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CHEMICAL-BIOLOGICAL WARFARE: U.S. POLICIES AND INTERNATIONAL EFFECTS

HEARINGS

BEFORE THE

SUBCOMMITTEE ON NATIONAL SECURITY POLICY AND SCIENTIFIC DEVELOPMENTS

OF THE

COMMITTEE ON FOREIGN AFFAIRS HOUSE OF REPRESENTATIVES

NINETY-FIRST CONGRESS

FIRST SESSION

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NOVEMBER 18, 20; DECEMBER 2, 9, 18, AND 19, 1969

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INTRODUCTION

In November 1969 identical resolutions on chemical and biological warfare, sponsored or cosponsored by some 108 Members of Congress, were referred for consideration to the Subcommittee on National Security Policy and Scientific Developments. These resolutions called upon the President to (*a*) resubmit to the Senate for ratification the Geneva Protocol of 1925, (*b*) conduct an extensive intra-governmental review of CBW policies, and (*c*) reassert America's traditional "no-first-use" policy on lethal chemical and biological agents.

Exactly 1 week after the subcommittee had opened hearings on the resolutions, the President in an historic statement on November 25 announced his intention to resubmit the protocol to the Senate. In addition, he unilaterally renounced all future use of biological weapons on the part of the United States and pledged to work for new agreements which would universally ban biological warfare.

Although the President's action had rendered the resolutions moot, the subcommittee continued its inquiry into international aspects of chemical and biological warfare. Its objectives were three: First, it sought to deepen congressional and public understanding of the considerations involved in Senate ratification of the Geneva Protocol. Second, it attempted to shed additional light on other issues which had been raised both domestically and internationally on America's CBW policies, particularly the use of chemical agents such as tear gas and herbicides in Vietnam. Third, the subcommittee looked beyond the ratification of the protocol to the requirements for new international agreements to control the spread and use of chemical and, particularly, biological weapons.

In its efforts the subcommittee was fortunate to have the cooperation of a distinguished group of witnesses, including Members of Congress, private experts, representatives of interested organizations and spokesmen for the Departments of Defense and State, and the Arms Control and Disarmament Agency. Their testimony provides a significant body of information and opinion on chemical and biological warfare. In order to present as comprehensive a record as possible, an appendix of related documents also has been included.

This volume is being released now because of its timely relevance to the current national discussion of Senate ratification of the Geneva Protocol and related CBW issues. Following further review of the information received during the hearing, the subcommittee intends, in the near future, to release a report of its analysis, findings, and recommendations.

CLEMENT J. ZABLOCKI,
Chairman, Subcommittee on National Security Policy and Scientific Developments.

JANUARY 29, 1970.

CHEMICAL-BIOLOGICAL WARFARE: U.S. POLICIES AND INTERNATIONAL EFFECTS

TUESDAY, NOVEMBER 18, 1969

HOUSE OF REPRESENTATIVES,
COMMITTEE ON FOREIGN AFFAIRS,
SUBCOMMITTEE ON NATIONAL SECURITY POLICY
AND SCIENTIFIC DEVELOPMENTS,
Washington, D.C.

The subcommittee met, pursuant to call, at 10:07 a.m., in room 2255, Rayburn House Office Building, Hon. Clement J. Zablocki (chairman of the subcommittee) presiding.

Mr. ZABLOCKI. The subcommittee will please come to order.

The subcommittee today opens its hearings on U.S. policies regarding chemical-biological warfare. More specifically, we have under consideration a number of identical resolutions, sponsored or cosponsored by some 108 Members of Congress, calling on the President to resubmit to the Senate for ratification the 1925 Geneva Protocol on chemical-biological warfare.

(The text of the protocol follows:)

PROTOCOL PROHIBITING THE USE IN WAR OF ASPHYXIATING, POISONOUS OR OTHER GASES, AND OF BACTERIOLOGICAL METHODS OF WARFARE, GENEVA, JUNE 17, 1925

The undersigned plenipotentiaries, in the name of their respective Governments:

Whereas the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world; and

Whereas the prohibition of such use has been declared in Treaties to which the majority of Powers of the world are Parties; and

To the end that this prohibition shall be universally accepted as a part of International Law, binding alike the conscience and the practice of nations;

Declare:

That the High Contracting Parties, so far as they are not already Parties to Treaties prohibiting such use, accept this prohibition, agree to extend this prohibition to the use of bacteriological methods of warfare and agree to be bound as between themselves according to the terms of this declaration.

The High Contracting Parties will exert every effort to induce other States to accede to the present Protocol. Such accession will be notified to the Government of the French Republic, and by the latter to all signatory and acceding Powers, and will take effect on the date of the notification by the Government of the French Republic.

The present Protocol, of which the French and English texts are both authentic, shall be ratified as soon as possible. It shall bear to-day's date.

The ratifications of the present Protocol shall be addressed to the Government of the French Republic, which will at once notify the deposit of such ratification to each of the signatory and acceding Powers.

The instruments of ratification of and accession to the present Protocol will remain deposited in the archives of the Government of the French Republic.

The present Protocol will come into force for each signatory Power as from the date of deposit of its ratification, and, from that moment, each Power will be bound as regards other Powers which have already deposited their ratification.

In witness whereof the Plenipotentiaries have signed the present Protocol.

Done at Geneva in a single copy, this seventeenth day of June, One Thousand Nine Hundred and Twenty-Five.

Mr. ZABLOCKI. These resolutions also call for complete review by the U.S. Government of its policies on chemical-biological weapons, and for reaffirmation of the no-first-use policy of our Nation.

Today we will hear testimony from Members of Congress who have a special interest in the very important subject of chemical-biological warfare. Our first witness is the Honorable Donald M. Fraser of Minnesota.

Congressman Fraser is a valued member of this subcommittee, who has contributed significantly to our work over the past 11 months.

Mr. Fraser.

STATEMENT OF HON. DONALD M. FRASER, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MINNESOTA

Mr. FRASER. Thank you, Mr. Chairman.

First, Mr. Chairman, I want to express my appreciation for the fact that you have scheduled these hearings. I think this is consistent with the initiative which you have shown as chairman of this subcommittee in moving into areas of vital national concern and areas which I think deserve the attention which you are giving them.

Mr. ZABLOCKI. I thank my colleague for the observation. I want to also state that in no small measure your deep interest in calling to the attention of the chairman the necessity of going into these fields has contributed much to the activity of this subcommittee.

