For some activities the taking of on-site and near site samples will be necessary. This must be done by standardized techniques and, on those occasions when international inspectors are present, duplicate samples would be taken for comparison analysis in laboratories of both the national and international agencies.

Other mechanisms of verification control which should occur under a convention, and may be assisted by the national and international agencies, will include the initial declarations, periodic exchanges of statements and review conferences to update definitions, criteria and agent lists. Bilateral discussions, appeals to the Consultative Committee and if necessary, appeals to the United Nations Security Council or General Assembly. These mechanisms seem to be those which are necessary to provide adequate international control of the verification process and the degree of co-operation between national and international agencies as outlined should ensure that national interests are not compromised by this process.

COMMITTEE ON DISARMAMENT

CD/114
9 July 1980
Original: ENGLISH

AUSTRALIA

Reply at this stage submitted by the Australian Delegation to the questionnaire relating to chemical weapons submitted by the Netherlands to the Committee on Disarmanent in Document CD/41

1. We agree that a CW Convention should be comprehensive.

2.(a) We agree that CW agents and delivery systems should not be developed.

(b) We agree to a ban on the production of all single purpose CW agents and all single purpose precursors.

(c) We agree to a ban on the production for chemical weapons purposes of dual purpose agents and dual purpose precursors. Lethal agents and incapacitating agents should be prohibited. We share the view that herbicides and defoliants are more appropriately covered by the ENMOD Convention and it would not therefore be necessary to include these in a CW Convention. It would not be appropriate, in our view, to include non-toxic riot control agents. These have some legitimate and humane uses and do not cause lasting harm to civilian populations.

(d) We agree that the ban should cover the destruction of existing stockpiles of chemical warfare agents and weapons systems. We appreciate that the time necessary for the destruction of stockpiles is influenced by the size of the existing stocks and by the stringent safety requirements required during destruction to ensure the safety of personnel and the environment. We have noted that one current estimate is that the destruction process could take of the order of ten years.

(e) We agree that the Convention should cover the dismantling, "moth-balling" or conversion to peaceful use of existing facilities. Because of the greater difficulties involved in verification of a "moth-balled" or converted facility our preference is for the complete dismantling of existing CW facilities.

(f) We agree with the banning of production of munitions, equipment and means of delivery for CW purposes.

2.(g) We agree that planning, organization and training for offensive chemical warfare should be banned.

(h) We agree that protection against chemical warfare should not be banned, at least until comprehensive and effective verification measures have ensured full compliance with the provisions of the Convention calling for the destruction of all CW stocks and production facilities.

(i) We agree that the Convention should prohibit the use of CW provided this is not interpreted as limiting or detracting from the obligations undertaken in the 1925 Geneva Protocol and other international law.

(j) We agree that the prohibition must include the transfer and acquisition of offensive chemical warfare capability in the form of hardware and technological knowhow.

3. We agree that there would be a number of permitted purposes within the production ban. These would include:

(i) the manufacture of small quantities of identified chemicals for medical purposes;

(ii) production of some toxic materials which have a military use (such as rocket fuels) but which would not be used as chemical warfare agents;

(iii) small agreed quantities of certain chemicals required, during the period in which stockpiles still exist, for research and development of CW protective measures.

4.(a) and (b) We believe that the most important element in defining prohibited CW agents is the "general purpose" criterion - i.e. that the intended purpose of and use for the agents is chemical warfare. Toxicity and possibly other criteria are important supplementary elements in the definition which can assist in verification of the ban.

(c) We would agree that a list of agents temporarily exempted from the ban could be a useful measure. We would consider, however, that a complete list of banned agents would be impossible to draw up and hence would be inadequate.

5. We agree that each party should establish the necessary system of national control for the implementation of internal legislation that would enable it to comply with the provisions of the Convention.

6. We consider the international verification measures to be implemented under the Convention to be of great importance and that these should be carefully spelt out within the provisions of the Convention. These measures should provide for the concept of "verification by challenge". An important place will need to be given to on-site verification and other control methods. Systematic measures for, inter alia, the organization of international investigation and inquiry procedures will need to be included.

7. We agree that systematic international verification measures will need to be concentrated on:

(a) the destruction of existing stockpiles of CW agents;

(b) the dismantling of existing CW production plants, or ensuring that moth-balled plants are not used, or ensuring that plants are converted to peaceful activities;

(c) the non-production of single purpose highly toxic (mainly nerve) agents, including single purpose precursors.

8. We would support an international verification structure that would include a Consultative Committee open to all parties to the Convention. A small permanent secretariat and an international "roster of experts" with specialized laboratory facilities could service the Committee. The experts could be involved in the problems of near-site and on-site inspections. Assistance by this group could be provided as required to national control agencies with advice on manning and equipping their own control organizations.

9. The Convention should not restrict the right of any States who wish to accept regional measures stricter than those laid down in the Convention. While these should not be necessary in a comprehensive and unambiguous Convention they may be seen as a useful confidence building measure in the short term.

10.(a) We consider it important that States possessing CW stocks and production facilities declare these stocks and facilities at the earliest possible date. Declaration by States that do not possess CW agents, nor have any intention to acquire them, would also be useful as a confidence building measure.

10.(b) and (c) We agree that technical visits for the exchange of information between States Parties would be helpful. We would also agree that co-operation and exchanges of information between States Parties in the field of chemical warfare protection measures would be helpful.

CD/117
10 July 1980
Original: ENGLISH

CANADA

Definitions and Scope in a Chemical Weapons Convention

During the seminar attended by experts on 24 and 25 June much technical information was presented on the definition of chemical warfare agents. In particular papers by the Australian and Czechoslovakian experts provided excellent summaries of some of the criteria. On the other hand papers which discussed the usefulness of a toxicity criterion failed to reach a consensus, demonstrating that in this area in particular confusion remains as to the definition.

This paper will attempt to clarify these concepts and provide a further analysis of the criteria necessary to define a chemical warfare agent in relation to the scope of a convention on chemical weapons.

When the Geneva Protocol was written in 1925 a rather simple description of chemical agents in terms of asphyxicating, poisonous or other gases was used. This was thought to be sufficient because the intent not to use any such materials again in warfare was thought to be clear. However, as new types of toxic chemicals were developed differences of opinion arose in some countries as to whether they were included and it has become clear that such a general statement is not adequate and must be supplemented by other criteria which leave no doubt as to the intention of the convention.

On some occasions it has been proposed that materials to be banned could be simply listed and perhaps attached to a convention as an annex to be updated as the science of chemistry advanced. Undoubtedly experts could prepare a list very quickly which would contain all of the known chemical warfare agents, both single and dual purpose, including sarin, tabun, soman, VX, mustard, chlorine, phosgene, hydrogen, cyanide, cyanagen chloride, lewisite, and so on. Even some intermediates and binary precursors could be easily included. It may still be desirable to append such a list to the convention, however it is immediately obvious that this does not solve the problem. These chemicals are merely representatives of large families of toxic substances and modern chemical science has produced many more that have not yet been associated with chemical warfare, but which have toxic properties that might be quite useful in that role. Furthermore as the more lethal materials become banned and defensive postures relax, many chemicals having lesser toxicities could become threats.

If chemical weapons are to be eliminated, they must first be so defined that there is no doubt now or in future years as to what is included. In her paper at the informal session on 24 June, the Australian expert Dr. Freeman suggested a simple definition as follows: "A militarily effective anti personnel weapon which depends on the toxic action of a chemical to render troops hors de combat". This contains many of the essentials of an adequate definition, however as it became evident later, this definition deals primarily with lethal agents and would not include some of the materials such as harrassing agents and antiplant agents which many States feel are types of chemical weapons which should not be used in combat situations. In this way the Australian definition may have been too narrow for a comprehensive ban.

Unquestionably the final definition chosen and what it will include must be negotiated, however to facilitate these negotiations perhaps a more comprehensive definition could be considered. Some countries, most notably Belgium in CD/94 and Sweden in CD/97 have recently attempted such a definition. Our own attempt might be expressed as follows: <u>A chemical weapon is a weapon which incorporates a chemical mixture and is designed to achieve military objectives in wafare through its toxicological action on biological systems</u>.

This would include effects on plant and animal systems as well as man himself. Toxicology in this context is taken in the broad sense of any toxicological response of which lethality is but one example. Thus both physical and metal incapacitation, irritancy and detrimental effects on plants would be included as well as other effects which may become threats in the future such as genetic alteration, human pheromones, or even the use of chemicals for torture, truth serums and mind control.

This definition would not include weapons which produce physical effects and may be used in other types of warfare including for example high explosives, rocket fuels, smokes and flame warfare agents.

The identification of "single purpose agents" within this definition is perhaps the easiest as there is little doubt of their lethal effect on humans and they have no other use than military for which they may be mass produced. Controversy however arises when attempts are made to generalize the scope of this category through the use of a toxicity criterion. Various figures have been suggested that are meant to ensure that all known and likely single purpose agents are included. Canada itself attempted such a definition as far back as 1973 in CCD/414. More recently the USA and USSR suggested figures in their joint statement of August 1979 (CD/48) and others were proposed by several experts during the informal session on 24 June. It should be recognized that whatever figures are chosen, exceptions will soon be found. Some toxic substances will be found that lie below the line yet have no obvious use other than in chemical weapons and as soon as it is declared that a substance above the line is a single purpose agent and subject to a total ban, someone will devise a commercial use for the material. The only solution to this situation is to choose a reasonable set of figures and to provide within the convention a mechanism, such as an annex, to set forth a list of exceptions. These are materials to be banned which are found to fall outside the normal toxicity limits of the single purpose category. A second list might be included of materials falling within the scope of the single purpose category which are allowed to be manufactured for certain peaceful purposes for which they have been found useful. The ability to deal with these situations as they arise must be included in the verification control functions of the convention.

For the purpose of establishing the normal limits of a single purpose agent category, the figures suggested within the joint statement of the USA and USSR of August 1979 (CD/48) would appear to be satisfactory.

Much has been said recently about "binary chemical weapons" and the complications they create both for definition and for verification purposes. With respect to the definition criteria the acquisition of such weapons would fall under the ban on the single purpose agent which was finally produced at the target. Where possible, certain of the binary precursors having no other peaceful use could be included in the ban by placing them on the list of additional materials. Otherwise binary precursors must be treated in the same fashion as "dual purpose" chemical agents.

While dual purpose chemical agents are readily placed within the definition given, the banning of the production and stockpiling of materials in this category is not possible. In many instances it may be possible to ban the development, production and stockpiling of critical components of the weapon systems utlizing these materials, such as a projectile filled with the agent. Unfortunately this would lead to difficulties with materials such as tear gases and herbicides which would require dispersal systems for non-warfare uses. This leads then to the conclusion that it may only be possible to ban chemicals having dual purposes on the basis of their use in warfare and this immediately raises the question of encroachment on an existing treaty that is the 1925 Geneva Protocol.

It might be argued on this basis that the use of all dual purpose materials for chemical warfare is already banned by the Geneva Protocol and nothing more can be done. However it has also been seen that the Geneva Protocol lacks both an adequate definition of a chemical weapon and a verification mechanism. Either the Geneva Protocol must be somehow supplemented by a better definition such as the one we have presented above, or a new convention negotiated by the Committee on Disarmament must include a ban on the use of chemicals in warfare in order to deal effectively with dual purpose agents, and a verification mechanism.

It would appear that the use of a comprehensive definition of chemical weapons such as given in this paper provides an adequate means to define the scope of a chemical weapons convention and could form the basis for further negotiation.

COMMITTEE ON DISARMAMENT

CD/121
17 July 1980
Original: ENGLISH

POLAND

Some of the issues to be dealt with in the negotiation on a CW convention: working paper

The Committee on Disarmament, seeking to facilitate its work in the area of the prohibition of chemical weapons, has established the ad hoc working group with a mandate which instructed it "to define, through substantive examination, issues to be dealt with in the negotiation on such a convention", naturally, with due account taken of all existing proposals.

Among the major issues which have so far emerged from such an examination are the following:

Character of a ban

In the view of the Polish delegation a CW convention, in accordance with the Final Document of the Tenth Special Session of the General Assembly devoted to disarmament, should provide for the complete and effective prohibition of the development, production and stockpiling of all chemical weapons and for their destruction. Such comprehensive ban should be universal and verifiable.

Scope of a ban

The ban should cover the development, production, acquisition, stockpiling, retention and transfer - on the basis of single purpose criterion and additional toxicity criteria - of super toxic lethal, other lethal and other harmful CW agents and their precursors. It should also cover assistance or encouragement to acquire CW agents.

The ban should also cover binary weapons.

Exempt from the ban should be CW agents intended for civilian or nonhostile military purposes of agreed types and in agreed quantities.

Exempt from the ban, moreover, should be such dual purpose CW agents as are demonstrably destined for nonhostile use.

Approach to the question of use of CW

It is felt that any restatement in a CW convention of the ban of use of CW would be inappropriate since it would objectively tend to undermine and detract from the 1925 Geneva Protocol, thus putting into question the continued effectiveness of that instrument. As it is known, such restatement of the ban of use has not been incorporated in the Convention on the Prohibition of Bacteriological (Biological) and Toxin Weapons.

On the other hand, it might be desirable to incorporate in the preambular part of a future CW convention a reference to the important significance of the Geneva Protocol of 1925, the Bacteriological (Biological) Convention and the Convention on the Prohibition of Military or any Other Hostile Use of Environmental Modification Techniques, as well as a reaffirmation of adherence to their principles and objectives and an appeal for their universalization.

Verification

Adequate verification of compliance with the obligations assumed under a CW convention can effectively be assured through appropriate combination of national verification measures and specific international mechanisms and procedures.

The framework of national verification measures would be provided by specific legislation enacted by each State Party to the convention whereas international mechanisms would be developed around an international consultative committee (body) and a complaint procedure involving the UN Security Council.

In case of suspected violation of the provisions of the convention any party to the convention would have the right, bilaterally or through the consultative committee (body), to approach the suspected party asking for clarification, investigation of facts on site or off site. It is to be understood that responding to such a well founded request, the party thus approached would offer appropriate clarification of fact, issue an invitation for on site investigation or take other substantiated decision.

It is generally recognized that verification problem in a CW convention is at least as important as it is complex. Precisely in order to facilitate such verification, the USSR and the United States in their Joint Report (CD/112) have suggested the use, in addition to the general purpose criterion, of supplementary toxicity criteria.

In the context of the recent consideration of the question of the ban of chemical weapons, both in the Committee on Disarmament and in its ad hoc working group, a view was expressed that while desirable, an absolutely effective verification system may be impossible to elaborate. For one thing, the verification of a ban on precursors of identified single purpose CW agents is quite difficult in view of their wide application in a variety of peaceful industrial processes. Indeed, to tell which one of such precursors could be used for CW purposes, in violation of the CW convention, might well border on the impossible. A similar degree of difficulty would pose the verification in the case of dual purpose agents. With regard to binary weapons in particular, effective control would be practically impossible. Even on site inspection of the entire chemical industry manufacturing pesticides would not prove with any certainty whether or not binary weapons are or can be produced.

It is also a widely held view that a fully effective verification of the destruction of CW stockpiles would require the physical inspection of each and every military warehouse of a State party.

It can, therefore, be concluded that in each of the above mentioned cases the verification process is likely to depend to a large extent on voluntary declarations of States party to a CW convention.

It is consequently believed that whatever verification system is eventually developed and agreed upon in a CW convention, its effectiveness would be enhanced by and largely depend on good will, good faith and mutual understanding of States parties. Such a verification system should in no case give rise to an impression that any provision of a CW convention could legitimately question the recognized principle of international law which says that treaties are implemented in good faith. Indeed, unless there is good faith - no agreement can be trusted.

COMMITTEE ON DISARMAMENT

CD/122
21 July 1980

ENGLISH
Original: FRENCH

MOROCCO

Proposed definition of chemical weapons

"Chemical weapons" means systems of weapons based on solid, liquid or gaseous chemical components designed or likely to cause:

Death, serious injury or physical or mental illness to people;

Extensive, lasting and serious damage to the natural environment.

GE.80-64293

MONGOLIAN PEOPLE'S REPUBLIC

Working document

Interrelationship between the future convention on the complete prohibition and destruction of chemical weapons and the Geneva Protocol of 1925

Like the other sponsors of the draft convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction, submitted for the consideration of the Committee on Disarmament in 1972, the delegation of the Mongolian People's Republic considers that the conclusion of an international convention on the complete prohibition and destruction of chemical weapons will be yet another real measure of disarmament, excluding from the life of human society one of the most dangerous kinds of weapons of mass destruction.

Thus, with the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, which already entered into force in 1975, the conclusion of a convention on the complete prohibition and destruction of chemical weapons, and measures to secure its universality, will be a logical completion of the Geneva Protocol of 1925, which in turn plays a significant part in the achievement of such international agreements.

The present document has been prepared because certain delegations in the Committee on Disarmament have spoken in favour of the inclusion in the future convention on the complete prohibition and destruction of chemical weapons of a provision concerning the non-use of chemical weapons, as well as of provisions concerning the prohibition of their development, production and stockpiling, and their destruction. In particular, such a proposal is to be found in document CD/102 of 19 June 1980.

In this connexion, the delegation of the Mongolian People's Republic deems it necessary to draw the attention of the members of the Committee to the following considerations:

1. The use of chemical and bacteriological means of warfare is already prohibited under the Geneva Protocol of 1925. Consequently, the duplication of this important norm of international law in another document may be detrimental to such an authoritative international treaty as the Geneva Protocol, whose effectiveness is widely recognized by the world community.

2. At the present time it is not known how many and what States will be parties to the convention which is to be prepared, and there is no guarantee that all the States parties to the Geneva Protocol, of which there are already more than 100, will also become parties to the future convention on the complete prohibition of chemical weapons. The Geneva Protocol is unique in the sense that its characteristic feature is the participation in it of all five Powers which are permanent members of the United Nations Security Council, and of other militarily significant States. It would therefore be undesirable to take any steps which, directly or indirectly, may undermine the effectiveness and efficacy of this important instrument.

3. Under the relevant resolutions of the United Nations General Assembly, and particularly resolution 34/72, adopted at the Assembly's last session, it is a priority responsibility of the Committee on Disarmament to undertake negotiations on an agreement on the complete and effective prohibition of the development, production and stockpiling of all chemical weapons, and on their destruction. Those resolutions do not speak of the prohibition of the use of chemical weapons. The statement concerning the complete prohibition of chemical weapons in the Final Document of the tenth special session of the United Nations General Assembly, devoted to disarmament, is in the same spirit.

4. It would be appropriate to mention the importance of the Geneva Protocol in the preamble to the future convention, and also to include in the convention an article to the effect that no provision of the convention should be interpreted as in any way limiting or detracting from the obligations assumed under the Geneva Protocol by States, for such a provision is to be found in many agreements concluded in the sphere of disarmament. A duplicate prohibition of the use of chemical weapons will undoubtedly create difficulties of a legal nature, however, and may constitute a precedent with serious consequences for possible attempts to review other existing agreements on the limitation of the arms race and on disarmament.

5. The Geneva Protocol prohibits the use, both of chemical and of bacteriological weapons. Bacteriological weapons, and their development, production and stockpiling, are fully prohibited and subject to complete destruction under the 1975 Convention; and there is of course no provision in that Convention concerning the non-use of bacteriological weapons. There is no reason why the future convention on the prohibition of chemical weapons, covering the second of the different kinds of weapons of mass destruction considered together in the Geneva Protocol should, unlike the 1975 Convention, contain a provision on non-use. This would only result in a weakening both of the Geneva Protocol and of the future convention on the complete prohibition of chemical weapons.

COMMITTEE ON DISARMAMENT

CD/124
24 July 1980

Original: ENGLISH

INDONESIA

Some Views of the Prohibition of Chemical Weapons

1. Definition of Chemical Warfare Agents, and their Classification

Indonesia holds the view that under the term of single purpose warfare agents is understood agents used solely for military purposes; the Geneva Protocol of 17 June 1925 prohibits their use in war or in armed conflict. In this respect, as far as Indonesia is concerned, for purposes of study on necessary protective measures, on health aspects of personnel as well as on general laboratory work, a few hundred milligrams per annum per type of chemical warfare agent may be allowed.

On the other hand, as regards dual-purpose agents the question is more complex. Many such agents, particularly phosgene and hydrocyanic acid, are widely used by some sectors of the chemical industry. Concerning these agents, the treaty should contain a definition based on general purpose criterion. Chemical substance that is used as chemical warfare agents should be prohibited. Its civilian use as raw material should be subject to negotiation in order to find agreement on its development and application in industry. Since in certain circumstances such chemical substances, instead of being stored in that condition, could be converted into chemical weapons by a special process and stockpiled as such, special attention should be given in the relevant discussion. The Indonesian delegation suggests that the general purpose criterion should be complemented by criteria of toxicity in relation to its lethality and other properties, and supplemented by structural formulae of chemical substance. Accordingly, it is suggested that the definition should be as follows:

> "A chemical warfare agent is any chemical substance or any combination of chemical substances, which, due to its toxic properties, may cause severe casualty effects on human being, animal or plant whether by direct contact or through other forms of contamination."

GE.80-64830

As to binary weapons, the Indonesian Delegation is of the opinion that the proposed definition also applies to binary weapons, whose characteristics of releasing toxicity is not based on the invividual substances (components or precursors) themselves, but on the final product they combinedly generate.

Chemical warfare agents may be classified into 2 (two) main groups : anti-personnel agents and anti-plant agents.

<u>Anti-Personnel Agents</u> may be further classified into inter alia:

a. <u>Lethal agents</u> comprising :

(i) <u>Choking agents</u> such as phosgene, disphosgene, Chlorine;

(ii) <u>Blister agents</u> such as Sulfur-Mustard, Nigrogen Mustard, Lewisite, etc.;

(iii) <u>Blood agents</u> such as Hydrogen Cyanide, Cyanogen Chloride;

(iv) <u>Nerve agents</u> such as Tabun, Sarin, Soman, VX, etc.

(v) <u>Lethal Toxins</u> such as Botulin, Ricin, Saxitoxin (Shellfish poison).

b. <u>Incapacitating agents</u> such as LSD, BZ (3-Quinuclidinyl-benzilate).

c. <u>Harrassing agents</u> such as Tear gases: Chloroacetophenone (CN), 2-Chlorobenzalmalononitrile (CS).

As regard to <u>Anti-Plant Agents</u>, they may be classified into inter alia:

a. <u>Defoliant and Herbicide such as</u>:

- 2, 4, - Dichlorophenoxy acetic acid (2,4-D)
- 2, 4, 5 - Trichlorophenoxy acetic acid (2,4,5,-T)
- 4 - Amino - 3, 5, 6, - Trichloropicolinic (Picloram)

b. <u>Anti Crops Agents</u> such as Dimethylarsinic Acid (Cacodylic Acid)

c. <u>Soil Sterilant</u>, such as:

5 -Bromo-3-sec-butyl-6-methyluracil (Bromacil)

3 -(p-Chlorophenyl)-1, 1-dimethylurea (Manuron)

Under these classifications, problems may arise with regard to certain chemical substances, such as:

- Phosgene, Hydrocyanic Acid, Herbicides as dual-purpose agents;
- Tear gases as riot control agents or harrassing agents.

Therefore the criteria of prohibition of chemical warfare agents may include the following:

a. General purpose criterion;

b. Toxicity criterion.

The toxicity of chemical warfare agents differs qualitatively and quantitatively from one another since each chemical warfare agent has its own lethal dose (LD_{50} or LCT_{50}).

As regards the existing chemical munitions, stockpiling and means of production should be prohibited. They should gradually be totally destroyed within a fixed time-frame. All devices and equipments that would be used for specific delivery of chemical warfare agents should be prohibited.

2. Verification

The verification aspect of the prohibition of chemical weapons is an important element to be included in any future convention. The target of verification in the first place is military stockpiles and their installations. The second one, which is more complicated, is civilian industries, especially those manufacturing organo-phosphorous compound. In this connection the verification should be carried out at every stage of the production process as well as on its final product.

Indonesia supports the idea of having an international body as well as a national agency, to carry out such functions.

Method and scope of verification both international and national are similar; therefore one approach or system in verification should be applied.

National measures of verification should include the use of national technical means and taking into account the particular condition of each State.

At the international level, the organizational structure of inspection should include a number of technical experts of different backgrounds of knowledge, constituting a team of verification.

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CD/131/Rev.1
4 August 1980
Original: ENGLISH

Report to the Committee on Disarmament

Ad Hoc Working Group on Chemical Weapons

1. In the course of consideration of item 4 of its 1980 agenda, entitled "Chemical Weapons", the Committee at its sixty-ninth plenary meeting on 17 March 1980, adopted the following decision contained in document CD/80:

> "In discharging its responsibility for the negotiation and elaboration as a matter of high priority, of a multilateral convention on the complete and effective prohibition of the development, production and stockpiling of chemical weapons and on their destruction, the Committee on Disarmament decides to establish, for the duration of its 1980 session, an ad hoc working group of the Committee to define, through substantive examination, issues to be dealt with in the negotiation on such a convention, taking into account all existing proposals and future initiatives.
>
> The ad hoc working group will report to the Committee on the progress of its work at any appropriate time and in any case before the conclusion of its 1980 session."

2. At the 80th meeting on 22 April 1980 the Committee elected Ambassador Y. Okawa, Japan, as Chairman of the ad hoc Working Group. Mrs. L. Waldheim-Natural, Chief, Geneva Unit, United Nations Centre for Disarmament, was appointed Secretary of the Working Group.

3. At their request and on the basis of decisions taken by the Committee on Disarmament at its eighty-sixth and ninety-first sessions, contained respectively in documents CD/PV.86 and CD/PV.91, representatives of Denmark, Finland and Switzerland attended meetings of the Group in addition to members of the Committee on Disarmament.

4. The Group held 16 meetings between 23 April 1980 and 1 August 1980.

5. In carrying out its mandate the ad hoc Working Group took into account paragraph 75 of the Final Document of the first special session of the General Assembly of the United Nations devoted to disarmament, which stated that the conclusion of a convention on chemical weapons was one of the most urgent tasks of multilateral negotiations.

6. In the conduct of its work, the following working papers were circulated to the Working Group:

(a) a "Working paper introduced by the Chairman" (CD/CW/WP.1)

(b) a working paper entitled "List of Documents" (CD/CW/WP.2 and its addenda 1 and 2) containing a list of Committee on Disarmament documents relevant to the work of the *ad hoc* Working Group on Chemical Weapons, circulated between July 1979 and July 1980

(c) a working paper by the United States of America entitled "Issues to be defined by the *Ad Hoc* Chemical Weapons Working Group" (CD/CW/WP.3)

(d) a working paper by Sweden entitled "Issues to be dealt with in the negotiation on a Convention on Chemical Weapons" (CD/CW/WP.4)

(e) a working paper by the Federal Republic of Germany entitled "The impact of on-site inspections of current civilian production on the chemical industry" (CD/CW/WP.5)

(f) a working paper submitted by France entitled "Criteria for the Definition of Chemical Warfare Agents" (CD/CW/WP.6)

7. The Chairman stated that all existing proposals and all future initiatives would be treated on an equal basis by the Working Group. He was of the view that document CD/26, "Compilation of material on Chemical Weapons from the Conference of the Committee on Disarmament and the Committee on Disarmament Working Papers and Statements 1972-1979 (Prepared by the Secretariat)" was a useful reference for the group in its work.

8. At the suggestion of the Chairman, the Group agreed to structure its work under three general headings: "Scope", "Verification" and "Other matters". In a first round, one meeting was devoted to each of these headings, followed by a second round in the same order. During the course of these meetings, delegations made statements of substance on the issues under consideration.

9. The Chairman also provided the group with Conference Room Papers which contained lists of issues raised under the three general headings under which the Group conducted its substantive deliberations. These Conference Room Papers were later consolidated into one document, CD/CW/CRP.3/Rev.1, which is annexed to this report as an aide-mémoire from the Chairman, for future reference.

10. In order to define the issues to be dealt with in the negotiation on a convention on the prohibition of chemical weapons, the Working Group undertook a substantive examination under the three general headings mentioned in paragraph 8 above. In this context, there appeared to be a general convergence of views among the delegations who participated in the discussions on the following issues:

A. Comprehensive scope of a prohibition

(1) Issues relating to activities that could be prohibited under a convention:

(a) development
(b) production
(c) stockpiling
(d) acquisition
(e) retention
(f) transfer and assistance to other States

(2) Issues relating to specific items, subject to agreed definitions, that could be prohibited under a convention:

(a) chemical warfare agents
(b) chemical munitions
(c) precursors
(d) chemical weapons, equipment or systems
(e) means of/facilities for the production of the above

(3) Issues relating to the criteria that could be used as the basis in determining the scope of the prohibition:

(a) general purpose criterion
(b) toxicity criteria
(c) additional criteria

(4) Issues relating to actions that States Parties to a convention could be required to take in implementation of the prohibition:

(a) declaration and destruction, within specific periods, of existing stocks of chemical weapons
(b) declaration and destruction or dismantling, within specific periods, of means of/facilities for production

(5) Issues concerning the exceptions that could be allowed under a convention:

(a) for civilian purposes, such as:

- medical
- scientific and research
- industrial
- agricultural
- riot control

(b) for certain non-hostile military purposes and for military purposes not related to the use of chemical weapons

B. Verification

The importance of adequate verification was recognized. It was held that verification measures should be commensurate with the scope of the prohibition and other aspects of a convention.

(1) Issues relating to national verification measures that could be provided for under a convention:

(a) internal legislation

(2) Issues relating to international verification measures that could be provided for under a convention:

(a) consultation and co-operation
(b) establishment of a consultative body
(c) on-site inspections under certain conditions and procedures
(d) handling of complaints

C. Other Issues

(1) Confidence-building measures

(2) International Co-operation

11. In the course of substantive examination of issues to be dealt with in the negotiation on a convention under the three general headings mentioned in paragraph 8 above, there appeared to be no convergence of views among delegations who participated in the discussions on, *inter alia*, the following issues:

A. Comprehensive scope of the prohibition

(1) The view was expressed that a convention should cover "chemical warfare capability" and that this concept should include every activity, facility and material intended to utilize the toxic properties of chemical substances for hostile purposes in an armed conflict. In this view exceptions should, however, be allowed for peaceful purposes, including some measures of a military nature and measures for protection against chemical warfare. Others expressed serious doubts about the value of this concept but the question was not discussed in depth.

(2) Issues relating to activities that could be prohibited under a convention:

(a) Use

It was common ground that the convention should not detract from the 1925 Geneva Protocol. Some held that the issue of use was already adequately covered by that Protocol, while others were of the view that a ban on the use of chemical weapons would be an essential element of a comprehensive convention.

(b) Planning and Organization

One view was that planning and organization were essential elements of the development of a capability for chemical warfare and should therefore be banned. Another view held that a ban on planning and organization would be practically impossible to verify and hence hard to enforce; in any event it would not be needed if other elements were successfully banned.

(c) Training

Some delegations held the view that, since it was difficult to distinguish between offensive and defensive training, all training should be prohibited; others believed that training in protective measures would contribute to deterring possible violations of a convention and, therefore, should be allowed; still others thought that protective training should be permitted at least until all stocks of chemical weapons were destroyed.

(3) Issues relating to specific items, subject to agreed definitions, that could be prohibited under a convention:

(a) Means of/facilities for production.

The issue of what specific types of means of/facilities for production would fall under the prohibition was not examined in depth.

(b) Biochemical warfare agents.

Some held that potential biochemical warfare agents that fall in the so-called grey area between biological and chemical warfare agents should be prohibited. The issue was not the subject of further examination.

(4) Issues relating to the criteria that could be used as the basis in determining the scope of the prohibition

(a) There were differing views regarding the relative importance of the various criteria mentioned in para. 10.A.(3) above.

(b) With reference to toxicity criteria, although several approaches for defining toxicity were discussed - including quantitative, qualitative, descriptive and nominative - no attempt was made to narrow the issue to a particular approach or combination of approaches.

(c) Varying views were expressed on whether a list of chemical agents - either positive, negative or illustrative - should be established.

(d) The question of the treatment to be accorded to single and dual purpose agents and precursors respectively was not discussed in detail.

(5) Issues relating to action that State Parties to a convention could be required to take:

(a) Some held that means of/facilities for production should be destroyed, dismantled or converted to peaceful uses. Others, expressing concern about the verification problem involved, were of the opinion that all means of production should be destroyed.

(b) Differing views were expressed on the content of the declaration of existing stocks and the declaration of plans for the destruction of such stocks, as well as on their timing, including whether these declarations should be made before, at the time or after a convention came into force.

(c) Differing views were also expressed on the content of the declaration of plans for the disposition of means of/facilities for production and filling facilities, as well as on their timing, including whether these declarations should be made before, at the time or after a convention came into force.

(6) Issues concerning the exceptions that could be allowed under a convention:

(a) There was a divergence of views on whether an exception for protection purposes should be allowed under a convention. A view was expressed that the exception of "protective measures" may create serious problems of verification and control.

(b) The issue of what specific riot control agents would be excepted was not discussed.

(c) It was pointed out that any exception which would be allowed would have to be clearly and precisely defined.

B. Verification

(1) General approach

Opinions differed as to what would be a realistic verification system which responded adequately to the requirements of a convention, since a totally effective verification system, while desirable, appeared to be technically unattainable. Some held that an effective convention called for very stringent verification measures, while others felt that less stringent measures could suffice and still meet the requirements of a reasonable verification system. Since the different aspects of verification were related to the scope of the prohibition and other aspects of a convention, some delegations withheld their comments on this issue for the time being.

(2) What is to be verified?

