

t, however, denying non-nuclear weapons of PNEs that might be realized by the to the Treaty.² The approach taken in by the recent Review Conference, and believe that the NPT régime provides the approach to the PNE arms control attention has been given to PNEs as a control issue. This is due to a number of of a sixth State having a demonstrated the bilateral agreement on a Threshold recent United States-USSR negotiations provided for in the Threshold Treaty; the assessments in many countries of the role be expected to play in their economies. gs, the United States experts endeavor penetrating questions relating to these me time, we were not able to present ation systems which are the subject of NE negotiations, nor to speculate on the tations. We would, of course, expect to ntent and the significance of any PNE ncluded.

ne arms control implications of PNEs, a d their views that procedures consistent appropriate way for non-nuclear-weapon potential benefits of PNEs. In this con- and the central role of IAEA was often as fact that any PNEs must be conducted international obligations including, in

nts found general acceptance during the nited States experts made clear that they plosive devices could be developed that ary application. It follows from this that tinguishing between a "PNE Power" and e was no disagreement expressed on this

reement was expressed with the view of t the explosion of nuclear devices specifi- applications would not necessarily add apability of nuclear weapon testing States riety of sophisticated nuclear weapons. nne would or would not provide weapon-

ts on Disarmament, 1968, pp. 461-465.

related benefits for a nuclear-weapon State would depend upon the extent and character of that State's existing nuclear weapons capabilities, the nature of any constraints on its weapon testing activities, and the level and nature of its PNE activity.

The general proposition was put forward that neither nuclear-weapon States nor non-nuclear-weapon States should be able to use a PNE programme to obtain nuclear weapons-related benefits not otherwise available to it. This means that any constraints on nuclear weapons tests by the nuclear-weapon States should be accompanied by appropriate constraints on PNEs, and by verification procedures adequate to assure that such constraints are being observed. None of the participants in our meetings disagreed with this general proposition.

The ultimate nuclear weapon testing constraint is, of course, an adequately verifiable CTB. During our meetings several States, including the United States, reaffirmed their commitment to this goal. If PNEs were to be accommodated under a CTB, a verification system would have to be devised capable of providing adequate assurance to all States that no weapon-related benefits were being acquired from PNE activities. Although there is general recognition of this problem, I think it is fair to say that we do not yet have a consensus on its solution. Further creative efforts to resolve the technical, legal and political issues connected with PNEs are needed in the context of further constraints on the testing of nuclear weapons. Many States, both those with and those without experience in the field of nuclear explosives, can contribute to this important task.

The United States believes that exchanges such as those that took place here this month can help to solve the difficult and important arms control problems posed by nuclear explosions for peaceful purposes.

Swedish Working Paper Introduced in the Conference of the Committee on Disarmament: Model for Delimitating Chemical Warfare Agents in an International Treaty, July 29, 1975¹

INTRODUCTION

During the negotiations on a prohibition against development, production and stockpiling of chemical weapons, it was realized almost from the outset that it would be a difficult task to obtain meaningful and useable delimitations between different types of chemicals.

The need for differentiation stems from the obvious facts that, relatively speaking, only a few chemicals are useful as chemical warfare agents and that the overwhelming amount of chemicals have no

¹ CCD/461, July 29, 1975.

actual or potential warfare use. It would obviously be unnecessary, or even damaging, to have too extensive a ban on chemical production. However, no self-evident principles are available for delimitation.

Many attempts have been made during the years of negotiations to solve the problem. Few attempts have been made to analyze more closely the concepts involved (see, however, CCD/414, 21 August 1973²) and to relate them to each other. It goes without saying that various suggestions on delimitation have been presented, each connected with some special application. In the practical negotiation work it has turned out to be an increasingly difficult task to try to sort out and to remember to what extent and on what grounds the different approaches do or do not cover each other. A first attempt was made in the Swedish working paper CCD/427, 2 July 1974.³

The present working paper is an attempt at a more detailed analysis of the matter indicating some common trends in international conventions which might be useful in disarmament discussions. A model for an overall view of the problem is presented. Efforts have also been made to give the model some dynamic properties, in view of possible future alterations and of alternative outcomes of negotiations.⁴