Mr. FRASER. Thank you, Mr. Chairman.

The hearings which we begin today were called because one-fourth of the House has requested the President to resubmit the Geneva Protocol of 1925 to the Senate for ratification. Undoubtedly, support for this resolution would increase dramatically were we to mount a campaign on its behalf. It is disturbing to me that successive administrations have let over 40 years lapse without requesting the advice and consent of the Senate to ratify this treaty, which we originated and signed in 1925.

A POLICY CHANGE ON CBW

Until recently I had thought that our policy in this field was identical to the rule of the Geneva protocol: We would not be the first to use chemical or biological weapons in war. Over the past few years, however, it has become clear that policy with respect to the use of these weapons has changed. The United States initiated chemical warfare operations in Vietnam. It is reported that plans were made to use biological weapons against the Cuban people and that contingency plans exist for the first use of these weapons in many countries. Our research, stockpiles, and delivery capabilities have increased substantially during this decade.

Because the Pentagon has surrounded chemical and biological weapons with greater secrecy than it has imposed on nuclear weapons, Con-

gress and the American public have been unaware of this policy change. The Pentagon has spent a minimum of $2 billion on those weapons since 1961 with virtually no congressional review until this year. It is hardly surprising that we have produced a CBW arsenal whose necessity even ranking Chemical Corps officers could not justify to the Government Operations Committee in May 1969.

The immediate issue of ratification of the Geneva Protocol needs to be discussed in the context of the national security and foreign policy implications of CBW. Unfortunately, this task is made difficult by the absence of any systems analysis or strategic studies of these weapons by the Pentagon. The Chemical Corps discusses the potential employment of CBW as if nuclear weapons either did not exist or did not constitute a credible deterrent threat. No wonder the Defense Department does not speak with a single voice on CBW.

The United Nations Report on CBW, prepared by scientific and military experts from 14 countries, including the United States, concluded that the development of a CBW armory "implies an economic burden without necessarily imparting any proportionate compensatory advantage to security. And, at the same time, it imposes a new and continuing threat to future international security."

I submit that this conclusion holds true no matter how we analyze the costs and utilities of CBW, whether we look separately at chemical in contrast to biological weapons, or lethal in contrast to so-called incapacitating weapons, or tactical use in contrast to strategic use. The marginal military utility which these weapons represent does not justify their development or retention in our arsenal. Furthermore, because these weapons of mass destruction are within the reach of many less developed countries, we should not by our own activities, be encouraging their proliferation.

ON THE "HUMANENESS" OF CBW

The ultimate myth employed by CBW advocates is to justify their development and use as "humane" weapons. The ideal of making warfare humane has captured man's imagination for centuries. Chemical and biological weapons, however, do not advance us down that road. There is nothing humane about weapons which kill people but do not destroy property. We have no weapons which can incapacitate without producing fatalities. Relatively innocuous agents like tear gas are being used every day in Vietnam to increase enemy casualties.

I believe that the principal reason we have so far maintained a CBW capability is because of the old refrain: "The other side has them." Being able to retalitate-in-kind has become an ingrained, but superficial, response to justify a wide range of weapons systems.

Yet biological weapons are unpredictable in their effects and unsuitable for immediate response, even if we could determine the origin of the attack. Chemical weapons entail a level of violence approximating tactical nuclear weapons, but from a military viewpoint are less efficient.

We have consistently attributed an enormous stockpile to the Soviet Union, much greater than our own, without once coming to terms with the fact that no country in the world has a biological warfare

production facility such as we have at Pine Bluff, Ark. We also appear to have so many chemical stocks on hand that the Pentagon last summer wanted to dispose of tons of modern nerve gas weapons by dumping them at sea.

These contradictions between official policy pronouncements and Chemical Corps practice, the justifications for the U.S. program which do not hold up under analysis, and the series of accidents that have plagued CBW operations for 2 years have prompted these hearings. We obviously must find ways to place constraints on the U.S. CBW program. Ratification of the Geneva Protocol would be a long overdue first step that would legally bind us to do what 84 countries have already agreed upon—refrain from the first use of these weapons in war.

VIETNAM WAR POSES OBSTACLE

But at a time when public and congressional pressure for action is growing, the war in Vietnam raises certain obstacles against any initiatives the United States might now take. The protocol must be considered in relation to the war, but I hope it will not be used to further a divisive debate on the war itself. The protocol, should it be ratified, will stand for decades to come as a legal barrier to the use of these weapons. The Vietnamese experience hopefully is unique and should not dictate the nature of our commitment to the protocol.

My specific concern here is how the protocol can be ratified in view of our military use of tear gas in Vietnam, which nearly all parties to the protocol would consider to be prohibited. A legal analysis of the protocol would show that this issue is not free from ambiguity, and the United States even in 1930 questioned the wisdom of prohibiting wartime use of nonlethal tear gas.

ALTERNATIVE COURSES OF ACTION

Nevertheless, we now seem faced with alternative courses of action. First, we could bring about a uniform interpretation of the protocol that prohibited the use of tear gas by so agreeing when

we ratify, or we could maintain our freedom to use tear gas when we ratify. This latter alternative would not be accepted without some criticism from the other parties and certainly would lower the restraints to using gas in warfare.

Personally, I doubt that tear gas could be a useful weapon in other theaters of combat. It may not be an option worth preserving. Abandoning its use in Vietnam soon would be a welcome sign of deescalation, I believe, and would enable us to ratify the protocol so as to maintain an absolute barrier to the use of all gas in warfare. Should careful analysis lead to the other conclusion, however, I still believe it worthwhile to ratify the protocol. We would at least be bound not to use all other gas and germ weapons, a major restraint on military planning to judge from press accounts of Pentagon plans. Beyond that, it is a necessary step to take if we are serious about pursuing further arms control agreements in this field.

We have been told repeatedly that new agreements must await U.S. ratification of the basic treaty on CBW, the Geneva Protocol. Let us decide to make good on a past mistake.

Thank you, Mr. Chairman.

Mr. ZABLOCKI. Thank you, Mr. Fraser.

I wish to commend you for a very thoughtful statement.

THE U.S.S.R. AS A SIGNER OF GENEVA PROTOCOL

You mentioned 88 nations have ratified the Geneva Protocol of 1925. Was the U.S.S.R. one of the nations?