(a) Differing views were expressed on the requirements of verification in the following areas:

(i) destruction of chemical weapons' stocks

(ii) destruction or dismantling of means of/facilities for production of chemical weapons

(iii) non-production of chemicals for prohibited purposes

(iv) production of certain chemicals for non-hostile military purposes

(b) Some held that non-production of chemicals for prohibited purposes could be verified even in highly industrialized countries with reasonable means and without prejudice to the interests of the chemical industry. Others were of the view that inspection of entire chemical industries would not be practicable. In this context some held that verification of a ban on identified dual-purpose agents and their precursors, and in particular binary weapons, could pose insurmountable difficulties. Others disagreed with this view.

(c) Differing views were expressed on whether prohibition of planning, organization and training, if included in a convention, could be verified.

(3) Verification procedures

While delegations were of the view that a verification system could be based on an appropriate combination of international and national measures, there were differences as to their relative effectiveness. One view was that a verification system should rely primarily on international measures. Another view was that national measures, with certain international procedures, would provide adequate assurance of compliance.

(a) Issues relating to national verification measures

There appeared to be no convergence of views on whether national organs for verification should be envisaged, in a convention and, if so, on the role and importance of such organs. Differing views were expressed regarding whether or not standardized programmes for national organs for verification, including their organization, functions and obligations, should be provided for.

(b) Issues relating to international verification measures

(i) While delegations believed that international verification measures should include arrangements for on-site verification, their views differed on specifics of such arrangements.

(ii) There were differences of view as to whether or not systematic on-site inspections would be necessary to verify:

- destruction of chemical weapons stocks;
- destruction or dismantling of means of/facilities for production of chemical weapons as well as filling facilities;
- production of certain chemicals for non-hostile military purposes; and
- non-production of chemicals for prohibited purposes.

(iii) On the issue of conversion of facilities, some delegations held that, if conversion was allowed, systematic on-site inspection of converted facilities would be required.

(iv) According to one view, the establishment of an international verification agency, in addition to the consultative body, would be desirable in the system of international verification. Others did not share this view. Still others believed that the establishment of such an agency was a broader question that transcended the framework of a chemical weapons prohibition.

(v) While some delegations were of the opinion that complaint procedures could involve the United Nations Security Council, others believed that the United Nations General Assembly could be a more appropriate body.

C. Other Issues

(1) Confidence-building measures

The view was expressed that international means of verification should include procedures for confidence-building measures, but the issue was not examined in detail.

(2) Negative guarantees

One view was that such guarantees should be considered in the course of the elaboration of a convention. Others held the view that the question of non-use was covered by the 1925 Geneva Protocol.

(3) Co-operation in the development of protective measures

Suggestions were made that a convention should contain specific provisions regarding co-operation and technical assistance in the field of protective measures. This question was not examined in depth.

(4) Co-operation and technical assistance

It was suggested that a convention should include provisions regarding co-operation and technical assistance in the peaceful uses of toxic chemicals as well as on the transfer, especially to developing countries, of resources released by the prohibition of chemical weapons. This question was not examined in depth.

12. At the suggestion of the Chairman, the Working Group noted that, inter alia, the following issues had not been discussed in depth during the 1980 session and would have to be taken into consideration at a later stage:

- Preamble
- Conditions for entry into force
- Signature, ratification, accession, etc.
- Depositories (Governments or Secretary-General of the United Nations)
- Duration
- Review conferences
- Withdrawals
- Protocols and annexes
- Procedures for amendment

13. Various definitions of "chemical weapons" and other terms were suggested during the discussions. At the suggestion of the Chairman the Working Group noted that the question of definition of terms and the clarification of various concepts would need to be taken up at a later stage.

14. The discussions confirmed the general recognition of the urgent need to negotiate and elaborate a multilateral Convention on the complete and effective prohibition of the development, production and stockpiling of chemical weapons and on their destruction.

15. The Working Group recommends that at the beginning of its 1981 session the Committee on Disarmament set up a further working group under an appropriate mandate to be determined at that time to continue and advance the work undertaken by the 1980 Working Group in the discharge of the Committee's responsibility for the negotiation and elaboration of such a multilateral convention.

CD/CW/CRP.3/Rev.1
17 July 1980

Original: ENGLISH

Annex I

Issues raised at the Meetings of the Ad Hoc Working Group on Chemical Weapons

(Aide-Mémoire from the Chairman)

I - SCOPE

1. Aims and Purpose of a convention

- as set forth in the Final Document of the Special Session of the General Assembly
- as set forth in CD/97 (Sweden)
- as set forth in CD/48 (USSR/USA)
- as set forth in CD/44 (Poland)
- other proposals

2. Relationship with other international conventions

(a) Geneva Protocol of 1925

(i) carry over prohibition of use into a chemical weapons convention
(ii) need for strengthening

(b) Biological Weapons Convention of 1972

(i) need to ensure symmetry between two conventions
(ii) need to cover loopholes, grey areas
(iii) ensure that all biochemical agents are covered

(c) Enmod Convention of 1977

3. Comprehensive nature of ban

(a) Activities that could be banned

(i) development
(ii) production
(iii) stockpiling
(iv) acquisition
(v) retention
(vi) transfer and assistance
(vii) use
(viii) planning
(ix) organization
(x) training
(xi) dissemination of information
(xii) others

(b) Items that could be dealt with

(i) Chemical weapons agents, including precursors

- definition
- criteria

  - general purpose
  - distinction between single purpose agents and dual purpose agents

  - toxicity:
    - quantitative approach
    - qualitative "
    - descriptive " (chemical formula)
    - nominative "
    - fitness for military use

  - binary weapons

(ii) Chemical weapons munitions

- definition

(iii) Chemical weapons equipment or systems, including means of delivery

- definition

(iv) Chemical weapons facilities

- for development and research
- for production
- for training in their use
- others

(c) Actions that could be required under a convention

(i) Declaration

- of existing stocks
- of production facilities, including location
- of time programme for destruction, conversion, etc.

(ii) Conversion to peaceful purposes or mothballing

- verification disadvantages compared to destruction
- economical and social consequences

(iii) Destruction of stocks
(iv) Destruction or dismantling of production facilities

4. Protection against CW attack

(a) Distinction between "protective" and "defensive" capability

(b) Type of instrument in which protection would be provided for

(i) in the convention itself?
(ii) in an annex to the convention?
(iii) in a separate instrument?

(c) Modalities of protection

(i) protective measures

- medical
- equipment
- others

(ii) training for protection
(iii) treatment of victims
(iv) additional issues regarding protection of civilians

(d) Decontamination

(i) equipment and facilities
(ii) training

(e) Should protective measures be prohibited?

(i) prohibition would be counter-productive as it would lead to a search for security through a CW deterrent
(ii) excessive protective measures may induce others to increase chemical weapons capabilities
(iii) they should not be prohibited, since protective measures are a stabilizing factor
(iv) protective measures will in any case be elaborated in relation to accidents in the civilian chemical industry

(f) Other matters

(i) relationship between protective measures and verification systems
(ii) cost of protective measures
(iii) exchange of information on protective measures (see also "confidence building measures")
(iv) advisory and training facilities for developing countries

5. Exceptions or "permitted activities"

(a) For civilian purposes

(i) For scientific and research purposes
(ii) For medical purposes
(iii) For industrial purposes
(iv) For agricultural purposes
(v) For riot control and other police activities

(b) For certain non-hostile military purposes

(i) For protective purposes
(ii) For rocket fuel, etc.

II - VERIFICATION

1. Objectives

   (a) To ensure compliance with the obligations of a convention

   (b) To enhance credibility of a convention and induce countries to adhere to it

   (c) Others

2. Guiding Principles

   (a) Respect for equality of all Parties

   (b) Respect for sovereignty

   (c) Respect for international solidarity and co-operation

   (d) Non-interference in internal affairs

   (e) Others

3. What is to be verified?

   (a) Destruction of stocks of CW agents and munitions

   (b) Conversion or mothballing of production facilities, etc.

   (c) Destruction or dismantling of production facilities, etc.

   (d) Ensure that prohibited agents are not being produced

   (e) Planning, organizing and training for tasks listed above

   (f) In the initial stages primarily to be directed at:

   - well-known agents
   - super toxic agents

4. National Verification

   (a) National organ

   - Each State to set up national system
   - Modalities to be left to each party in initial stage?
   - Need for internal legislation?

   (b) Possible functions

   - Observation and supervision of relevant national activities
   - Collection of pertinent data
   - Preparation of reports (periodic and upon request) to international verification organ
   - Acting as contact and host for international inspection teams
   - Providing of candidates for international secretariat and its technical staff
   - Others

5. International Verification

(a) International organs

(i) Consultative Committee?

- membership
- mandate
- secretariat
- financing

(ii) International Verification (Control) Agency?

- membership
- mandate
- compostion of secretariat, including technical staff
- laboratory services
- financing

(b) Possible functions

- collection of data through national organs
- analysis and evaluation of such data
- compilation and distribution of results of above
- handling of complaints of alleged breaches of the convention
- on-site inspections
- off-site inspections
- collection and analysis of material evidence
- reporting to Security Council or United Nations General Assembly
- others

6. Other means to supplement the verification procedure

(a) Initial declarations

(b) Periodic exchange of statements

(c) Review Conferences

(d) Periodic up-dating of definitions, criteria and agent lists

7. Handling of complaints (see also 5 (b) above)

(a) Procedures

(b) Role of Consultative Committee

(c) Investigations into

- alleged use
- alleged production
- alleged stockpiling and research

(d) Recourse to United Nations Security Council and/or the General Assembly

8. Confidence building measures

(a) General principles

(b) Objectives

(c) Measures

(i) Preconvention measures

(1) declaration of stocks, production facilities
(2) invitation to visit to CW facilities

(ii) Measures to be provided under convention

(1) exchange of information

- military protective measures against CW agents
- protective measures for civilians against CW agents
- protective measures against industrial accidents

(2) exhibitions in framework of the United Nations of protective measures and equipment

(3) invitations to visit production facilities to be destroyed on voluntary basis

9. General considerations

(a) Verification should be seen in light of and as a function of the scope of a convention

(b) National means of verification and international verification should complement each other

(c) National means alone would not be credible, and not all States have means to verify beyond their borders

(d) All States parties to the convention should be enabled to participate and benefit from verification procedures

(e) Relationship between level of protection against CW attacks, level of sophistication of CW attacks and probability of detection (or verification)

III - OTHER MATTERS */

1. <u>Security assurances for Parties to the convention</u>

   (a) Negative guarantee or non-use declarations

   (b) Positive guarantees

      (i) medical assistance to State victim of CW attack
      (ii) co-operation of parties in development of protective measures and equipment
      (iii) international advisory body could be established under the convention to help developing countries
      (iv) economic co-operation on peaceful uses of toxic substances - assistance in acquiring know-how would further confidence
      (v) political and military assistance

2. <u>Right of withdrawal from the convention</u>

   (a) Specify conditions for withdrawal

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*/ Issues such as review conferences, entry into force, amendment procedures, etc. were not raised at the meetings of the Working Group.

CD/132
1 August 1980

Original: ENGLISH

PAKISTAN

WORKING PAPER

Views of the Government of Pakistan submitted in response to the circulation of document CD/39

1. The urgency of concluding an effective ban on chemical weapons has increased in recent months in the light of persistent reports regarding the use of chemical weapons in Afghanistan and certain other regions of the world. Several statements have been made in the Committee on this subject. Pakistan initially refrained from commenting on the matter because of its desire to avoid exacerbating the already charged political atmosphere in the Committee. However, the circulation of document CD/39, transmitting a telegram from the so-called "Deputy Minister for Foreign Affairs" of the present imposed regime in Kabul, and some of the statements which were made to defend this document, obliged Pakistan to express its views on the subject.

2. For some time now, persistent reports have emanated from refugees coming from Afghanistan, and some of these have appeared in the world press, about the use of chemical toxic agents against the civilian population of Afghanistan and against the Afghan nationalist resistance. It has been asserted that these reports are "fabrications", or that, at best, there is no "conclusive proof". As yet, there may be no "conclusive proof" that lethal chemical weapons have been used in Afghanistan. However, from all that is known, it appears that some kinds of chemical toxic agents have been used in Afghanistan against the civilian population and Mujahedeen alike. In this report a particularly disturbing report appeared in the French newspaper "Le Monde", of 27 March 1980.

3. Although it remains to be established that lethal chemical weapons have been used in Afghanistan, even less toxic substances, which may be non-lethal if used in certain quantities, could become lethal if utilized in concentrated forms or against people who have no protection against such chemical agents. And, as the representative of Sweden stated on 24 April 1979 in the Committee on Disarmament, "launching attacks with incapacitating agents and irritants in war is by most countries considered to be prohibited by the Geneva Protocol of 1925".

4. In this context, the assertion emanating from the Kabul regime, reflected in document CD/39, that "subversive bands" have used "lethal chemical weapons" given to them "from outside of the country", appears to be a patent concoction designed to shift attention from the particularly brutal manner in which the Afghan patriots are being suppressed. More disturbingly, this is considered by some to be an ex-post-facto attempt to justify the use of chemical weapons against the Afghan population.

5. The Government of Pakistan has already rejected and continues to reject any imputation that the Afghan nationalist resistance is being provided with any kind of weapon by or through our country. Pakistan has consistently followed a policy of scrupulous non-interference in the internal affairs of Afghanistan, despite repeated provocations, malicious propaganda and the influx into our country of nearly one million Afghan refugees.

6. Pakistan has taken note of the "readiness" expressed by the Kabul regime "to investigate and examine, along with competent international authorities", the use and functioning of the chemical grenades allegedly in the possession of the Mujahadeen in Afghanistan. Although this appears to be a diversionary manoeuvre by the Kabul regime to gain international acceptance and respectability, nevertheless, Pakistan believes that an impartial investigation is necessary of <u>all</u> reports of the use of chemical weapons in Afghanistan - and elsewhere, if necessary - in order to establish the facts and to determine whether the provisions of the 1925 Geneva Protocol have indeed been violated.

7. For the conduct of an impartial and effective investigation into all these reports, an appropriate body should be constituted by the CD or some other international forum. Such an investigation body should be provided access to all areas in Afghanistan where the use of chemical substances, and other inhumane weapons and methods of warfare, has been reported. The investigating body should also be able to interview refugees and others from Afghanistan who claim to have knowledge of the use of such weapons in that country. Pakistan is prepared to co-operate fully for the purposes of such an investigation without prejudice to its position regarding the legality of the present imposed regime in Kabul.

8. Finally, Pakistan reiterates the hope, which is shared by the vast majority of the world community, that foreign troops will be speedily withdrawn from Afghanistan. This will assist in creating suitable conditions for the Afghan refugees in Pakistan to return to their homeland and enable the people of Afghanistan to freely determine their own destiny.

COMMITTEE ON DISARMAMENT

CD/139
9 August 1980
Original: ENGLISH

REPORT TO THE UNITED NATIONS GENERAL ASSEMBLY

APPENDICES

*/ To be issued as separate volumes of this report.

I. INTRODUCTION

1. The Committee on Disarmament submits to the thirty-fifth session of the United Nations General Assembly its annual report on its 1980 session, together with the pertinent documents and records. This report also includes an account of the organization of the Committee (part II) and of the Committee's work based on the agenda adopted for 1980 (part III).

II. ORGANIZATION OF THE COMMITTEE

A. 1980 Session of the Committee

2. The Committee was in session from 5 February to 29 April and from 12 June to 9 August 1980. During this period, the Committee held 48 formal plenary meetings at which members set forth their Governments' views and recommendations on the questions before the Committee.

3. The Committee also held 45 informal meetings on various subjects, including its schedule of work, organization and procedures, as well as items of the agenda considered by the Committee.

4. In accordance with rule 9 of the Rules of Procedure, the following Member States assumed the Chairmanship of the Committee: Canada for February, China for March, Cuba for April and the recess between the first and second part of the 1980 session of the Committee, Czechoslovakia for the remainder of June, Egypt for July, and Ethiopia for August and the recess until the 1981 session of the Committee.

B. Participants in the Work of the Committee

5. Representatives of the following Member States participated in the work of the Committee: Algeria, Argentina, Australia, Belgium, Brazil, Bulgaria, Burma, Canada, China, Cuba, Czechoslovakia, Egypt, Ethiopia, France, German Democratic Republic, Germany, Federal Republic of, Hungary, India, Indonesia, Iran, Italy, Japan, Kenya, Mexico, Mongolia, Morocco, Netherlands, Nigeria, Pakistan, Peru, Poland, Romania, Sri Lanka, Sweden, Union of Soviet Socialist Republics, United Kingdom of Great Britain and Northern Ireland, United States of America, Venezuela, Yugoslavia, Zaire. The lists of participants are included as Appendix I to the report.

C. Agenda for the 1980 Session and Programme of Work for the First and Second Parts of the Session

6. At the 61st plenary meeting the Chairman submitted a proposal on the provisional agenda of the Committee, in conformity with rule 29 of the Rules of Procedure. In submitting that proposal, the Chairman stated the following:

> "In accordance with rule 27 of its rules of procedure the Committee, in adopting its agenda for 1980 (contained in Working Paper No. 1) shall take into account the recommendations made to it by the General Assembly, the proposals presented by members of the Committee and the decisions of the Committee.

"The recommendations made to the Committee by the General Assembly at its thirty-fourth session, some of which contain specific requests to report to the Assembly at its thirty-fifth session, are referred to in the letter of the Secretary-General in document CD/55. They are the following:

34/72	'Chemical and bacteriological (biological) weapons'
34/73	'Implementation of General Assembly resolution 33/60'
34/79	'Prohibition of the development and manufacture of new types of weapons of mass destruction and new systems of such weapons'
34/83 B	'Report of the Committee on Disarmament'
34/83 G	'Non-use of nuclear weapons and prevention of nuclear war'
34/83 J	'Nuclear weapons in all aspects'
34/84	'Conclusion of an international convention on the strengthening of guarantees of the security of non-nuclear-weapon States'
34/85	'Conclusion of an international convention to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons'
34/86	'Strengthening of the security of non-nuclear-weapon States against the use or threat of use of nuclear weapons'
34/87 A	'Conclusion of an international convention prohibiting the development, production, stockpiling and use of radiological weapons'
34/87 D	'Prohibition of the production of fissionable material for weapon purposes'.

"In addition to the items inscribed in the provisional agenda, proposals were presented by members of the Committee concerning the inclusion of (a) as a sub-item of item 2, the question of 'Non-use of nuclear weapons and prevention of nuclear war', (b) additional items on 'Conventional weapons', on which an official document has been circulated during the current session of the Committee, as well as on 'Disarmament and development', and (c) a separate item on 'Radiological weapons'.

"Previous decisions of the Committee relating to the items on the provisional agenda are contained in its report to the General Assembly at its thirty-fourth session (document CD/53).

"It is understood that members of the Committee will take into account the recommendations made to it by the General Assembly at its thirty-fourth session under the relevant items of its agenda, and that, in accordance with rule 30 of the rules of procedure, it is the right of any Member State of the Committee to raise any subject relevant to the work of the Committee at a plenary meeting and to have full opportunity of presenting its views on any subject which it may consider to merit attention.

"It is further understood that the annual report of the Committee (item 7) will, inter alia, deal with the following two questions: (a) State of the consideration of the proposals and suggestions listed in paragraph 125 of the Final Document of the tenth special session of the General Assembly devoted to disarmament, which were transmitted to the Committee with General Assembly resolution 33/71 L., and (b) Consideration of the modalities of the review of the membership of the Committee, referred to in General Assembly resolution 33/91 G."

7. Some delegations made statements in connexion with the provisional Agenda, which was adopted by the Committee at the same plenary meeting. At the 67th plenary meeting of the Committee, the Chairman submitted a proposal concerning the programme of work for the first part of the session, which was also adopted by the Committee. The text of the agenda and programme of work for the first part of the session (document CD/62 and Add.1) read as follows:

"The Committee on Disarmament, as the multilateral negotiating forum, shall promote the attainment of general and complete disarmament under effective international control.

"The Committee, taking into account <u>inter alia</u> the relevant provisions of the Final Document of the first special session of the General Assembly devoted to disarmament, will deal with the cessation of the arms race and disarmament and other relevant measures in the following areas:

I. Nuclear weapons in all aspects;

II. Chemical weapons;

III. Other weapons of mass destruction;

IV. Conventional weapons;

V. Reduction of military budgets;

VI. Reduction of armed forces;

VII. Disarmament and development;

VIII. Disarmament and international security;

IX. Collateral measures; confidence-building measures; effective verification methods in relation to appropriate disarmament measures, acceptable to all parties concerned;

X. Comprehensive programme of disarmament leading to general and complete disarmament under effective international control.

"Within the above framework, the Committee on Disarmament adopts the following agenda for 1980 which includes items that, in conformity with the provisions of section VIII of its rules of procedure, would be considered by the Committee:

1. Nuclear test ban.

2. Cessation of the nuclear arms race and nuclear disarmament.

3. Effective international arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons.

4. Chemical weapons.

5. New types of weapons of mass destruction and new systems of such weapons; radiological weapons.

6. Comprehensive programme of disarmament.

7. Consideration and adoption of the annual report and any other report as appropriate to the General Assembly of the United Nations.

"In compliance with rule 28 of its rules of procedure, the Committee also adopts the following programme of work for the first part of its 1980 session:

PROGRAMME OF WORK

* * *

5-15 February	Statements in the plenary. Consideration of the agenda and programme of work.
19-29 February	Preliminary consideration, including the question of the establishment of ad hoc working groups, of the following items: nuclear test ban; effective international arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons; radiological weapons; chemical weapons and comprehensive programme of disarmament.
3-7 March	Nuclear test ban - Chemical weapons - Consideration of the question of the establishment of ad hoc working groups.
11-12 March	Effective international arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons.
13-14 March	Chemical weapons - radiological weapons.
17-28 March	Comprehensive programme of disarmament.
31 March - 4 April	New types of weapons of mass destruction and new systems of such weapons; radiological weapons.
7-18 April	Cessation of the nuclear arms race and nuclear disarmament.
21-25 April	Nuclear test ban.
28-29 April	Reports of ad hoc working groups, if any.

"In adopting its agenda and programme of work, the Committee has kept in mind the provisions of rules 30 and 31 of its rules of procedure".

8. During the second part of the 1980 session of the Committee, the Chairman submitted, at the 84th plenary meeting, a proposal on the programme of work for the second part of the session. In submitting that proposal, the Chairman made the following statement: "It is the Chairman's understanding that in scheduling meetings of Ad hoc Working Groups the Chairman of the Committee and the Chairmen of the Working Groups will, inter alia, take into account the availability of technical experts, bearing in mind the need for an equitable allocation of time among the Ad hoc Working Groups".

9. At the same plenary meeting, the Committee adopted the proposal of the Chairman. It read as follows (document CD/101):

"In compliance with rule 28 of its Rules of Procedure and taking into account rule 30, the Committee on Disarmament adopts the following programme of work for the second part of its 1980 session:

12-16 June	Consideration of the programme of work for the second part of the 1980 session.
17-20 June	Nuclear test ban.
23 June - 4 July	Cessation of the nuclear arms race and nuclear disarmament. 1/
7-16 July	New types of weapons of mass destruction and new systems of such weapons; radiological weapons.
17-25 July	Nuclear test ban.
28 July - .. August	Consideration of the reports of the ad hoc working groups on (a) effective international arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons (b) comprehensive programme of disarmament (c) radiological weapons and (d) chemical weapons; 2/
	Consideration and adoption of the annual report to the General Assembly of the United Nations. 3/

Members of the Committee wishing to make statements in the plenary on items before the ad hoc working groups may do so at any time.

"1/ As decided by the Committee at its 82nd plenary meeting on 29 April 1980, the period 24-26 June will also be devoted to informal meetings with experts on matters related to chemical weapons.

2/ Reports of ad hoc working groups that are ready may be considered at plenary or informal meetings earlier.

3/ In accordance with rule 44 of the Rules of Procedure, the draft reports to the United Nations General Assembly shall be made available to all Member States of the Committee for consideration at least two weeks before the scheduled date for their adoption. The annual report of the Committee will, inter alia, deal with the following two questions: (a) State of the consideration of the proposals and suggestions listed in paragraph 125 of the Final Document of the first special session of the General Assembly devoted to disarmament, and (b) Consideration of the modalities of the review of the membership of the Committee. Informal meetings to consider these two questions will be scheduled earlier."

"In accordance with the decision taken by the Committee at its 82nd plenary meeting on 29 April 1980, the ad hoc working groups established by the Committee shall meet for the first time during the second part of the 1980 session on the following dates:

- Radiological Weapons on	16 June at 3.00 p.m.
- Chemical Weapons on	17 June at 3.30 p.m.
- Effective International Arranagments to assure non-nuclear weapon States against the use or threat of use of nuclear weapons on	18 June at 3.00 p.m.
- Comprehensive Programme of Disarmament on	19 June at 3.00 p.m.

Thereafter the ad hoc working groups shall hold at least one meeting per week, as follows:

- Radiological Weapons on	Mondays **afternoon**
- Effective International Arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons on	Tuesdays **afternoon**
- Chemical Weapons on	Wednesdays **afternoon**
- Comprehensive Programme of Disarmament on	Thursdays afternoon

"Additional meetings of the ad hoc working groups will be convened weekly after consultation between the Chairman of the Committee and the Chairmen of the ad hoc working groups, according to the circumstances and needs of the various groups, as well as availability of additional time for meetings, bearing in mind the need for equitable allocation of time among the ad hoc working groups.

"In adopting its programme of work, the Committee has kept in mind the provisions of its Rules of Procedure."

10. At its 93rd plenary meeting, the Committee decided to close its 1980 session on 8 August. At its 99th plenary meeting, the Committee decided to postpone the closing date to 9 August.

D. Participation by States not members of the Committee

11. In conformity with rule 32 of the Rules of Procedure, the following States not members of the Committee communicated their intention to attend the plenary meetings of the Committee: Austria, Burundi, Denmark, Finland, Greece, the Holy See, Jordan, New Zealand, Spain, Switzerland, Turkey and Viet Nam.

12. The Committee received and considered requests to participate in its work from States not members of the Committee. Several delegations made statements in this connexion. The statements of two of them were circulated as official documents of the Committee on Disarmament (CD/83 and CD/137). In accordance with its rules of procedure, the Committee invited:

(a) the representatives of Denmark and Finland to participate in the formal and informal meetings of the Committee dealing with chemical weapons, as well as in meetings of its ad hoc Working Group on the same item during its 1980 session;

(b) the representative of Spain to participate in the formal meetings of the Committee dealing with chemical weapons during its 1980 session;

(c) the representative of Austria to participate in the formal and informal meetings of the Committee dealing with effective international arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons, as well as in meetings of its ad hoc Working Group on the same item during its 1980 session; and

(d) the representative of Switzerland to participate in meetings of its ad hoc Working Group on chemical weapons during its 1980 session.

13. At the request of the Socialist Republic of Viet Nam (CD/PV.87, CD/108), the Committee decided to postpone consideration of the question of its participation in the discussion on chemical weapons. Several statements were made in this context (PV/76 and PV/87).

14. At the 69th plenary meeting of the Committee, the Chairman stated that it was understood that, in accordance with rule 32 of the Rules of Procedure, representatives of non-member States should have reserved seats in the conference room during the meetings of the ad hoc Working Groups established by the Committee to continue to negotiate with a view to reaching agreement on effective international arrangements to assure non-nuclear weapons and to initiate negotiations on the comprehensive programme of disarmament.

15. At its 86th plenary meeting, the Committee decided that the informal meetings with experts on chemical weapons held during the period 24 to 26 June should be open to States not members of the Committee and to the public.

16. At its 92nd plenary meeting, the Committee also decided to invite States not members of the Committee which are members of the Ad hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events to be present at the informal meeting with experts members of that Group, held on 18 July 1980 to consider the Tenth progress report of the Group, (CD/119) and the subjects referred to in document CD/93.

E. Proposal to Amend the Rules of Procedure Regarding Participation by States not members of the Committee

17. The delegation of Mexico submitted on 31 July 1980 (CD/PV.95) for consideration at the 1981 session of the Committee, a Working Paper contained in document CD/129, dated 29 July 1980, entitled "Working Paper Containing Draft Amendments to Section IX of the Rules of Procedure of the Committee on Disarmament, entitled 'Participation by States not members of the Committee'".

F. Communications from Non-Governmental Organizations

18. In accordance with Article 42 of the Rules of Procedure, a list of all communications from non-governmental organizations was circulated to the Committee (CD/NGC.2).

III. WORK OF THE COMMITTEE DURING ITS 1980 SESSION

19. The work of the Committee during its 1980 session was based on its agenda and programme of work adopted for the year. The list of documents issued by the Committee, as well as the texts of those documents, are included as Appendix II to the report. An index of the verbatim records by country and subject, listing the statements made by delegations during 1980, and the verbatim records of the meetings of the Committee are attached as Appendix III to the report.

20. The Committee also had before it a letter dated 25 January 1980 from the Secretary-General of the United Nations (CD/55), transmitting all the resolutions on disarmament adopted by the General Assembly at its thirty-fourth session in 1979, in particular those entrusting specific responsibilities to the Committee on Disarmament, which are mentioned in paragraph 6 of this report.

21. In the same letter the Secretary-General drew attention, in particular, to the following provisions of those resolutions:

(a) In resolution 34/72, operative paragraph 2 urges the Committee on Disarmament to undertake, at the beginning of its 1980 session negotiations on an agreement on the complete and effective prohibition of the development, production and stockpiling of all chemical weapons and on their destruction, as a matter of high priority, taking into account all existing proposals and future initiatives; and operative paragraph 3 requests the Committee on Disarmament to report on the results of its negotiations to the General Assembly at its thirty-fifth session.

(b) In resolution 34/73, operative paragraph 4 requests the Committee on Disarmament to initiate negotiations on a treaty to achieve the prohibition of all nuclear test explosions by all States for all time, as a matter of the highest priority.

(c) In resolution 34/79, operative paragraph 1 requests the Committee on Disarmament, in the light of its existing priorities, actively to continue negotiations, with the assistance of qualified governmental experts, with a view to preparing a draft comprehensive agreement on the prohibition of the development and manufacture of new types of weapons of mass destruction and new systems of such weapons and, where necessary, specific agreements on particular types of such weapons; and operative paragraph 2 requests the Committee on Disarmament to submit a report on the results achieved to the General Assembly for consideration at its thirty-fifth session.

(d) In resolution 34/83 B, operative paragraph 1 urges the Committee on Disarmament to proceed, without any further delay, to substantive negotiations on the priority questions of disarmament on its agenda, in accordance with the provisions of the Final Document of the Tenth Special Session of the General Assembly and the other relevant resolutions of the Assembly on these subjects; operative paragraph 3 requests the Committee on Disarmament to initiate negotiations at its next session on the comprehensive programme of disarmament, with a view to completing its elaboration before the second special session of the General Assembly on disarmament and, in doing so, to take as a basis the recommendations adopted by the Disarmament Commission; and operative paragraph 4 requests the Committee on Disarmament to submit a report on its work to the General Assembly at its thirty-fifth session.

(e) In resolution 34/83 G, operative paragraph 1 decides to transmit to the Committee on Disarmament the views of States concerning the non-use of nuclear weapons, avoidance of nuclear war and related matters; and operative paragraph 2 requests the Committee on Disarmament to take those views into appropriate consideration and to report thereon to the General Assembly at its thirty-fifth session.

(f) In resolution 34/83 J, operative paragraph 1 requests the Committee on Disarmament to continue at the beginning of its 1980 session consideration of the item "Nuclear weapons in all aspects" and to undertake preparatory consultations on the negotiations referred to in paragraph 2 of the same resolution; operative paragraph 2 requests the Committee on Disarmament to initiate, as a matter of high priority, negotiations, with the participation of all nuclear-weapon States, on the question of the cessation of the nuclear arms race and nuclear disarmament, in accordance with the provisions of paragraph 50 of the Final Document of the Tenth Special Session of the General Assembly; and operative paragraph 3 further requests the Committee on Disarmament to report on the results of those negotiations to the General Assembly at its thirty-fifth session.

(g) In resolution 34/84, operative paragraph 4 requests the Committee on Disarmament to continue negotiations on a priority basis during its 1980 session with a view to their early conclusion with the elaboration of a convention to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

(h) In resolution 34/85, operative paragraph 4 recommends that the Committee on Disarmament should conclude effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons during its 1980 session, taking into account the widespread support for the conclusion of an international convention and giving consideration to any other proposals designed to secure the same objective.

(i) In resolution 34/86, operative paragraph 3 requests the Committee on Disarmament to continue its efforts at its next session with a view to reaching agreement on effective international arrangements further to strengthen the security of the non-nuclear-weapon States and report to the General Assembly at its thirty-fifth session.

(j) In resolution 34/87 A, operative paragraph 2 requests the Committee on Disarmament to proceed as soon as possible to achieve agreement, through negotiation, on the text of an international convention prohibiting the development, production, stockpiling and use of radiological weapons and to report to the General Assembly on the results achieved for consideration by the Assembly at its thirty-fifth session.

(k) In resolution 34/87 D, its operative paragraph requests the Committee on Disarmament, at an appropriate stage of its work on the item entitled "Nuclear weapons in all aspects", to pursue its consideration of the question of adequately verified cessation and prohibition of the production of fissionable material for nuclear weapons and other nuclear explosive devices and to keep the General Assembly informed of the progress of that consideration.

22. By the same letter and in compliance with paragraph 6 of General Assembly resolution 34/83 H, the Secretary-General transmitted to the Committee the report and recommendations of the Disarmament Commission on the elements of a comprehensive

programme of disarmament, which are contained in document A/34/42. In accordance with General Assembly resolutions 34/79, 34/86 and 34/87 A, the Secretary-General also transmitted to the Committee all documents relating to the subjects considered by those resolutions.

23. At the 53rd plenary meeting of the Committee on 5 February 1980, the Secretary of the Committee and Personal Representative of the Secretary-General conveyed to the Committee a message from the Secretary-General on its 1980 session (CD/PV.53).