A COMPREHENSIVE MODEL

Earlier Attempts

The presentation of the Japanese draft treaty CCD/420, 30 April 1974 with the explicit introduction of alternatives of exempted or absolutely prohibited chemical agents made it necessary to try to get a comprehensive view of all the criteria and delimitation concepts.⁵ In the attempt made at this in the Swedish working paper CCD/427 a so called Venn diagram (Fig. 1) was used⁶, covering the concepts of Chemical



Warfare Agents, Dual-Purpose Warfare Agents, and the Chemical Compounds for Peaceful Use. The relationship between the proposed Japanese annexes and these concepts was demonstrated. This model

² *Documents on Disarmament*, 1973, pp. 524-529.

³ *Ibid.*, 1974, pp. 222-227.

⁴ Further discussion and references are given in J. Lundin "Description of a model for delimitating chemical warfare agents in an international treaty". FOA Reports, vol. 9, No. 4, 1975. [Footnote in original.]

⁵ *Documents on Disarmament*, 1974, pp. 99-106.

⁶ Named after the mathematician Venn. The Venn diagram implies (in this case) that each chemical compound can be assigned to a point within a bounded surface, see figure below. [Footnote in original.]

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⁶1 Venn. The Venn diagram implies (in this case) that assigned to a point within a bounded surface, see figure

turned out to be useful during informal discussions between experts and non-experts in chemistry.

It still seems to be widely felt that the chemical field is too complex to be covered by a treaty banning production of chemical weapons. Therefore, a wider application of the model will be made in the following, with the aim to show that this pessimism need not be justified.

Application of a Comprehensive Model

A model presented in the Swedish working paper CCD/427 did not treat all the criteria discussed earlier in the CCD nor did it indicate the dynamic aspects to be considered, i.e., a model must also describe the function and effects of a treaty over a time span. The concepts discussed in the CCD are listed in Table 1. In Fig. 1 an attempt has been made to analyze how these concepts interfere with each other and how their coverages overlap.

TABLE 1. Concepts, criteria and conditions constituting means of delimitation of chemicals to be covered by a treaty prohibiting development, production and stockpiling of chemical weapons.

Purpose (of use)	Supertoxic, Toxic and Low-toxic (non-toxic)
Quantity (of production)	
Verifiable production	
Dual-purpose and Single-purpose	Exemptions from a prohibition listed in a treaty annex Absolutely prohibited production of chemicals listed in a treaty annex Conditional and unconditional prohibition

The areas allotted to the various concepts in Fig. 1 are not intended to represent the actual relations in size between the different groups. Instead, they are meant to indicate whether many or few chemicals can be expected to be found in a group. The capital letters in the figure denote the various concepts and show, in another way, where the different areas in Fig. 1b, c, d and f represent several concepts.

The consequences of the need for verifiability presented in the Japanese draft are illustrated in Fig. 1 e and f. The letter combinations in the appropriate areas show that all the combinations from Fig. 1 d are covered.

Fig. 1 g and h illustrate what the combination of the concepts of conditional and unconditional prohibitions and annexed lists of exempted and absolutely prohibited chemical warfare agent production might look like when a treaty comes into force.

Fig. 1 h shows how possible changes, after a number of years and after continued negotiations, e.g., at future review conferences, have resulted in a treaty which is comprehensive from all practical points of view. The annexed list of exemptions has diminished, and the list of absolutely prohibited chemical warfare agent production has grown as

large as might be possible from a practical point of view. The possible direction in which this growth might have taken place is indicated by a corresponding increase of the screened field covering the various areas. It should be noted that possible future developments are marked in the model (the dots in Fig. 1 h).

The principally important feature of Fig. 1 g and h is the demonstration of a simple and easily understandable way to construct a treaty prohibiting development, production and storage of chemical weapons.

(1) *Production of temporarily exempted chemicals*, listed in an annex, is allowed when necessary for various reasons (thinly hatched area in Fig. 1 g and h).