Mr. FRASER. My understanding, Mr. Chairman, is that only two industrial nations have not ratified the protocol. That is Japan and the United States.

Mr. ZABLOCKI. The only two that have not?

Mr. FRASER. They have not.

Mr. ZABLOCKI. I think it would be very helpful if the list of those nations who have ratified the Geneva Protocol would be made a part of the record at this point.

Mr. FRASER. I agree.

Mr. ZABLOCKI. Without objection, it is so ordered.

(The document referred to follows:)

STATES PARTIES TO THE PROTOCOL FOR THE PROHIBITION OF THE USE IN WAR OF ASPHYXIATING, POISONOUS OR OTHER GASES AND OF BACTERIOLOGICAL METHODS OF WARFARE, DONE AT GENEVA, JUNE 17, 1925

States which have deposited instruments of ratification, accession, or continue to be bound as the result of succession agreements concluded by them or by reason of notifications given by them to the Secretary General of the United Nations:

Argentina—May 12, 1969
Australia—January 22, 1930 [1]
Austria—May 9, 1928
Barbados [2]
Belgium—December 4, 1928 [1]
Botswana [2]
Bulgaria—March 7, 1934 [1]
Burma [2]
Canada—May 6, 1930 [1]
Ceylon—January 20, 1954
Chile—July 2, 1935 [1]
China—August 7, 1929
China Democratic People's Republic—August 9, 1952 [1]
Cuba—June 24, 1966
Cyprus—December 12, 1966
Czechoslovakia—August 16, 1938 [1]
Denmark—May 5, 1930
Estonia—August 28, 1931 [1]
Ethiopia—September 18, 1935
Finland—June 26, 1929
France—May 9, 1926 [1,3]
Gambia, The—November 16, 1966
Germany, Federal Republic of—April 25, 1969
Ghana—May 3, 1967
Greece—May 30, 1931
Guyana [2]
Holy See—October 18, 1966
Hungary—October 11, 1952
Iceland—November 2, 1967
India—April 9, 1930 [1]
Indonesia [2]
Iran—July 4, 1929
Iraq—September 8, 1931 [1]
Ireland—August 18, 1930 [1]
Israel—February 20, 1969 [1]
Italy—April 3, 1928
Jamaica [2]
Latvia—June 3, 1931
Lebanon—April 17, 1969
Lesotho [2]
Liberia—April 2, 1927
Lithuania—June 15, 1933
Luxembourg—September 1, 1936
Madagascar—August 12, 1967
Malawi [2]
Malaysia [2]
Maldive Islands—January 6, 1967
Malta [2]
Mauritius [2]
Mexico—March 15, 1932
Monaco—January 6, 1967
Mongolia—December 6, 1968 [1]
Nepal—May 9, 1969
Netherlands—October 31, 1930 [1,4]
New Zealand—January 22, 1930 [1]
Niger—April 19, 1967
Nigeria—October 15, 1968 [1]
Norway—July 27, 1932
Pakistan—June 9, 1960
Paraguay—January 14, 1969
Poland—February 4, 1929
Portugal—July 1, 1930 [1]
Rumania—August 23, 1929 [1]
Rwanda—June 25, 1964
Sierra Leone—March 20, 1967
Singapore [2]
South Africa—January 30, 1930 [1]
Spain—August 22, 1929 [5]
Swaziland [2]
Sweden—April 25, 1930
Switzerland—July 12, 1932
Syrian Arab Republic—December 17, 1968 [1]
Tanzania—April 22, 1963
Thailand—June 6, 1931
Trinidad and Tobago [2]
Tunisia—July 12, 1967
Turkey—October 5, 1929
Uganda—May 24, 1965
Union of Soviet Socialist Republics—April 5, 1928
United Arab Republic—December 6, 1928
United Kingdom—April 9, 1930 [1,6]
Venezuela—February 8, 1928
Yugoslavia—April 12, 1929 [1]
Zambia [2]

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[1] With reservation.
[2] By virtue of agreement with former parent State or notification to the Secretary General of the United Nations of succession to treaty rights and obligations upon independence.
[3] Applicable to all French territories.
[4] Applicable to Surinam and Curacao.
[5] With declaration.
[6] It does not bind India or any British Dominion which is a separate member of the League of Nations and does not separately sign or adhere to the protocol. It is applicable to all colonies.

TEAR GAS A CAUSE OF CASUALTIES?

Mr. ZABLOCKI. You note, and I quote from pages 2 and 3 of your written statement, that there are no weapons which can incapacitate without causing casualties.

Would you include tear gas in that category?

Mr. FRASER. Well, tear gas is being used in Vietnam to flush out the Vietcong, in order that our bombs and other weaponry can reach them. And in that sense it is being used to increase their casualties. It apparently is being used to drive them out of caves and other protective areas, where they might be immune from artillery or bombardment.

Mr. ZABLOCKI. Well, flame throwers have been used in warfare, which I think are much more inhumane. Would you agree?

Mr. FRASER. Well, this is the problem, I think, that one gets into. If one is trying to determine what is humane and what isn't, I think it turns out that in a war——

Mr. ZABLOCKI. At best, war is inhumane.

Mr. FRASER. And the name of the game in a war is to inflict casualties on the other side.

The point I am trying to make is that tear gas is being used in support of that effort.

Mr. ZABLOCKI. Could you clarify your statement on page 1 where you say that U.S. policy with respect to the use of chemical and biological weapons has changed. You follow that up with a statement that the U.S. initiated chemical warfare operations in Vietnam. Do you mean chemical warfare other than the use of tear gas?

Mr. FRASER. Yes, we are using herbicides for the destruction——

Mr. ZABLOCKI. For defoliation?

Mr. FRASER. And the destruction of food, the destruction of crops.

Now, the question of whether herbicides come under the protocol, I think, is probably more arguable. But most nations, I think, at the moment take the view that—and they certainly did in the United Nations report, the 14-member report—that tear gas came within the prohibition of the 1925 protocol.

ALLEGED DEVIATIONS FROM NO-FIRST-USE POLICY

Mr. ZABLOCKI. I would like to develop that point and obtain your views. Even though the United States has not ratified the Geneva Protocol of 1925, it was my understanding that our policy has been one of no-first-use of chemical-biological warfare materiel. Have we deviated from this policy, and to what extent? And, thereby, to what extent are we in violation of the protocol, although the United States is not a signatory?