24. The Committee received the following documents concerning various items of the agenda:

(a) Document CD/57, dated 11 February 1980, submitted by the delegation of Romania and entitled "Romania's position on disarmament".

(b) Document CD/58, dated 12 February 1980, submitted by the delegation of the German Democratic Republic, transmitting the communiqué adopted at the meeting of the Committee of the Ministers for Foreign Affairs of the Warsaw Treaty Member States held at Berlin on 5 and 6 December 1979.

(c) Document CD/60, dated 13 February 1980, submitted by the delegation of Poland and entitled "Poland's Policy on détente and disarmament".

(d) Document CD/63, dated 3 March 1980, submitted by the delegation of Bulgaria and entitled "The position of the People's Republic of Bulgaria on détente and disarmament at the present stage".

(e) Document CD/64, dated 27 February 1980, entitled "Statement of the Group of 21 */ on the establishment of working groups on items on the annual agenda of the Committee on Disarmament in 1980".

(f) Document CD/67, dated 28 February 1980, submitted by the delegation of Poland and entitled "Resolution of the Eighth Congress of the Polish United Workers' Party".

(g) Document CD/71, dated 4 March 1980, submitted by the delegation of the Union of Soviet Socialist Republics and entitled "Extracts from the address delivered by Mr. L.I. Brezhnev, General Secretary of the Central Committee of the Communist Party of the Soviet Union and Chairman of the Presidium of the Supreme Soviet of the USSR, at the meeting of electors in the Bauman electoral district, Moscow, on 22 February 1980".

(h) Document CD/88, dated 14 April 1980, entitled "Letter dated 11 April 1980 addressed to the Chairman of the Committee on Disarmament from the Permanent Representative and Head of the Delegation of Egypt to the Committee on Disarmament in connexion with CD/71 of 4 March 1980".

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*/ Algeria, Argentina, Brazil, Burma, Cuba, Egypt, Ethiopia, India, Indonesia, Iran, Kenya, Mexico, Morocco, Nigeria, Pakistan, Peru, Sri Lanka, Sweden, Venezuela, Yugoslavia, Zaire.

(i) Document CD/92, dated 17 April 1980, submitted by the delegation of the Union of Soviet Socialist Republics and entitled "Letter from the Minister for Foreign Affairs of the USSR addressed to the Secretary-General of the United Nations concerning the tasks of the Second Disarmament Decade".

(j) Document CD/98, dated 17 June 1980, entitled "Letter dated 9 June 1980 from the Chargé d'Affaires A.I. of the Permanent Representation of the Polish People's Republic enclosing the Declaration of the States Parties to the Warsaw Treaty adopted at the meeting of the Political Consultative Committee in Warsaw on 15 May 1980".

(k) Document CD/99, dated 12 June 1980, entitled "Letter dated 10 June 1980 from the Permanent Representative of Canada forwarding a document 'Compendium of Arms Control Verification Proposals'".

(l) Document CD/100, dated 12 June 1980, entitled "Letter dated 10 June 1980 from the Permanent Representative of the Mongolian People's Republic, enclosing the text of a statement dated 20 May 1980 by the Government of the Mongolian People's Republic in support of the Declaration adopted at a meeting of the Political Consultative Committee of the States Parties to the Warsaw Treaty, held at Warsaw on 14 and 15 May 1980".

(m) Document CD/107, dated 27 June 1980, entitled "Letter dated 27 June 1980 from the Permanent Representative of the German Democratic Republic transmitting a letter of Mr. Oskar Fischer, Minister of Foreign Affairs of the German Democratic Republic".

(n) Document CD/127 dated 29 July 1980, entitled "Letter from the Counsellor of the Permanent Mission of Canada forwarding a document 'Quantitative Working Paper on the Compendium of Arms Control Verification Proposals'".

A. Nuclear test ban

~~25. The item on the agenda entitled "Nuclear test ban" was considered by the~~ Committee, in accordance with its programme of work, during the periods 19-29 February, 3-7 March, 21-25 April, 17-20 June, 17-25 July and 1-5 August.

26. The Committee had before it the progress reports on the Ninth and Tenth Sessions of the *Ad Hoc* Group of Scientific Experts to consider International Co-operative Measures to Detect and Identify Seismic Events (documents CD/61 and CD/119) which met from 11 to 15 February and from 7 to 16 July.

27. In addition to the reports submitted by the *Ad Hoc* Group, the following documents were presented to the Committee during the year in connexion with the item:

(a) Document CD/72, dated 4 March 1980, entitled "Statement of the Group of 21 on a Comprehensive Nuclear Test Ban Treaty".

(b) Document CD/73, dated 5 March 1980, submitted by the delegation of the Federal Republic of Germany and containing a working paper entitled "Workshop on the demonstration of procedures to obtain seismic data at individual stations under ~~different conditions".~~

D. Chemical weapons

50. The item on the agenda entitled "Chemical weapons" was considered by the Committee, in accordance with its programme of work, during the following periods: 19-29 February, 3-7 March and 13-14 March.

51. In addition to earlier documents the following were before the Committee in connexion with the item:

(a) Document CD/59, dated 12 February 1980, submitted by the delegation of Australia and entitled "Chemical weapons: Proposal for Informal Meetings with Experts".

(b) Document CD/68, dated 28 February 1980, submitted by the delegation of Poland and entitled "Chemical weapons - a possible procedural approach to the tasks facing the Committee on Disarmament: working paper".

(c) Document CD/82, dated 20 March 1980, entitled "Letter dated 18 March 1980 from the Chargé d'Affaires ad interim of the Permanent Mission of the Socialist Republic of Viet Nam transmitting a document entitled 'Memorandum on the use of chemicals by the United States of America in Viet Nam, Laos and Kampuchea'."

(d) Document CD/84, dated 26 March 1980, submitted by the delegation of the Netherlands, containing a working document entitled "Draft Initial Work Programme of the Ad Hoc Working Group on Chemical Weapons".

(e) Document CD/85, dated 27 March 1980, entitled "Letter dated 26 March 1980 from the Permanent Representative of the Permanent Mission of Democratic Kampuchea transmitting two documents entitled 'Statement of 5 February 1980 by the Ministry of Foreign Affairs of Democratic Kampuchea on the intensification by Hanoi of the use of chemical weapons and other activities to exterminate the Kampuchean People' and 'The use of chemical weapons by the Vietnamese aggressors in Kampuchea; Report issued by the Ministry of Information of Democratic Kampuchea on 25 February 1980'."

(f) Document CD/89, dated 14 April 1980, and entitled "Telegram dated 13 April 1980 from the Deputy Minister for Foreign Affairs of the Democratic Republic of Afghanistan transmitting a 'Declaration of the Government of the Democratic Republic of Afghanistan issued on 11 April 1980'."

(g) Document CD/94, dated 18 April 1980 submitted by the delegation of Belgium and entitled "Proposed definition of a chemical warfare agent and chemical munitions".

(h) Document CD/96, dated 22 April 1980, submitted by the delegation of Poland and entitled "Ad Hoc working group on CW - Initial Work Programme: Working Document".

(i) Document CD/97, dated 24 April 1980, submitted by the delegation of Sweden and entitled "Working Paper on the Prohibition of Chemical Warfare Capability".

(j) Document CD/102, dated 19 June 1980, entitled "Letter dated 19 June 1980 from the Acting Head of the Chinese delegation, transmitting a working paper on the 'Chinese Delegation's proposals on the main contents of a convention on the prohibition of chemical weapons'."

(k) Document CD/103, dated 24 June 1980, entitled "Letter dated 24 June 1980 from the Permanent Representative of Finland transmitting a document entitled 'Identification of degradation products of potential organophosphorus warfare agents'."

(l) Document CD/105, dated 27 June 1980, entitled "Elements of a reply by the French delegation to the questionnaire relating to chemical weapons submitted by the Netherlands to the Committee on Disarmament (CD/41)".

(m) Document CD/106, dated 27 June 1980, submitted by the delegation of France, containing a working paper entitled "Control of the non-manufacture and non-possession of agents and weapons of chemical warfare".

(n) Document CD/110, dated 2 July 1980, submitted by the delegation of Yugoslavia and entitled "Working Paper on Medical Protection Against Nerve Gas Poisoning (Present Situation and Future Possibilities)".

(o) Document CD/111, dated 2 July 1980, submitted by the delegation of Yugoslavia and entitled "Working Paper on the Definition of Chemical Warfare Agents (CWA)".

(p) Document CD/112, dated 7 July 1980, submitted by the delegations of the Union of Soviet Socialist Republics and the United States of America, transmitting a document entitled "USSR-United States Joint Report on the Progress in the Bilateral Negotiations on the Prohibition of Chemical Weapons".

(q) Document CD/113, dated 8 July 1980, submitted by the delegation of Canada and entitled "Organization and Control of Verification Within a Chemical Weapons Convention".

(r) Document CD/114, dated 9 July 1980, entitled "Reply at this stage submitted by the Australian Delegation to the questionnaire relating to chemical weapons submitted by the Netherlands to the Committee on Disarmament in document CD/41.".

(s) Document CD/117, dated 10 July 1980, submitted by the delegation of Canada and entitled "Definitions and Scope in a Chemical Weapons Convention".

(t) Document CD/121, dated 17 July 1980, submitted by the delegation of Poland and entitled "Some of the issues to be dealt with in the negotiation on a CW convention: working paper".

(u) Document CD/122, dated 21 July 1980, submitted by the delegation of Morocco and entitled "Proposed definition of chemical weapons".

(v) Document CD/123, dated 21 July 1980, submitted by the delegation of Mongolia, containing a working document entitled "Interrelationship between the future convention on the complete prohibition and destruction of chemical weapons and the Geneva Protocol of 1925".

(w) Document CD/124, dated 24 July 1980, submitted by the Delegation of Indonesia and entitled "Some views on the prohibition of chemical weapons".

(x) Document CD/132, dated 1 August 1980, containing a working paper entitled "Views of the Government of Pakistan submitted in response to the circulation of Document CD/89".

52. In discharging its responsibility for the negotiation and elaboration, as a matter of high priority, of a multilateral convention on the complete and effective prohibition of the development, production and stockpiling of chemical weapons and on their destruction, the Committee on Disarmament decided at its 69th plenary meeting on 17 March 1980 to establish for the duration of its 1980 session, an Ad Hoc Working Group of the Committee to define, through substantive examination, issues to be dealt with in the negotiation on such a convention, taking into account all existing proposals and future initiatives. The Committee further decided that the Ad Hoc Working Group would report to the Committee on the progress of its work at any appropriate time and in any case before the conclusion of its 1980 session (Document CD/80).

53. At its 80th plenary meeting on 22 April 1980 the Committee also decided to nominate the representative of Japan as Chairman of the Ad Hoc Working Group. The Ad Hoc Working Group held 16 meetings between 23 April and 1 August 1980 and the Chairman also conducted informal consultations during that period. As a result of its deliberations the Ad Hoc Working Group submitted a report to the Committee (Document CD/131/Rev.1).

54. As proposed in Document CD/59 and in accordance with the decision taken at its 82nd plenary meeting, the Committee held four informal meetings with experts on chemical weapons during the period 24 to 26 June 1980.

55. Both prior and subsequent to the establishment of the Ad Hoc Working Group on Chemical Weapons, the Committee had, in plenary and informal meetings, useful discussions of issues relating to the prohibition of such weapons. Presentations by experts during the informal meetings referred to in the preceding paragraph were welcomed as useful and provided further insights into the issues involved. The Joint Report on the progress in USA-USSR bilateral negotiations (CD/112) was commented upon, and further clarifications on certain points were provided by the two negotiating parties. The need to ensure strict respect for the 1925 Geneva Protocol was stressed, especially in view of controversial allegations of the use of chemical weapons. In this connection, the need for appropriate international measures to determine the facts was emphasized. However, varying views were expressed concerning what type of measures would be appropriate.

56. At its 100th plenary meeting on 9 August 1980, the Committee adopted the report of the Ad Hoc Working Group, which is an integral part of this report and reads as follows:

1. In the course of consideration of item 4 of its 1980 agenda, entitled "Chemical Weapons", the Committee at its sixty-ninth plenary meeting on 17 March 1980, adopted the following decision contained in Document CD/80:

> "In discharging its responsibility for the negotiation and elaboration as a matter of high priority, of a multilateral convention on the complete and effective prohibition of the development, production and stockpiling of chemical weapons and on their destruction, the Committee on Disarmament decides to establish, for the duration of its 1980 session, an ad hoc working group of the Committee to define, through substantive examination, issues to be dealt with in the negotiation on such a convention, taking into account all existing proposals and future initiatives.
>
> The ad hoc working group will report to the Committee on the progress of its work at any appropriate time and in any case before the conclusion of its 1980 session."

2. At the 80th meeting on 22 April 1980 the Committee elected Ambassador Y. Okawa, Japan, as Chairman of the ad hoc Working Group. Mrs. L. Waldheim-Natural, Chief, Geneva Unit, United Nations Centre for Disarmament, was appointed Secretary of the Working Group.

3. At their request and on the basis of decisions taken by the Committee on Disarmament at its eighty-sixth and ninety-first sessions, contained respectively in Documents CD/PV.86 and CD/PV.91, representatives of Denmark, Finland and Switzerland attended meetings of the Group in addition to members of the Committee on Disarmament.

4. The Group held 16 meetings between 23 April 1980 and 1 August 1980.

5. In carrying out its mandate the ad hoc Working Group took into account paragraph 75 of the Final Document of the first special session of the General Assembly of the United Nations devoted to disarmament, which stated that the conclusion of a convention on chemical weapons was one of the most urgent tasks of multilateral negotiations.

6. In the conduct of its work, the following working papers were circulated to the Working Group:

(a) a "Working paper introduced by the Chairman" (CD/CW/WP.1);

(b) a working paper entitled "List of Documents" (CD/CW/WP.2 and its addenda 1 and 2) containing a list of Committee on Disarmament documents relevant to the work of the ad hoc Working Group on Chemical Weapons, circulated between July 1979 and July 1980;

(c) a working paper by the United States of America entitled "Issues to be defined by the Ad Hoc Chemical Weapons Working Group" (CD/CW/WP.3);

(d) a working paper by Sweden entitled "Issues to be dealt with in the negotiation on a Convention on Chemical Weapons" (CD/CW/WP.4);

(e) a working paper by the Federal Republic of Germany entitled "The impact of on-site inspections of current civilian production on the chemical industry" (CD/CW/WP.5);

(f) a working paper submitted by France entitled "Criteria for the Definition of Chemical Warfare Agents" (CD/CW/WP.6)

7. The Chairman stated that all existing proposals and all future initiatives would be treated on an equal basis by the Working Group. He was of the view that Document CD/26, "Compilation of material on Chemical Weapons from the Conference of the Committee on Disarmament and the Committee on Disarmament Working Papers and Statements 1972-1979 (Prepared by the Secretariat)" was a useful reference for the group in its work.

8. At the suggestion of the Chairman, the Group agreed to structure its work under three general headings: "Scope", "Verification" and "Other matters". In a first round, one meeting was devoted to each of these headings, followed by a second round in the same order. During the course of these meetings, delegations made statements of substance on the issues under consideration.

9. The Chairman also provided the group with Conference Room Papers which contained lists of issues raised under the three general headings under which the Group conducted its substantive deliberations. These Conference Room Papers were later consolidated into one document, CD/CW/CRP.3/Rev.1, which is annexed to this report as an aide-mémoire from the Chairman, for future reference.

10. In order to define the issues to be dealt with in the negotiation on a convention on the prohibition of chemical weapons, the Working Group undertook a substantive examination under the three general headings mentioned in paragraph 8 above. In this context, there appeared to be a general convergence of views among the delegations who participated in the discussions on the following issues:

A. <u>Comprehensive scope of a prohibition</u>

(1) Issues relating to activities that could be prohibited under a convention:

(a) development
(b) production
(c) stockpiling
(d) acquisition
(e) retention
(f) transfer and assistance to other States

(2) Issues relating to specific items, subject to agreed definitions, that could be prohibited under a convention:

(a) chemical warfare agents
(b) chemical munitions

(c) precursors
(d) chemical weapons, equipment or systems
(e) means of/facilities for the production of the above

(3) Issues relating to the criteria that could be used as the basis in determining the scope of the prohibition:

(a) general purpose criterion
(b) toxicity criteria
(c) additional criteria

(4) Issues relating to actions that States Parties to a convention could be required to take in implementation of the prohibition:

(a) declaration and destruction, within specific periods, of existing stocks of chemical weapons

(b) declaration and destruction or dismantling, within specific periods, of means of/facilities for production

(5) Issues concerning the exceptions that could be allowed under a convention:

(a) for civilian purposes, such as:

- medical
- scientific and research
- industrial
- agricultural
- riot control

(b) for certain non-hostile military purposes and for military purposes not related to the use of chemical weapons

B. Verification

The importance of adequate verification was recognized. It was held that verification measures should be commensurate with the scope of the prohibition and other aspects of a convention.

(1) Issues relating to national verification measures that could be provided for under a convention:

(a) internal legislation

(2) Issues relating to international verification measures that could be provided for under a convention:

(a) consultation and co-operation
(b) establishment of a consultative body
(c) on-site inspections under certain conditions and procedures
(d) handling of complaints

C. Other Issues

(1) Confidence-building measures

(2) International Co-operation

11. In the course of substantive examination of issues to be dealt with in the negotiation on a convention under the three general headings mentioned in paragraph 8 above, there appeared to be no convergence of views among delegations who participated in the discussions on, inter alia, the following issues:

A. Comprehensive scope of the prohibition

(1) The view was expressed that a convention should cover "chemical warfare capability" and that this concept should include every activity, facility and material intended to utilize the toxic properties of chemical substances for hostile purposes in an armed conflict. In this view exceptions should, however, be allowed for peaceful purposes, including some measures of a military nature and measures for protection against chemical warfare. Others expressed serious doubts about the value of this concept but the question was not discussed in depth.

(2) Issues relating to activities that could be prohibited under a convention:

(a) Use

It was common ground that the convention should not detract from the 1925 Geneva Protocol. Some held that the issue of use was already adequately covered by that Protocol, while others were of the view that a ban on the use of chemical weapons would be an essential element of a comprehensive convention.

(b) Planning and Organization

One view was that planning and organization were essential elements of the development of a capability for chemical warfare and should therefore be banned. Another view held that a ban on planning and organization would be practically impossible to verify and hence hard to enforce; in any event it would not be needed if other elements were successfully banned.

(c) Training

Some delegations held the view that, since it was difficult to distinguish between offensive and defensive training, all training should be prohibited; others believed that training in protective measures would contribute to deterring possible violations of a convention and, therefore, should be allowed; still others thought that protective training should be permitted at least until all stocks of chemical weapons were destroyed.

(3) Issues relating to specific items, subject to agreed definitions, that could be prohibited under a convention:

(a) Means of/facilities for production.

The issue of what specific types of means of/facilities for production would fall under the prohibition was not examined in depth.

(b) Biochemical warfare agents.

Some held that potential biochemical warfare agents that fall in the so-called grey area between biological and chemical warfare agents should be prohibited. The issue was not the subject of further examination.

(4) Issues relating to the criteria that could be used as the basis in determining the scope of the prohibition:

(a) There were differing views regarding the relative importance of the various criteria mentioned in paragraph 10.A.(3) above.

(b) With reference to toxicity criteria, although several approaches for defining toxicity were discussed-- including quantitative, qualitative, descriptive and nominative -- no attempt was made to narrow the issue to a particular approach or combination of approaches.

(c) Varying views were expressed on whether a list of chemical agents -- either positive, negative or illustrative -- should be established.

(d) The question of the treatment to be accorded to single and dual purpose agents and precursors respectively was not discussed in detail.

(5) Issues relating to action that State Parties to a convention could be required to take:

(a) Some held that means of/facilities for production should be destroyed, dismantled or converted to peaceful uses. Others, expressing concern about the verification problem involved, were of the opinion that all means of production should be destroyed.

(b) Differing views were expressed on the content of the declaration of existing stocks and the declaration of plans for the destruction of such stocks, as well as on their timing, including whether these declarations should be made before, at the time or after a convention came into force.

(c) Differing views were also expressed on the content of the declaration of plans for the disposition of means of/ facilities for production and filling facilities, as well as on their timing, including whether these declarations should be made before, at the time or after a convention came into force.

(6) Issues concerning the exceptions that could be allowed under a convention:

(a) There was a divergence of views on whether an exception for protection purposes should be allowed under a convention. A view was expressed that the exception of "protective measures" may create serious problems of verification and control.

(b) The issue of what specific riot control agents would be excepted was not discussed.

(c) It was pointed out that any exception which would be allowed would have to be clearly and precisely defined.

B. Verification

(1) General approach

Opinions differed as to what would be a realistic verification system which responded adequately to the requirements of a convention, since a totally effective verification system, while desirable, appeared to be technically unattainable. Some held that an effective convention called for very stringent verification measures, while others felt that less stringent measures could suffice and still meet the requirements of a reasonable verification system. Since the different aspects of verification were related to the scope of the prohibition and other aspects of a convention, some delegations withheld their comments on this issue for the time being.

(2) What is to be verified?

(a) Differing views were expressed on the requirements of verification in the following areas:

(i) destruction of chemical weapons' stocks

(ii) destruction or dismantling of means of/facilities for production of chemical weapons

(iii) non-production of chemicals for prohibited purposes

(iv) production of certain chemicals for non-hostile military purposes

(b) Some held that non-production of chemicals for prohibited purposes could be verified even in highly industrialized countries with reasonable means and without prejudice to the interests of the chemical industry. Others were of the view that inspection of entire chemical industries would not be practicable. In this context some held that verification of a ban on identified dual-purpose agents and their precursors and in particular binary weapons, could pose insurmountable difficulties. Others disagreed with this view.

(c) Differing views were expressed on whether prohibition of planning, organization and training, if included in a convention, could be verified.

(3) Verification procedures

While delegations were of the view that a verification system could be based on an appropriate combination of international and national measures, there were differences as to their relative effectiveness. One view was that a verification system should rely primarily on international measures. Another view was that national measures, with certain international procedures, would provide adequate assurance of compliance.

(a) Issues relating to national verification measures

There appeared to be no convergence of views on whether national organs for verification should be envisaged, in a convention and, if so, on the role and importance of such organs. Differing views were expressed regarding whether or not standardized programmes for national organs for verification, including their organization, functions and obligations, should be provided for.

(b) Issues relating to international verification measures

(i) While delegations believed that international verification measures should include arrangements for on-site verification, their views differed on specifics of such arrangements.

(ii) There were differences of view as to whether or not systematic on-site inspections would be necessary to verify:

- destruction of chemical weapons stocks;

- destruction or dismantling of means of/facilities for production of chemical weapons as well as filling facilities;

- production of certain chemicals for non-hostile military purposes; and

- non-production of chemicals for prohibited purposes.

(iii) On the issue of conversion of facilities, some delegations held that, if conversion was allowed, systematic on-site inspection of converted facilities would be required.

(iv) According to one view, the establishment of an international verification agency, in addition to the consultative body, would be desirable in the system of international verification. Others did not share this view.. Still others believed that the establishment of such an agency was a broader question that transcended the framework of a chemical weapons prohibition.

(v) While some delegations were of the opinion that complaint procedures could involve the United Nations Security Council, others believed that the United Nations General Assembly could be a more appropriate body.

C. <u>Other Issues</u>

(1) Confidence-building measures

The view was expressed that international means of verification should include procedures for confidence-building measures, but the issue was not examined in detail.

(2) Negative guarantees

One view was that such guarantees should be considered in the course of the elaboration of a convention. Others held the view that the question of non-use was covered by the 1925 Geneva Protocol.

(3) Co-operation in the development of protective measures

Suggestions were made that a convention should contain specific provisions regarding co-operation and technical assistance in the field of protective measures. This question was not examined in depth.

(4) Co-operation and technical assistance

It was suggested that a convention should include provisions regarding co-operation and technical assistance in the peaceful uses of toxic chemicals as well as on the transfer, especially to developing countries, of resources released by the prohibition of chemical weapons. This question was not examined in depth.

12. At the suggestion of the Chairman, the Working Group noted that, inter alia, the following issues had not been discussed in depth during the 1980 session and would have to be taken into consideration at a later stage:

- Preamble
- Conditions for entry into force
- Signature, ratification, accession, etc.
- Depositaries (Governments or Secretary-General of the United Nations)
- Duration
- Review conferences
- Withdrawals
- Protocols and annexes
- Procedures for amendment

13. Various definitions of "chemical weapons" and other terms were suggested during the discussions. At the suggestion of the Chairman the Working Group noted that the question of definition of terms and the clarification of various concepts would need to be taken up at a later stage.

14. The discussions confirmed the general recognition of the urgent need to negotiate and elaborate a multilateral convention on the complete and effective prohibition of the development, production and stockpiling of chemical weapons and on their destruction.

15. The Working Group recommends that at the beginning of its 1981 session the Committee on Disarmament set up a further working group under an appropriate mandate to be determined at that time to continue and advance the work undertaken by the 1980 Working Group in the discharge of the Committee's responsibility for the negotiation and elaboration of such a multilateral convention."

"Annex I

Issues raised at the Meetings of the Ad Hoc Working Group on Chemical Weapons

(Aide-Mémoire from the Chairman)

I - SCOPE

1. Aims and Purpose of a convention

- as set forth in the Final Document of the Special Session of the General Assembly
- as set forth in CD/97 (Sweden)
- as set forth in CD/48 (USSR/USA)
- as set forth in CD/44 (Poland)
- other proposals

2. Relationship with other international conventions

(a) Geneva Protocol of 1925

(i) carry over prohibition of use into a chemical weapons convention
(ii) need for strengthening

(b) Biological Weapons Convention of 1972

(i) need to ensure symmetry between two conventions
(ii) need to cover loopholes, grey areas
(iii) ensure that all biochemical agents are covered

(c) Enmod Convention of 1977

3. Comprehensive nature of ban

(a) Activities that could be banned

(i) development
(ii) production
(iii) stockpiling
(iv) acquisition
(v) retention
(vi) transfer and assistance
(vii) use
(viii) planning
(ix) organization
(x) training
(xi) dissemination of information
(xii) others

(b) Items that could be dealt with

(i) Chemical weapons agents, including precursors

- definition
- criteria

  - general purpose
  - distinction between single purpose agents and dual purpose agents

  - toxicity:
    - quantitative approach
    - qualitative "
    - descriptive " (chemical formula)
    - nominative "
    - fitness for military use

- binary weapons

(ii) Chemical weapons munitions

- definition

(iii) Chemical weapons equipment or systems, including means of delivery

- definition

(iv) Chemical weapons facilities

- for development and research
- for production
- for training in their use
- others

(c) Actions that could be required under a convention

(i) Declaration

- of existing stocks
- of production facilities, including location
- of time programme for destruction, conversion, etc.

(ii) Conversion to peaceful purposes or mothballing

- verification disadvantages compared to destruction
- economical and social consequences

(iii) Destruction of stocks

(iv) Destruction or dismantling of production facilities

4. Protection against CW attack

(a) Distinction between "protective" and "defensive" capability

(b) Type of instrument in which protection would be provided for

(i) in the convention itself?
(ii) in an annex to the convention?
(iii) in a separate instrument?

(c) Modalities of protection

(i) protective measures

- medical
- equipment
- others

(ii) training for protection
(iii) treatment of victims
(iv) additional issues regarding protection of civilians

(d) Decontamination

(i) equipment and facilities
(ii) training

(e) Should protective measures be prohibited?

(i) prohibition would be counter-productive as it would lead to a search for security through a CW deterrent
(ii) excessive protective measures may induce others to increase chemical weapons capabilities
(iii) they should not be prohibited, since protective measures are a stabilizing factor
(iv) protective measures will in any case be elaborated in relation to accidents in the civilian chemical industry

(f) Other matters

(i) relationship between protective measures and verification systems
(ii) cost of protective measures
(iii) exchange of information on protective measures (see also "confidence building measures")
(iv) advisory and training facilities for developing countries

5. Exceptions or "permitted activities"

(a) For civilian purposes

(i) For scientific and research purposes
(ii) For medical purposes

(iii) For industrial purposes
(iv) For agricultural purposes
(v) For riot control and other police activities

(b) For certain non-hostile military purposes

(i) For protective purposes
(ii) For rocket fuel, etc.

II - VERIFICATION

1. <u>Objectives</u>

(a) To ensure compliance with the obligations of a convention

(b) To enhance credibility of a convention and induce countries to adhere to it

(c) Others

2. <u>Guiding Principles</u>

(a) Respect for equality of all Parties

(b) Respect for sovereignty

(c) Respect for international solidarity and co-operation

(d) Non-interference in internal affairs

(e) Others

3. <u>What is to be verified?</u>

(a) Destruction of stocks of CW agents and munitions

(b) Conversion or mothballing of production facilities, etc.

(c) Destruction or dismantling of production facilities, etc.

(d) Ensure that prohibited agents are not being produced

(e) Planning, organizing and training for tasks listed above

(f) In the initial stages primarily to be directed at:

- well-known agents
- super toxic agents

4. <u>National Verification</u>

(a) National organ

- Each State to set up national system
- Modalities to be left to each party in initial stage?
- Need for internal legislation?

(b) Possible functions

- Observation and supervision of relevant national activities
- Collection of pertinent data
- Preparation of reports (periodic and upon request) to international verification organ
- Acting as contact and host for international inspection teams
- Providing of candidates for international secretariat and its technical staff
- Others

5. International Verification

(a) International organs

(i) Consultative Committee?

- membership
- mandate
- secretariat
- financing

(ii) International Verification (Control) Agency?

- membership
- mandate
- composition of secretariat, including technical staff
- laboratory services
- financing

(b) Possible functions

- collection of data through national organs
- analysis and evaluation of such data
- compilation and distribution of results of above
- handling of complaints of alleged breaches of the convention
- on-site inspections
- off-site inspections
- collection and analysis of material evidence
- reporting to Security Council or United Nations General Assembly
- others

6. Other means to supplement the verification procedure

(a) Initial declarations

(b) Periodic exchange of statements

(c) Review Conferences

(d) Periodic up-dating of definitions, criteria and agent lists

7. Handling of complaints (see also 5 (b) above)

(a) Procedures

(b) Role of Consultative Committee

(c) Investigations into

- alleged use
- alleged production
- alleged stockpiling and research

(d) Recourse to United Nations Security Council and/or the General Assembly

8. Confidence building measures

(a) General principles

(b) Objectives

(c) Measures

(i) Preconvention measures

(1) declaration of stocks, production facilities

(2) invitation to visit to CW facilities

(ii) Measures to be provided under convention

(1) exchange of information

- military protective measures against CW agents
- protective measures for civilians against CW agents
- protective measures against industrial accidents

(2) exhibitions in framework of the United Nations of protective measures and equipment

(3) invitations to visit production facilities to be destroyed on voluntary basis

9. General considerations

(a) Verification should be seen in light of and as a function of the scope of a convention

(b) National means of verification and international verification should complement each other

(c) National means alone would not be credible, and not all States have means to verify beyond their borders

(d) All States parties to the convention should be enabled to participate and benefit from verification procedures

(e) Relationship between level of protection against CW attacks, level of sophistication of CW attacks and probability of detection (or verification)

III - OTHER MATTERS */

1. Security assurances for Parties to the convention

(a) Negative guarantee or non-use declarations

(b) Positive guarantees

(i) medical assistance to State victim of CW attack
(ii) co-operation of parties in development of protective measures and equipment
(iii) international advisory body could be established under the convention to help developing countries
(iv) economic co-operation on peaceful uses of toxic substances - assistance in acquiring know-how would further confidence
(v) political and military assistance

2. Right of withdrawal from the convention

(a) Specify conditions for withdrawal

*/ Issues such as review conferences, entry into force, amendment procedures, etc. were not raised at the meetings of the Working Group."

CD/132
1 August 1980

Original: ENGLISH

PAKISTAN

WORKING PAPER

Views of the Government of Pakistan submitted in response to the circulation of document CD/89

1. The urgency of concluding an effective ban on chemical weapons has increased in recent months in the light of persistent reports regarding the use of chemical weapons in Afghanistan and certain other regions of the world. Several statements have been made in the Committee on this subject. Pakistan initially refrained from commenting on the matter because of its desire to avoid exacerbating the already charged political atmosphere in the Committee. However, the circulation of document CD/89, transmitting a telegram from the so-called "Deputy Minister for Foreign Affairs" of the present imposed regime in Kabul, and some of the statements which were made to defend this document, obliged Pakistan to express its views on the subject.

2. For some time now, persistent reports have emanated from refugees coming from Afghanistan, and some of these have appeared in the world press, about the use of chemical toxic agents against the civilian population of Afghanistan and against the Afghan nationalist resistance. It has been asserted that these reports are "fabrications", or that, at best, there is no "conclusive proof". As yet, there may be no "conclusive proof" that lethal chemical weapons have been used in Afghanistan. However, from all that is known, it appears that some kinds of chemical toxic agents have been used in Afghanistan against the civilian population and Mujahedeen alike. In this report a particularly disturbing report appeared in the French newspaper "Le Monde", of 27 March 1980.

3. Although it remains to be established that lethal chemical weapons have been used in Afghanistan, even less toxic substances, which may be non-lethal if used in certain quantities, could become lethal if utilized in concentrated forms or against people who have no protection against such chemical agents. And, as the representative of Sweden stated on 24 April 1979 in the Committee on Disarmament, "launching attacks with incapacitating agents and irritants in war is by most countries considered to be prohibited by the Geneva Protocol of 1925".

4. In this context, the assertion emanating from the Kabul regime, reflected in document CD/89, that "subversive bands" have used "lethal chemical weapons" given to them "from outside of the country", appears to be a patent concoction designed to shift attention from the particularly brutal manner in which the Afghan patriots are being suppressed. More disturbingly, this is considered by some to be an ex-post-facto attempt to justify the use of chemical weapons against the Afghan population.