(2) *Unconditionally prohibited* chemical warfare agent production is listed in an annex and is made dependent on the degree of verifiability (screened area in Fig. 1 g and h).

(3) Production etc. whether controllable or not, of *all* chemical warfare agents and weapons which are *not specifically mentioned* in one of the two lists of the annex, is *prohibited* according to the general purpose and quantity criteria of the treaty text, (conditional prohibition, densely hatched area in Fig. 1 g and h).

It might be possible to diminish the number of agents exempted by mentioning only those dual-purpose agents which actually have been used, or might become suitable, as chemical warfare agents and perhaps also single chemical warfare agents, explicitly needed or not yet destroyed e.g., for deterrence by retaining a limited capacity for retaliation in case effective verification measures are still being built up. It might also be necessary to make exemptions for agents which were not yet destroyed.

It should be observed that all agents, also those listed as exemptions, might still be subject to verification measures, in order to make comprehensive verification of, i.e., organophosphorus compounds.

A particular merit of such a list of exemptions would be that the number of agents would eventually decrease, subject to subsequent agreements to the effect that an increasing number of exceptions either be transferred to a list of absolutely prohibited agents, or become prohibited merely according to a general purpose criterion (see Fig. 1 h).

These advantages were discussed by Sweden in the CCD (CCD/PV. 652 15 August 1974).⁷ The simplicity of the model may by some seem to be jeopardized by the risk that extensive and unmanageable lists of substances will result. Before discussing this aspect it might be illuminating to look at some other international agreements regarding chemicals, with consideration to their relation to the model discussed here.

⁷ *Documents on Disarmament*, 1974, pp. 411-416.

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Figure of Fig. 1 g and h is the demonstration of a way to construct a treaty on production and storage of chemical weapons. *Exempted chemicals*, listed in an annex, for various reasons (thinly hatched area in

of chemical warfare agent production is dependent on the degree of verifiability).

controllable or not, of *all* chemical warfare agents are *not specifically mentioned* in one of the prohibited according to the general purpose treaty text, (conditional prohibition, dense-hatched area).

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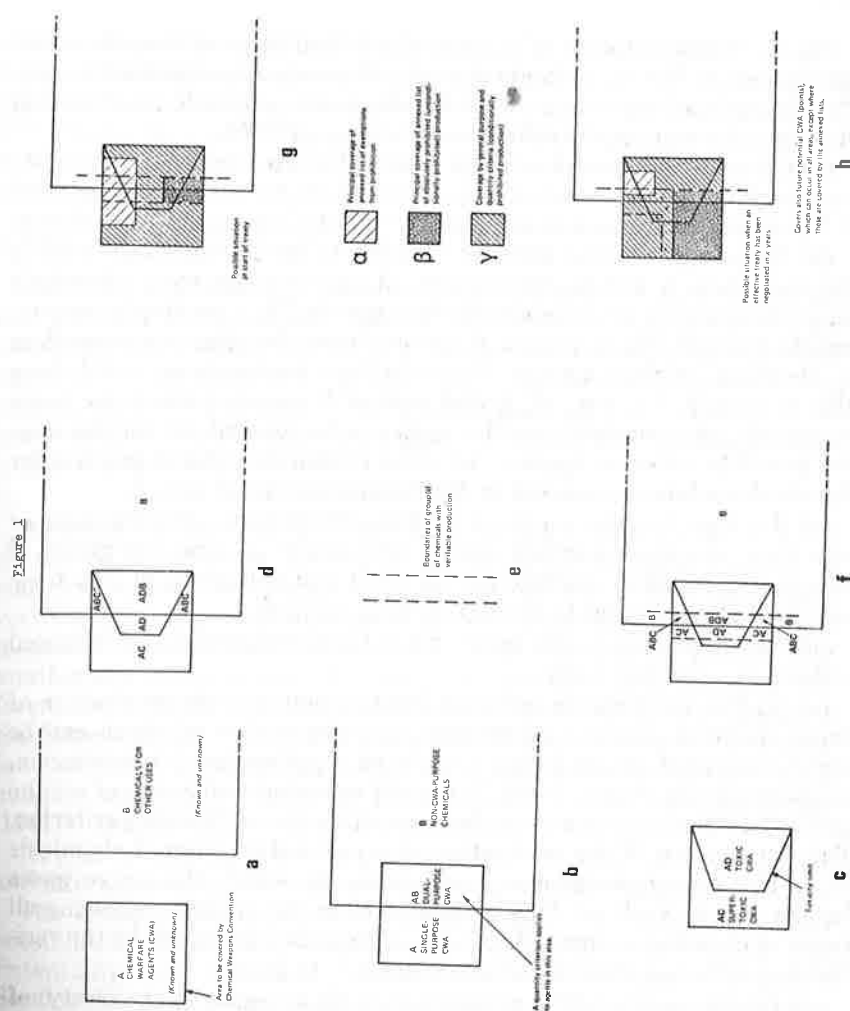