Mr. FRASER. Well, I think that if one accepts the interpretation of most of the nations, that then we are in violation, when we employ tear gas in Vietnam. We may be in violation when we employ herbicides to destroy food supplies, crops.

Congressman McCarthy has reported—and as I understand it, without contradiction—that we had contingency plans to use biological weapons in Cuba and that we have contingency plans of that kind with respect to other countries, well, other theaters of possible conflict.

But in Vietnam, accepting the interpretation that most nations give to the protocol, we would appear to be in violation of it already.

PROHIBITION OF TEAR GAS IN VIETNAM

Mr. ZABLOCKI. Would you advocate the prohibition of tear gas in Vietnam for all purposes?

Mr. FRASER. Well, I personally would accept the prohibition of the use of tear gas in connection with war, as a general proposition. Now we are in the middle of a war in Vietnam, and whether at the time we—let me put in this way: I wouldn't like to see this issue become a major obstacle to the ratification of the protocol itself. And if it were necessary for us to adopt some kind of reservation or statement about its use, either with a limited time period, or even an open-ended time period, I would prefer to see that done than to have the protocol itself delayed in its ratification.

As the chairman knows, I would like to see the United States disengage from Vietnam, in any event, so that I perhaps have a different view about what the necessities may be over the next few years in Vietnam. But I would not like to see that issue become the obstacle to ratification.

LOGIC IN TEAR GAS USE DOMESTICALLY BUT NOT IN WAR

Mr. ZABLOCKI. This is a very delicate and difficult subject. However, where would the logic lie, if we would permit the use of tear gas in nonwarfare situations, and prohibit it in warfare if it was intended for the same purposes?

We use it in our own country for riot control. It logically could be used in Vietnam for similar purposes.

Mr. FRASER. Yes, it could be, and, of course, this is the argument that is commonly advanced in favor of having tear gas not come under the operation of the ban. When you do use tear gas, however, to drive the enemy out, in order that they are then more susceptible to other weapons, then it seems to me it becomes a use intended to increase fatalities.

I don't think that is a humane use of tear gas. I am not trying to be moralistic about it, because once we are in a war, obviously, we are trying to do our best. But the point is that a chemical substance is being used in a theater of operations in order to inflict or increase the number of casualties on the enemy.

BIOLOGICAL RESEARCH IN U.S.S.R.

Mr. ZABLOCKI. The Soviet Union ratified the protocol in 1928. Since that time, has not the Soviet Union entered into research or development of chemical-biological warfare? Do they have an establishment similar to our Pine Bluff, Ark., establishment, to your knowledge?

Mr. FRASER. My understanding is that the Defense Department claims that the Soviet Union has been doing work in both chemical and biological areas. But thus far they have been unable, the intelligence sources have been unable to identify any facility that would be a counterpart to the facility we have in Arkansas, namely, a production facility of bacteriological agents.

So it raises the question, I think, as to how far the Soviets really are into it. I suppose the answer is that we probably don't know for sure, but at least to my understanding, there has not been brought forward any information that could confirm the existence of such a facility.

Mr. ZABLOCKI. I want to make it clear, so far as I am concerned, even if the Soviet Union did have a production facility similar to or even greater than our Pine Bluff, Ark., facility, it does not necessarily mean that we should do likewise.

Mr. FRASER. Right.

Mr. ZABLOCKI. However, under our system of government, such facilities have become known very easily, while the Soviet Union, operating in a closed society, may be in more extensive production. There is no way we can tell.

I agree with the gentleman's aspirations. I wish we could now find the system, the key or the formula by which we could stop wars: disengage ourselves from present conflicts, and prevent future conflicts. But until mankind finds that solution and formula, we do face difficult problems ahead. I want to join with my colleague from Minnesota in the sincere hope that we can find some way to bring humanity back to its senses.

THE QUESTION OF ARMS CONTROL

Mr. FRASER. Mr. Chairman, if I may comment on that, I am not an outspoken enthusiast about the possibilities of arms control across-the-board. I am frankly fairly skeptical, based on past history, of the ability to bring conventional arms under effective control, if one just looks at the history of arms-control negotiations and the way nations will flip-flop their position when they begin to get too close to agreements.

One has only to remember the thirties and what happened in that period. I say that because I think in the case of chemical and biological warfare, and in the case of nuclear weapons, we are dealing with weaponry which is quite a different matter. Nuclear weapons, of course, is a different subject. But I just want to make clear that I think that a fairly healthy skepticism needs to be maintained about our ability to deal with the problems of war, through an effort to limit conventional arms. I think that is in a way dealing with the wrong end of the problem. I think you have got to deal with the causes that give rise to international conflict.

But I say that just so that you will understand that when I talk about the desirability of imposing or agreeing to the same restraints on CBW as other nations are prepared to agree to, and in the nuclear field. I do so in the light of this other belief that I hold.

Mr. ZABLOCKI. Mr. Broomfield.

Mr. BROOMFIELD. Thank you, Mr. Chairman.

USE OF TEAR GAS BY NORTH VIETNAM

What is the situation in North Vietnam? What are they doing in this particular field? Are they using any of these chemical or biological weapons against the United States, or troops fighting in South Vietnam?

Mr. FRASER. Well, I can only say that I know of no report that the other side has used either chemical or biological weapons.

Mr. BROOMFIELD. How about tear gas? Are they using that?

Mr. FRASER. I am not familiar with any report that they are. And I don't want to suggest that if they are not, that it is out of any sense of humanity. It may just be that they lack the capability or the technical competence, or the stockpiles to do it. But I am not aware of any reports of that kind.

Mr. BROOMFIELD. On page 1 of your statement you say that U.S. policy with respect to the use of chemical and biological weapons has changed. Would you explain that further?

STATUS OF NO-FIRST-USE POLICY

And one final question. Do you mean that the United States has abandoned the no-first-use policy on these weapons?

Mr. FRASER. Well, I suppose that the question is, Where do we start from in identifying our policy? We were the authors, as I understand, of the 1925 protocol, even though we subsequently failed to ratify it. We did sign it. We were the authors. We signed it, but didn't ratify it.

Even on the issue of tear gas, I might say that I understand that in 1932, at a disarmament conference, we were prepared to exclude that, in a disarmament treaty that never went anywhere.