5. The Government of Pakistan has already rejected and continues to reject any imputation that the Afghan nationalist resistance is being provided with any kind of weapon by or through our country. Pakistan has consistently followed a policy of scrupulous non-interference in the internal affairs of Afghanistan, despite repeated provocations, malicious propaganda and the influx into our country of nearly one million Afghan refugees.

6. Pakistan has taken note of the "readiness" expressed by the Kabul regime "to investigate and examine, along with competent international authorities", the use and functioning of the chemical grenades allegedly in the possession of the Mujahadeen in Afghanistan. Although this appears to be a diversionary manoeuvre by the Kabul regime to gain international acceptance and respectability, nevertheless, Pakistan believes that an impartial investigation is necessary of all reports of the use of chemical weapons in Afghanistan - and elsewhere, if necessary - in order to establish the facts and to determine whether the provisions of the 1925 Geneva Protocol have indeed been violated.

7. For the conduct of an impartial and effective investigation into all these reports, an appropriate body should be constituted by the CD or some other international forum. Such an investigation body should be provided access to all areas in Afghanistan where the use of chemical substances, and other inhumane weapons and methods of warfare, has been reported. The investigating body should also be able to interview refugees and others from Afghanistan who claim to have knowledge of the use of such weapons in that country. Pakistan is prepared to co-operate fully for the purposes of such an investigation without prejudice to its position regarding the legality of the present imposed regime in Kabul.

8. Finally, Pakistan reiterates the hope, which is shared by the vast majority of the world community, that foreign troops will be speedily withdrawn from Afghanistan. This will assist in creating suitable conditions for the Afghan refugees in Pakistan to return to their homeland and enable the people of Afghanistan to freely determine their own destiny.

1981

SWEDEN

Working Paper

Prohibition of retention or acquisition of a chemical warfare capability enabling use of chemical weapons (4 Annexes)

1. Sweden considers that in order to secure an effective abolition of chemical weapons and chemical warfare, it is not sufficient to prohibit development, production and stockpiling of chemical weapons. It is also necessary to prohibit activities, facilities and materials aimed at using chemical weapons in the battlefield or elsewhere in war. The reason for the Swedish position is that unless such an extended prohibition is accepted there would not exist any major difficulties for a Party either to retain or acquire the ability to use chemical weapons within a comparatively short time, were it to withdraw from a ban on development, production and stockpiling. This is illustrated in Annex I. If preparative activities aimed at the acquisition of a qualified capability to use chemical weapons were not prohibited, they would also not be subject to verification measures. This would undoubtedly cause the prospective parties to a convention to feel a lesser degree of security, and might lead to a reluctance on their part to adhere to such a convention. In Sweden's view these circumstances have to be taken into consideration in the drafting of the convention on chemical weapons now being negotiated in the CD. The following considerations appear relevant in this context.

2. A chemical warfare capability consists of two elements:

(a) ability (including resources) to use chemical weapons in a militarily effective way against an adversary,

(b) ability to perform combat duties on different levels in an environment contaminated through the use of chemical weapons, one's own or the adversary's, that is a protective capacity stretching from only surviving to actually continuing combat.

Both tasks require proper protective equipment and training. However, in order to use chemical weapons effectively some specific measures are required as exemplified in Annex I.

Recognizing the almost unanimously held view that a capability to protect oneself against attacks with chemical weapons is to be allowed in a chemical weapons convention, the Swedish delegation holds that the particular measures required to obtain or retain a capability to use chemical weapons could and ought to be prohibited in a convention. As discussed in the following, such a prohibition would -- apart from rendering it more meaningful -- increase significantly the possibilities to verify compliance thereof.

The expression used by Sweden so far to describe the suggested prohibition has been formulated "prohibition of planning, organization and training for a chemical warfare capability". This expression is to be taken as referring to a capability to use the chemical weapons.

3. Before discussing the Swedish proposals more in detail, some important conditions will be considered.

(a) The Swedish delegation is aware that its suggestions concern much more of purely military matters usually guarded by strict secrecy measures, than would a convention banning only development, production and stockpiling of chemical weapons. However, since the ultimate goal is the final abolition of chemical warfare, the Swedish delegation is convinced that normal military secrecy in relation to specific measures required for a chemical warfare capability need not be upheld in the long run.

(b) It is often argued that since a protective capability against chemical weapons would be allowed, it would in practice be possible to disguise efforts to obtain a capability to use chemical weapons among allowed efforts to acquire or maintain such a protective capability. There are indeed particular activities which do not fall within the area of general protection, such as training of flight behaviour or munition transportation directives (see Annex I). Sweden therefore believes that the opportunities offered by the distinction that can thus be made should be explored in order to obtain an effective prohibition.

(c) An option inherent in Sweden's approach is the possibility to increase significantly the effectiveness of the verification of compliance with the convention. If a greater number of activities were covered by a prohibition, this would clearly increase the possibilities to verify compliance thereof. It would also improve the grounds on which the Parties might adhere to or continue adherence to the convention. Examples of the activities to be monitored are given in Annex I.

(d) It is sometimes argued that the most effective way to secure the abolition of chemical warfare would be to prohibit also protective measures. It must be recalled, however, that a very long time would be needed to implement provisions concerning, inter alia, destruction of existent stockpiles of chemical weapons. Obviously during such a time many States would want to retain their capacity for protection against chemical weapons. If protective measures were to be prohibited from the outset, it would imply a diminished security for these States for whom chemical weapons at present have a military significance and might cause them not to adhere to a treaty in the foreseeable future. This would obviously detract from the value of the convention.

To this must be added that a certain capacity, military as well as civilian, will always be necessary to protect against accidents and catastrophes involving poisonous chemical substances, not intended for use as chemical weapons.

4. A prohibition of a capability to use chemical weapons would require specific undertakings to be spelled out in annexes to a convention. The following are possible examples of such undertakings:

- to declare the content of, or the non-existence of, doctrines, manuals and chains of command for the use of chemical weapons;

- to declare schools, training facilities and curricula intended for teaching the use of chemical weapons;

- to declare weapons production and training plans. (Items that might be included in such declarations would concern munition handling instructions, including labelling practices, artillery firing tables, air plane flying and bombing instructions, etc.);

- to declare the organization of protection units against (NB)C warfare;

- to invite observers or inspectors to attend military manoeuvres in general, and those which include training in (NB)C-protection in particular. In the latter case observers might be allowed to monitor also electronic communications;

- to issue a general order for all armed forces that no planning, organization and training for retaining or acquiring a capability to use chemical weapons is allowed as long as the State is a party to the convention;

- to co-operate regarding specific protective activities, e.g. exchange information on therapeutic means;

- to allow regular visits -- on site inspection -- to military units, munition stockpiles and air fields;

- to allow on site inspection when complaints about violations of a prohibition of the kind discussed here are made;

- to provide parties to a convention with information, either direct or through e.g. a consultative committee, concerning items exemplified in Annex II.

These different undertakings would be carried out on different occasions during the implementation of the convention, e.g. when the convention enters into force, when declared stockpiles have been destroyed and when a certain number of States have adhered to the convention.

. To illustrate the proposal that a convention on chemical weapons should also prohibit activities, facilities and materials aimed at using such weapons in war, a text is given in Annex IV containing the elements which might be included in the corresponding provision of the convention.

ANNEX I

Examples of time scales for preparatory activities aimed at the acquisition of a qualified capability to use chemical weapons.

Years	Technique	Staff preparations	Logistics
.....		Decision	
.....	Development[1)]	Strategy[2)]	
7	Munition testing[1)]	Tactics[2)]	
6			
5	Production[1)]		Transportation directives, etc.[2)]
	Stockpiling[1)]		
4		Training preparations[3)]	
3			
2		Training[4)]	Training[4)]
1			
½	(Acquisition of chemical munition, etc, from e.g. an allied country)		Munition distribution
0		Chemical weapons ready for use	

(1) Activities to be covered by a ban on development, production and stockpiling of chemical weapons. The time required for production and stockpiling may vary depending on the agent and quantity envisaged.

(2) E.G., studies, doctrine evaluation, manual writing.

(3) Higher staff training, preparations for training of the units of the armed services which are to deliver chemical charges.

(4) Not protective training alone but for specialized activities. like donning protective equipment when handling munition, varying transporting routines for different kinds of munition, training particular flight manoeuvres at take off and landing depending on

(5) ////////// "Visibility line" = the approximate time range during which a certain activity cannot be kept secret any longer.

Comments:

It is clear from the table that banning only development, production and stockpiling would permit some of the most important activities necessary for attaining a capability to use chemical weapons. States already in possession of such a capability would in fact suffer only a minor setback of this ability since, due to previous experiences, they would most probably be able to delay a chemical weapons production until very late, perhaps only ½-2 years before they wished to be able to use chemical weapons. Regarding verification of such a ban, see Annexes II and III.

ANNEX II

Examples of relevant information in the context of a CW-convention prohibiting also planning, organization and training.

GENERAL CONDITIONS

Geographical area

Climatic conditions

Admitted capability to use chemical weapons before adhering to the convention

Scientific-technical level regarding issues relevant to chemical weapons

MILITARY ACTIVITIES

Military CW protective posture

Available equipment:

Protective masks, type

Collective protection (for tanks, vehicles, etc.)

Protective gear

Decontamination

Detection

Warning

Medical theraphy:

Antidote

Type

Distribution

Therapeutic methods

General military education

Preparedness:

Chains of command for ordering use of chemical weapons (before adhering to the convention)

Staff functions:

Alarm rules

Special personnel

Special units:

Tasks

Equipment for use of chemical weapons*/

Salvo guns:

Caliber

Size of salvo

Range

Unit allocation

Artillery rockets:

Warhead alternatives

Range

Unit allocation

Missiles:

Type

Guiding system

Warhead alternative

Range

Unit allocation

Tear gas equipment:

Type

Caliber

Utilization

Unit allocation

Aerborne material:

Bombs

Type

Weight of charge

Spraying equipment

Capacity

---

*/ Chemical charges available to a State Party when adhering to the convention should be declared.

<u>Maintenance functions</u>

Protection for food and water

Protection for repairing services

Protection for medical service

CIVIL DEFENCE ACTIVITIES

<u>Civil defence posture</u>

<u>Materials and equipment</u>:

Protective masks

Type

Collective protection

Shelters with filter

Shelters without filter

Decontamination

Detection

Medical therapy

Education

Units

Staff function - alarm system

Special units

Type

Number

ANNEX III

Examples of activities, facilities and materials to be prohibited for the purpose of retention or acquisition of a capability to use chemical weapons.

Activities

Commerce

Transfer

Development including testing

Production

Stockpiling

Military planning, organization and training specifically intended to enable use of chemical weapons

Information

Facilities and equipment

Development and testing facilities

Production facilities (including munition filling facilities)

Training facilities (for training in the use of chemical weapons)

Stockpiles and storage facilities for chemical warfare agents

Other facilities and resources enabling handling of chemical weapons like special equipment for transporting chemical weapons and for bringing them to the target area.

Materials

Chemical warfare agents */, or precursors to such substances, warheads and weapons systems intended for use of chemical weapons.

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*/ To be defined.

ANNEX IV

Elements which may be included in a provision of the convention concerning the prohibition of retention or acquisition of a chemical warfare capability enabling use of chemical weapons.

Each State Party to this Convention undertakes not to acquire or retain a chemical warfare capability, constituted by one or many activities, facilities and materials or their combinations, as specified in Annex X */, intended to enable a Party to use chemical weapons containing chemical warfare agents, whether gaseous, liquid or solid, or precursors to such chemical warfare agents, effective because of their direct toxic properties, on man, animal or plant, for hostile purposes or in armed conflict.

Corresponding activities, facilities and materials intended for use of chemical substances for peaceful purposes, or for the medical or physical protection of a State Party's military forces and civilian population against chemical weapons, are not covered by this convention, unless specifically stated.

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*/ See Annex III for examples of activities, facilities and materials suggested to be covered. Some of the expressions have to be further defined.

CD/164
19 March 1981
Original: ENGLISH

LETTER DATED 18 MARCH 1981 ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT FROM THE MINISTER COUNSELLOR OF THE PERMANENT MISSION OF FINLAND, TRANSMITTING A WORKING DOCUMENT ENTITLED "CREATION OF CHEMICAL WEAPONS CONTROL CAPACITY - PRESENT PHASE AND GOALS OF THE FINNISH PROJECT"

Upon instructions of my Government I have the honour to submit to the Committee on Disarmament a working document concerning the creation of chemical weapons control capacity, present phase and goals of the Finnish project. This document, which we intend to introduce at a plenary meeting of the Committee devoted to chemical weapons, discusses in general terms some aspects of the verification problem.

I would be grateful if the document could be circulated as an official document to the members of the Committee on Disarmament.

(Signed) Paavo Keisalo
Minister Counsellor

Working Document

Creation of Chemical Weapons Control Capacity - Present Phase and Goals of the Finnish Project

1. The need for the prohibition of chemical weapons is widely recognized as a question of high priority. This question has been on the agenda of multilateral disarmament negotiations for almost two decades. A commitment to reach an early agreement on the banning of chemical weapons is stated i.a. in Article IX of the Biological Weapons Convention, and the urgency of the matter has been reiterated in several resolutions of the United Nations General Assembly.

2. Believing that all nations, whether parties to multilateral negotiations or not, have a vital interest in promoting disarmament and a duty to do whatever they can to pave the way towards this goal, the Government of Finland has endeavoured to make practical contributions to the negotiations on a ban of chemical weapons. Since 1973 Finland has been carrying out experimental research for the creation, on the national basis, of a chemical weapons control capacity, which could be put to international use. The progress of the project has been described in working papers and handbooks that Finland has annually presented to the CCD and the CD. They are the following:

- on definitions of chemical warfare agents and technical possibilities for verification and control of c-weapons with particular regard to a Finnish project on creation of a national basis of a CW control capacity for possible future international use (CCD/381, 1972),

- on the progress of the Finnish project for the creation of a national basis of a CW control capacity for possible future international use (CCD/412, 1973),

- on methodology for chemical identification of CW agents and related compound - progress of a Finnish research project (CCD/432, 1974, CCD/453, 1975, CCD/501, 1976),

- chemical and instrumental verification of organophosphorus warfare agents (CCD/544, 1977),

- an analytical technique for the verification of chemical disarmament - trade analysis by glass capillary gas chromotography with specific detectors (CCD/577, 1978),

- chemical identification of chemical weapons agents - a Finnish project (CD/14, 1979),

- identification of degradation products of potential organophosphorus warfare agents (CD/103, 1980).

3. The Finnish project concentrates on the development of methodology necessary for a detailed trace analysis of any control samples that could be collected to verify a ban of chemical weapons. After the development of satisfactory methodology and the corresponding data bank, problems connected with the collection of samples will be studied.

4. One of the several methods proposed for verification of production and stockpiling of CW agents and for testing their use on field is on-site inspection, including sample collection and trace analysis. Unfortunately, it is quite intrusive and serves, therefore, best as the last step of a complete multistep verification procedure (as proposed in some recent working papers). International verification becomes meaningful only if the chemical identity of all agents and related compounds found is fully elucidated. True, it may be possible to verify non-production of supertoxic nerve agents just by observing the absence of special safety constructions, but the non-production of only slightly toxic components of binary weapons is not that straightforward. From the binary components sample collection and analysis may be the only fully reliable verification method. Ultrasensitive off-site monitoring of air and water for agent traces is still another potential application of the verification method based on the analysis of samples.

5. Sample collection and trace analysis are equally useful for the verification of alleged use in combat of chemical weapons. Armies use on battlefield simple test sets like colour indicator papers which are neither very sensitive nor quite specific. If verification has to be carried out from outside the battlefield or even on it but a longer time after the alleged use, a more effective method has to be used.

6. The first step of the Finnish project was to synthesize model nerve agents and related chemical compounds, and examine their relevant properties with respect to possible verification analyses. After that, the suitability of available instrumental techniques for the identification of CW agents was studied. By using the most suitable techniques, and selected repeatable measuring conditions, an initial data base was recorded for about 150 agents and their degradation products. The selected techniques were arranged in the form of a system of microanalytical methods, and this system was proposed for consideration as a basis of international standardization of CW-verification analysis. The proposed system was published by the Ministry for Foreign Affairs of Finland in 1978 and 1980 in the form of handbooks referred to above (CCD/577 and CD/103).

7. The Finnish project has also trained several research workers in the field of CW verification analysis. The head laboratory of the project is located at the Department of Chemistry of the University of Helsinki but the research is carried out in close co-operation with several other Finnish laboratories.

8. The primary goal of the first phase of the Finnish project was reached in summer 1980. It was a sensitive identification system for the most important supertoxic agents. The goal of the next phase is the development of detailed procedures for sample prepreparation and quantitative organic determination on the trace level of known and potential agents. Accurate methods are necessary for obtaining useful information also on complex and metabolized sample matrices. Parallelly to these studies the Finnish project concentrates on the automation of the verification analysis including the development of automatic monitoring instrumentation. Automated verification analysis makes possible sensitive monitoring of the prohibited chemicals alone decreasing the fear of revealing commercial and industrial secrets from industrial samples by unnecessary revelation of other, peaceful compounds. The third future goal is the extension of the original data base to any chemical compound relevant to a CW ban.

9. Detailed studies on sample collection can be initiated only after completing the present methodological development of trace analysis. Such studies are, however, of primary importance in preparing detailed instructions for sample collection for verification analysis. Miniature field tests in the open air are necessary, and are being planned. They will include experiments for remote monitoring of air and water.

10. The eight years' experience of the Finnish CW project indicates that in spite of being only a single problem in the very complex CW verification field, continuous research, such as the Finnish project, is necessary to bring the chemical verification methodology along with the rapid technical development.

COMMITTEE ON DISARMAMENT

CD/167
26 March 1981

Original: ENGLISH

CANADA

VERIFICATION AND CONTROL REQUIREMENTS FOR A CHEMICAL ARMS CONTROL TREATY BASED ON AN ANALYSIS OF ACTIVITIES

INTRODUCTION

There seems little doubt that most nations would prefer to see the end of chemical weapons and of the threat of chemical warfare. Chemical weapons are not generally integrated components of conventional arsenals and are not required for normal defensive purposes by any nation. There is no excuse for a nation possessing them to avoid the timely negotiation of a protocol. Yet the Committee on Disarmament and its predecessor, the CCD, have actively negotiated for nearly 15 years without success.

The two Superpowers, the United States and the USSR, are the only nations thought to possess significant quantities of chemical weapons. Since neither needs them for defensive purposes, except for retaliation in kind against the other, a disposal formula which would preserve the relative security of each should be achievable. This would remove the bulk of world chemical arsenals and the remaining nations would most likely follow suit. However, even in direct bilateral negotiations, agreement has not been possible.

The major stumbling block appears to be verification mechanisms which would assure each Superpower that the promised weapon destructions in fact take place and that no new weapons are produced. There is a distinct difference of opinion on the extent of international involvement in verification activities and on the degree of intrusiveness which must be allowed. This situation may be further strained if the reported disparity in stocks continues or the United States decides to renew its capability with binary weapons. The problem of verification involves political judgements, but it is also a technical matter, and every effort should be made to ensure that technical difficulties do not stand in the way of an agreement.

note mention of binaries

In spite of the great variety of verification proposals that have been made over the years, no clear agreement has been reached as to which should be implemented. To assist in overcoming this block to agreement it should be feasible to systematically review the technical requirements for verification for each basic activity to be undertaken or banned. This should determine the minimum levels of verification necessary and in particular the minimum levels of intrusiveness which would be unavoidable. It should then be possible to predict the type and levels of national and international control which must be provided under a treaty.

The following is an attempt to provide an initial analysis of these factors. It leads to suggested guidelines for national and international verification agencies. A general statement on control mechanisms to which this analysis is related was provided in a presentation to the Ad Hoc Working Group on 27 June 1980 (CD113).

ACTIVITIES

From a survey of past proposals including previous protocol drafts, there appears to be general agreement that a treaty should require elimination of existing chemical warfare agents, weapons (including all means of delivery) and their means of production, and it should ban the further development, production, acquisition, retention or stockpiling of chemical agents and weapons. The Geneva Protocol bans "use", however it is subject to conditions with respect to retaliation and its scope is not clear. To settle these matters and to deal with the problems of dual purpose agents and binary components, a further ban on "use" should also be included in a new treaty, and verification mechanisms for use are assessed in this analysis. This leads to a list of basic activities which will require some form of monitoring and verification. They fall into two groups, activities which must be undertaken, and those which must be banned.

A. Activities to be Undertaken and Monitored

1. Declaration of existing agent and chemical weapon production facilities including specific sites.

2. Declaration of existing agent and weapon stocks including storage sites and numbers.

3. Dismantling of existing production facilities.

4. Destruction of existing agent and weapon stocks.

B. Activities to be Banned and Verified

5. Development of new agent/weapon systems.

6. Construction or conversion of new agent or weapon (means of delivery) production facilities.

7. Production of chemical agents.

8. Retention, stockpiling or other acquisition of chemical agents and weapons.

9. Offensive military training or other activities in preparation for undertaking chemical warfare.

10. Use of chemical weapons for war purposes including dual purpose agents and binary components.

For the purpose of the following analysis, a comprehensive definition of chemical agents such as that given in CD117, which includes the use of any toxic effect on plants, animals or man in warfare, has been assumed.

ANALYSIS OF ACTIVITY REQUIREMENTS FOR VERIFICATION AND CONTROL

A. Activities to be Undertaken and Monitored

1. Declaration of existing agent and chemical weapon production facilities including specific sites. Should any nation declare production facilities for agents or weapons, their existence would not likely be doubted. Remote confirmation of the declaration may be possible by "National Technical Means" (satellite) which is available to the Superpowers but not to others. No other technical means of verification would be in place at that time. To provide a minimum confirmation to all nations, some on-site visits would be necessary. An inspection team including national and international personnel (non-technical) would be required to meet within the declaring nation, select one declared site at random, and visit it to confirm the accuracy of the declaration. Visits to all declared sites would be highly desirable, but not essential. Such on-site inspection should not put the host nation at risk, since it is unlikely that site or process information beyond that released in the original declaration would be observed. In fact, the visit should serve to demonstrate the good faith of that nation to the world.

2. Declaration of existing agent and weapon stocks including storage sites and numbers. Verification requirements would be identical to those for production facilities. A random visit by non-technical staff to confirm weapon quantities at one site would be an essential minimum requirement. This should include both national and international personnel. The deliberate non-declaration of some existing stocks (or production facilities) would be a violation of the agreement, but this could not be detected by any technical means including on-site visits, and means to do so should not be required of a treaty. Cover-ups might be exposed by "National Technical Means" which would then require a challenge mechanism. Hidden stocks would also be covered by bans on retention and stockpiling and eventually on use of chemical weapons in warfare and would be subject to verification mechanisms required to monitor those activities.

3. Dismantling of existing production facilities. All production facilities for agents and weapons should be dismantled. General agreement seems to have been reached that conversion to other uses would generally not be cost effective and in many instances would not be practical. Dismantling is also the only way to ensure that the facilities could not be rapidly reconverted to agent production and it eliminates the requirement for continued verification of the site. While dismantling toxic agent plants may be hazardous, it should not be technologically complex. It is suggested that any nation declaring such facilities should be able to dismantle them within five years. It may be possible to observe dismantling by satellite (national technical means) but by no other remote means. Satisfactory international verification

can only be achieved by visits. As a minimum, one site could again be randomly selected for inspection by a combined national and international team (non-technical) at the end of the five years. Alternatively all declared sites might be visited at the end of the five years. Inspection once a year would be more desirable but not essential. No sampling would be required. A declaration announcing completion of the task, confirmed by the inspectors, might be expected from each nation at a five year review conference. Failure to complete the task in five years should not constitute a violation of the treaty, if the nation could show that the process was well underway and proceeding on a definite schedule. However, a nation requiring such an extension of time might be required to admit international inspectors to its sites on a semi-annual basis thereafter.

4. Destruction of existing agent and weapon stocks. One approach to this problem might be to accept non-verification assuming that any nation admitting to the possession of CW agents and weapons in a declaration would be compelled to destroy them. Monitoring would be carried out by national agencies, however a few international visits to the site might perhaps be arranged by the nation in question for publicity purposes.

If such non-verification of stock destruction is considered inadequate for treaty purposes, then a much more intrusive and technical means would be required. Technically, the United States may represent the most difficult verification case due to the extreme containment required by its environmental protection laws. Fortunately suitable technology has been developed for the CAMDS */ system and has been released internationally. This or similar contained systems may also be used by other nations. Because of the containment, remote systems including national technical means or black box monitors will not verify the actual destruction of agents. Even periodic visits to storage and destruction sites, with sampling, will not ensure that stockpiles are being completely destroyed (rather than being moved to another hidden site). Monitoring of the process must be virtually continuous with periodic spot sampling and analysis. Inspection teams must be adequately trained, have access to laboratory space, and at least some members must be from the international community.

There has been general agreement that stock destruction would require ten years and this has been confirmed in reports of United States/USSR bilateral discussions (CD48). As a suggested schedule, the first five years might be allowed for building of destruction plants after which stocks could be destroyed at the rate of 20 per cent per year. This would allow retention of weapon ratios till destruction was completed.

B. Activities to be Banned and Verified

5. Development of new agent/weapon systems. Nations with current stocks will already have developed weapons and would require little further work. However development activities could be readily hidden and it would be very difficult to separate work of offensive intent from that for legitimate defensive purposes.

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*/ CAMDS - chemical agent and munition disposal.

Atmospheric testing might be detected by remote means but the use of remote detection systems by international agencies against a specific nation would be tantamount to an accusation. It would also be very expensive. These activities may be routinely monitored and reported by national agencies, but the only international activities which seem feasible would be in response to challenge mechanisms.

6. Construction or conversion of new agent or weapon (means of delivery) production facilities. The construction of new chemical plants or the conversion of existing plants to new functions will occur continuously in most nations. Similar activities will occur with munitions plants. The intent to use new or converted plants for chemical warfare purposes connot possibly be verified even with on-site inspections These activities may be monitored nationally, but routine international verification for this activity does not appear to be feasible under a treaty. However, it would be necessary in response to challenge mechanisms.

7. Production of chemical agents. The banning of this activity is a key problem for chemical arms control verification and a technical solution is very complex due to the wide variety of chemicals which may be involved. Proposals over the past 15 years include analysis of economic and production data and a variety of remote, near-site and on-site observations involving sampling and analysis. A number of visits to industrial sites, carried out to determine if clandestine agent manufacture could be carried out in existing plants, have lead to the conclusion that the highly toxic single purpose agents would require special containment not normally available. Inspection, if it includes some sampling, would readily demonstrate the production or non-production of banned chemicals and would not result in compromise of commercial information. Water sampling downstream from a chemical facility should reveal nerve agent production, even from a high containment plant, but may not be suitable for all other agents. It is unlikely that remote air sampling downwind from a high containment plant would be successful. Routine monitoring of chemical plants in all nations including inspections might be feasible for national control agencies, but would be beyond the capabilities of an international agency without a large number of inspectors. In addition, it would be nearly impossible to verify intent for production of dual purpose materials even when it appears there were greater amounts being produced than needed for peaceful purposes.

It is concluded that it would be very difficult to provide verification of the non-production of banned materials on a routine basis by an international agency and that a satisfactory minimum international assurance might be provided by a structured information exchange and response to challenge mechanisms. On-site challenge inspections will require experts and the sampling and analysis of waste water and air effluents as well as process products. Routine inspections and reporting of accurate data on chemical manufacturing within a nation should be carried out by national agencies.

8. Retention, stockpiling or other acquisition of chemical agents and weapons. This activity is closely associated with agent production, although the treaty would also ban the transfer of chemical agents and weapons from one nation to another. Stockpiles once acquired could be readily hidden, especially if they involve binary munitions. Even with routine on-site inspections, verification would be very difficult. International measures, other than information exchange might therefore be limited to challenge mechanisms. Experts and sampling would be required for on-site inspections.

9. Offensive military training or other activities in preparation for undertaking chemical warfare. It has been generally agreed that defensive activities should not be banned and as a result an aggressive intent will be very difficult to verify. While offensive military activities should be included in the ban, international monitoring could be limited to informal exchanges and responses to challenge situations.

10. Use of chemical weapons for war purposes including dual purpose agents and binary components. In many instances the effects of chemical agents used in war will be apparent and verification will be provided by the antagonists. However in some instances involving isolated battles or limited wars and insurrections in remote areas few outside observers will be present and reports of clandestine use of chemicals must be carefully weighed by the international community. If reports are substantial, then the nations involved should be requested to allow samples to be taken at the site by international inspectors within 48 hours of an event if possible so that the use or non-use of chemical weapons could be verified.

SUMMARY OF VERIFICATION REQUIREMENTS

Through this analysis of specific activities it is apparent that remote detection, as might be available through "national technical means" or at considerable expense to an international verification agency, may be sufficient to arouse suspicions which could lead to challenge situations, but is not likely to be sufficient to demonstrate non-compliance with a treaty. To provide assurance and security for all nations, some on-site inspections would be necessary although it would seem that these occasions should not be an unbearable intrusion. In most instances such on-site visits could be to the distinct advantage of the nation being inspected.

To verify initial declarations and the dismantling of production plants, on-site inspections would require the presence of some international personnel though not necessarily technical experts. For the activities to be banned including development, production, stockpiling and use, the provision of technical means of verification on a routine basis by an international agency would pose overwhelming logistic difficulties. Information and data on these activities should be routinely exchanged through an international verification agency but on-site inspection could be limited to unilateral invitations or challenge situations. For challenge inspections, appropriate experts must be involved and some sampling must be permitted. For the destruction of declared stockpiles intrusion will be greatest as guaranteed verification will require continuous on-site monitoring with periodic sampling and analysis by expert international inspectors.

See CD/113

CD/167

CD/313

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ACTION REQUEST | FICHE DE SERVICE

To — A	File No. — Dossier N°
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IMPLICATIONS FOR NATIONAL AND INTERNATIONAL VERIFICATION AGENCIES

A. NATIONAL AGENCIES

On the basis of this analysis each signatory would be required to maintain a national verification group. This need not be a separate permanent group established especially for this purpose, but could be an existing government agency with an environmental or health control function. It would need access to a selection of inspection personnel both technical and non-technical, but they need not be on permanent staff unless a variety of sites require routine periodic visits. The national agency would be responsible for all routine monitoring required by the treaty and for the provision of data and other pertinent information to the international control agency for exchange. If on-site visits and sampling were required either automatically for some activities or by challenge for others, all arrangements within the nation should be provided by the national agency. Whenever samples were to be taken this should be done in triplicate using standardized techniques so that they could be analysed nationally as well as independently in two designated laboratories elsewhere.

B. INTERNATIONAL AGENCIES

For the international verification measures indicated in the preceding sections, technical or non-technical inspectors would be required for most activities; however the level of employment would not warrant placing these individuals on the permanent staff of an international agency. The most logical approach would be for each signatory to nominate one technical and one non-technical inspector who would then be available when needed. Similarly signatories could be encouraged though not required to designate a national laboratory where the analysis of samples could be carried out by standardized techniques on request.

On this basis an international verification agency need consist only of a supervisory (consultative) committee at the political level which would meet periodically or in response to a challenge, supported by a small secretariat. The committee would determine the verification measures to be carried out and arrangements would be made through the secretariat which would also provide for routine measures. From the foregoing analysis it is clear that much of the verification emphasis will be placed on challenge mechanisms and the treaty must specify them in some detail.

CONCLUSIONS

An analysis of verification requirements based on specific activities to be undertaken or banned under a treaty has suggested that the minimum levels needed for adequate assurance to the international community are not extensive and should be achievable by available means. However, it is clear that remote technical means will not provide the necessary measures and for most activities some form of on-site inspection will provide the only realistic evidence of compliance. For only one activity, stockpile destruction, inspections have to involve a significant level of intrusiveness. In all cases, for publicity purposes, inspections should be to the advantage of the nation being inspected unless that nation has been guilty of non-compliance, or for some other unexplained reason denies an inspection.

An international verification agency will require only a controlling (consultative) committee at the political level supported by a small secretariat, with inspectors drawn from nominees provided by each signatory. National agencies will be required to provide most routine monitoring and would collect data within the nation for exchange.

It is hoped that this analysis of verification factors on the basis of activities has provided some insight into the minimum levels essential for international assurance of compliance with a chemical arms treaty and appears to have provided useful guidelines for the establishment of national and international verification agencies.

COMMITTEE ON DISARMAMENT

CD/168
27 March 1981

ENGLISH
Original: CHINESE

CHINA

WORKING PAPER

Prohibition of Chemical Weapons: on the Definition of Chemical Warfare Agents

It is generally held that chemical weapons are composed of three elements: 1. The chemical warfare agent which produces a direct toxic effect on the target. 2. The chemical munitions or devices which are filled with the chemical warfare agents and disperse them into a combat state. 3. The launching system or means of delivery which sends such munitions or devices filled with the chemical warfare agent to the area of the target. The main element of the three is the chemical warfare agent, since the most essential difference between chemical weapons and conventional or other weapons lies in the former's reliance on the toxic effects of chemical warfare agents to produce lethal and injurious capabilities.

Chemical warfare agents should form the central contents for negotiations. In elaborating the Convention, it is imperative to first clearly ascertain the definition of chemical warfare agents. This definition will have a bearing on the scope and content of the prohibition, methods and means of verification, and will ffect the solution of a whole series of problems including the destruction of chemical weapons and dismantling of production facilities. Therefore, it is necessary to carry out serious discussions on the question of the definition of chemical warfare agents, in order to reach a consensus at the earliest date.

Many delegations have already expressed their points of view in different forms on the question of definition of chemical warfare agents, and have advanced quite a number of useful proposals. In our view, it would not be difficult to draw up a scientific and generally acceptable definition of chemical warfare agents, on the basis of the reasonable portions of various viewpoints and proposals advanced in the CD.