Fig. 1. Representation of a model for delimitation of chemical warfare agents (CWA) in a comprehensive chemical disarmament treaty. The treaty is assumed to prohibit development, production and storing of chemical weapons, the provisions covering all CWA.

(a) Chemical substances are represented by two areas covering *chemical warfare agents*, denoted A and *chemicals for other uses*, denoted B. To indicate the vastness of the latter area the boundary is not closed.

(b) When applying the *purpose criterion* to the chemicals covered by the two areas A and B, respectively, it appears that some chemicals have purpose only as chemical warfare agents. They are *single-purpose* agents and still belong to area A. Others have also other purposes than as chemical warfare agents. They are thus *dual-purpose* and belong also to area B, i.e., part of A and part of B together cover the same chemicals, and the corresponding area can be denoted AB. In this area the *quantity criterion* applies. All other chemicals without any use for chemical warfare are covered by the remaining part of area B.

(c) If a *toxicity criterion* (C) is used to differentiate between more or less toxic chemical warfare agents one might get one sub-group of *supertoxic* chemical warfare agents (AC) and one group of less *toxic* agents (AD), separated by the agreed toxicity limit.

(d) The figure shows the result when the three previously discussed criteria are applied jointly.

(e)-(f) The *verifiability criterion* implies that only the production of those chemical warfare agents the (non-)production of which can be verified (e), shall be absolutely prohibited. Application of this criterion, gives the result shown in (f). It should be noted that parts of all the previously discussed areas can be covered by the verifiability criterion. This means that if the production of a particular group of chemicals (e.g., the organophosphorus compounds, to which the nerve gases belong) can be verified. This is illustrated in the model by showing all types of chemical compounds of such a group being covered by the verifiability criterion, even those belonging only to area B.

(g)-(h) Areas covered by proposed *lists* (in an annex to the treaty) of () *exemptions* of substances from production prohibition, and () of substances *absolutely* (or *unconditionally*) prohibited to produce are marked by thinly hatched and screened areas, respectively. Densely hatched areas () cover chemicals which are not mentioned in the envisaged lists, but which are still prohibited to produce according to the purpose and quantity criteria (*conditional prohibition*).

(g) The situation when a treaty enters into force. A large list of exemptions can be conceived of. The list of absolutely forbidden agents will probably be relatively small.

(h) Shows how the content—but not the comprehensive scope—of the treaty may have changed over x years of continuing negotiations or review conferences, and with respect to new technical developments. The result is a small list of, militarily probably insignificant, exemptions and an extended list of substances the production of which is

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absolutely prohibited. The increase in the content of the latter list may
be the result of improved verification methods or other means which
may facilitate their transfer to the list of absolutely prohibited agents.
The model also indicates that the new CWA can be discovered or
developed (*dots in densely hatched area*) and may instigate further
negotiations.

Application of the Model to Other Conventions

Several times during this century, regulations of the use, production
and handling of chemicals detrimental to human beings or to the en-
vironment have been agreed upon internationally. An analysis of the
construction of these regulations shows that nearly all delimitation
criteria dealt with in this working paper have been used in one or an-
other of these earlier treaties. Table 2 sums up the content of some
treaties in this field.