But, in any event, my understanding was that generally we took the view that we would not be the first to employ these kinds of weapons.

Now, as I told the chairman, in Vietnam, we are using tear gas, in a way that goes beyond the civil-strife control type of use. We are using herbicides. And as I indicated, there is some reason to believe—at least Congressman McCarthy understands this—that we did have contingency plans in Cuba, and have them for other nations.

Now, contingency plans always are subject to the question, you know, what contingency? Does that really involve a first use? But with respect to Cuba, and with respect to our present activities in Vietnam, it would appear that we are now using them without the other side having used them first.

DETERRENT VALUE IN CB WEAPONS

Mr. BROOMFIELD. One argument used in favor of having the CB weapons is a deterrent against the possible use by an enemy. Do you see any deterrent value in our stockpiles?

The mere fact that we have apparently a large supply, does this——

Mr. FRASER. Well, I see very little value in biological stockpiles. For one thing, one of the problems involved in germ warfare is identifying

the source of the germs. At least if you are hit with a missile, you can usually figure out, or you hope you can figure out, where it came from.

Mr. BROOMFIELD. But you are just as much dead.

Mr. FRASER. Maybe just as much dead, but if the plague breaks out in New York City, you are going to be hard put to know where that came from. And so it seems to me that that is one problem with biological weapons.

Secondly, if you did know where it is coming from, it seems to me that our ability to retaliate is really much greater in our existing weaponry, including our nuclear missiles. And I suppose one can argue the relative degrees of humaneness.

If you infect a population with some of these fatal diseases, these people are just as dead as though they had been hit with a nuclear weapon.

So the point I am trying to make is that if a biological or germ attack were carried out by another power, in such a way that we could identify the source, it would seem to me that our ability to retaliate is abundant already, without our having to maintain stocks, the delivery of which is still an uncertain proposition. I mean, there are lots of technical problems involved in the delivery of germ weapons. I think this has been noted a number of times. We really don't know exactly what would happen.

CREDIBILITY OF CONFORMANCE TO PROTOCOL

Mr. BROOMFIELD. Suppose the Senate goes ahead with the ratification of this protocol. What gives you any feeling that the enemy, whoever it might be, is going to abide by it any more than they have on the Geneva Accords on the prisoners of war?

Mr. FRASER. Well, I think one has to look at the practical side of it. In the protocol, we are talking about the ban of its use.

Mr. BROOMFIELD. Right.

Mr. FRASER. Now there is a British treaty that was tabled at Geneva which goes further and would require all stockpiles in bacteriological fields to be destroyed, I think, in 3 months.[1]

But let's deal just with this protocol, for the moment; that is, a ban on use.

Mr. BROOMFIELD. Right.

Mr. FRASER. It does not mean, standing alone, that we can't have stockpiles. It simply says that we won't be the first to use them.

Now, I think one has to raise the question of whether it is useful from the practical point of view, in terms of the total weaponry and power that we possess, whether it is useful to maintain a stockpile separate from that. But the protocol, I don't believe, raises the issue of stockpiling.

Mr. BROOMFIELD. I congratulate you on a fine statement this morning, Congressman Fraser.

Mr. FRASER. Well, I am sure you can learn a lot more from subsequent witnesses.

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[1] This document may be found in the appendix, p. 276.

THE MEANING OF "OTHER GASES" IN PROTOCOL

Mr. ZABLOCKI. Don, the protocol prohibits the use in war of asphyxiating, poisonous, or other gases, and of bacteriological methods of warfare.

Now, in your interpretation, would tear gas come under the category of "other gases"?

Mr. FRASER. I haven't really sought to make an independent judgment, Mr. Chairman. When I was in Geneva, talking with some of our disarmament people, they commented to me then that the 14-Nation Report on Chemical and Biological Warfare took that position. And this apparently has been the position historically of most of the signatories to the protocol.

Mr. ZABLOCKI. That tear gas would be included.

Mr. FRASER. Would be included. And I think, in fairness to their point of view, that, when tear gas is used as an adjunct to other weaponry, so that its use has the effect of increasing fatalities, that their case becomes much stronger.

Mr. ZABLOCKI. Well, we conceivably could use water, in the form of steam, instead of tear gas, as an adjunct to war. Would that be prohibited? Instead of using tear gas in flushing out VC's in caves, then water would become a weapon.

Mr. FRASER. Except that water doesn't come under the ban, I don't believe.

Mr. ZABLOCKI. Yes, but it would be used in war.

Mr. FRASER. Right. But my point is that the protocol deals with chemical substances. Water, I suppose, could be considered a chemical substance, but tear gas is clearly aimed to produce a reaction on the part of the person who is exposed to it. And in this case it is a chemical, then.

Mr. ZABLOCKI. Of course, it is not poisonous.

Mr. FRASER. In and of itself.

Mr. ZABLOCKI. Yes. It does have certain reactions, if administered too closely to the body, of course, including asphyxiating a victim. It can burn the flesh.

But I think we are getting into technicalities far removed from the point.

Mr. FRASER. And I don't intend to give you an independent legal judgment. I am just trying to tell you what I understand the international viewpoint is on it.

DUMPING NERVE GAS INTO THE OCEAN

Mr. ZABLOCKI. A final question, Don.

In your statement, page 3, you say:

> We also appear to have so many chemical stocks on hand that the Pentagon last summer wanted to dispose of tons of modern nerve-gas weapons by dumping them at sea.

It was my understanding that the surplus was pre-World War I vintage.

Mr. FRASER. Well, some of it, I think, was mustard gas. But, also, some of it was nerve gas, more modern nerve gas, if I remember the

testimony correctly. There were several kinds of chemicals involved, not just the old mustard gas.

Mr. ZABLOCKI. Of course, the Pentagon's decision to dispose of them by dumping in the sea was a poorly conceived idea. But if we have such stockpiles, there must be some way of getting rid of them by chemical processes, returning them to inactivity and possible peaceful use.

Mr. FRASER. Well, I understand that while the Army had testified how difficult and expensive and prolonged the process would be of detoxifying them, that, in fact, they are doing this, and it is turning out not to be so expensive, or such a long process.

Mr. ZABLOCKI. Again, I want to congratulate you on a very fine statement and for your presentation before the committee this morning.

Mr. FRASER. Thank you, Mr. Chairman.

Mr. ZABLOCKI. Mr. Dellenback.