In accordance with its basic position of the complete prohibition and total destruction of chemical weapons, the Chinese delegation is of the view that in determining a definition of chemical warfare agents, account should be taken of its comprehensiveness and accuracy. Its comprehensiveness is designed to ensure that all chemical warfare agents which ought to be prohibited are in fact prohibited, and not leave any loopholes which can be used for violations of the convention, its curacy is designed to avoid the prohibition of chemical substances which ought not to be prohibited, as if they were chemical warfare agents, as this would have an adverse effect or the development of industrial and agricultural production and on scientific and technological progress.

Basing ourselves on above considerations, and having drawn upon the reasonable portions of the proposals made by all sides, we wish to make a preliminary proposal on the definition of chemical warfare agents for the exploration of delegations.

We propose the following definition for chemical warfare agents:

All chemical substances which are developed, produced, stockpiled and used for hostile purposes, and whose toxic effects are used to interfere with or destroy the normal functions of man, animal and plant in such a way as to lead to death, temporary incapacitation or permanent injury, regardless of whether these poisonous effects occur immediately or in delayed fashion, and regardless of the origin and method of manufacture of these substances, should all be considered chemical warfare agents.

In accordance with above formulation of the definition, chemical warfare agents specifically include:

(1) Single-purpose chemical warfare agents: including lethal agents, incapacitating agents and blister agents.

(2) Dual-purpose chemical warfare agents: i.e. dual-purpose chemical substances which have already been developed into weapons (such as those which have filled munitions and whose quantity stockpiled no longer indicates use for peaceful purposes.) Examples: phosgene, hydrogen cyanide, etc. irritant agents and anti-plant agents.

(3) Potential chemical warfare agents: these are chemical substances which have not yet been used as chemical warfare agents but which, because of their toxicity and physical and chemical characteristics can be or may be used as chemical warfare agents, e.g. dioxin, bicyclic phosphorous esters etc. This category of substances should be monitored, in order to prevent their development into chemical warfare agents.

Here we are using the term "potential chemioal warfare agents" to replace the term "chemical agents" used in some documents, since we consider the term "chemical agents" too broad in its meaning and does not accurately express the relationship between it and chemical warfare agents. The term "potential chemical warfare agents", however, does more accurately reflect the concept which we wish to express.

(4) Precursors of chemical warfare agents: these themselves are not chemical warfare agents, but in the course of the use of two or more than two of this type of chemical substances, a reaction can be caused, thus producing a chemical warfare agent.

(5) Biochemical warfare agents: these refer to other natural poisons used as warfare agents not yet included in other relevant conventions, and other substances similar to natural poisons or their active pieces which have been artificially synthesized or semi-synthesized.

It is clear from the above definition and its specific content that:

(1) The definition proposed brings within its scope all chemical warfare agents.

(2) The definition proposed embodies the principle of using mainly the general-purpose criterion but combining it with the toxicity criterion. That is to say, that chemical warfare agents must possess some degree of toxicity, but toxic substances are not necessarily all chemical warfare agents. Therefore even though toxicity is an important criterion of chemical warfare agents, it is not the only criterion; whether or not a substance is a chemical warfare agent, should mainly depend on whether it is used for "hostile purposes". This is also the main indication for distinguishing dual-purpose chemical warfare agents.

(3) The definition proposed also reflects the scope of activities to be prohibited -- that is all the stages of the entire process from the development right up to the use of chemical warfare agents. Some chemical substances can be determined as being chemical warfare agents, only when they are connected with certain specific activities, e.g. substances such as phosgene, hydrogen cyanide can be clearly identified as chemical warfare agents only when they have filled munitions and developed into weapons, whereas irritants would be included as substances to be prohibited only when they are utilized on the battlefield. Proceeding from this characteristic of chemical warfare agents, it can also be clearly seen why in any convention prohibiting chemical weapons, the prohibition of use is an issue which cannot be evaded.

CD/169
27 March 1981

ENGLISH
Original: CHINESE

CHINA

WORKING PAPER

Dismantling of Production Facilities/Means of Production for Chemical Weapons

One of the most important measures for the complete prohibition and total destruction of chemical weapons and the prevention of chemical warfare is the prohibition of producing chemical weapons and the dismantling of their existing production facilities/means of production. This is because the industrial production of chemical weapons accounts for the most crucial link among the various activities aimed at the attainment of chemical warfare capability and the use of chemical weapons, i.e. development, production, stockpiling, acquisition and transfer of chemical weapons. Only those countries which can produce chemical weapons on a certain industrial scale are able to stockpile and transfer these weapons as well as to engage in chemical warfare. This has been proven by the history of the two World Wars. Therefore, the Chinese Delegation is of the opinion that:

1. The convention for the prohibition of chemical weapons, besides prohibiting in clear terms the production of chemical weapons, should stipulate the total dismantling of all types of their production facilities/means of production, rather than the shutting down and the conversion of these facilities. The Chinese Delegation has already indicated in Working Paper CD/102 that "shutting down the facilities for the production of chemical weapons or converting them to peaceful production is not the best approach". The measures of converting the production facilities for chemical weapons to peaceful use is loaded with the potential risk of their reconversion, since the plants thus converted can easily be reconverted to the production of chemical weapons and this will increase the work load of verification and make it more difficult. If it is argued that the dismantling of production facilities for chemical weapons could take years, and that an interim measure is required, we can agree to consider the use of the method of shutting down the facilities as an auxiliary measure of supervision.

2. The convention for the prohibition of chemical weapons should also provide for limitations and dispositions regarding dual-purpose plants. There may be plants which have been designed and built originally for the purpose of producing chemical warfare agents, but during peace time are producing products for civilian use. In such cases, the entire dual-purpose plants or some of their units should be dismantled, if they or their units are identified as production facilities for chemical warfare agents, regardless whether they are engaged or not actually in producing chemical warfare agents, whether they are independent plants for the production of chemical warfare agents or just units producing chemical warfare agents in a large chemical complex. This is because the facilities and conditions of these plants exist to meet the requirement of producing chemical warfare agents, and they are ready to produce them at any time. If these plants produce products of civilian use, this might be a camouflage to cover up the production of chemical warfare agents or intended to make use of surplus production capacity of these plants. If such conversion is permitted, it will legalize these dual-purpose activities and thus offer an opportunity to the violators of the convention.

3. The convention for the prohibition of chemical weapons should pay special attention to the problem of dismantling the munition-filling facilities for the manufacture of chemical weapons. This is because of the fact that although the chemical warfare agents constitute the nucleus and the basis of the three components of chemical weapons, namely: chemical warfare agents munition and launching system, yet to make these agents weapons usable in warfare, it is necessary to fill them into munitions which are capable of dispersing them into combat state. This is a salient feature, the presence or the absence of which determines whether a dual-purpose substance is being used for military purpose. These munition filling facilities are very often specifically designed. It is difficult to convert them to peaceful uses. Therefore, all these facilities should be totally dismantled and strict verification should be applied to their dismantling.

COMMITTEE ON DISARMAMENT

CD/173
3 April 1981
Original: ENGLISH

CANADA

Disposal of Chemical Agents

It is the purpose of this paper to review common techniques for the disposal of chemical warfare agents and specifically to bring the Committee on Disarmament up to date on the Canadian experience in the disposal of World War II stocks of Mustard.

DISPOSAL METHODS

Historically a number of methods have been used to destroy toxic chemicals. They include:

(a) venting to the atmosphere;

(b) burning in the atmosphere;

(c) burial in the ground; and

(d) disposal at sea.

In each case it was left to nature to disperse or detoxify them. Unfortunately these processes have not always worked well as the chemicals have polluted the environment and in some cases remained a hazard for many years. Over the past two decades it has become increasingly apparent that hazardous materials must be destroyed under controlled conditions and only the most innocuous residues should be returned to the environment. Each toxic chemical must be considered individually as each may require a different process to destroy it especially if it must be done chemically. Laws governing disposal in the environment may vary from nation to nation, but the release of hazardous materials into the air or into water systems will affect all nations alike. As a result the above techniques are no longer considered to be acceptable for chemical agent disposals.

A great variety of toxic chemicals have been used or proposed as war agents and it may be useful to review suitable methods for their disposal. The following is a brief survey of some of the more common agent types.

Hydrogen Cyanide, Chlorine, Phosgene, Cyanogen Chloride

These were all used during World War I and are among the so-called "dual purpose agents" having common commercial uses. Because of their relatively low toxicity and the widespread availability of adequate respiratory protection, they are now of marginal utility as warfare agents. If any stocks of these materials should be declared under a new treaty, it would be necessary to consider their disposal. All are reactive chemically and could easily be destroyed by numerous reactions. They are also relatively volatile and could be readily vented to the atmosphere, although this would result in unnecessary pollution. It would be far better not to destroy such stocks, but to use them and all other dual purpose agents for legitimate industrial purposes, even when it involves drilling and draining of shells or other munitions.

Arsenicals

Some arsenic based compounds such as Lewisite, Adamsite and other arsines were used during the first world war and still others were investigated during World War II. Some arsenicals have also been manufactured as insecticides, but have now been banned in many countries because of toxicity persistence in the environment. The toxicity of arsenic and its compounds is not readily destroyed even through chemical reactions or incineration. Eventually some toxic residue must be returned to the environment. This problem is also common to many mining and smelting operations and a great deal of research into means for disposal of arsenic residues has been carried out. Arsenicals are normally roasted to AS_2O_3 and stored, usually underground. A few arsenic compounds have found commercial uses, and conversion of some warfare stocks to useful materials might be possible. Recently some uses have also been found for elemental arsenic.

Mustard

This compound is quite persistent in the environment. It is hydrophobic and does not tend to migrate within the soil. It is not readily attacked by soil micro-organisms. Examples are still being found of soils contaminated with mustard during World War II that yield potent vapour when freshly turned. Mustard is heavier than water and non-miscible and so forms a layer under it. Any hydrolysis which may occur at the interface is rapidly quenched by the acid formed. As a result mustard which has been disposed at sea will not be destroyed by the sea water should the container leak. It will tend to form a layer at the bottom. If released in deep water, it will presumably be incorporated eventually into the sea-bed as normal bottom deposits grow. However in shallow water, currents may move it towards shore or wave action could bring droplets to the surface. Munitions may be washed up on beaches or caught in fishing nets.

Mustard may be hydrolyzed above pH10 with heating and agitation but the disposal of the foul smelling products remains a problem. The Canadian experience with this technique will be described later in this paper. Mustard may be readily burned. In the atmosphere, this produces heavy black smoke filled with hydrogen chloride and sulphur acids. Perhaps the most reasonable disposal method is through contained incineration with good effluent scrubbing to remove the acids. Salts formed by neutralization are sufficiently harmless to be released to the environment. Useful incinerators are now commercially available and an incineration process is used in the United States Chemical Agent and Munitions Disposal System (CAMDS). A description of the CAMDS processes was provided during a visit to the Toole facility by the 6th Pugwash Workshop in CW disarmament May 1978 and copies of the Final Environmental Impact Statement, March 1977 containing technical details were distributed to its members. A further description of CAMDS was presented at the experts seminar held by the Ad Hoc Working Group on Chemical Weapons in June 1980.

Protein Toxins

This class of compound is derived from natural sources (puffer fish, shellfish, venoms, micro-organisms, castor bean, etc.) and contains the most toxic materials known, some of them orders of magnitude more toxic than the nerve agents. Most are untreatable. However they are normally solids which must be ingested for effect so have not been generally adopted for chemical warfare. Those of microbiological origin may be spread using the micro-organism as a vector in which case they are classed as biological agents and toxins in general are included under the biological warfare convention. Toxic proteins may be readily denatured and detoxified with heat usually above 100°C.

G Agents (methylphosphonofluoridates)

Some containers of sarin are known to have been dumped at sea. G agents are hydrolyzed by sea water with a half life of a few hours so that leaks from shells or containers should not pose a prolonged hazard especially in deep water, however public concern now precludes the further dumping of G agents at sea. G agents may be incinerated in contained systems but extensive safety precautions would be required. They are easily destroyed by alkaline hydrolysis. Organic solvents such as alcohol or acetone will promote the reaction through solubilization. Hydrolysis with aqueous sodium hydroxide is the method utilized for sarin disposal in the United States CAMDS system.

V Agents

These materials are also hydrolized by sea water, however some phosphonic acids produced are themselves toxic and are sufficiently resistant to further hydrolysis that this is not a practical disposal method. V agents may be detoxified by alkaline hydrolysis although an organic solvent to increase solubilization is usually required. V agents may also be oxidized with bleach or chlorine and this is the basis of decontamination techniques in the field. Acid chlorinolysis is the process used in the United States CAMDS system. As with the G agents, extreme safety precautions must be incorporated into any disposal plant in order to protect both the workers and the surrounding ecosystems.

DDT

While this and related insecticides are not CW agents, they are now banned in many countries and their disposal is typical of the problems encountered with many toxic industrial chemicals and wastes. In the environment, DDT decomposes very slowly and may be accumulated within some plants, animals, birds or fish. The complete disposal of DDT requires contained incineration at very high temperatures (1700°F). Effluents must be scrubbed to remove acids.

In order to overcome environmental and safety concerns, extreme and highly expensive methods are often required to destroy stocks of chemical warfare agents. A preliminary description of the disposal of mustard at Suffield was presented in CCD 434 on 16 July 1974. The destruction was completed in 1976, and disposal of the hydrolysate products has been continuing at a slow rate since that time. The following is an updated version of the process.

MUSTARD DISPOSAL IN CANADA

During World War II Canada, like many other nations, acquired supplies of chemical warfare agents in the event that gas warfare was used. Early in the war some mustard was obtained from the United States and the United Kingdom. Canadian mustard was produced by the thiodiglycol process in a special plant set up at Cornwall, Ontario in 1941. The plant ceased operation in 1945 and was dismantled in 1946. Mustard was not manufactured at Suffield, but because of its primary role as a Commonwealth CW Test Centre, a large storage capacity was created and Canadian stocks were stored there in bulk. Some of this material was used for wartime tests and experiments on the range. At the end of the war, the bulk mustard remaining at Suffield was stored in four large lead-lined concrete vats. As it would have been difficult to package this material for disposal elsewhere, it was left in situ to be used for experimentation. With the discovery of nerve agents, experimental interests shifted and little of the mustard was used.

By 1972 changes in Canadian Policy suggested that the mustard was no longer of use to the Canadian Forces. By measurement of fluid levels and simple density calculations, it was determined that about 700 tons of liquid remained in the vats, although some decomposition had occurred and layers of impurities had separated. However, analysis showed that the bulk of the liquid was still potent mustard.

The simplest means of disposal would have been by burning on the range or dumping at sea, however advances in environmental science by this time precluded either method. Burial in the ground was also out of the question. An ideal approach would have been to burn the mustard in a thermal destructor with stack scrubbing to remove the acids. In 1969 a large thermal destructor had been constructed at Suffield to destroy DDT stocks remaining after the banning of its use as an insecticide. The destructor was available but was located in the midst of tank maintenance facilities which had been constructed after the thermal destructor. It was not possible to move the mustard to the destructor safely either by truck or through a pipeline. Costs of moving the thermal destructor to a safer location or of building a new one were very high and the possibility of more economical chemical methods was examined.

Details of the study were reported in CCD 434. Eventually it was shown that mustard could be readily destroyed by alkaline hydrolysis. Some heating was required for initiation but the reaction was exothermic and rapidly rose to a maximum of about 95°C. Good agitation was required and lime was found to be a convenient and inexpensive base with which to maintain the pH above 10. The reaction product was a thick non-vesicant suspension of lime, salts and thiodiglycol in water. The DRES mustard was destroyed in eight ton batches over a three year period. Work could not proceed during the winter as all equipment was exposed to the elements and the mustard congealed in the vats. The disposal was also slowed by some equipment failures particularly in the steam generators and stirrers. Hydrolysis of the final batch of mustard was carried out on 18 October 1976.

The hydrolysate products were placed first into a spare vat and then into each of the others as they were emptied of mustard. This hydrolysate was stirred and kept above pH10 in order to act as a decontaminant for the traces of mustard which could not be removed from the vats with the pumps. When cool, without agitation the hydrolysate separated into two layers, the top one being mainly water with dissolved salts, and the lower one a thick syrupy gel of thiodiglycol and solid impurities.

Early experiments on the disposal of the mustard hydrolysate are described in CCD 434. Eventually many thousands of gallons were incinerated in the thermal destructor. In this process, the water evaporated, the thiodiglycol was consumed and the salts were dispersed as a finely divided aerosol. A high stack was added to the destructor so that all products including the aerosolized salt could be dispersed at such a height that all emission standards were met. Unfortunately the salt aerosolization was not completely efficient and the stack and destructor gradually became clogged.

In the meantime, experiments were attempted in which the hydrolysate was spread in strips onto the prairie grass to determine its effect. Studies by experts showed that the thiodiglycol was rapidly consumed by micro-organisms, however, the salts, primarily calcium chloride and lime, retarded some of the prairie grasses. These experiments were eventually terminated and the grass is now returning to normal.

Once hydrolysis had been completed, it was no longer possible to keep the hydrolysate stirred. The undisposed material was allowed to separate and over a period of time the aqueous layers were removed and evaporated in a pit.

At the present time the five vats remain intact with a shallow layer of thiodiglycol at the bottom of each. It is possible that traces of mustard were trapped under the lead liners, although none has been detected through sampling and analysis. Studies have been carried out to recommend suitable means of decontamination and destruction of the vats. Some consideration has been given to recovery of the lead, however for safety reasons it has been decided against this. Also, the remaining thiodiglycol will not be removed. Contracts are now being negotiated to cut the concrete tops and upper walls of the vats into sections and lower them into the cavity. As the vats are more than 50 per cent below the surface, the resulting materials will be covered with earth and planted to grass. It is anticipated that this work will be completed within 1981.

CD/179/Add.1
23 April 1981

Original: ENGLISH

<u>The Chairman's Progress Report to the Committee on Disarmament on the work of the Ad Hoc Working Group on Chemical Weapons</u>

Page 2, paragraph 7, <u>add</u> after the last document in the list, the following:

"(g) CD/124/Rev.1 submitted by Indonesia entitled "Revision of CD/124 on the Definition of Chemical Agent and Chemical Warfare Agent""

COMMITTEE ON DISARMAMENT

CD/179
23 April 1981
Original: ENGLISH

The Chairman's Progress Report to the Committee on Disarmament on the work of the Ad Hoc Working Group on Chemical Weapons

Introduction

1. The ad hoc Working Group on Chemical Weapons has authorized the Chairman to submit the following progress report to the Committee on Disarmament. It was, however, understood that the contents of this report, including its annex, will not bind or constrain delegations in the continuation of their work.

2. In the course of consideration of item 4 of its 1981 agenda, entitled "Chemical Weapons", the Committee at its one hundred and fifth plenary meeting on 12 February 1981, adopted the following decision contained in document CD/151:

> "The Committee further decided to re-establish, for the duration of its 1981 session, the ad hoc working groups on effective international arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons, chemical weapons and radiological weapons, which were established on 17 March for its 1981 session, so that they may continue their work on the basis of their former mandates.
>
> It is understood that the Committee will, as soon as possible, review the mandates of the three ad hoc working groups with a view to adapting, as appropriate, their mandates to advance the progress of the process of negotiations towards the objective of concrete disarmament measures.
>
> ...
>
> The ad hoc working groups will report to the Committee on the progress of their work at any appropriate time and in any case before the conclusion of its 1981 session."

3. At its 107th meeting on 17 February 1981 the Committee elected Ambassador Lidgard, Sweden, as Chairman of the ad hoc Working Group. Mrs. L. Waldheim-Natural, Chief, Geneva Unit, United Nations Centre for Disarmament, was reappointed Secretary of the Working Group.

4. At their request and on the basis of decisions taken by the Committee on Disarmament at its one hundred and fourth and one hundred and twenty-second sessions, contained respectively in documents CD/PV.104 and CD/PV.122, representatives of Austria, Denmark, Finland, Norway, Spain and Switzerland attended meetings of the Group in addition to members of the Committee on Disarmament.

5. The Group held 12 meetings between 18 February 1981 and 22 April 1981.

6. In carrying out its mandate the ad hoc Working Group took into account paragraph 75 of the Final Document of the first special session of the General Assembly of the United Nations devoted to disarmament, which stated that the conclusion of a convention on chemical weapons was one of the most urgent tasks of multilateral negotiations. The Working Group also took into consideration A/RES/35/144 B which in operative paragraph 3 "Urges the Committee on Disarmament to continue, as from the beginning of its session to be held in 1981, negotiations on such a multilateral convention [on the complete and effective prohibition of the development, production and stockpiling of all chemical weapons and on their destruction] as a matter of high priority, taking into account all existing proposals and future initiatives."

7. During the period under consideration the following official documents dealing with Chemical Weapons were presented to the Committee on Disarmament:

(a) CD/142 submitted by Sweden entitled "Prohibition of retention or acquisition of a chemical warfare capability enabling use of chemical weapons (4 Annexes)"

(b) CD/164 submitted by Finland entitled "Creation of Chemical Weapons Control Capacity - Present Phase and Goals of the Finnish Project"

(c) CD/167 submitted by Canada entitled "Verification and Control Requirements for a Chemical Arms Control Treaty based on an Analysis of Activities"

(d) CD/168 submitted by China entitled "Prohibition of Chemical Weapons: on the Definition of Chemical Warfare Agents"

(e) CD/169 submitted by China entitled "Dismantling of Production Facilities/Means of Production for Chemical Weapons"

(f) CD/173 submitted by Canada entitled "Disposal of Chemical Agents"

8. In the conduct of its work from February to April 1981, the following working papers were circulated to the Working Group:

(a) a working paper by the Chairman entitled "Outline suggested by the Chairman for the work of the group - Part 1" (CD/CW/WP.7 and Rev.1)

(b) a working paper by the Chairman entitled "Outline suggested by the Chairman for the work of the group - Part 2" (CD/CW/WP.8 and Corr.1)

(c) a working paper by Canada entitled "Verification and Chemical Weapons" (CD/CW/WP.9)

(d) a working paper by the Chairman entitled "Outline suggested by the Chairman for the work of the group - Part 3" (CD/CW/WP.10 and Corr.1)

(e) a working paper by Mongolia, Poland and the USSR entitled "Chemical Weapons: types of activity to be covered by a convention on the prohibition of chemical weapons" (CD/CW/WP.11)

(f) a working paper by the Chairman entitled "Outline suggested by the Chairman for the work of the group - Part 4" (CD/CW/WP.12)

(g) a working paper by the Chairman entitled "Outline suggested by the Chairman for the work of the group - Part 5" (CD/CW/WP.13)

(h) a working paper by the Chairman entitled "Outline suggested by the Chairman for the work of the group - Part 6" (CD/CW/WP.14)

(i) a working paper by Bulgaria, Hungary and Poland entitled "Chemical weapons: definitions" (CD/CW/WP.15)

(j) a working paper by France entitled "Declarations and destruction of materials and facilities" (CD/CW/WP.16)

(k) a working paper by France entitled "Chemical weapons - definitions, criteria" (CD/CW/WP.17)

(l) a working paper by Australia entitled "Initial Comments on the Consolidated Outline suggested by the Chairman of the Ad Hoc Working Group on Chemical Weapons (CD/CW/WP.18)

9. The following Conference Room Papers were submitted to the group during the first part of the Committee's 1981 session:

(a) a conference room paper by the Chairman entitled "Suggestions by the Chairman for particular technical issues to be addressed during CD's 1981 work on chemical weapons" (CD/CW/CRP.5 and Rev.1 and 2)

(b) a conference room paper by the Chairman entitled "List of topics to be discussed with regard to the definitions and criteria of importance for a chemical weapons convention" (CD/CW/CRP.6)

(c) a conference room paper by Belgium entitled "Proposed definitions (revision of document CD/94)" (CD/CW/CRP.7)

(d) a conference room paper by France entitled "Criteria for definition" (CD/CW/CRP.8)

(e) a conference room paper by the Chairman entitled "List of questions put to the delegations of the USSR and the USA at the meeting of 30 March 1981 with respect to the bilateral report, CD/112, and outlines by the Chairman for the work of the Working Group" (CD/CW/CRP.9)

(f) a conference room paper by the Chairman entitled "Draft Progress Report to the Committee on Disarmament" (CD/CW/CRP.10 and Add.1 and 2 and Corr.1 and Rev.1)

10. The Group agreed to structure its work on the basis of the outline annexed hereto, which was suggested by the Chairman as contained in documents CD/CW/WP.7, 8, 10, 12, 13 and 14 with the addition of some related suggestions for amendments, clarifications and corrections. The outline does not however reflect all the views and suggestions expressed during the Working Group's consideration and delegations attached importance to their proposals being further considered at the appropriate time as the Working Group continues its work.

11. In accomplishing its task, the Working Group, from February to April 1981, carried out another substantive and more detailed examination of the issues to be dealt with in the negotiation on a convention on the prohibition of chemical weapons. Last year's report to the Committee of the Working Group (CD/131/Rev.1) and the USSR-US Joint Report on the Progress in the Bilateral Negotiations on the Prohibition of Chemical Weapons of 7 July 1980 (CD/112) were of great assistance in this endeavour.

Scope of the convention, definitions, criteria

12. As regards the scope of the Convention three alternatives were presented in the outline (see Annex I). The first of these, which proposes the prohibition of the development, production, stockpiling, acquisition, retention and transfer of chemical weapons, received the broadest support. The second, which suggested a more comprehensive prohibition, including also planning, organization and training for the use of chemical weapons, met with considerably less support, mainly because of the verification difficulties it would entail. Views were expressed that the subject should be discussed more in depth. The third alternative, according to which also the use of chemical weapons should be prohibited, was supported by several delegations, but criticized by others, who feared that it would diminish the authority of the 1925 Geneva Protocol. Still others thought that it would be possible to find a compromise formula in establishing a link between the Geneva Protocol and the Convention. In this connection it was also suggested that a link between the scope of the Biological Weapons Convention and that of a chemical weapons convention should be established wherever appropriate.

13. The issues of definitions and criteria were also extensively discussed. In that connection valuable clarification was given as to the intentions behind the suggestions contained in the Joint Report. This contributed to a greater degree of understanding of those suggestions, which should facilitate future negotiations on these specific issues.

14. There seemed to be convergence of views that the difficulties in defining chemical warfare agents, especially with reference to their single and dual purpose character, could be overcome by stipulating, with the help of a general purpose, quantity and toxicity critieria, that chemicals must not be produced for other than non-hostile purposes or military purposes not involving the use of chemical weapons. No chemical would then need to be labelled a chemical warfare agent. The toxicity criteria would serve to delimit those chemicals, the production of which will have to be more or less strictly regulated and verified. The group of the most toxic chemicals, the supertoxic lethal chemicals', had been defined so as to include mustard gas.

15. One difficulty regarding the toxicity criteria was found to derive from the lack of acceptable methods for determining toxicity limits for incapacitating and

irritating chemicals. In view of the assumed scientific development in this context, it was suggested that the Convention should stipulate possibilities to introduce new criteria for incapacitating effects.

16. Some delegations emphasized the necessity of elaborating standardized testing methods and procedures for establishing a toxicity spectrum.

17. The issue of other criteria was discussed, and different opinions were expressed about the necessity for any specific further criterion.

18. The need for and definition of different concepts like "chemical warfare agents", "chemical weapons", "chemical weapons system" etc. were discussed, but it was felt that only future negotiations could determine to what extent those concepts should be used in the Convention.

19. On the issue of possible exceptions from the prohibitions it was stated that peaceful chemical production and research as well as protective activities should not be described as exceptions, since they would together account for the overwhelming amount of chemical activities. Thus, they would not have to be referred to as exceptions in a convention.

20. It was held that certain types of chemicals, e.g. riot control agents and herbicides, are prohibited in war under the 1925 Geneva Protocol. Their widespread use in peacetime would, however, make it impossible to cover them by a prohibition of production, not least due to verification difficulties. On this issue views diverged.

21. The amount of production of supertoxic chemicals to be allowed for certain purposes were discussed. A number of delegations questioned the necessity of allowing an annual total production of one ton of such agents. With the obligation to make a detailed declaration of such production, including its purpose, and a clarification that the total would be an aggregate for all supertoxic chemicals for non-hostile military purposes, the issue seemed less controversial.

Declarations, Destruction.

22. On the issue of declaration of possession of specific materials, facilities and activities and of plans for disposals of materials and facilities there were differing views as to the timing and content of such declarations. The confidence building effects of such declarations, if undertaken already at the negotiation stage, were pointed out.

23. Some delegations emphasized that destruction and dismantling were to be regarded as the most important elements of the scope of the Convention and that this should be reflected already in its title.

24. Concerning the time required for destruction or conversion of declared stocks and destruction or dismantling of means of production, note was taken of the indication in the Joint Report that such activities may take up to 10 years. There were differing views whether the means of production instead of being destroyed or dismantled could also be temporarily converted for peaceful production. Some delegations felt that conversion of production facilities should be permitted only to make these facilities suitable to be used for the purpose of destroying stocks of chemical weapons.

Compliance

25. On verification there was a convergence of views that an adequate verification system should be commensurate with the scope of the Convention and implemented through a combination of national and international verification measures.

26. Some delegations felt that the destruction of stocks of chemical weapons and production facilities as well as the prohibition of production of chemical weapons would have to be overseen and controlled routinely through on-site inspection. Other delegations held that the intrusive form of control over these activities should take place rather within the concept of verification by challenge. The discussion did, however, not clarify the full meaning of these concepts.

27. Even if the principle that control should not be more intrusive than necessary seemed to be generally adhered to, the views differed on what is necessary, i.a. concerning the need for occasional, periodic, or permanent on-site inspection in order to follow the process of destruction, dismantling or conversion or production facilities.

28. Some technical methods for verifying destruction of stocks and production facilities were discussed, as for instance chemical analyses, toxicity determinations and "black boxes".

29. Concerning the combination of national and international verification measures, it was stated that too little attention had been devoted to the national control possibilities. Only through such national means could sufficiently intrusive verification be carried out to ensure compliance within the chemical industry. Still, this was considered more difficult in the market economies than in the centrally planned economies. This view was not shared by all the delegations, since it was pointed out that also in the market economies a great variety of production regulations, i.a. for environmental protection purposes, were strictly enforced in the chemical industry. National verification measures could according to these delegations only be regarded as a form of national self-control and as a source of information and data for further stages in the verification process.

30. Technical methods for international verification activities were briefly discussed. Chemical off-, near- and on-site analyses of air, water and soil samples were mentioned among such methods, as well as remote sensing by satellites.

31. The establishment of a Consultative Committee as an international verification body seemed to enjoy general support, but views differed on its tasks, organization and procedures.

32. Also on the complaints procedure a number of different proposals were made. Some favoured, as a first step, bilateral consultation directly between the parties, whereas others thought that from the beginning all consultation should take place within the Consultative Committee and be brought to the knowledge of all the Parties of a convention.

33. Some delegations considered that complaints should be lodged with the Consultative Committee. Others suggested that the United Nations Security Council would be a suitable organ for taking up complaints regarding non-compliance with the convention. Strong objections were raised to this suggestion. Complaints should instead be lodged with the General Assembly according to some delegations.

Voluntary confidence building measures (CBMs)

34. On CBMs there were divergencies of views with respect to suitable times for their application. Four periods of time were mentioned in which various CBMs could be undertaken: the negotiating phase, after signing the convention and before a State had become party to it, the period until stocks of chemical weapons and production facilities had been destroyed, and the time thereafter.

35. It was stated that CBMs could be undertaken on a bilateral or multilateral basis, regionally or world-wide and with or without the condition of reciprocity. It was felt that also additional examples of CBMs other than those discussed so far could be explored.

International co-operation

36. There was convergence of views that the convention should promote co-operation between parties in fields related to the technical subjects dealt with in the convention, but not to what extent or in which organizational modes. However, there seemed to be large support for the view that provisions for co-operation and assistance with respect to protection against chemical weapons should be included in the convention.

Formal provisions

37. The issues in this context were only briefly examined. It was recognized that the formal provisions would best be discussed in the course of the actual negotiations at a later stage. Views were put forward that some of the more technical matters and some more detailed provisions might be put into annexes to the convention, and that the annexes should form an integral part of the convention.

Conclusion

38. After the extensive examination of the various issues, both last year and during the spring part of this year's session, the Working Group considers that while there was substantial convergence of views on a number of issues some considerable differences of views still exist and that it is necessary to proceed to further substantive work towards achieving a convention. Many delegations felt that the mandate of the Working Group should be revised, whereas others did not consider this necessary or were not in a position to agree to this.

Consolidated Outline Suggested by the Chairman for the work of the Group

Activities, facilities and materials to be prohibited, including criteria and definitions

1.1 Alternative views regarding the prohibitions

Three main alternative views have been expressed, which require further consideration:

Alt.1. There is a convergence of views that the convention should prohibit at least the development, production and stockpiling of chemical weapons.

Alt.2. It has also been suggested that the convention should be more comprehensive and prohibit all activities, facilities and materials intended to enable a Party to use chemical weapons or utilize the toxic properties of chemical substances for hostile purposes or in armed conflict.

Alt.3. Another suggestion is that the convention should prohibit also the use of chemical weapons in addition to the development, production and stockpiling of chemical weapons.

The alternatives are specified below.

1.2 The following activities, facilities and materials would be prohibited or otherwise regulated in the three alternative views:

1.2.1 Activities

Common for alternatives 1-3;

- development
- production
- stockpiling
- acquisition
- retention
- transfer (including trading) and assistance to other States

Additional for alt. 2:

- planning
- organization
- training

Additional for alt. 3:

- use

1.2.2 Facilities

Common for alternatives 1-3:

- development and testing facilities
- production facilities/means of production
- specific storing facilities .

