

With regards to nuclear weapons, the proposal of the Socialist countries provides in conformity with the general concept of equitable reductions that those weapons of mass destruction and their means of delivery should be reduced by all States-direct participants which hold them. It cannot be a matter of a one-time action, carried out by one single State, conditioned moreover by various requirements. The fact in itself that the Western delegations have, at last, come to recognize the necessity to deal with at least a certain part of nuclear weapons and their means of delivery—be it US nuclear arms only—does but confirm the rightness of our requirement that nuclear armaments must be an integral part of the programme of reductions. In this respect, the Western States should elaborate to a full measure those positive elements which, for the first time, have appeared in their proposal of 16 December in connection with nuclear weapons.

To conclude my statement, I should like to stress that we consider the discussion we had in the course of this eighth round of negotiations as a useful and mutually fruitful exchange of views. There has been, inter alia, a profitable and concrete debate in order to reach a clear definition of the "armed forces", just for all participants. It bore namely on what should be included in or excluded from reductions and on what should be related to ground forces and to air forces. This debate has not only permitted to elucidate to a greater extent and in a more detailed manner the viewpoints of the various participants to the negotiations, it has also been leading us in our search of ways to attain mutually acceptable solutions. The gradual widening of these ways could bring about, within a measurable space of time, the working out of an agreement. This depends, however, on the good will of all participants and makes it essential that our Western colleagues take into due account the legitimate requirements of the Socialist States and renounce their attempts to obtain, by means of our negotiations, unilateral military advantages.

**Swedish Working Paper Submitted to the Conference of the
Committee on Disarmament: Some Aspects of On-Site
Verification of the Destruction of Stockpiles of Chemical
Weapons, April 9, 1976¹**

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.

¹ CCD/485, Apr. 9, 1976.

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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.

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. [sic] the risk for unwanted spread of secret information leading to proliferation. These thoughts were expressed by the Soviet delegation (CCD/PV. 647, p. 18² and CCD/PV. 652, pp. 19-20³) 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 usable 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/324,⁴ 344,

² *Documents on Disarmament, 1974*, pp. 364-369.

³ *Ibid.*, pp. 416-419.

⁴ Printed *ibid.*, 1971, pp. 180-183.

366,⁵ 367,⁶ 432, 434, 436⁷ 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).⁸

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 analyses 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 of secrecy presented above. Alternative (c) probably is the one to calculate with. As pointed out in the Introduction it seems possible for a party 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:

⁵ Printed *ibid.*, 1972, pp. 348-352.

⁶ Printed *ibid.*, pp. 352-354.

⁷ *Ibid.*, 1974, pp. 335-340.

⁸ *Ibid.*, pp. 99-106.

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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:⁹

- (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).

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 LD₅₀ 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 *conclusion* 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.

VERIFICATION BY CHEMICAL ANALYSIS

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.

⁹ For a discussion of the method, see e.g., CCD/435, 16 July 1974, working paper on toxicity of chemical warfare agents, by the U.S. delegation (see *Documents on Disarmament, 1974*, pp. 330-335).

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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 *conclusion* is that use of chemical methods—combined or not with toxicological 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	<i>No on-site activity allowed</i>	Methods for remote verification of destruction do not exist presently	No verification possible
<i>Perimeter inspection allowed</i>	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
<i>Sampling allowed</i>	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