STATEMENT OF HON. JOHN DELLENBACK, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

Mr. DELLENBACK. Thank you, Mr. Chairman.

Let me say, if I may, as a preliminary, that I appear before you as a Congressman who is deeply concerned. I don't want to mislead you or anybody else into thinking that I am an expert on this subject. But I have some deep concern, and I will make reference at least in the course of the testimony to some involvement that we have had in this.

Mr. Chairman and members of the committee, I appreciate this opportunity to express my views on the 1925 Geneva Protocol. Certainly, these hearings will be very informative to the Congress. It is my hope that they will mark the beginning of a reexamination in depth by the Congress of our Nation's chemical and biological warfare policies.

As we all realize, the Geneva Protocol prohibits the first use of chemical and biological weapons by protocol adherents against other ratifying parties. It is thus appropriate to decide whether a no-first-use CBW policy is in our national interest. I think it is.

Previous American policy concerning CBW has been one of possible swift retaliation, not one of initiation. President Roosevelt made a landmark statement to that effect on June 8, 1943, in the midst of World War II. President Eisenhower reaffirmed this position in one of his last press conferences as Commander-in-Chief. Other official pronouncements have accorded with these Presidential declarations.

There are both sound military arguments and laudable humanitarian reasons why the United States should continue to avoid initiating chemical or biological warfare. Militarily, our considerable conventional firepower advantage is neutralized when gas is introduced into the battlefield. When pondering the human costs of war, we should be well aware that chemical and biological weapons can be extremely destructive and almost invariably will involve considerable civilian casualties.

URGES RATIFICATION OF GENEVA PROTOCOL

Some may ask why I urge ratification of the Geneva Protocol if the United States is already, in effect, committed to a CBW policy of no-first-use. Several arguments for ratification seem persuasive to me.

First, it was the United States which originally proposed the protocol in 1925. Our failure to ratify it has been a constant source of embarrassment to our diplomats. When we encourage others to ratify it during discussions at the U.N. we appear highly inconsistent. When we support moves to clarify or strengthen bans on chemicals or biologics, our representatives appear to be intruders telling other countries how to improve a protocol which they have ratified while we have not.

Second, a solemn national pledge will seem more firm and more permanent than a Presidential declaration, since the question repetitiously arises as to whether the latter will expire as each administration leaves office. Possible adversaries will feel more assured after the protocol is ratified that they will not be subjected to a surprise CBW attack. Contingency planners in Washington will be alerted that the United States cannot rely on any contingency plan that calls for the initiation of chemical or biological warfare.

Third, the overall strength of the protocol will be reinforced when the world's greatest military, industrial and economic power ratifies it. The worthwhile goal of eliminating chemical and biological warfare altogether could be significantly promoted if we added our influence to the prestige of this long-standing protocol.

PROBLEM OF RESERVATIONS TO PROTOCOL

Undoubtedly, there will be reservations offered to the protocol when it is resubmitted to the Senate. It is my hope that no substantive reservations will be attached. One which will almost certainly be offered would specifically exclude the use of tear gas for military purposes from the first-use prohibition.

Let me point out that no one seriously contends that the protocol outlaws tear gas in riot situations when police or soldiers are restoring civil order. It would not prohibit nonmilitary use of any gas, lethal or nonlethal.

While the protocol language itself might be considered unclear on the question of the use of tear gas for military purposes, there have been attempts to resolve the issue among protocol adherents.

Britain announced in 1930 that it felt the agreement prohibited such use of tear gas, and 11 other Nations quickly agreed. Both Russia and Red China subscribe to this broad reading of the agreement. Although Belgium has agreed with the United States in one international conference that such use of tear gas is not prohibited, no ratifying party has submitted a formal reservation to this effect.

It should be clear from the virtually complete abstinence since 1925 from the use of tear gas in war that most countries do, in fact, believe it to be outlawed by international law. If the United States, as the most recent and most powerful ratifier of the protocol, were to attach such a reservation, the force of the agreement would be significantly

weakened. For our ratification to be reciprocally binding with the other parties, each country would have to specifically accept our reservation. Some nations have already indicated that they will not countenance substantive changes in the protocol. Thus, an American reservation on tear gas could well mean a significant weakening of the protocol rather than a significant strengthening of it.

TEAR GAS RESERVATION UNWISE

There are additional reasons why a tear gas reservation is unnecessary and unwise. I do not feel that such a reservation would preserve a valuable military option for the United States. Tear gas is only effective against troops lacking simple gas masks. In addition, it could probably only be used in operations where the United States is not an ally of a protocol adherent which feels that the use of tear gas for military purposes is prohibited. Both allies would want to follow similar weapons policies, and the use of tear gas by the United States could easily lead to gas retaliation by our common enemy against both the United States and its allies. This would certainly be completely unacceptable to any ratifying ally. Thus, realistic opportunities for using tear gas may be quite rare.

Where tear gas is used for military purposes, and where the enemy has the potential for retalitation, there is a constant danger of rapid escalation to more destructive chemical and biological weapons. World War I saw escalation from tear gas to chlorine, phosgene, and mustard gases. The dangers involved in rapid CBW escalation outweigh any advantages of using tear gas for military purposes in those rare instances where it could be effective.

CONSIDERATION OF TIMING

The final consideration in resubmitting the protocol is one of timing. It might seem wise to delay consideration until the Vietnam war is over and tear gas is no longer being actively employed by our military. I agree that the protocol should not be reviewed while we are using chemicals in Vietnam, but the solution which I would propose would be to end chemical warfare in Vietnam, not to wait until the war is over to resubmit the protocol.

Chemical weapons may well cause permanent damage to the environment the Vietnamese must live in long after the fighting is over. These weapons are associated, at least psychologically, with an aggressively offensive strategy rather than the strategy of steady deescalation and of protective reaction toward which we are apparently moving in Vietnam.

Finally, there is a danger that chemical weaponry will be used indiscriminately or inhumanely, particularly if our own military commanders lose control of the weapons. We should have discontinued the use and supply of these weapons prior to the time that Vietnamization of the conflict has been completed.

The soundest time to begin such a move is immediately. Stopping chemical warfare now could be a qualitative reduction in the level of fighting and a clear indication of our desire for peace which could not be ignored at home or abroad.

ELIMINATE CHEMICAL WARFARE IN VIETNAM

I would urge the immediate elimination of chemical warfare in Vietnam and a prompt consideration of ratification of the Geneva protocol soon afterwards.