Additional for alt. 2:

- resources for planning and organization
- training facilities

1.2.3 Materials

1.2.3.1 Common for alternatives 1-3:

- chemical warfare agents which might include

(a) supertoxic chemical warfare agents

(b) toxic, single purpose chemical warfare agents

(c) toxic, dual purpose chemical warfare agents (insecticides, etc.)

(d) others, (herbicides etc.)

(e) precursors

1.2.3.2 Warheads, weapon systems and other materials, equipment and resources specifically intended for the use of chemical weapons

1.3 <u>The following definitions could be considered</u>:

1.3.1 Chemical agent: a chemical substance which may be used in a chemical weapon but is in fact not utilized or planned to be utilized in it.

1.3.2 Chemical warfare agent: a chemical substance, which alone or together with other chemical substances have direct toxic effects on man, animal or plant and with such physical and chemical characteristics that it can be utilized in a chemical weapon, i.e. a chemical substance which is actually used or intended to be used in chemical weapons. It may be a single purpose agent or a dual purpose agent, which groups may be differentiated according to their toxicities in super-toxic and toxic chemical warfare agents.

1.3.3 Single purpose chemical warfare agent: a chemical substance which is used or may be used for chemical warfare solely.

1.3.4 Dual purpose agent: a chemical substance which is used or may be used not only for chemical warfare but also for peaceful purposes.

1.3.5 Precursors to a chemical warfare agent: chemical substances which not necessarily themselves are suitable chemical warfare agents but which form particular chemical warfare agents when made to react chemically with each other whether for bulk production of chemical warfare agents or in a chemical weapons system. (The term precursor is a recognized general concept in chemistry).

1.3.6 Chemical Weapon: the combination of a charge of a chemical warfare agent and means of dispersing the agent in the target (chemical munitions).

1.3.7 Chemical weapons system: chemical weapons and means to make possible their use.

1.3.8 Chemical warfare capability: the capability to use chemical weapons.

1.4 <u>The following criteria could be considered as the basis in determining the scope of the prohibition</u>:

1.4.1 General purpose criterion: the intention

(a) with regard to chemical warfare

(b) non-hostile purposes - of activities, facilities and materials. The general purpose criterion might be supplemented by further criteria, like quantity and toxicity criteria.

1.4.2 Quantity criterion: allowance of activities, facilities and materials for peaceful and protective purposes to the extent justified by these purposes.

1.4.3 Toxicity criteria:

(a) Super-toxic lethal chemical might be any toxic chemical with a medium lethal dose which is less than or equal to 0.5 mg/kg (subcutaneous administration, LD_{50}) or 2,000 mg min/m^3 (by inhalation, LCt_{50}) when measured by an agreed method.

(b) Other lethal chemical might be any toxic chemical with a median lethal dose which is greater than 0.5 mg/kg (subcutaneous administration, LD_{50}) or 2,000 mg min/m^3 (by inhalation LCt_{50}) and which is less than or equal to 10 mg/kg (subcutaneous administration , LD_{50}) or 20,000 mg min/m^3 (by inhalation, LCt_{50}), when measured by an agreed method.

(c) Other harmful chemical might be any toxic chemical with a median lethal dose which is greater than 10 mg/kg (subcutaneous administration, LD_{50}) when measured by an agreed method.

(d) In the case that chemicals exert incapacitating or irritating effects particular toxicity criteria might apply. These might then state dose limits for the effects of such chemicals, ED_{50}. Since such toxicity criteria relating to man are not available today, a convention might provide for possible later inclusions of them.

1.4.3.1 Toxicological methods:

(a) Definitions

LD_{50} (Lethal Dosis, 50 per cent) scientifically defined as the dosis of a substance, which is expected to kill 50 per cent of an exposed population. It is expressed as mg/kg body weight.

LCt_{50} (Lethal Concentration and Time, 50 per cent) scientifically defined as the product of time for exposure and concentration of a substance in air, which is expected to kill 50 per cent of an exposed population. It is expressed as mg min/m^3.

ED_{50} (Effective /incapacitating, irritating/ Dosis, 50 per cent) scientifically defined as the dosis of a substance, which is expected to incapacitate 50 per cent of an exposed population. It is expressed as mg/kg body weight.

ECt_{50} (Effective /incapacitating, irritating/ Concentration and Time, 50 per cent) scientifically defined as the product of time for exposure and concentration of a substance in air, which is expected to incapacitate 50 per cent of an exposed population. It is expressed as mg min/m^3.

The expression "expected to incapacitate 50 per cent of an exposed population" could be understood as "expected to disable 50 per cent of the exposed soldiers to perform their usual duties in a war situation".

(b) Methods

General considerations. Toxicity tests could be in accordance with "Principles and Methods for Evaluating the Toxicity of Chemicals", Environmental Health Criteria 6, World Health Organization, Geneva 1978.

Toxicity tests may have to be preceded by chemical analysis, as described below. As far as possible, toxicity tests may have to be performed on pure substance. When determining lethal effects of a substance (LD_{50} and LCt_{50}) two species may have to be used - mice and rats of well-defined, easily available strains.

Lowest value may be decisive.

For LD_{50}-determinations, subcutaneous injection could be the way of administration. Survival during 48 hours could be observed. Calculation of LD_{50} may have to be done according to established procedure.

For LCt_{50}-determinations, the time of exposure is maximized to ten minutes. When aerosols are used, particle size distribution may have to be determined and optimized in order to ascertain maximal uptake. Survival during 48 hours may have to be observed. Calculation of LCt_{50} may have to be done according to established procedure.

For evaluating incapacitating effects of chemical substances (ED_{50} and ECt_{50}) animal tests may have to be devised that, as far as possible, are analogous to the situation for soldiers, which is suggested for the definition of incapacitating effects as mentioned above.

Primates could be used for such experiments. Experience from human use of incapacitating agents can be utilized to evaluate ED_{50} and ECt_{50}.

(c) Chemical identification

The chemical identity of all compounds must be ascertained, and expressed according to existing chemical nomenclature e.g. IUPAC.

In the case of mixtures, the active compound or compounds must first be isolated and purified by suitable methods to at least 99 per cent purity.

Whenever possible, the alleged chemical identity of a compound may have to be verified by mass spectrometry and nuclear magnetic resonance. If optical isomerism is possible, the presence or absence of optical activity of the compound should be verified. If mass spectrometry and/or nuclear magnetic resonance methods cannot be applied, e.g. in the case of macromolecules, other unequivocal physical, chemical, biochemical or biological methods might be used.

1.4.4 Other criteria:

- structural formulae for chemical substances
- shelf life
- volatility
- explosion stability

1.5 Exceptions (relating to exceptions from prohibitions in alternatives 1-3, as well as to possibly allowed activities):

1.5.1 for civilian purposes:

- protection against chemical weapons in civil defence
- medical
- scientific and research
- industrial
- agricultural
- riot control

1.5.2 for certain military purposes:

- protection against chemical weapons
- medical
- riot control

1.5.3 Parties may be allowed an annual production of super-toxic and toxic single-purpose warfare chemical agents together not exceeding one ton for peaceful and protective purposes.

Implementation of the convention, i.e. declarations and disposal of materials and facilities

2.1 Declarations

At the time States become parties to the convention concerning the possession or non-possession of specific materials, facilities and activities and of plans for disposal of materials and facilities.

2.1.1 Materials

2.1.1.1 Chemical warfare agents, stored in bulk or in munition.

Specific rules:

(a) Supertoxic and toxic single-purpose chemical warfare agents (i.e. sarin, soman, tabun, VX, mustard gas): declarations may have to be comprehensive, stating also the amount of the agents relating to bulk stockpiles and to munitions, and to be given each year;

(b) Toxic dual purpose chemical warfare agents (i.e. phosgene, hydrogen cyanide, chlorine): declarations may concern approximate amounts of each agent, estimation of yearly production and consumption. When stored in munitions, the declarations may have to be as comprehensive as for super-toxic and single purpose chemical warfare agents.

(c) Precursors: may have to be declared if they are stockpiled alone or together with the other reactant(s) of a binary set in munition or parts of munition, or in bulk for military purposes. The phosphorous containing precursors for binary nerve agents: may have to be declared as supertoxic and toxic single purpose warfare agents.

2.1.1.2 Chemical weapons (munition): may have to be declared comprehensively including special warheads intended for but not filled with chemical warfare agents.

2.1.1.3 Weapons systems, especially designed for the dissemination of chemical warfare agents and chemical munition: may have to be declared comprehensively.

2.1.1.4 Location of a State's stockpiles of chemical warfare agents and chemical munition, both within its territory and, if under its jurisdiction, outside: may have to be declared.

2.1.2 Facilities may have to be declared with respect to existence, location, capacity, function, etc.

2.1.2.1 Production facilities/means of production (including munition filling facilities and facilities related to dual-purpose production).

2.1.2.2 Testing facilities

If such facilities are also used for developing and testing protection against chemical weapons, this may have to be declared.

2.1.2.3 Facilities for training for use of chemical weapons may have to be declared. (Relates to alt. 2 in 1.1). If such facilities are also used for training for protection against chemical weapons, this may have to be declared.

2.1.2.4 Other facilities intended to enable the use of chemical weapons e.g. special transportation equipment (Relates to alt. 2 in 1.1).

2.1.3 Activities

2.1.3.1 Training and other activities to enable the use of chemical weapons. (Relates to alt. 2 in 1.1).

2.1.4 Other modalities of declarations

Plans for destruction, dismantling and converting of materials and facilities, including periodical exchange of statements and notifications concerning the implementation of the plans.

2.1.4.1 Timing of declarations

2.1.4.2 Time frames (programmes) of plans for destruction, dismantling and converting of materials and facilities.

2.1.4.3 Other modalities, including for periodical exchange of notifications concerning the implementation of the plans.

2.2 <u>Destruction, dismantling and conversion</u>

The specific objects, timing issues and verification measures.

2.2.1 Chemical warfare agents

2.2.1.1 Supertoxic and toxic single purpose chemical warfare agents, stored in bulk or in munition: to be destroyed within a specific period of time.

2.2.1.2 Precursors, stored in munition, as well as the more specific compound in each set of precursors, if stored in bulk: may have to be destroyed within a specific period of time.

2.2.1.3 Specific issues concerning verification relating to destruction of chemical warfare agents:

To ascertain that chemical substances brought to a destruction plant really are chemical warfare agents and that the amount of substance brought to the plant corresponds to the given declaration an on-site verification procedure may be necessary.

Such verification procedure could comprise

(1) measuring the amount of substance delivered and the amount of products obtained:

(2) toxicity tests on materials delivered and products obtained.

Toxicity tests may have to be performed only in order to determine lethal dosis of the substances delivered to the destruction plant, i.e. to find out whether a substance is a super-toxic or toxic chemical warfare agent. Incapacitating agents and precursors could presumably not be monitored in this way. For such substances, chemical analysis could be used to ascertain the identity.

(organizational and procedural aspects on verification relating to the issues covered by Part 2 will be dealt with in Part 3).

2.2.2 Warheads and other means of disseminating chemical warfare agents in the target, including weapon systems, specifically intended for chemical warfare: to be dismantled and destroyed within a specific period of time.

The amount of chemical weapons etc. brought to a destruction plant may have to be verified.

2.2.3 Production facilities/means of production: to be dismantled or, if particular reasons are given, converted to production of other chemical substance within a specific period of time. Facilities might have to be "moth-balled" upon entering into force of a convention until they were disposed of.

2.2.3.1 Specific issues concerning verification relating to dismantling or conversion of production plants/means of production:

To ascertain that the plant etc. really has been or could be used for the production of chemical warfare agents an on-site inspection may be necessary before the pertinent action has begun. The destruction/dismantling procedure may have to be verified in the same way.

As probably some time will elapse between closing a plant and starting the dismantling, the plant may have to be sealed by mechanical means in the meantime. This procedure could be verified by on-site inspection and monitored by remote control.

For a production plant, which has been allowed to be converted to peaceful purposes instead of being destroyed, on-site inspection before and after the conversion may ascertain that the plant

(a) has been used for chemical warfare agent production and

(b) has been converted for production of other chemical compounds.

Such verification may consist of toxicity tests regarding the new product and inspection of the protection level at the converted plant. Furthermore, chemical analysis of waste water and the air around the building may be performed to confirm the permanence of the conversion.

For the perhaps permitted (exempted) production of certain amounts of chemical warfare agents, special facilities could be created, thus no existing production would be left for this purpose. The new plant may have to be under control through on-site inspection, ascertaining that the capacity of a new plant corresponds to the permitted production. (The issue will be further elaborated in Part 3).

2.2.4 Munition filling facilities: may have to be dismantled or converted to be used for filling munitions of a non-chemical warfare nature within a specific period of time.

2.2.4.1 Specific issues concerning verification relating to dismantling or conversion of munition filling facilities:

Verification may be made by the same means as specified for production plants.

2.2.5 Testing and training facilities, e.g. test fields: may have to be destroyed or dismantled unless preserved and used for protective or other purposes, in which case their use may have to be subject to verification measures. (The issue of training facilities relates to alt. 2 in 1.1).

Implementation of the convention, i.e. verification measures and complaints procedures

3. Verification

The verification measures should be commensurate with the scope of the prohibition, obligations of destruction, dismantling and conversion and other aspects of the convention in order to provide assurance of compliance with the convention. Such measures may have to be both national and international.

3.1 National verification measures

3.1.1 Such measures may have to be decided in accordance with the provisions of the convention and the States parties' own constitutional procedures.

3.1.2 National means of verification including the use of national technical means of verification may have to be allowed in consistency with generally recognized principles of international law and without hindrance, e.g. through the use of deliberate concealment measures, from other parties.

3.1.3 Parties may have to undertake appropriate internal measures in accordance with their constitutional procedures to prohibit and prevent anywhere under their jurisdiction or control, any activity contrary to the provisions of the convention.

3.2 Scope of international verification measures

3.2.1 At the time States become parties to the convention:

Compliance with obligations concerning destruction, dismantling or conversion into peaceful use of

- stockpiles of chemical warfare agents and those weapons specifically intended for chemical warfare
- production facilites/means of production for chemical warfare agents and chemical weapons
- munition filling facilities
- testing and training facilities (The issue of training facilities relates to alt. 2 in 1.1).

3.2.2 Continuously as long as the convention remains in force:

(a) Status of production facilities/means of production which have been converted to peaceful use

(b) Compliance with the prohibitions and other regulations concerning certain activities, materials and facilities (see 1.2), i.a.:

- production of single purpose chemical warfare agents

- production of dual-purpose chemical warfare agents and some binary chemical weapons precursors

- some activities and facilities related to planning, organization and training. (This issue relates to alt. 2 in 1.1)

3.3 <u>International measures and procedures for verification</u>

3.3.1 Declarations and exchange of information.

Parties may have to undertake to declare possession (or non-possession) of specific materials, facilities and activities and of plans for disposal of materials and facilities according to 2.1, as well as exchange information on the progress of disposal of stocks and production facilities/means of production. Information may have to be exchanged on permitted production of chemical warfare agents for protective and peaceful purposes.

3.3.2 Consultations

3.3.2.1 Parties may have to undertake to consult each other and to co-operate in solving problems which may arise in relation to the convention.

3.3.2.2 Such consultations could be undertaken bilaterally between the parties concerned, or within the framework of a special procedure established by the convention (see 3.3.3) or within the framework of the United Nations and in accordance with its Charter.

3.3.3 Consultative committee

A consultative committee may have to be established to handle international verification measures at the entry into force of the convention.

3.3.3.1 The committee may be composed of one expert from each State party and with the Secretary-General of the United Nations or his representative as its chairman. It may for specific tasks set up sub-committees and verification teams.

3.3.3.2 The committee may meet for a regular meeting at least once a year and otherwise at the request of a party.

3.3.3.3 The committee may be competent:

(a) to follow the performance of destruction, dismantling and conversion to peaceful purposes of stockpiles of chemical warfare agents, chemical weapons, production facilities/means of production etc. (see 2.2)

(b) to enquire into facts concerning alleged violations of the convention

(c) to check periodically through on-site visits facilities for permitted production of chemical warfare agents, with respect to amounts produced and their use

(d) facilitate compliance with the convention, e.g. by developing international standardization of methods and routines to be applied by national and international verification organs.

3.3.3.4 The committee may be empowered to request from States parties, international organizations, groups and individuals such information and assistance as may be appropriate and relevant to its work.

3.3.3.5 The parties to the convention may have to undertake to co-operate with the committee in carrying out its tasks.

3.3.3.6 The working rules and procedures of the committee may have to provide for effective, fair, impartial and unobtrusive proceedings.

3.3.3.7 If the committee is unable to provide for a unanimous report on its findings of fact, it will present the different views of the experts involved.

3.3.3.8 In order to carry out its tasks the committee may have to be provided with or have access to specific facilities, such as a secretariat, technical experts, chemical and toxical laboratories and remote sensing equipment.

3.3.3.9 The committee may be allowed to undertake on-site inspections:

(a) in order to confirm received information concerning planned, on-going or effected destruction, dismantling or conversion, after consultation with the State party concerned (see 3.3.3.3);

(b) in order to inquire into facts concerning alleged ambiguities in or violations of the compliance with the convention, provided appropriate reasons have been given in support of the necessity of such an investigation.

If the requested party does not agree to on-site inspection, it may have to give appropriate explanations that an on-site inspection would at that time jeopardize its supreme interests.

Procedures are to be developed for on-site investigation, including provisions regarding the rights, obligations and functions of the inspection personnel, and those of the host side.

3.3.4 The Security Council

3.3.4.1 The convention may have to provide for the possibility for States parties to lodge a complaint with the Security Council or the General Assembly of the United Nations, if they have made unsuccessful efforts of consultation and co-operation pursuant to the relevant provisions of the convention and have reason to believe that any other State party is acting in breach of obligations under the convention.

3.3.4.2 Parties may then also have to undertake to co-operate in carrying out any investigation which the Security Council may initiate on the basis of the complaint received by the Council.

4. Voluntary confidence building measures (CBMs)

4.1 Object

Voluntary measures to build confidence with respect to the credibility of States' intentions.

(a) during the negotiating process and after the convention has been concluded but before it has entered into force;

(b) after the convention has entered into force.

CBMs might be undertaken on a bilateral, or multilateral basis, regionally or worldwide, with or without the condition of reciprocity.

4.2 Examples of CBMs during the negotiating process and after the convention has been signed but before it has entered into force

4.2.1 Declarations of possession or non-possession of chemical weapons, production facilities, stockpiles and testing facilities and their location.

4.2.2 Invitations to visit stockpiles, testing facilities, production plants - with or without production of chemical warfare agents - and destruction plants.

4.2.3 Measures to facilitate co-operation between States regarding protection for civilian and military personnel.

4.2.4 Exchange of information on and invitations to attend military manoeuvres which could include elements related to the use of chemical weapons.

4.2.5 Exchange of information on methods for monitoring scientific and technical development relevant to chemical weapons.

4.3 Examples of CBMs after the convention has entered into force

4.3.1 Exchange of information on protective measures, military and civilian, including industrial protective measures, relating also to the protection of workers in the chemical industry.

4.3.2 Invitations to co-operative efforts in areas related to the convention.

4.3.3 Exchange of information on results obtained by national technical means of verification.

5. International co-operation

5.1 Negative provision(s)

The convention should be implemented in a manner designed to avoid hampering the economic and technological development of parties, for peaceful and protective purposes in fields related to the convention.

5.2 Positive provisions

5.2.1 Parties could undertake to exchange information, equipment and materials in order to facilitate the use of chemical agents for peaceful and protective purposes.

5.2.2 The convention could reflect the principle that a substantial portion of possible savings from disarmament measures should be devoted to promoting economic and social development, particularly in developing countries.

5.2.3 The convention could provide for assistance in accordance with the United Nations Charter to parties which so request, if the Security Council decides that they have been exposed to danger as a result of a violation of the convention. This assistance could include protective equipment and medical support in the treatment of chemical casualties.

As an alternative the consultative committee could fulfil this function.

6. Formal provisions

6.1 Entry into force

As in the ENMOD Convention it could be stipulated that the convention shall enter into force upon the deposit of instruments of ratification by .... Governments. For those States whose instruments of ratification or accession are deposited after the entry into force of the convention, it could enter into force on the date of the deposit of their instruments of ratification or accession.

6.2 Signature, ratification, accession

As in the ENMOD Convention it could be stipulated that the convention shall be open to all States for signature - to be subsequently ratified - and that any State which does not sign the convention before its entry into force may accede to it at any time.

6.3 Depositary

As in the ENMOD Convention instruments of ratification or accession could be deposited with the Secretary-General of the United Nations.

6.4 Duration

As in the Biological Weapons and the ENMOD Conventions the convention could be of unlimited duration.

6.5 Withdrawals

As in the Biological Weapons Convention States parties could have the right to withdraw from the convention if they decide that extraordinary events, related to the subject matter of the convention, have jeopardized their supreme interests. It could be stipulated that notice of withdrawal should be given three months in advance and would include a statement of the extraordinary events which the notice-giving parties regard as having jeopardized their supreme interests.

6.6 Review conferences

As in the Biological Weapons Convention it could be stipulated that a conference of the States parties should be held at Geneva ... years after the entry into force of the convention, or earlier if this is requested by a majority of the parties, possibly including the five permanent members of the Security Council, to review the operation of the convention. Provisions for further review conferences, to be held at intervals of five years thereafter and at other times, if requested by a majority of the parties, possibly including the five permanent members of the Security Council, could be included in accordance with established practice concerning the Biological Weapons Convention, though in that case such a provision was not specifically included. Review conferences could also have the function of revising the convention.

6.7 Amendments

As in the Biological Weapons Convention it could be stipulated that amendments, proposed by States parties, shall enter into force for each State party accepting the amendments upon their acceptance by a majority of the States parties and thereafter for each remaining State party, when it accepts them.

6.8 Preamble, annexes and other texts related to the convention

A preamble could be considered expressing the general considerations of the object and purpose of the convention. Furthermore, it could contain a reference to the relationship between the Convention, the 1925 Geneva Protocol and the Biological Weapons Convention.

The detailed technical questions involved in the convention, as well as the detailed organizational and procedural questions regarding the possible consultative committee could be dealt with in annexes, which would form integral parts of the convention.

Voluntary confidence-building measures could be dealt with in resolutions to be adopted by the United Nations General Assembly.

If detailed provisions are needed to deal with the relationship between the convention, the 1925 Geneva Protocol and the Biological Weapons Convention, it could be considered whether such provisions should be embodied in an annex or in a separate protocol.

A protocol could also be considered to deal with possible applications to the 1925 Geneva Protocol, and the Biological Weapons Convention of provisions in a chemical weapons convention, e.g. those concerning the functions of a consultative committee.

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YUGOSLAVIA

Working Paper

INCAPACITATING AGENTS

(Some aspects of definition, classification and toxicological characteristics)

According to the general purpose criterion, incapacitating agents, owing to their physical, chemical and other characteristics, canbe used for both military and non-military purposes (better known as a part of dual-purpose agents). According to the degree of toxicity, these compounds should be classified as non-lethal or other harmful chemicals (USSR-USA Joint Report, CD/112, 7 July 1980).

The need to establish the toxicity (not only the lethality) criteria as part of the definition of scope for a chemical weapons convention has been generally agreed in the Committee on Disarmament. For these reasons, the classification of incapacitating agents can be made on the basis of the toxicological manifestations (symptoms) or on the basis of the time of their onset and the duration and disappearance of symptoms after exposure to these substances (Table 1). For the purpose of the future convention on the prohibition of chemical weapons, it seems more acceptable to us to classify incapacitating agents according to the duration of toxic effects into two main categories:

- Short-term incapacitants

- Long-term incapacitants

In the military sense, both categories could be defined as chemical agents which impair the subjects' ability to carry out duties, but the use of which does not incur serious risk or death or permanent injury. Therefore, incapacitating agents produce in normal (healthy) people a temporary, reversible disability with few, if any, permanent effects. However, in young children, old people and those with impaired health, the effect may sometimes be aggravated. They are called incapacitating agents because the ratio between the lethal and incapacitating doses is very high.

SHORT-TERM INCAPACITANTS

Short-term incapacitants may be defined as chemical compounds that are capable of rapidly causing a temporary disablement that lasts a little longer than the period of exposure. They have also been called "harassing agents", "riot agents", etc. They are unlikely to kill or produce long lasting injury, except when used in doses (concentrations) much higher than those necessary to produce disablement. Short-term incapacitants have been extensively employed in wars and by police forces (about 15 sensory irritants have been used at various times in different parts of the world). They are peripheral sensory irritant materials which interact, at the site of action (contamination), with sensory receptors in the skin and mucosae, causing local uncomfortable sensation with related reflex effects (Table 2). The uncomfortable sensation and reflex effects hinder the performance of co-ordinated activities and this forms the basis for the short-term incapacitating or harassing properties of these chemical substances. We would like to underline that what is characteristic of these substances is the prompt onset of effect upon exposure and the rapid disappearance of signs and symptoms after the period of exposure.

On the basis of exposure to aerosols or smokes, sensory irritants have been broadly classified into those for which the principal site of action is the upper respiratory tract ("sternutators"), and those having their main effect on the eye ("lachrymators" or, euphemistically, "tear gases").

The most important members of this group are:

- O-chlorobenzylidenemalononitrile (CS) ("Irritant agent")

- Dibenzoxazepine (CR) ("Irritant agent")

- Chloracetophenone (CN) ("Tear gas")

- Dipnenylaminochlorarsine (DM) ("Sickening agent", "Vomiting agent").

On the basis of the onset of symptoms (several minutes after exposure) and recovery time (several hours), DM is unsuitable as a short-term incapacitating agent.

LONG-TERM INCAPACITANTS

Long-term incapacitants may be defined as chemical compounds whose application causes temporary illness or induces temporary mental or physical disability, the effect of which may be delayed in onset and whose duration greatly exceeds the exposure period. These incapacitating agents could be classified as physical incapacitants or mental incapacitants, according to whether they act predominantly on the physical or mental activities of the subject.

Physical incapacitants

The effects of physical incapacitants - that is to say, agents which do not depend for their incapacitating effects solely upon action on the central nervous system, or on military performance - are more predictable than those with dominant action on the central nervous system ("psychochemicals", "mental incapacitating agents"). On the other hand, physical incapacitants, i.e. agents which disrupt the basic life-sustaining system of the body and thus prevent the execution of physical activity (lower blood pressure, paralysis of skeletal muscles, respiratory depression, etc.) almost invariably have a low margin of safety between the effective (incapacitating) and possible lethal doses and thus do not fulfil the basic purpose of an incapacitating agent which is to reduce military effectiveness without endangering life.

Possible mechanisms of physical incapacitation are many, but the mentioned criterion of low margin of safety means that no practical physical incapacitant is known at present, although the vomiting agent DM is described as a physical incapacitant.

Mental incapacitants

There are many chemical substances which act upon the central nervous system to produce incapacitation. Few of these are sufficiently potent and "safe", or possess the necessary chemical and physical properties to make them potential chemical agents. An example of this type of agent is the BZ-compound whose application produces severe mental disturbances. In minute doses it will merely give changes in mood, varying from an apparent drunken happiness to deepest despair. In larger doses, it produces severe hallucinations and one no longer knows who they are or what they are doing. The military effect, therefore, varies from disturbance of morale to a complete breakdown of military discipline, resulting in the inability to appreciate and carry out orders. The onset of symptoms may be delayed from one to several hours while the duration of effects from a few hours to several days. During this phase, the subject may inflict injury on himself or on others. Memory during the period of intoxication may be lost or fragmentary.

* * *

On the basis of all that has been mentioned, the problem of quantitative evaluation of incapacitants, especially psychochemicals, regarding experimental animals in relation to lethal chemical warfare agents seems to be more complicated. As we have pointed out, different incapacitating agents produce different effects and each type requires a separate method for the determination of the effective (incapacitating) dose and the possible extrapolation with regard to humans.

If the toxicity criterion is to be one of the foundations for the prohibition of highly toxic or lethal chemical warfare agents, then incapacitating agents and among them riot control agents only, should be the subject of further consideration and agreement. The other incapacitating agents should be encompassed by the Convention in order to be banned. In our opinion, a quantitative limitation of production and a limitation of the types of incapacitating agents and types of devices for their use should be set in order to distinguish them as much as possible from those agents which can be used as chemical weapons. If new short-term incapacitating compounds are discovered in the future, the criterion for their possible use should be based on the safety threshold for humans and should in any case be of a similar or lesser toxicity than the existing ones.

Table 1

CLASSIFICATION OF INCAPACITATING AGENTS
ACCORDING TO DIFFERENT SOURCES

Medical (Toxicological) Classification	Equivalent Military (Service) Classification
SHORT-TERM INCAPACITANTS	
Sensory irritant agents (Lachrymators - tear gases, Sternutators, Vomiting or Sickening agents, etc.)	Riot control agents Harassing agents
LONG-TERM INCAPACITANTS	
1. Peripherally-acting physiochemicals Non-irritant agents Non-irritant physiochemicals	Physical incapacitants Immobilizing agents Physically incapacitating agents
2. Centrally-acting physiochemicals Psychotomimetic agents	Mental incapacitants Psychochemicals Mentally incapacitating agents

Table 2

LOCAL EFFECTS OF SENSORY IRRITANTS AT VARIOUS BODY AREAS*/

Affected area	Symptoms
Eyes	Burning sensation or pain, heavy flow of tears. Involuntary closing of eyes.
Mouth	Stinging or burning sensation of palate and tongue.
Nose	Irritation, burning sensation. Nasal discharge.
Chest	Irritation, burning sensation. Coughing, feeling of suffocation. Tightness in chest, often accompanied by a feeling of panic.
Skin	Stinging or burning sensation on moist skin areas, usually accompanied by redness (erythema). Blisters from very heavy concentrations.

*/ Mentioned effects on the recipient create a sense of panic, make him cease performing acts of violence and force him to abandon the immediate area.

COMMITTEE ON DISARMAMENT

CD/196
16 July 1981

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LETTER DATED 13 JULY 1981 ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT FROM THE MINISTER COUNCELLOR OF THE PERMANENT MISSION OF FINLAND TRANSMITTING A DOCUMENT ENTITLED "TRACE ANALYSIS OF CHEMICAL WARFARE AGENTS" 1/

I have the honour to transmit to you a document entitled "Trace Analysis of Chemical Warfare Agents". This study was presented at a Chemical Weapons Workshop held in Helsinki on 2-4 July 1981.

The workshop was arranged in order to demonstrate the Finnish project for CW verification.

Thirty diplomats and experts from 16 countries and United Nations Secretariat participated in the workshop which gave a possibility for exchange of views on various aspects of the role and requirements of laboratory analysis in verification of chemical disarmament. Discussions with experts indicated wide agreement on the suitability and efficiency of the presented analytical methodology and instrumentation for CW verification analysis. Adaptation of analytical systems for practical use and extension of the methodology and data base also for non-phosphorus warfare agents was considered as important future work in many comments. Capability to analyse biological samples for verification of alleged exposure to CW agents was also considered necessary.

Demonstration of the developed analytical systems, laboratories and selected instrumental facilities were performed in two stages in relation to the proposed approach to the potential verification tasks: as a research or central laboratory verification procedure and as a mobile laboratory verification procedure. The former procedure is capable of detecting and identifying any toxic chemical agent and its degradation product, and the latter is used for on-site monitoring of known chemical agents. Because of simplicity and clarity, all research teams demonstrated Sarin and Soman monitoring as model experiments. These agents are also the model compounds of the fourth Blue Book published just before the workshop. The research laboratory procedure proposed as a basis for standardization consists of sampling and sample concentration, enzymatic toxicity test for nerve agents, phosphorus and fluorine compound analysis, and finally ultrasensitive trace organic analysis. If no nerve agents or related compounds are found in the sample standard organic chemical structure, analysis will be carried out for the suspected toxic compound. Despite the fact that the procedure demonstrated was designed for organophosphorous warfare agents it is after certain modifications also applicable for any important chemical warfare agents. This work is part of the next phase of our project.

1/ A limited distribution of this document in English has been made to the members of the CD. Additional copies are available from the Ministry for Foreign Affairs in Helsinki.

The complete verification procedure requires rather heavy and sophisticated instrumentation which presupposes a well equipped analytical laboratory. The equipments and instrumentation demonstrated consist of sampling and sample preparation equipments, enzymatic analysers, high resolution gas and liquid chromatographs, high resolution mass spectromater and Fourier transform nuclear magnetic resonance spectrometer. Different instrumental techniques are needed to produce unambiguous verification data from control samples to be able to cope with any type of sample matrices and agent categories. While enzymatic measurements serve as characterizing nerve agent type toxicity chromatographic, mass spectrometric and nuclear magnetic resonance spectrometric data serve as mutually independent data for chemical characterization and identification of agents.

Excluding mass and nuclear magnetic resonance spectrometry from the complete procedure a simplified monitoring procedure is obtained. Sampling, sample concentration, enzymatic and high resolution gas chromatographic analysis can be carried out in a light and easily transferable mobile laboratory. Principle and operation of such a mobile laboratory developed in connection of the Finnish project was also demonstrated to the participants of the CW verification workshop. The presented laboratory is a prototype and its construction and instrumentation as well as application for openair verification tests will be described in a later report.

(Signed) Paavo Keisalo

Minister Counsellor

CD/197
17 July 1981
Original: ENGLISH

ROMANIA

WORKING PAPER

SUGGESTIONS FOR ELEMENTS OF A CHEMICAL WEAPONS CONVENTION

DEFINITIONS AND CRITERIA

A. DEFINITIONS

1. Chemical agents are: chemical warfare agents including irritating chemical agents used for riots control, as well as herbicides and defoliants used for military purposes.

2. Chemical warfare agents are: all chemical substances or their combinations, which used in accordance with their toxic properties cause intoxications of human body and animals or bring about the destruction of plants and vegetation and whose physical and chemical characteristics make them appropriate for use as chemical weapons. Chemical warfare agents are: super-toxic lethal chemical agents; other lethal chemical or biochemical agents; harmful agents including incapacitating agents as well as their precursors, including compounds used in binnary chemical munitions.