It should be observed that the list comprises treaties on the abuse of
chemicals in peacetime as well as on the use of chemical weapons in
war. Among both types of agreement provisions occur for international
verification measures and for international organizations to apply such
measures, by making suggestions to member-states of the treaties. The
number of substances actually covered by a treaty is substantially dif-
ferent for different treaties, varying from the general descriptions in
the Geneva protocol⁸ and the Biological Weapons Convention,⁹ via the
few chemicals mentioned in the Brussels Treaty (1954),¹⁰ to the several
hundred agents covered in the Single Convention on Narcotic Drugs
(1961)¹¹ and the Codex Alimentarius (1969).

At present there is a strong trend towards monitoring both national
and international agreements relating to the environment.

The United Nations Environmental Program is investigating the
possibilities for building up an extensive International Register of
Potentially Toxic Chemicals (IRPTC) and an International Reference
Service (IRS) on environmental information. OECD has completed a
project concerning Unintended Occurrence of Pesticides in the Environ-
ment discussing also international co-operation regarding toxicological
information.

On the efforts on the national level, only those in Japan and Sweden
will be mentioned here. Japan has instituted the Law Concerning Ex-
amination of Chemical Substances and Control of their Manufacture,
effective 16 April 1974 and the consequence here of the compilation of
a List of Names of Existing Chemical Substances to be used in Japan
as a basis for further toxicological investigations especially about long

⁸ *Ibid.*, 1969, pp. 764-765.

⁹ *Ibid.*, 1972, pp. 133-138.

¹⁰ *American Foreign Policy, 1950-1955: Basic Documents*, vol. I, pp. 981-982.

¹¹ 18 UST 1407; 520 UNTS 204.

time effects of some of these substances. The list of 1974 comprised some 20,000 substances.

In Sweden a data-based information system on properties of chemicals to be allowed in production and in the environment is being set up. The Swedish Environmental Protection Agency will then license the production and use only of such chemicals as are not detrimental to Man and Nature. Special laboratories will be charged with analyzing products as a basis for the licensing. The system is expected to cover several thousands of chemicals. Many other countries are actively working along similar lines.

Altogether it is thus obvious that the trend today of watching the production and use of all kinds of chemicals is deliberate and purposeful. Consciousness about chemical weapons is, however, necessary, also among those who only work on the problem with peaceful activities.

Discussion of the Implications of the Model

The analysis presented in this paper of existing attempts to construct the scope of a treaty prohibiting the development, production and stockpiling of chemical weapons has aimed at showing that no principal technical difficulties need arise in the fulfilment of this task.

As a means for this analysis a model has been constructed which shows how different suggestions discussed so far in the CCD are inter-related and can be looked upon as parts of a common concept.

One special feature of the model presented is that it allows for a dynamic view on a production ban. It does so by showing that changes in the coverage of the treaty can be foreseen:

- (a) the number of dual purpose agents and perhaps even warfare agents that may initially have to be exempted from the ban will diminish with time;
- (b) the number of chemical warfare agents the production of which shall be unconditionally prohibited will rise along with improving conditions for verification.

The dynamic approach also ensures the possibility that the treaty can be built up gradually without loss to the over-all aim of reaching a comprehensive ban.

Comparisons with other international treaties regulating the use and control of chemicals show that they apply, to varying degrees, the same criteria as those discussed in the model. It can also be observed that some of these treaties manage to cover a large number of chemicals.

The model indicates that, in principle, both international and national measures have to be taken in order to ensure a meaningful treaty. Such measures obviously concern verification and forms for continuous evaluation of changing conditions, etc. Although no political steps are identified by the model, the comparison with other international treaties shows that the necessary steps have been taken before, with respect to chemicals in general as well as to chemical warfare agents.

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This paper of existing attempts to construct a model for the development, production and stockpiling of chemicals is aimed at showing that no principal obstacle exists in the fulfilment of this task. The model has been constructed which is discussed so far in the CCD are intended to be parts of a common concept. The model presented is that it allows for a dynamic approach. It does so by showing that changes in the model can be foreseen:

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TABLE 2. Types of criteria used in some international treaties covering use and production of chemicals.