The final point I would like to make—and in many ways I feel it is the most important one I have to make—is that ratification of the Geneva protocol would be the first step, not the last, in a thorough reevaluation of our CBW policy. The British have submitted a draft treaty to eliminate biological weapons production. I believe the United States should support this proposal. In addition to this and other possible international moves the United States could make in the field of CBW, there are important steps we can take at home.

REPUBLICAN MEMBERS' CBW STUDY

Recently I chaired a study group of Members of the Congress which sponsored an analysis of the tactical and strategic implications of chemical and biological weapons. This study suggested that such weapons might offer little advantage either in prosecuting a limited war or in avoiding an all-out war. These weapons have not necessarily been used humanely in the past, and their effectiveness is more dubious than that of the conventional weapons they seek to replace or supplement. Moreover, the risks we run by continuing to produce, stockpile and secretly test these weapons may very well far outweigh their dubious advantages.

As a result of that study, it seemed to the members of our informal group that serious consideration should be given to the elimination of all chemical and biological stockpiles, to publication of all future research in the field, and to a declaration that the United States would not use chemicals and biologics in any military situation, but would instead rely on appropriate conventional and nuclear power to respond to enemy aggression.

I am appending a copy of that study to my remarks with the request that it be made part of the record of these hearings. If I may make that request, Mr. Chairman, instead of reading it, I think that the committee has been supplied with copies of our report.

Mr. ZABLOCKI. Without objection, it is so ordered.

Mr. DELLENBACK. And it is of such length, that I think we would all agree that there would not be the time to read it.

Mr. ZABLOCKI. Without objection, the document will be included in the appendix.[1]

Mr. DELLENBACK. I hope that others will join with our study group in supporting a complete reexamination of our chemical and biological policies, not merely on the question of first use, as required by a consideration of the Geneva protocol, but on the more fundamental questions of production, stockpiling and retaliation which have received far too little attention in the past.

And if I may, I would point out that this study that I am appending, as I have said in the course of my formal statement, was sponsored by an informal group. It consisted of Mr. Mosher of Ohio, Mr. Robison of

[1] The document may be found on p. 285 in the appendix.

New York, and Mr. Schwengel of Iowa, and myself. In addition, Mr. Esch of Michigan, Mr. Frelinghuysen of New Jersey, Mr. Gude of Maryland, Mr. Horton of New York, Mr. McCloskey of California, Mr. McDade of Pennsylvania, Mr. Morse of Massachusetts, Mr. Reid of New York, Mr. Ruppe of Michigan, Mr. Schneebeli of Pennsylvania, Mr. Stafford of Vermont, and Mr. Whalen of Ohio, have joined in making the statement available for study by the Members of Congress.

That concludes the few formal remarks, Mr. Chairman, that I wanted to make.

Mr. ZABLOCKI. Thank you, Mr. Dellenback, for your excellent statement.

DETAILS OF THE CBW STUDY

John, could you advise the committee how and why the study was undertaken, and other details surrounding its issuance?

Mr. DELLENBACK. Well, some of us, in talking about all of the problems that Congress faces, were all constantly seeing other things which were not within our own particular field of expertise. And I readily acknowledge that this is not within my direct committee responsibility or otherwise, as was the case with the other members, by and large, of this group. But we have become concerned that if we are really anxious as I think we all are, not merely to end Vietnam, but to really move the world toward peace, that we are going to have to look at the broad-scale aspects of weaponry, and what are we doing in that field.

And one of the most obvious to look at is this whole field, Mr. Chairman, of chemical and biological warfare. It appeared to us as one of the most sensitive. It is one of those that the deepest psychological implications, and we wanted to do some thinking about how really valuable was it. And so we undertook some thinking about it, and had some staff work done in examining materials on it, to examine the questions of how really valuable is our chemical and biological work, either in dealing with limited war, or in dealing with all-out war.

That was the thrust of our study, and we have come to the conclusion that it is of very questionable value, Mr. Chairman, and that its value is far outweighed by other weaponry, and that it adds very little at a very considerable risk.

Mr. ZABLOCKI. Did your group also study the efforts being made in CBW by other countries, the Soviet Union, for example?

STUDY CONFINED TO U.S. POLICIES

Mr. DELLENBACK. No, we did not reach them. We were confining our thinking to the question of our own need for chemical and biological weapons—and it is just a beginning, in a complex field, and we readily concede that. It is not a exhaustive study of the whole field by any means, but our concern was, looking at it through American eyes, what is the real value to our defense position, to our own international involvement, and to the protection of our land, to have continued not only research, but also production, stockpiling and perhaps use of the weapons.

And we make a distinction, Mr. Chairman and members of the committee, between research and production and stockpiling and use.

And we are not advocating that research be terminated, because, quite frankly, if for no other reason than self-protection, not in the sense of retaliation, but self-protection in knowing what to do if these weapons should be used against us, it seemed to us that study must go on in the area of research, so that we can identify enemy weapons and have antidotes, or have protective measures available.

But we were confining our thinking against that background, you see, Mr. Chairman, to the question of what real value does this weaponry have to the American defense posture? Is it really something that we need, that is really valuable? Or is it something that we have accepted and because other people do it, therefore we should do it?

We were not persuaded, frankly, Mr. Chairman, that just because other people do it, we should do it. We should do it only if it really is important to our own position.

Again, I would commend, on behalf of the group, the paper to you, for at least a hasty examination. And I recognize that you, like we, have a great many things to read, but we would urge you at least to read the introduction, wherein in three pages we have tried to condense some of our thinking, and then some of the backup is behind it.

Mr. ZABLOCKI. I want to assure you that the subcommittee will give careful consideration and thorough study to the report that you have perpared.

Mr. DELLENBACK. Thank you, Mr. Chairman.

THE QUESTION OF CBW RESEARCH

Mr. ZABLOCKI. You said that for our own national interest, research in CBW ought to be continued. To what degree should research continue? It is my understanding that in research there has to be some development, though not necessarily massive deployment.

In order for the research to be worthwhile, there would have to be some development, would there not? And limited production?

Mr. DELLENBACK. I think this would be a thing that we would have to look at very carefully, Mr. Chairman. And I don't mean to move into a complex area with a meat ax, and thrash around and make wild statements on it.