- Super-toxic lethal chemical warfare agents are all agents whose medium lethal dose is equal or less than 0.5 mg/Kg (Kilo-body) (LD - 50) or less than 2,000 mg.min/mc. (LC_t - 50), measured by a method to be agreed upon by all States Parties to the future Convention.

- Other lethal chemical warfare agents are all agents whose medium lethal dose is between 0.5 - 10 mg/Kg (LD - 50) or between 2,000 - 20,000 mg.min/mc (LC_t - 50) measured by a method to be agreed upon by all States Parties to the future Convention.

- Harmful chemical agents[x/] including incapacitating agents are all agents whose lethal dose is greater than 10 mg/Kg (LD - 50) or 20,000 mg.min/mc (LC_t - 50) measured by a method to be agreed upon by all States Parties to the future Convention.

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x/ Non-lethal chemical agents.

3. Chemical warfare agents may be produced for single or dual purpose:

- Single purpose chemical warfare agents are all agents which may be used only for military purposes;

- Dual purposes chemical warfare agents are all agents which may be used for military as well as peaceful purposes;

4. Chemical munitions are any means whose warfare charge is a chemical warfare agent or precursors which during their delivery through a synthetical reaction do produce an agent and which can be dispersed on the target.

5. Chemical weapons are combinations of chemical munitions or chemical warfare agents and devices or equipment which permit dispersing the agent on the target.

6. Chemical weapons systems include chemical munitions or chemical warfare agents in bulk and specifically means to make possible their use.

B. CRITERIA FOR DEFINITION

The definition of chemical warfare agents should be based on two important criteria: purpose and toxicity, but which may be complemented by other secondary criteria, such as: effectiveness, chemical structure, volatility and others.

The main criterion and the most important is the purpose criterion. It defines the destination and the quantities in which chemical warfare agents are produced. From this point of view chemical warfare agents can be classified as follows:

- Single purpose chemical warfare agents which can be used only for military purposes.

- Dual purpose chemical warfare agents which can be used in military and peaceful purposes alike. The use of chemical substances considered as chemical warfare agents for peaceful purposes covers their use in:

  - industrial output;
  - protection against chemical weapons in civil defence;
  - medical field;
  - science and research.
  - agriculture;

The second criterion is the toxicity criterion, which defines the efficiency of the chemical warfare agents against men, animals and plants.

Toxicity criteria are in fact necessary to determine the following:

- inhalation toxicity;
- subcutaneous toxicity;
- percutaneous-route toxicity;
- intraperitoneal injection toxicity.

From the toxicity point of view, chemical warfare agents can be classified as follows: super-toxic chemical warfare agents, other lethal chemical warfare agents and harmful chemical warfare agents, with non-lethal effects.

Effectiveness criterion can be very important for incapacitating agents.

Chemical structure criterion may be used as a basical element in verification system. The chemical structure criterion can be very useful for binary weapons control.

Volatility criterion is an important criterion from a military point of view. Thus, chemical warfare agents can be classified as: persistent and non-persistent chemical warfare agents.

CD/199
24 July 1981
Original: ENGLISH

CZECHOSLOVAKIA

WORKING PAPER

DEFINITION AND CHARACTERISTICS OF THE TOXINS

In three classical instances (diphtheria, tetanus and botulism), typical bacterial exoproducts were discovered early in the history of bacteriology, soon after the identification of bacteria (Corynebacterium diphtheria 1884, Clostridium tetani 1890, Clostridium botulinum 1897). While in most instances it is still difficult to establish which of the multitude of bacterial properties determine the microb's ability to cause disease, in these three cases it was fairly easy to establish the role of bacterial "toxins"; it was found that the bacteria produce exoproducts, which when applied to experimental animals mimic the natural disease.

The introduction of the term toxin is rather obscure. It originated soon after the three above-mentioned infectious diseases were identified as "intoxications" (that is, not the proliferation of bacteria in the organs, but the production of toxic exoproducts causes the disease).

A poison may be defined as any chemical substance which when introduced into a suitable host -- either parenterally (by injection), orally, by inhalation or by any other route results in overt damage to tissues or interruption of normal physiological functions, and if the dosage is sufficient, in death of the individual.

The distinction between poison and toxin was made by early investigators although no hard rules were even established, nor are they established today. A tacit agreement was arrived at, namely that toxins are antigenic poisons of microbial origin (the term antigenic means that they are able to induce the antibody response in the body; to be able to do this, their molecules must have rather high molecular weight and a complex structure -- in most instances they are proteins).

This definition does not cover, however, the whole problem. An infectious disease is a result of complicated interrelationships between the host and the micro-organism. The micro-organisms display metabolic activity and produce many soluble substances which can be found in the tissues of the infected host, as well as in laboratory cultivating media. The majority of these substances have been found to have a "toxic activity", demonstrated by damaging cells or tissues in some laboratory artificial system (experimental animals, their isolated tissues and cells etc.); their concrete role in causing the disease in man remains, however, uncertain. This is specifically true for some bacterial species, which -- before the BW treaty was concluded -- had belonged to the most important candidates as biological warfare agents (such as the agents of anthrax or plague). Hence it is very difficult (at present time largely impossible) to make a clear borderline between infection and intoxication.

There is also an increasing evidence indicating that only a few toxins are "simple toxins" -- as are for instance tetanus or botulinum toxins, both being homogeneous proteins, synthesized by bacterial cells as a fully active molecule. More often, the toxins are actually mixtures of substances of different chemical nature, and with different functions. The final "toxic activity" is thus often a sum of different discrete metabolic and other changes, and no one specific substance can be identified as the main one responsible for the "toxicity".

It should be also understood that toxins are not produced by a micro-organism just to be toxic. For the microb they serve as tools necessary mainly for active accommodation of the microenvironment, to create conditions needed for metabolism, growth and proliferation of microbial cells. They have been developed during the long evolution process of adaptation of the micro-organisms to their hosts. Accordingly, the "toxic mechanism" might be rather complex and subtle.

A lethal infectious disease such as cholera may be used as an example. Cholera is a typical intoxication localized in the small intestine. The toxin (cholera enterotoxin) is able to cause damage to some isolated tissues of experimental animals, so it was believed that some kind of injury of the small intestine mucous membrane is the reason for the disease in man. In the last years the "intoxication process" has been analysed in more detail. It appeared than in man, there is no injury to the mucous membrane cells at all. The toxin has only learnt the mechanism regulation secretion of fluid into the small intestine (something that the science itself has not yet sufficiently understood), is able to recognize and to react with the necessary receptors in the cell membrane and to give them false signal for secreting the fluid. Nothing more is needed for the cholera bacterium for which alkaline fluid, pumped into the intestine in an amount of 20-30 litres, is the most satisfactory living medium.

To find such very specific toxic activities, equally specific testing methods are needed for objective evaluation of the effects on man. These methods are not based on ccepted toxicological techniques; the discrete regulatory mechanisms and cell-interactions ought to be studied. For research as well as for routine purposes they are performed by microbiological, not by toxicological laboratories.

Another important fact is that in spite of much effort spent on these problems, the chemical structure of majority of toxic substances has not yet been deciphred. In the protein toxins some typical aminoacid components were identified (e.g. in botulo- and tetanotoxin), but the molecular groups determining the specific biological activities are not known.

In addition to all these factors emerging from deeper understanding of micro-organisms and of infectious disease, it should be stressed that the current understanding of the term "toxins" has also become substantially broader. It actually shifted to a vast variety of metabolic products of many species of micro-organisms as well as of higher living organisms (plants, mushrooms, snakes, etc.), with a great diversity of damaging biological activities.

Many of these products are not of protein nature; their molecule has a more simple structure, and there is an increasing list of toxins whose chemical formula has been already recognized (e.g. saxitoxin, tarichatoxin, tetrodotoxin, bufotoxin, urare, strychnin, muscarin...). Substances of such simple chemical structure are not able to stimulate the antibody production. With respect to chemical structure (and hence also to their antigenicity), these toxic substances clearly differ from bacterial toxins. Clear enough, also, that having their molecule more simple, and better understood, they might become candidates for production by modern methods of chemical synthesis.

For all these reasons, the definition of toxins as a class of chemical substances, based on their chemical structure, is not available (and with present scientific knowledge it is not possible); hence it is not possible to include the toxins into a certain category of chemicals. The only fundamentally important characteristic valid for all toxins is their organic origin plus a kind of prominent biological activity.

<u>Conclusion:</u>

The toxins whatever their origin or method of production have been covered by the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction. The consequence of any other arrangement could be predicted with certainty: undermining he reputation of the BW treaty, and creating a really important "grey area" of ill-defined situations in CW treaty, leading to many misunderstandings, misinterpretations and endless queries.

COMMITTEE ON DISARMAMENT

CD/203
30 July 1981

Original: ENGLISH

THE NETHERLANDS

Consultation and Co-operation, Verification Measures and Complaints Procedure in the framework of the Convention on the complete and effective Prohibition of the Development, Production and Stockpiling of all Chemical Weapons and on Their Destruction.

1. Consultation and Co-operation

1. The States Parties to this Convention undertake to consult one another and to co-operate in solving any problems which may arise in relation to the objectives of, or in the application of the provisions of the Convention.

2. Consultation and co-operation pursuant to this article may be undertaken directly between two or more States Parties to this Convention and through appropriate international procedures within the framework of the United Nations and in accordance with the Charter. These international procedures include the services of appropriate international organizations, as well as of a Consultative Committee of experts as provided for in paragraph 3 of this article.

3. For the purpose of providing a permanent body for consultation and co-operation pursuant to paragraph 1 of this article and to ensure the availability of international data and expert advice for assessing and verifying compliance with the provisions of this Convention in accordance with the provisions of this Convention a Consultative Committee of experts shall be established at the entry into force of this Convention for the duration of the Convention. Each State Party to the Convention may appoint .. representative. to this Committee.

4. The depositary or his personal representative shall serve as president of the Committee and convene it at least once a year, or otherwise immediately upon receipt of a request from any depository to this Convention.

5. Each State Party to this Convention undertakes to co-operate with the Committee in carrying out its tasks, including through its National Implementation Agency specified in article ..., paragraph ..

6. The functions, organization and procedures of the Committee are set forth in annex ..

2. Verification

(a) General

1. Verification will consist of national and international measures that shall be considered as complementary to each other.

2. Each State Party to this Convention will designate a National Implementation Agency that will oversee the implementation of the Convention and that will be responsible for the collection of all data relevant to the activities required by the provisions of this Convention.

3. The National Implementation Agency of each State Party to this Convention will provide the Consultative Committee of experts with all data necessary to the execution of the task of the Committee with respect to verification of compliance with the Convention. In case of inspections or other on-site visits by experts, organized by and under responsibility of the Consultative Committee according to the provisions of this Convention, the National Implementation Agency will extend all assistance requested including technical assistance and the provision of data.

(b) Verification tasks of the Consultative Committee of experts
Destruction and Diversion of Stocks

4. The Consultative Committee of experts shall permanently oversee the destruction and diversion for permitted purposes of declared stocks of chemical weapons as stipulated in article .. of this Convention.

5. The Consultative Committee shall undertake on-site inspections, if it so deems necessary on a permanent basis, in order to confirm, in conformity with its task specified in paragraph 4 above, received information that the destruction and diversion for permitted purposes of declared stocks of chemical weapons as stipulated in article .. of this Convention is effectuated in accordance with this Convention.

Destruction, Dismantling and Conversion of Means of Production

6. The Consultative Committee of experts shall oversee the destruction, dismantling and temporary conversion of declared means of production of chemical weapons as stipulated in article .. of this Convention.

7. The Consultative Committee shall undertake on-site inspections at the beginning as well as upon completion of the destruction, dismantling and temporary conversion of declared means of production of chemical weapons as stipulated in article .. of this Convention, in order to confirm, in conformity with its task specified in paragraph 6 above, received information that these activities are effectuated in accordance with this Convention.

Production of Supertoxic Lethal Chemicals

8. The Consultative Committee shall check periodically whether the declared production of supertoxic lethal chemicals for permitted purposes does not exceed the quantity specified in .....

9. The Consultative Committee shall randomly inspect on-site in order to confirm, in conformity with its task specified in paragraph 8 above, that the declared production of supertoxic lethal chemicals for permitted purposes does not exceed the quantity specified in ....

Confidence with respect to compliance

10. The Consultative Committee shall in any possible way endeavour to create confidence that the production of supertoxic lethal chemicals for permitted purposes does not exceed the quantity specified in ...... and that production of chemicals for non-permitted purposes does not take place.

11. The Consultative Committee shall undertake on-site inspection on a random basis at facilities and on the territory of States Parties that will at regular intervals be assigned by lot, with a view to enhance confidence, in conformity with paragraph 10 above, that the production of supertoxic lethal chemicals for permitted purposes does not exceed the quantity specified in .... and that production of chemicals for non-permitted purposes does not take place.

Alleged ambiguities and violations

12. The Consultative Committee shall be competent to enquire into facts concerning alleged ambiguities in or violations of the compliance with the Convention, including reports or indications the confirmation of which would corroborate the conclusion that a State Party would have violated any obligation under this Convention. This competence includes enquiry into facts concerning reports or indications of use of chemical weapons by or with the assistance of a State Party to this Convention.

13. The Consultative Committee shall be competent to undertake on-site inspections in order to enquire into facts concerning alleged ambiguities or violations according to paragraph 12 of this article. Such on-site inspection shall take place only after consultation with the State Party concerned. If that State Party does not agree to on-site inspection, it must give appropriate explanations to the effect that an on-site inspection would at that time jeopardize its supreme interests. In such case the Consultative Committee shall examine the validity of these explanations.

(c) National technical means of verification

14. Each State Party to this Convention may use national technical means of verificatiom, at its disposal for the purpose of monitoring compliance with the provisions of this Convention in a manner consistent with generally recognized principles of international law.

15. Each State Party to this Convention undertakes not to impede, including through the use of deliberate concealment measures, the national technical means of verification of other States Parties operation in accordance with paragraph .. above.

3. Complaints Procedure

1. Any State Party to this Convention which has reason to believe that any other State Party is acting in breach of obligations deriving from the provisions of the

Convention may lodge a complaint with the Security Council of the United Nations. Such a complaint should include all relevant information as well as all possible evidence supporting its validity.

2. Each State Party to this Convention undertakes to co-operate in carrying out any investigation which the Security Council may initiate, in accordance with the provisions of the Charter of the United Nations, on the basis of the complaint received by the Council. The Security Council shall inform the States Parties of the results of the investigation.

3. Each State Party to this Convention undertakes to provide or support assistance, in accordance with the provisions of the Charter of the United Nations, to any State Party which so requests, if the Security Council decides that such Party has been harmed or is likely to be harmed as a result of violation of the Convention.

COMMITTEE ON DISARMAMENT

CD/212
13 August 1981

ENGLISH
Original: CHINESE

CHINA

Some viewpoints on the Prohibition of Chemical Weapons

The question of the prohibition of chemical weapons has been one of universal concern to the peoples of the world for a long time. Paragraph 75 of the Final Document adopted by the General Assembly at its first special session on disarmament points out: "The complete and effective prohibition of the development, production and stockpiling of all chemical weapons and their destruction represent one of the most urgent measures of disarmament. Consequently, the conclusion of a convention to this end, on which negotiations have been going on for several years, is one of the most urgent tasks of multilateral negotiations".

As is well known, during the First World War nearly 1,300,000 people were injured or killed by poisonous gases. Since then, the chemical weapons developed have been more numerous in type and characterized by their greater capacity for mass destruction.

The Geneva Protocol of 1925 already provides for the prohibition of the use of chemical weapons in war; nevertheless, in many wars, including some wars that took place recently in the Asian region, chemical weapons have been used all along.

Chemical weapons possess these characteristics: they are multiple in their effects, low in cost, easy to manufacture and convenient to proliferate. The rapid development of modern science and technology has provided various necessary conditions and new possibilities for the production of chemical weapons. The appearance of new chemical warfare agents of higher toxicity that are more rapid in their effects, and whose physical and chemical characteristics are more suitable to the requirements of utilization, and the improvement of dissemination techniques will all substantially increase the lethal and injurious capabilities of chemical weapons. In particular, after the emergence of binary chemical weapon technology the production of chemical warfare agents has already become part of general chemical and industrial production, thus enabling preparations for chemical warfare to be conducted in greater secrecy and with greater ease. The Superpowers are developing and stockpiling large quantities of chemical weapons and have made chemical weapons one of their important means of warfare. Under these circumstances, it is all the more urgent that a convention completely prohibiting chemical weapons be concluded.

The Chinese Government has always attached great importance to the question of the prohibition of chemical weapons. In various United Nations forums, the Chinese delegation has clearly stood for the complete prohibition and total destruction of all chemical weapons, and the conclusion, as soon as possible, of an international convention on the complete prohibition and total destruction of all chemical weapons. In 1980, after participating for the first time in the work of the Committee on Disarmament, the Chinese delegation put forward working paper CD/102 in which we clearly indicated our basic position on the main contents of a convention prohibiting chemical weapons. The following are some further comments on certain substantive issues relating to the prohibition of chemical weapons:

1. The Chinese delegation proposes that the scope of the future convention prohibiting chemical weapons should include the prohibition of their development, production, stockpiling, acquisitions, transfer and use. Our proposal to include use in the scope of prohibition of the future convention is based on the following considerations.

Firstly, the Committee on Disarmament is engaged in negotiations on the conclusion of a separate convention which has not been in existence, aimed at the complete prohibition of chemical weapons. It is very important that such a convention should be truly comprehensive in nature.

Secondly, the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare concluded in Geneva in 1925 only provides for the prohibition of the use of chemical weapons in war, but does not provide for the prohibition of the use of chemical weapons in other armed conflicts apart from wars. This no longer corresponds to the realities of the international situation.

Thirdly, with the ceaseless development and evolution of military technology and methods of warfare, there can be found many examples of international treaties regulating wars reaffirming and supplementing each other. For example, in the two Additional Protocols to the four Geneva Conventions of 12 August 1949 on the protection of victims of international armed conflicts, which were elaborated in 1977, there are some articles which reaffirm the provisions of the four Geneva Conventions of 1949, and others which supplement and develop the Geneva Conventions. The 1925 Geneva Protocol itself is also a reaffirmation of and complement to the 1907 Hague Convention on the Prohibition of the Use of Poison and Poisoned Weapons. It can thus be seen that the strengthening of existing protocols or treaties by reaffirming and supplementing them with new international instruments is after all a normal phenomenon in the constant development of international treaties regulating wars. This has been done in the past, and will certainly be done again in the future.

In accordance with the above considerations, the inclusion of use in the scope of prohibition of the future convention prohibiting chemical weapons could only strengthen the 1925 Geneva Protocol. Such a convention will strengthen trust between countries, and we believe that more countries will accede to it as a result.

2. The Chinese delegation is of the view that in drafting a convention on the complete prohibition and total destruction of chemical weapons, it is imperative first to arrive at a clear definition of the chemical warfare agents to be prohibited. The question of definition not only concerns the scope of prohibition and the contents of the convention, but also has a bearing upon the relevant means and methods of verification.

The definition of a chemical warfare agent must be both comprehensive and accurate. Its comprehensiveness is designed to ensure that all chemical warfare agents which should be prohibited are brought within the scope of the prohibition. It should include not only supertoxic lethal agents but also incapacitating agents and irritant agents; it should include not only single-purpose chemical warfare agents but also dual-purpose chemical warfare agents and precursors which can turn into chemical warfare agents during the process of their use. The accuracy of the definition is designed to avoid erroneously including in the scope of the prohibition chemical substances which should not be prohibited, since that would adversely affect the development of the industrial and agricultural production of States and their scientific and technological progress.

3. The Chinese delegation, like many other delegations, has consistently favoured stringent and effective international monitoring and verification measures for prohibiting chemical weapons. The view expressed in working paper CD/106 put forward by the French delegation that "it would be more dangerous for the security of the countries affected to prohibit the manufacture and possession of chemical agents and weapons without providing means of verifying the strict application of the prohibition than to have no agreement whatsoever" is completely in accord with the actual situation. The fact that the 1925 Geneva Protocol does not contain articles on complaint and verification procedures with regard to violations of the convention prohibiting the use of chemical weapons has resulted in there being no investigation and confirmation of chemical weapons having been used in many wars and armed conflicts. This has emboldened some countries to use chemical weapons unbridled.

In its working paper CD/102, the Chinese delegation also clearly states that there should be stringent and effective measures for international control and supervision to ensure the strict implementation of the provisions of the convention. An appropriate organ of international control should be set up for this purpose, charged with the responsibility of verifying the destruction of chemical weapon stockpiles and the dismantling of facilities for their production. The organ should also be empowered to investigate charges on the use of chemical weapons and on any other violations of the convention. Appropriate measures should be spelled out to deal with verified cases of violations of the convention with a view to bringing about their prompt cessation. Moreover, the organ should provide strong assistance to imperilled contracting parties. The organ of international control should have qualified experts and advanced and effective verification techniques and devices to enable it to discharge the function of clear verification with which it is charged. In this way all contracting parties will be subject to equal control, thereby ensuring the strict implementation of the convention.

Many delegations attach very great importance to the question of on-site inspection, and have put forward quite a number of specific proposals. The Chinese delegation is of the view that in order to ensure strict implementation of the articles of a convention on the complete prohibition and total destruction of chemical weapons, provision must be made for certain necessary on-site inspection measures. For instance, there should be international on-site inspection measures with regard to charges on the use of chemical weapons, the destruction of chemical weapon stockpiles and the dismantling of facilities for their production.

4. Various delegations have suggested three methods of dealing with the question of production facilities for chemical weapons: dismantling, conversion to peaceful purposes and shutting them down. We consider dismantling to be conducive to enhancing a sense of security and trust between States and that it is the most appropriate method for dealing with facilities for the production of chemical weapons. Converting them to peaceful production and shutting them down are not ideal measures since they would not only make verification more difficult but would also carry the potential risk of the facilities being utilized again within a short period of time to renew production of chemical weapons.

CD/220
17 August 1981
Original: ENGLISH

Report of the Ad Hoc Working Group on Chemical Weapons to the Committee on Disarmament

I. INTRODUCTION

1. At its 105th plenary meeting on 12 February 1981, the Committee on Disarmament adopted the following decision:

> "The Committee further decides to re-establish, for the duration of its 1981 session, the *ad hoc* working group on effective international arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons, chemical weapons and radiological weapons, which were established on 17 March for its 1980 session, so that they may continue their work on the basis of their former mandates.
>
> It is understood that the Committee will, as soon as possible, review the mandates of the three *ad hoc* working groups with a view to adapting, as appropriate, their mandates to advance the progress of the process of negotiations towards the objective of concrete disarmament measures.
>
> ...
>
> The *ad hoc* working groups will report to the Committee on the progress of their work at any appropriate time and in any case before the conclusion of its 1981 session." (Document CD/151)

II. ORGANIZATION OF WORK AND DOCUMENTATION

2. At its 107th plenary meeting on 17 February 1981 the Committee appointed Ambassador C. Lidgard, Sweden, as Chairman of the Ad Hoc Working Group. Mrs. L. Waldheim-Natural, Chief, Geneva Unit, United Nations Centre for Disarmament, served as Secretary of the Ad Hoc Working Group.

3. The Ad Hoc Working Group held 12 meetings from 18 February to 22 April 1981 and 11 meetings from 17 June to 17 August 1981.

4. At their request, the Committee on Disarmament, at its 104th plenary meeting on 10 February 1981 and its 122nd plenary meeting on 7 April 1981, respectively decided to invite the representative of the following States not members of the Committee to participate in the meetings of the Ad Hoc Working Group: Austria, Denmark, Finland, Norway, Spain and Switzerland.

5. On the basis of the decision taken by the Committee at its 137th plenary meeting on 14 July 1981, the World Health Organization and the European Office of the United Nations Environment Programme were invited to nominate representatives to attend certain of the meetings of the Ad Hoc Working Group to provide technical information when necessary. In response to this invitation Dr. Mercier and Dr. Parizek of the ILO/UNEP/WHO International Programme on Chemical Safety (IPCS) and Dr. Huismans and Dr. Gilbert of UNEP's International Register of Potentially Toxic Chemical (IRPTC) attended consultations of the Chairman or meetings of the Working Group concerning toxicity determinations.

6. In carrying out its mandate the Ad Hoc Working Group took into account paragraph 75 of the Final Document of the first special session of the General Assembly of the United Nations devoted to disarmament, which in part reads as follows: "The complete and effective prohibition of the development, production and stockpiling of all chemical weapons and their destruction represent one of the most urgent measures of disarmament. Consequently, conclusion of a convention to this end, on which negotiations have been going on for several years, is one of the most urgent tasks of multilateral negotiations." The Working Group also took into consideration A/RES/35/144 B which in operative paragraph 3 "Urges the Committee on Disarmament to continue, as from the beginning of its session to be held in 1981, negotiations on such a multilateral convention as a matter of high priority, taking into account all existing proposals and future initiatives."

7. During the 1981 session the following official documents dealing with Chemical Weapons were presented to the Committee on Disarmament:

- CD/142 submitted by Sweden entitled "Prohibition of retention or acquisition of a chemical warfare capability enabling use of chemical weapons (4 Annexes)"
- CD/164 submitted by Finland entitled "Creation of Chemical Weapons Control Capacity — Present Phase and Goals of the Finnish Project"
- CD/167 submitted by Canada entitled "Verification and Control Requirements for a Chemical Arms Control Treaty based on an Analysis of Activities"
- CD/168 submitted by China entitled "Prohibition of Chemical Weapons: on the Definition of Chemical Warfare Agents"
- CD/169 submitted by China entitled "Dismantling of Production Facilities/ Means of Production for Chemical Weapons"

- CD/173 submitted by Canada entitled "Disposal of Chemical Agents"
- CD/124/Rev.1 submitted by Indonesia entitled "Revision of CD/124 on the Definition of Chemical Agent and Chemical Warfare Agent"
- CD/179 and Add.1 entitled "The Chairman's Progress Report to the Committee on Disarmament on the work of the Ad Hoc Working Group on Chemical Weapons"
- CD/183 submitted by Canada entitled "A Conceptual Working Paper on Arms Control Verification"
- CD/195 submitted by Yugoslavia entitled "Incapacitating Agents"
- CD/196 submitted by Finland entitled "Trace Analysis of Chemical Warfare Agents"
- CD/197 submitted by Romania entitled "Suggestions for elements of a Chemical Weapons Convention"
- CD/199 submitted by Czechoslovakia entitled "Definition and Characteristics of the Toxins"
- CD/203 submitted by the Netherlands entitled "Consultations and Co-operation, Verification Measures and Complaints Procedure".

8. In the conduct of its work during its 1981 session, the following working papers were circulated to the Working Group:

- CD/CW/WP.7 and Rev.1 entitled "Outline suggested by the Chairman for the work of the group -- Part 1"
- CD/CW/WP.8 and Corr.1 entitled "Outline suggested by the Chairman for the work of the group -- Part 2"
- CD/CW/WP.9 submitted by Canada entitled "Verification and Chemical Weapons"
- CD/CW/WP.10 and Corr.1 entitled "Outline suggested by the Chairman for the work of the Group -- Part 3"
- CD/CW/WP.11 submitted by Mongolia, Poland and the USSR entitled "Chemical Weapons: types of activity to be covered by a convention on the prohibition of chemical weapons"
- CD/CW/WP.12 entitled "Outline suggested by the Chairman for the work of the group -- Part 4"
- CD/CW/WP.13 entitled "Outline suggested by the Chairman for the work of the group - Part 5"
- CD/CW/WP.14 entitled "Outline suggested by the Chairman for the work of the group -- Part 6"
- CD/CW/WP.15 submitted by Bulgaria, Hungary and Poland entitled "Chemical weapons: definitions"

- CD/CW/WP.16 submitted by France entitled "Declarations and destruction of materials and facilities"
- CD/CW/WP.17 submitted by France entitled "Chemical weapons -- definitions, criteria"
- CD/CW/WP.18 submitted by Australia entitled "Initial Comments on the Consolidated Outline suggested by the Chairman of the <u>Ad Hoc</u> Working Group on Chemical Weapons"
- CD/CW/WP.19 entitled "Suggestions by the Chairman of the Working Group on Chemical Weapons for elements of a chemical weapons convention"
- CD/CW/WP.20 entitled "Suggestions by the Chairman of the Working Group on Chemical Weapons for elements of a chemical weapons convention"
- CD/CW/WP.21 entitled "Suggestions by the Chairman of the Working Group on Chemical Weapons for elements of a chemical weapons convention"
- CD/CW/WP.22 and Corr.1 and Rev.1 entitled "Report of the Chairman to the Working Group on Chemical Weapons on the consultations held on issues relating to toxicity determinations"
- CD/CW/WP.23 submitted by Australia entitled "Chemical Weapons Verification: Consultative Committee of Experts"
- CD/CW/WP.24 submitted by Australia entitled "Chemical Weapons Convention: Assistance to Parties"
- CD/CW/WP.25 submitted by Australia entitled "Chemical Weapons Verification: The Methyl-Phosphorous 'Finger Print'"

9. The following Conference Room Papers were also submitted during the Committee's 1981 session:

- CD/CW/CRP.5 and Rev.1 and 2 entitled "Suggestions by the Chairman for particular technical issues to be addressed during CD's 1981 work on chemical weapons"
- CD/CW/CRP.6 entitled "List of topics to be discussed with regard to the definitions and criteria of importance for a chemical weapons convention"
- CD/CW/CRP.7 submitted by Belgium entitled "Proposed definitions (revision of document CD/94)"
- CD/CW/CRP.8 submitted by France entitled "Criteria for definition"
- CD/CW/CRP.9 entitled "List of questions put to the delegations of the USSR and the USA at the meeting of 30 March 1981 with respect to the bilateral report, CD/112, and outlines by the Chairman for the work of the Working Group"

- CD/CW/CRP.10 and Add.1 and 2 and Corr.1 and Rev.1 entitled "Draft Progress Report to the Committee on Disarmament"
- CD/CW/CRP.11 entitled "Note by the Chairman"
- CD/CW/CRP.12 entitled "Suggestions for consultations on toxicity determinations"
- CD/CW/CRP.13 and Corr.1 entitled "Consolidated text of suggestions for elements I, I (bis) and Annex I of a Chemical Weapons Convention, received as at Friday, 26 June 1981"
- CD/CW/CRP.14 submitted by Australia entitled "Delegation Amendments to CD/CW/WP.19 and CD/CW/WP.20, Subject to Revision"
- CD/CW/CRP.15 and Add.1 entitled "Revised Suggestions by the Chairman for elements of a Chemical Weapons Convention"
- CD/CW/CRP.16 and Add.1 entitled "Compilation of suggested amendments to the draft Elements and Annexes proposed by the Chairman in documents CD/CW/WP.19 to 20"
- CD/CW/CRP.17/Rev.1, Add.1 and 2 and Rev.2 and 3, and Corr.1 entitled "Draft Report of the Ad Hoc Working Group on Chemical Weapons to the Committee on Disarmament"
- CD/CW/CRP.18 entitled "Suggestion by the Chairman of the Working Group on Chemical Weapons for recommendation by the Working Group to the Committee on Disarmament regarding decision on further work to be undertaken on methods for toxicity determinations for a Chemical Weapons Convention"

III

SUBSTANTIVE CONSIDERATIONS DURING THE 1981 SESSION

10. In accomplishing its task, the Working Group carried out another substantive and more detailed examination of the issues to be dealt with in the negotiation on a multilateral convention on the complete and effective prohibition of the development, production and stockpiling of chemical weapons and on their destruction. During the first part of the Committee's 1981 session the Working Group conducted its work on the basis of the outline suggested by the Chairman as contained in documents CD/CW/WP.7, 8, 10, 12, 13 and 14. The Chairman at the Committee's 127th plenary meeting on 24 April 1981 presented his report on the work of the Group during the first part of the 1981 session as contained in document CD/179. During the second part of the session the Working Group considered the draft elements of a chemical weapons convention, suggested by the Chairman and contained in CD/CW/WP.19, 20 and 21.

11. On the basis of statements as well as of oral and written comments by delegations, the Chairman, in an effort to elaborate the initial framework for a future chemical weapons convention which could facilitate further work, prepared revised versions of the draft elements for such a convention. These revised elements do not, however, reflect all the views which emerged on certain issues and include elements on which the delegation's views differed. Some delegations did not deem it advisable, at the present stage, to enter into discussion on certain elements, in particular some related to the issues of verification, proceeding from the belief that it was too early to do this until general agreement had been reached on the scope of the prohibitions. Others, however, expressed their opinions on these elements, proceeding from the belief that they could be examined at the present stage of the work and contribute to future negotiations. The revised text of the Chairman's elements as well as dissenting views as outlined in the comments are presented below. These comments do not, however, record all the positions of delegations which opposed these dissenting views. Delegations reserved themselves the right to further consider those and other proposals at the appropriate time.

12. Elements suggested by the Chairman and summary of related comments

I

General provision

Each State Party to this Convention should undertake, as set forth in the following Elements, never under any circumstances to develop, produce, otherwise acquire, stockpile, retain or transfer chemical weapons and to destroy or otherwise dispose of existing stocks of chemical weapons and means of production of such weapons.

Comments

- Some delegations regarded this element as superfluous on the ground that it would complicate the structure of the main prohibition under the convention and would render this prohibition less distinct. They asserted that mentioning in this element some prohibitions but not others would give rise to ambiguities regarding the scope of a convention. Others, who agreed with this element, believed that it was essential because it stated in clear terms the two main purposes of a convention, namely a set of prohibitions and an obligation to destroy the existing stocks of chemical weapons and the means of production of such weapons. Furthermore, this element would ensure the binding character of the undertakings to be entered into by the Parties to a future convention.