Treaty (see also list of references)	Year	Purpose	Quantity	Applied criteria (see also text)		
				Types of property or description	Graded or amendable prohibition (measures)	Verification needs
Geneva Protocol prohibiting use of CWA	1925	Yes	—	Asphyxiating, poisonous, physical properties	—	No
Brussels Treaty of the WEU prohibiting production of BWA and CWA	1954	Yes	Yes	BWA: harmful insects, other living or dead organisms, toxic products CWA: asphyxiating, toxic, irritant, paralytic, growth regulating, antilubricating, catalyzing	Yes	Verifies nonproduction
Biological Convention of prohibiting production of BWA and toxin weapons	1972	Yes	Yes	B & CWA: lists of substances and key products, general formulas for chemicals Microbiological, other biological means, toxins	Yes	—
Codex Alimentarius Commission for the FAO/WHO Food Standards Program (Voluntary membership)	1962	Yes (handling)	—	Extensive description of properties and measures for handling food additives of listed substances	Yes	No verification, national acceptance of recommended standards
Single convention on narcotic drugs	1961	Yes	Yes	Schedules of drugs grouped according to degree of dangerousness and actual use	Yes	Yes

(Continued on next page)

TABLE 2. *Types of criteria used in some international treaties covering use and production of chemicals.*—Continued

Treaty (see also list of references)	Year	Purpose	Quantity	Applied criteria (see also text)		
				Types of property or description	Graded or amendable prohibition (measures)	Verification needs
Convention on psychotropic substances	1971	Yes	Yes	Schedules of drugs grouped accord- ing to degree of dangerousness and actual use	Yes	Yes
Protocol relating to intervention on the high seas in cases of marine pollution by substances other than oil	1973	Yes (hand- ling)	—	Lists of substances for different uses and of different properties, in appendix	Yes	Yes
Draft treaty of Japan in CCD pro- hibiting development, produc- tion and stockpiling of chemical weapons (CCD 420, 1974)	1974	Yes	Yes	Alternative lists of exempted or absolutely prohibited substances, respectively, in appendix	Yes	Yes

CONCLUSIONS

It should be possible to construct, on technical grounds, the scope of a comprehensive treaty banning development, production and stockpiling of chemical weapons in a manner meeting the political objections raised against previous attempts to this end.

The difficulties due to the fact that the chemical field is complicated and that a great number of chemicals might have to be considered when constructing the treaty can be alleviated considerably by applying to it the dynamic properties of the model described in this paper.

Likewise, the verification mechanism can be built up continuously allowing adaptative expansion to meet the demands expressed from time to time.

Address by President Ford to the Conference on Security and Cooperation in Europe [Extracts], August 1, 1975¹

We have sought a structure of European relations, tempering rivalry with restraint, power with moderation, building upon the traditional bonds that link us with old friends and reaching out to forge new ties with former and potential adversaries.

In recent years, there have been some substantial achievements.

We see the Four-Power Agreement on Berlin of 1971 as the end of a perennial crisis that on at least three occasions brought the world to the brink of doom.²

The agreements between the Federal Republic of Germany and the states of Eastern Europe and the related intra-German accords enable Central Europe and the world to breathe easier.

The start of East-West talks on mutual and balanced force reductions demonstrate a determination to deal with military security problems of the continent.

The 1972 treaty between the United States and the Soviet Union to limit anti-ballistic missiles and the interim agreement limiting strategic offensive arms were the first solid breakthroughs in what must be a continuing, long-term process of limiting strategic nuclear arsenals.³

I profoundly hope that this Conference will spur further practical and concrete results. It affords a welcome opportunity to widen the circle of those countries involved in easing tensions between East and West.

¹ *Weekly Compilation of Presidential Documents*, Aug. 11, 1975, pp. 810-811, 813-814.

² *Department of State Bulletin*, Sept. 27, 1971, pp. 318 ff.

³ *Documents on Disarmament*, 1972, pp. 197-205.

Yes

Yes

Alternative lists of exempted or absolutely prohibited substances, respectively, in appendix

Yes

Yes

1974

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