- Some delegations felt that a convention, so as to be comprehensive in nature, should aim at prohibiting chemical weapons in all their aspects and therefore also include a prohibition of use of chemical weapons in the scope of a convention. They held, inter alia, that this would strengthen the prohibition contained in the 1925 Geneva Protocol by adding measures of verification to it and by enlarging it to cover some hostile situations which they deemed not to be covered by the Protocol, whose scope of prohibition, in their view, only covers the use of chemicals in war. Others felt that a comprehensive prohibition of use was already contained in the 1925 Protocol, and that it should therefore not be restated because it would lead to the weakening of that Protocol. According to some delegations the verification mechanism of a future convention would also entail the division of States Parties to the Protocol into two categories on the basis of their obligations, namely those who have become Parties to a convention, and thus accepted the obligations of verification under it and those who have not become Parties to a convention and therefore have no such obligations. It was further felt by some that restating the prohibition of use would cast doubts on the recognized value of the Protocol. All agreed however that nothing in this convention should detract from the effectiveness of the 1925 Protocol.

- Some delegations supported the idea of including in the scope of a convention a prohibition specifically of planning, organization and training intended to enable the utilization of toxic properties of chemicals as chemical weapons in combat, in order to completely eliminate chemical warfare capability. Others objected that such a prohibition would be difficult to implement and verify. It was asserted, in addition, that the prohibition of the development, production, stockpiling and retention of all means of chemical warfare, including corresponding chemicals, munitions, devices and equipment as well as means of production of chemical weapons would lead to the elimination of the actual chemical warfare potential.
- Some delegations felt that the scope of a convention should include the prohibition of development etc. of chemicals for hostile purposes, involving the utilization of toxic properties of such chemicals not only against man but also against animals and plants. Some delegations indicated that they would prefer the scope of a convention to be extended to all chemicals capable of having toxic effects on all components of the environment. Others thought that the prohibition should refer to hostile purposes, involving the utilization of toxic properties of chemicals against man only, because, inter alia, the widespread civilian use of some of these chemicals would make verification very difficult.
- Some delegations suggested that the link between the scope of the Biological Weapons Convention and that of a chemical weapons convention should be referred to wherever appropriate.

II

General definition of chemical weapons

1. Chemical weapons, as referred to in Element I, would comprise:

(a) super-toxic lethal, other lethal, and other harmful chemicals as well as precursors of such chemicals, intended for hostile or military purposes involving the utilization of the toxic properties of such chemicals as weapons, provided their types are compatible with and that their quantities are sufficient for such purposes;

(b) munitions and devices, specifically designed to cause death or other harm through toxic properties of chemicals released from them as well as equipment specifically designed for use directly in connection with the employment of such munitions or devices.

2. Definitions of super-toxic lethal chemicals, other lethal chemicals, other harmful chemicals and precursors would be given in Annex I.

Comments

- Some delegations suggested that elements I and II, for increased clarity, should be combined and formulated along the lines in element I in CD/CW/WP.19. The Prohibition would then cover the development, production, acquisition, stockpiling, and retention of: (a) super-toxic lethal, other lethal and other harmful chemicals, and precursors of such chemicals, except those intended for non-hostile purposes or military purposes not involving the use of chemical weapons, provided their types and quantities are consistent with such purposes; (b) any munitions or devices, specifically designed to cause death or other harm through the toxic properties of the chemicals released as a result of the employment of these munitions or devices; (c) any equipment specifically designed for use directly in connection with the employment of such munitions or devices. Other delegations would prefer to maintain the formulation of element I, which seemed to them to reflect in a very clear manner the main purpose of a convention, which deals with a set of prohibitions, on the one hand, and with a precise obligation to destroy existing stocks and means of production, on the other. Element II would then contain the definition of chemical weapons, both for the purpose of the prohibitions and for the purpose of destruction.

- A delegation suggested that on logical grounds the subparagraphs in paragraph 1 of the element should be presented in the reversed order.

- Some delegations suggested the insertion of the words "chemical warfare agents, made up of" after "(a)" and before "super-toxic lethal".

- Some delegations also wished to have definitions of "chemical warfare agents", "hostile purposes", "non-hostile purposes", "permitted purposes", "chemical munitions" and "means of production of chemical weapons" included.

- Some delegations felt that all the definitions should be included in the main body of a convention and not in an annex. However the technical details such as those related to methods for toxicity determinations should remain in the annex.
- Some delegations suggested that chemical weapons should be understood to include certain chemical substances which, even if they are not toxic in nature could be employed as chemical weapons, for instance, psychochemicals and herbicides. Others saw great practical difficulties in this proposal.
- Some delegations considered that the general purpose criterion was not made sufficiently clear in this element. In their view the definition of chemical weapons should be formulated so as to state that these weapons include all kinds of chemical warfare agents whose toxic properties can be used for hostile purposes to cause death, injury or harm to human beings, animals and plant life.

ANNEX I

Definitions and Criteria

1. Definitions, criteria and methods in this Annex would be agreed upon for the purpose of this Convention.

2. A "super-toxic lethal chemical" is any toxic chemical, however produced, with a median lethal dose which is less than or equal to 0.5 mg/kg (subcutaneous administration) or 2,000 mg-min/m^3 (by inhalation), when measured by the methods set forth in paragraph 6 of this annex.

3. Any "other lethal chemical" is any toxic chemical, however produced, with a median lethal dose which is greater than 0.5 mg/kg (subcutaneous administration) or 2,000 mg-min/m^3 (by inhalation) and which is less than or equal to 10 mg/kg (subcutaneous administration) or 20,000 mg-min/m^3 (by inhalation) when measured by the methods set forth in paragraph 6 of this annex.

4. Any "other harmful chemical" is any toxic chemical, however produced, with a median lethal dose which is greater than 10 mg/kg (subcutaneous administration) or 20,000 mg-min/m^3 (by inhalation) when measured by the methods set forth in paragraph 6 of this annex.

5. "Precursors" are sets of chemicals, which, when made to react chemically with each other, form among others also such chemicals as are mentioned in paragraphs 2 - 4 of this Annex.

6. Methods for toxicity determinations and identification of chemicals.

[to be elaborated]

Comments

- It was generally felt that the definition of "precursors" required further study.
- Some delegations objected to the expression "however produced" in paragraphs 2 - 4 on the grounds that it would lead to confusion with regard to the Biological Weapons Convention.

III

Prohibition of transfer

Each State Party to this Convention should undertake:

(a) not to transfer to anyone, directly or indirectly, any chemical weapons;

(b) not to transfer to anyone, directly or indirectly, except to a State Party, any super-toxic lethal chemicals produced or otherwise acquired for permitted purposes, of types and in quantities which are suitable for chemical weapons purposes;

(c) not to assist, encourage or induce, directly or indirectly, anyone to engage in activities from which the State Party itself would be obliged to refrain under the Convention.

Comments

- Some delegations thought that the prohibition to transfer super-toxic lethal chemicals should be extended to other lethal chemicals. A delegation, however, felt that the prohibition on transfer of super-toxic lethal chemicals, except to State Parties, contained in (b) above, was subsumed under (c). No special provision therefore needed to be made with respect to super-toxic lethal chemicals, especially since this might imply less than strict application of the provision under (c).
- A delegation considered that the right implied in element III to transfer super-toxic lethal chemicals in types and quantities suitable for chemical weapons purposes to another State Party should only apply when these chemicals are intended for permitted purposes.
- Some delegations suggested that States Parties should be permitted to transfer to other States Parties their existing stocks of chemical weapons for the purpose of the destruction of these weapons.
- Some delegations felt that the wording of this prohibition was not sufficiently clear because of the ambiguity in the definition of chemical weapons.

IV

Declarations

1. Each State Party to this Convention should undertake to declare within 30 days after the Convention has entered into force or the State Party has adhered to it:

(a) its possession or non-possession of chemical weapons;

(b) its stocks of chemical weapons and means of production of such weapons;

(c) its plans for the destruction or, where appropriate according to Element V, diversion for permitted purposes of declared stocks of chemical weapons;

(d) its plans for the destruction, dismantling or, where appropriate according to Element V, conversion of declared means of production of chemical weapons.

2. Super-toxic lethal chemicals, acquired for non-hostile military purposes, should be declared. The location of facilities where super-toxic lethal chemicals are produced for such purposes should also be declared. Matters concerning the content and form would be set forth in Annex II.

Comments

- Some delegations considered that this element does not ensure a differentiated approach to the declarations, each of which has its own specificity. The element would have to be rearranged as regards the scope of activities to be declared and the time frames for various declarations.
- Some delegations suggested that all States Parties possessing stocks of chemical weapons and means of production of such weapons should simultaneously make the relevant declarations.
- Some delegations thought that all declarations should be made immediately at the entry into force of the convention or at the time of accession of States Parties.
- Some delegations felt that declarations concerning the location of the stocks of chemical weapons could not be provided within the time limit stipulated in the element.
- Some delegations suggested that chemical weapons munitions filling facilities and specific weapon systems designed for the employment of chemical warfare agents should be declared at the entry into force.
- Some delegations considered that States Parties should declare not later than 10 years after the entry into force of the convention the complete cessation of activities and the destruction or conversion of materials and facilities which are needed for the planning, organization and training intended to enable the utilization of toxic properties of chemicals as chemical weapons in combat.
- Some delegations felt that the wording of this element was not sufficiently clear because of the ambiguity in the definition of chemical weapons.

ANNEX II

Declarations of possession of stocks of chemical weapons and means of production of chemical weapons, plans for their destruction or diversion for permitted purposes and time frames as well as forms for making such declarations

1. The declarations stipulated in Element IV should contain information about:

(a) types and amounts of stocks of chemical weapons and of their location;

(b) location and capacity of means of production of chemical weapons, including specialized facility for permitted production of super-toxic lethal chemicals;

(c) plans for destruction or diversion of stocks of chemical weapons, including timing and specification of types and amounts and the location of plants for destruction and diversion;

(d) plans for the destruction, dismantling or conversion of means of production of chemical weapons, including their location and capacity.

2. Declarations as stipulated in Element IV should be forwarded to the Depositary, who would distribute them to the other States Parties to the Convention within one week after having received them.

3. Declarations should be sufficiently informative to allow independent verification of the information by national and international means of verification available to other States Parties to the Convention.

Comments

- Some delegations felt that it was premature to suggest the nature and content of declarations as long as no preliminary agreement had been reached on the general aspects of declarations in element IV.
- It was generally felt that further details would have to be elaborated concerning the standardization of forms for declarations.
- Some delegations felt that States Parties should not have to declare the location of stocks of chemical weapons at the entry into force of the Convention but rather the location where they would be assembled at a specific time after the entry into force.
- Some delegations felt that the wording of this annex was not sufficiently clear because of the ambiguity in the definition of chemical weapons.

V

Destruction, diversion, dismantling and conversion

1. Each State Party to this Convention should undertake to:

(a) destroy or divert for permitted purposes its stocks of chemical weapons;

(b) destroy or dismantle its means of production of chemical weapons.

2. Means of production of chemical weapons could be converted temporarily, before final destruction or dismantling, for the purpose of destroying stocks of such weapons. The destruction, diversion and dismantling stipulated in this Element should be completed within ten years after the Convention has entered into force or a State Party, which has to fulfil these provisions, has adhered to it.

3. Matters concerning procedures, including notifications, in connection with what is stipulated in this Element would be set forth in Annex III.

Comments

- Some delegations expressed their objection in principle to the implied possibility of conversion/diversion. They could, however, accept the term "conversion" provided it was only temporary conversion of means of production of chemical weapons for the purpose of destroying stocks of such weapons.
- Some delegations felt that destruction of stocks of chemical weapons should not take as long as 10 years. They thought, however, that if destruction must take so long, the stocks of chemical weapons should in the interim period be kept under international supervision.
- Some delegations suggested that appropriate forms of international co-operation should be envisaged in order to facilitate the implementation of provisions related to the destruction of stocks of chemical weapons for all States Parties.
- Some delegations felt that stocks of chemical weapons belonging to a State Party could be transferred for destruction purposes to another State Party and destroyed there.

ANNEX III

Destruction, dismantling or diversion for permitted purposes of declared stocks of chemical weapons and their means of production

1. Preparation for the destruction or diversion for permitted purposes of stocks of chemical weapons should start immediately after the entry into force of the Convention. So-called mothballing of means of production of chemical weapons should be undertaken immediately at the entry into force of the Convention and remain until their destruction, dismantling or diversion for permitted purposes would begin.

2. The provisions given in Element V should be performed in a manner allowing their verification through national and international means of verification.

3. The progress of destruction or diversion of stocks of chemical weapons and of destruction, dismantling or conversion of their means of production should be notified on a yearly basis to the Depositary until the State Party declares the final abolition of its stocks and means of production. The Depositary would transmit such notifications to the other States Parties to the Convention within one week after having received them.

Comments

- Some delegations felt that the contents of this annex must be further elaborated.
- Some delegations felt that the suggested content of this annex to a large extent had no direct relation to element V, but dealt with aspects which were provided for in other elements and opposed this annex.
- Some delegations felt that mothballing of means of production of chemical weapons should be under international supervision.

VI

Super-toxic lethal chemicals for non-hostile military purposes

Each State Party should undertake not to possess super-toxic lethal chemicals for non-hostile military purposes in an aggregate quantity, which at any time exceeds one thousand kilogrammes. A State Party producing super-toxic lethal chemicals for non-hostile military purposes shall carry out such production at a single specialized facility, the capacity of which shall not exceed ...

Comments

- Some delegations questioned whether it was appropriate to permit all States Parties, irrespective of their size, to possess as much as 1,000 kilogrammes of super-toxic lethal chemicals for non-hostile military purposes. Others considered the amount of 1,000 kilogrammes for the mentioned purposes excessive for any State Party.

VII

Relationship with other treaties

Nothing in this Convention should be interpreted as in any way limiting or detracting from the obligations assumed by any State under the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, signed at Geneva on 17 June 1925, or under the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, opened for signature on 10 April 1972, or any other international treaty or any existing rules of international law governing armed conflicts.

Comments

- Some delegations considered that mention should also be made of the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD) Convention among the treaties referred to. Others would have preferred to see all references to specific treaties deleted.
- Some delegations thought that the words "by any State under" should be replaced by "by States Parties to".
- Some delegations proposed the deletion of the words "or any existing rules of international law governing armed conflicts" while others suggested the deletion of the word "existing" only.

VIII

International co-operation

(1) This Convention should be implemented in a manner designed to avoid hampering the economic or technological development of States Parties to the Convention or international co-operation in the field of peaceful and protective chemical activities, including the international exchange of chemicals and equipment for the production, processing or use of chemical agents for peaceful and protective purposes in accordance with the provisions of the Convention.

(2) Each State Party to this Convention should undertake to facilitate, promote and participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the use of chemicals for peaceful and protective purposes consonant with the aims of this Convention.

(3) Each State Party to this Convention should undertake to allocate a substantial part of possible savings in military expenditures as a result of disarmament measures agreed upon in this Convention to economic and social development, particularly of the developing countries.

Comments

-- Some delegations considered that this element should contain categorical obligations for assistance to developing countries in training and equipping them with protective measures. A delegation further thought that a convention should include a provision for assistance to a State Party threatened with or subjected to a chemical attack.

-- Some delegations expressed concern, without questioning the importance of international co-operation measures referred to in this element, about the dangers of the transfer from one State Party to another of the technical knowledge necessary to produce chemical weapons.

-- Some delegations expressed doubts about the realism of the undertaking envisaged in paragraph 3 and suggested that it was inappropriate for inclusion in a chemical weapons convention. Others pointed out that the paragraph referred to "possible savings" and embodied a principle already accepted in other documents of the United Nations.

IX

General provision on verification

1. For the purpose of providing assurance of compliance with the provisions of this Convention, the States Parties should agree that verification would consist of national as well as international measures which should be considered as complementary to each other, as set forth in the following.

2. Such verification would be carried out through:

(a) monitoring of compliance with the obligations in Elements I-IV concerning prohibition of development, production, other acquisition, stockpiling, retention and transfer of chemical weapons;

(b) monitoring of compliance with the obligations in Elements I and V concerning

- destruction or diversion for permitted purposes of stocks of chemical weapons,
- destruction or dismantling of means of production of chemical weapons,
- temporary conversion of means of production of chemical weapons for the purpose of destroying stocks of such weapons;

(c) monitoring of compliance with the obligations in Element VI concerning super-toxic lethal chemicals for non-hostile military purposes;

(d) enquiry into facts, including where necessary on-site inspections, concerning alleged ambiguities in or violations of the compliance with the Convention.

3. National measures of verification would be carried out by a national verification system, organized, designated or employed by each State Party in accordance with its own legislation.

4. As regards international measures of verification a Consultative Committee of experts should be established in order to provide a permanent body for the monitoring of the implementation of and compliance with the provisions of this Convention on behalf of the international community by ensuring the availability of international data and expert advice to provide a basis for assessing such compliance.

Comments

- Some delegations stressed the importance of confidence-building measures, which ought to be discussed in context with the verification issues, especially those related to declarations.

- (Para. 1) Some delegations thought that international verification measures should form the basis for verification and that national measures could only be complementary to international measures.
- (Para. 1) Some delegations considered that national verification measures should form the basis for verification and that international measures were only supplementary, even though necessary, means.
- (Para. 2 (b)) Some delegations stated that the temporary conversion of means of production of chemical weapons was unacceptable.
- (Para. 2 (d)) Some delegations suggested the deletion of the words "including where necessary on-site inspection".
- (Para. 2 (d)) A delegation considered the term "ambiguities" as not sufficiently clear.
- (Para. 3) Some delegations thought that it should be left to each State Party to decide whether any specific national organization was required for national verification.
- (Para. 4) Some delegations suggested that the words "on behalf of the international community by ensuring the availability of international data and expert advice to provide a basis for assessing such compliance" be deleted, in order not to confuse the role of the Consultative Committee with regard to the verification of compliance as detailed in element XIII and annex V.
- (Para. 4) Some delegations would prefer to see the words "international community" replaced by "States Parties".
- (Para. 4) Some delegations felt that the Consultative Committee should also assess the collected data and that details for this activity should be given in Element XIII and Annex V. Other delegations thought however that the assessment should be made principally by each State Party individually.
- (Para. 4) Some delegations suggested that the following words should replace the text after the words "be established"; "to ensure the availability of international data and expert advice to provide a basis for assessing the implementation of and compliance with the provisions of this convention as described in Element XIII and annex V."
- (Para. 4) Some delegations considered that the term "monitoring" was not sufficiently clear and that they therefore reserved their positions on this element.
- Some delegations suggested the replacement of the word "monitoring" by the word "verification" throughout the element.

X

National legislation and verification measures

1. Each State Party to this Convention should undertake to take any measures it considers necessary in accordance with its constitutional processes to prohibit and prevent any activity in violation of the provisions of the Convention anywhere under its jurisdiction or control, including a national verification system according to Element IX.

2. Recommendations and guidelines concerning the functions and organization of the national verification system would be set out in Annex IV.

Comments

- Some delegations queried the necessity of this element.
- Some delegations suggested the deletion of the words "it considers necessary" in paragraph 1.
- Some delegations suggested the deletion of the words "including ... to Element IX" at end of paragraph 1.

Annex IV

Recommendations and guidelines concerning the functions and organization of the national verification system

(The contents of this annex remain to be elaborated)

Comments

- Some delegations would prefer to see more emphasis put on the functions of such a system than on its organizational structure.

XI

National technical means of verification

1. Each State Party to this Convention should undertake to use national means of verification, including national technical means, at its disposal for the purpose of monitoring compliance with the provisions of this Convention only in as far as it is consistent with generally recognized principles of international law.

2. Each State Party to this Convention should undertake not to impede, including through the use of deliberate concealment measures, the national technical means of verification of other States Parties operating in accordance with paragraph 1 of this Element.

Comments

- Some delegations proposed the insertion of the words "as appropriate and in accordance with paragraph 1 of Element IX" between the words "Convention" and "should undertake" in paragraph 1.
- Some delegations stated that they could agree to this element only after it had been made clear to what extent States Parties should undertake to disseminate to other States Parties information obtained through national technical means of verification.
- A delegation considered that the term "deliberate concealment measures" should be further elaborated and clarified.

XII

Consultation and co-operation

1. The States Parties to this Convention should undertake to consult one another and to co-operate, especially through the Consultative Committee, referred to in Element IX, in solving any problems which may arise in relation to the objectives of, or in the application of the provisions of, the Convention.

2. Any State Party to this Convention, which has reason to believe that any other State Party is acting in breach of its obligation under this Convention should have the right to request information either bilaterally or through the Consultative Committee in order to clarify the situation. Such a request should be accompanied by appropriate explanations of the reasons for concern.

3. Consultation and co-operation pursuant to this Element could also be undertaken through appropriate international procedures within the framework of the United Nations and in accordance with its Charter. These international procedures could include the services of appropriate international organizations, in addition to those of the Consultative Committee.

Comments

- Some delegations considered that the complaints mechanism which is dealt with in this element as well as in element XIII should be structured more clearly.
- A delegation felt that the words "in solving any problems" in paragraph 1 were too vague and required further elaboration.
- Another delegation considered that it was essential to make it clear to what extent the bilateral consultative process referred to in this element implied obligations to make information available to other States Parties.
- Some delegations felt that the word "appropriate" before "explanations" in paragraph 2 was not sufficiently precise and should be either further elaborated or deleted.
- Some delegations thought that the procedures, referred to in paragraph 3, should include a specific reference to the General Assembly and the Security Council. Opinions differed however on whether both or just one or the other should be referred to.

XIII

Consultative Committee

1. The Consultative Committee, referred to in Elements IX and XII, should be established at the entry into force of this Convention. Each State Party to this Convention could appoint one representative to the Committee. The representative could be assisted by one or more advisers. The Depositary or his personal representative should serve as President of the Committee and convene it at least once a year, or immediately upon receipt of a request from any State Party.

2. Each State Party to this Convention should undertake to co-operate fully with the Committee in carrying out its tasks. Each representative should have the right, through the Chairman, to request from States Parties, and from international organizations, such information and assistance as the representative considers desirable for the accomplishment of the Committee's work.

3. The Consultative Committee should:

(a) monitor the destruction and diversion for permitted purposes of stocks of chemical weapons, as well as the destruction, dismantling and temporary conversion of means of production of chemical weapons as stipulated in Element V;

(b) monitor permitted production of super-toxic lethal chemicals in accordance with Element VI;

(c) make appropriate findings of facts and provide expert views relevant to problems raised pursuant to the provisions of the Convention by a State Party, in particular concerning alleged ambiguities in, or violations of the compliance with the Convention at the request of a State Party;

(d) facilitate compliance with the Convention, e.g. by developing international standardization of methods and routines to be applied by national and international verification organs;

(e) receive and distribute data relevant to the provisions of this Convention, which may be made available by national verification systems;

(f) otherwise closely co-operate with national verification systems and provide them with necessary assistance.

4. The Committee should, after consultation with the State Party concerned, be competent to undertake on-site inspections:

(a) in order to confirm received information concerning planned, on-going or effected measures according to subparagraph 3(a) of this Element;

(b) in order to carry out monitoring according to subparagraph 3(b) of this Element.

5. Any State Party which has reason to believe that any other State Party is acting in breach of its obligations deriving from the provisions of this Convention would have the right to request an investigation by the Committee of the circumstances which have given rise to concern. Such a request could include a request for an on-site inspection to determine in accordance with subparagraph 3(c) of this Element, the facts of the situation and should be accompanied by an appropriate explanation of why an investigation is considered necessary. On-site inspection should take place only after consultation with the State Party concerned. If that State Party does not agree to on-site inspection, it should give appropriate explanations to the effect that an on-site inspection would at that time jeopardize its supreme national interests. The requesting Party could in this case pursue the complaint within the framework of the United Nations in accordance with Element XII, paragraph 3.

6. The work of the Committee should be organized in such a way as to permit it to perform its functions in an effective, fair and impartial manner. It could for specific tasks set up sub-committees and verification teams. The Committee should decide procedural questions relative to the organization of its work, where possible, by consensus, but otherwise by a majority of those present and voting. There should be no voting on matters of substance. If the Committee is unable to provide for a unanimous report on findings of fact or in giving expert views, it should present the different views of the experts involved.

7. The Committee should present an annual report of all its activities to the States Parties to the Convention. The Committee should further, whenever it has been requested by a State Party to carry out fact-finding or provide expert views concerning a specific question, transmit to the Depositary a summary of its findings or expert views incorporating all views and information presented to the Committee during its proceedings. The Depositary should distribute the summary to all States Parties.

8. The Committee should at all stages consider the possibility of a bilateral solution to any dispute and be prepared to assist therein. Nothing should impede the right of a State Party to request information from the State Party concerned as regards presumed treaty violations.

9. Details of the organization and procedures of the Committee, rights and duties of members, rights and duties of designated personnel for inspection, inspection procedures and rules for reports would be set out in Annex V.

Comments

- Some delegations felt that this element had to be further elaborated. They emphasized that agreement on verification procedures could promote a convergence of views on the scope of the convention. Other delegations noted that the functions of the Consultative Committee as well as other international verification measures can and should be considered and elaborated only with due regard to, and in inextricable interrelationship with the scope and the nature of the prohibition under a future convention. Therefore they had refrained so far from stating their views in detail on the tasks and terms of reference of the Consultative Committee.
- (Para. 1) Some delegations considered that the efficiency of the Consultative Committee would diminish if it were to include a representative of each State Party. It was therefore suggested that the Committee should consist of a limited number of members elected from experts nominated by States Parties. The Chairman sharing this concern drew the attention to the 1961 Single Convention on Narcotic Drugs as a possible model.
- (Para. 3) Some delegations considered that the competence of the Consultative Committee should include enquiry into facts concerning allegations of use of chemical weapons by or with the assistance of a State Party on the grounds that evidence of use would indicate a breach of the obligations assumed not to develop, acquire, transfer, stockpile or retain chemical weapons.
- (Para. 3) Some delegations suggested that verification of the non-production of chemicals for prohibited purposes should be based on a pragmatic on-site inspection system. They believed that this could be undertaken without prejudice to the interest of the chemical industry. Some delegations felt that such inspections should be undertaken periodically on the basis of random selection so as to take place in a businesslike and co-operative atmosphere. Others asserted that there was no evidence that on-site inspection of chemical industry was feasible without harming economic interests.
- (Para. 3) Some delegations emphasized that the tasks in (a) and (b) do not only belong to the Consultative Committee but also to the national verification systems.
- (Para. 3) Some delegations stated that they did not see any necessity for an obligation to set up specific national verification organs.

- (Para. 3) A delegation proposed that there should be specific provisions in the functions of the Consultative Committee for technical assistance in protection measures on request to States Parties.
- (Para. 3) Some delegations suggested that procedures for the verification of allegations of use, which is forbidden by the 1925 Geneva Protocol, could also be elaborated outside the framework of the envisaged convention on chemical weapons.
- (Para. 4) Some delegations felt that on-site inspections as a means to confirm information received from States Parties could contribute to the fostering of distrust among nations and could therefore not be accepted. They also felt that these provisions had not been sufficiently discussed.
- (Para. 5) Some delegations felt that only the first sentence was acceptable.
- (Para. 5) Some delegations suggested that the words "of the circumstances which have given rise to concern" were not sufficiently precise and should therefore be deleted.
- (Para. 5) Some delegations considered that even if it was within the right of each State Party to request on-site inspection, this should not be specifically mentioned. They considered that the Consultative Committee should decide to undertake an on-site inspection only if it could not obtain the necessary information to investigate the complaint by other means.
- (Para. 5) Some delegations suggested that there should be a provision in this element to enable a State Party to request on-site inspection within its own territory.
- (Para. 5) Some delegations suggested the inclusion of a provision to the effect that the Consultative Committee should consider and undertake action to establish the facts of the case, which may include requests for information and if necessary a proposal for on-site inspection.
- (Para. 5) Some delegations considered that the existing fourth sentence should stop after the words "appropriate explanations".
- (Para. 5) Some delegations thought that the entire complaints mechanism should be dealt with in a separate element.

ANNEX V

Consultative Committee

(The contents of this Annex remain to be elaborated)

Comments

XIV

Amendments

Any State Party could propose amendments to this Convention. Amendments should enter into force for each State Party accepting the amendments upon their acceptance by a majority of the States Parties to the Convention and thereafter for each remaining State Party on the date of acceptance by it.

Comments

XV

Review conferences

1. Five years after the entry into force of this Convention, or earlier if it is requested by a majority of Parties to the Convention by submitting a proposal to this effect to the Depositary, a conference of States Parties to the Convention should be held at Geneva, Switzerland, to review the operation of the Convention, with a view to assuring that the purposes of the Convention are being realized. Such review should take into account any new scientific and technological developments relevant to the Convention. Proposed amendments to the Convention could also be considered at the conference.

2. Further review conferences should be held at intervals of five years thereafter, and at other times if requested by a majority of the States Parties to this Convention.

Comments

- Some delegations considered it premature to suggest time-frames for meetings of review conferences.
- A delegation suggested that the last sentence in paragraph 1 should be put in element XIV.

XVI

Duration and withdrawals

1. This Convention should be of unlimited duration.

2. Each State Party to this Convention should in exercising its national sovereignty have the right to withdraw from the Convention, if it decides that extraordinary events related to the subject matter of the Convention, have jeopardized its supreme interests. It should give notice of such withdrawal to the Depositary three months in advance. Such notice should include a statement of the extraordinary events it regards as having jeopardized its supreme interests.

Comments

- Some delegations suggested that States Parties should be required to give notice of withdrawal not only to the Depositary but also to the Security Council on the grounds that extraordinary events which jeopardize their supreme interests have to be invoked for such withdrawal.
- A delegation suggested the deletion of the reference to "extraordinary events" as a corresponding rephrasing of the element.

XVII

Signature, ratification, accession

1. This Convention should be open to all States for signature. Any State which does not sign the Convention before its entry into force in accordance with paragraph 3 of this Element could accede to it at any time.

2. This Convention should be subject to ratification by signatory States. Instruments of ratification or accession should be deposited with the Secretary-General of the United Nations.

3. This Convention should enter into force upon the deposit of instruments of ratification by twenty Governments, in accordance with paragraph 2 of this Element.

4. For those States whose instruments of ratification or accession are deposited after the entry into force of this Convention, it should enter into force on the date of the deposit of their instruments of ratification or accession.

5. The Depositary should promptly inform all signatory States and States Parties the date of each signature, the date of deposit of each instrument of ratification or accession and the date of the entry into force of this Convention and of any amendments thereto, as well as of the receipt of other notices.

6. This Convention should be registered by the Depositary in accordance with Article 102 of the Charter of the United Nations.

7. Annexes I to V should be considered an integral part of this Convention.

Comments

- Some delegations considered that the Convention should enter into force only upon the deposit of instruments of ratification by a specific number of States, including those of the permanent members of the Security Council. Other delegations objected to this on the grounds that State Parties should not be treated in a different manner.

XVIII

Distribution of the Convention

This Convention, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, should be deposited with the Secretary-General of the United Nations, who should send duly certified copies thereof to the Governments of States members of the United Nations and its Specialized Agencies.

Comments

IV. RECOMMENDATIONS AND CONCLUSIONS

13. The Working Group took note of the report of the Chairman on consultations held on issues relating to toxicity determination, as contained in CD/CW/WP.22/Rev.1 and decided to make the following recommendations:

(a) that the Committee on Disarmament take note of the CD/CW/WP.22/Rev.1 of 23 July 1981, and consider it a suitable basis for the delegations to prepare further work on methods to be agreed for toxicity determinations for a chemical weapons convention;

(b) that the following issues be discussed at the Committee's 1982 session, using the toxicity values for super-toxic lethal, other lethal and other harmful chemicals given in CD/112 as a starting point for the work:

(i) Specific testing methods for determination of acute lethal toxicity, using the relevant points found in Annex V of CD/CW/WP.22/Rev.1;

(ii) Circumstances in which inhalation criteria will be required, including the possibility of supplementing inhalation toxicity measurements with intravenous injection;

(iii) Possible criteria based on other types of harmful effects;

(v) Inventory of international resources for toxicity determination and the possibility of international co-operation.

Expertise, particularly in toxicology, as well as scientific and technical background material, which may be provided by delegations, will be of value for such discussions.

(c) that further consultations, similar to those held this year, should take place in the week 1-5 March, 1982, on the issues mentioned under (b) unless the Committee on Disarmament decided otherwise at the beginning of its 1982 session.

(d) that the questions related to possible applications of toxicity criteria in a chemical weapons convention should be taken up within the Committee in the week thereafter.

14. The substantive considerations of the Working Group reaffirmed the conclusions, reflected in the Final Document of the first special session of the General Assembly devoted to disarmament, that the prohibition of chemical weapons and their destruction represented one of the most urgent measures of disarmament and that the conclusion of such a convention is of the highest priority in multilateral negotiations. The urgency of achieving concrete results to this end was especially recognized in the light of the second special session to be held in 1982.

15. After the extensive examination of the various issues related to a chemical weapons convention, both in 1980 and 1981, the Working Group considers that a convergence of views has emerged on many issues, but that some important divergencies

of views still exist on certain elements. The Group also expresses the hope that the Committee will take due account of the results of its work, as presented in this report, so that it will contribute to the process of negotiating and elaborating a chemical weapons convention.

16. While it was generally agreed that the Group made substantive progress during its 1981 session, many delegations regretted that it was not possible to obtain a revised mandate which would enable the group to initiate negotiations on the text of a convention. Emphasizing the responsibility of the Committee on Disarmament for the negotiation and elaboration of a chemical weapons convention, the Group recommends that the Committee at the beginning of its 1982 session re-establish the ad hoc Working Group on Chemical Weapons with an appropriately revised mandate, which will enable the Committee to build upon the areas of convergence and to resolve the differences of views which were identified by the Group during the 1980 and 1981 sessions, so as to achieve agreement on a chemical weapons convention at the earliest date.