I don't know exactly where the line would be drawn between research and production. The last page of our paper, the last couple of pages, have set forth some charts, in which we talk about general characteristics of lethal chemical agents. And we have outlined some six of them, and some features. And then what is even more, if you will, in one sense, frightening, is where we outlined biological agents that may be used to attack man. And we have perhaps about 15 agents that are known, and I am certainly of the opinion that until we have some assurances of an international nature that we can all lean upon, that we should not be in a position where we don't find our scientists able to recognize that which might possibly be used against us, and have some countermeasures to protect our own populace in the event that these measures should be used.

Now, where that needs to stop, Mr. Chairman, in order to be sure we have this type of protection that we can identify the agent which is causing the particular disease, a biological agent used, and that we can know what countermeasures are available while still avoiding actual stockpiling and production, I don't know.

Now, I would think it would be rather basic that we could draw a line between stockpile production and use, and where research must actually stop. Because production in mass to stock up, not of antibodies, but of aggressive biological weaponry, clearly is not being used for defensive purposes to take care of our civilians, our own citizens, in the event there should be an attack on us. So also stockpiling in general is clearly offensive in intent, rather than defensive in intent. So I would see the line drawn there.

I am not enough of an expert to try with minute precision today to tell you exactly where research should stop, but I would see in general a clean line between our continuing research for national defense, to protect our own populace, so we know what we can do to protect our people, and moving beyond that.

The first, I think, is important. The second, I have serious reservations and questions about. After our study, I see little value, Mr. Chairman, to our national posture in having these stockpiles. We have other weapons that are at least as effective as a deterrent.

THE BRITISH PROPOSAL ON BIOLOGICAL AGENTS

Mr. ZABLOCKI. John, would you suggest that the protocol be amended along the lines of the British proposal to eliminate production and current stockpiles, which the protocol does not deal with?

Mr. DELLENBACK. No, Mr. Chairman, I am expanding my testimony, if you will, and as I understood that the Chair was willing to be done, and the committee was willing to have done, beyond the simple protocol. I am not suggesting amendment to the protocol, because I think that we have got to make haste slowly in this particular field. And if we tried to take the protocol at this point, Mr. Chairman, and place major amendments in it, we would in effect be neutralizing much of that which has already been done, by all those other parties which have already ratified the protocol. It would be my own feeling that we should move forward in the field of ratification of the Geneva Protocol, which deals primarily with the first-use concept. And as I said in my statement, I see that as the first step, not as the final step, in this field. But I don't think we ought to get that first step, Mr. Chairman, so confused with a host of other things that the first step fails to be effective at all.

And so really I would separate my testimony, if there be any question in the minds of the committee, between talking to the Geneva Protocol, which is what I would urge we give careful consideration to and examining our overall chemical and biological weapons policy. And I personally feel we should ratify this protocol, and then beyond that, I am making a series of other suggestions. Our group in its paper on this is urging consideration of other possibilities, over and above and beyond the protocol, but not part of the protocol.

PRIORITIES IN CBW CONTROL

Mr. ZABLOCKI. Then your highest priority is the no-first-use, and ratification of the protocol; then the suggestion that the United States support the British proposal of eliminating biological production; and, third, the protocol may subsequently be amended to include chemicals.

Mr. DELLENBACK. Or other agreements could be worked out.

Mr. ZABLOCKI. Or other agreements to eliminate chemical stockpiling and production.

Mr. DELLENBACK. I would say that might be a third categorization of priority only because the protocol is right before us, and we can act swiftly on it without having to do a great deal of basic spadework, Mr. Chairman, not because it is necessarily the most important thing. I think it is a beginning in a field on which we are already sadly late in making an effective beginning.

WHY DID THE UNITED STATES FAIL TO RATIFY PROTOCOL?

Mr. ZABLOCKI. If I may just ask one further question, John, about your study group. Did they study the question of why the United States, after the protocol had been submitted and, indeed, after the United States had been spearheading the wording of the protocol, why there was unwillingness on the part of the other body of the Congress to ratify it? Has your study come up with any findings?

Mr. DELLENBACK. Only very surface, Mr. Chairman.

I have an article that was reprinted from the Wisconsin Law Review which makes some very simple statements on this, that deals, in effect, with the fact—and the chairman and the committee, I am sure, are fully aware of the fact—that the 1922 Washington Treaty on Noxious Gases preceded this, and had been ratified by the Senate. And if I can believe the full statement of the Wisconsin Law Review on this, those in charge of ratification of the Geneva Protocol in 1925 were misled by the ease with which the 1922 agreement was ratified, without a single dissenting vote in the Senate. And when it came to the 1925 protocol, they sort of took for granted it was going to go through very easily.[1]

They failed to do their homework, they let opposition arise, and the first thing they knew, they had a whale of a fight on their hands, and they backed away. And at that stage of the game, Borah, who was the chairman of the committee involved, backed away from it, because he possibly wasn't sure that he had the votes to get it through.

And since then, it has just never reached that crescendo of interest, and the opposition having once arisen on it, didn't abate. And the issue just sort of drifted off onto the sidelines.

Mr. ZABLOCKI. The subcommittee will go into that question Thursday, when we will have Mr. George Bunn as our witness.

Mr. DELLENBACK. Right. We are referring to the same document, and he can, I am sure, give a good deal more of detail on this particular question.

RESPONSIBILITIES OF HOUSE IN NATIONAL SECURITY ISSUES

Mr. ZABLOCKI. I want to commend you, as well as the other sponsors of the resolution, on your interest and your efforts in this regard. Under the Constitution, as you well know, the House does not have treaty ratification powers, but we do have responsibilities in national security policy. And this is the very reason why this subcommittee is holding hearings on the resolutions.

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[1] This document may be found on page 304 in the appendix.

Mr. DELLENBACK. If I may, Mr. Chairman, may I commend you as the chairman of this subcommittee and your members for having these hearings. I think we are here dealing with a tremendously important problem, so far as America is concerned, and we of the House recognize that while our direct responsibility is not to ratify the treaties that are involved, these problems are as much our concern as they are the other body's. And I commend all of you for your willingness to plunge into this and to do some helpful and creative thinking.

Mr. ZABLOCKI. After all, this is our obligation. We are spokesmen for the people, direct representatives of the people. Therefore, we should voice our views on this particularly delicate matter.

Mr. DELLENBACK. It is a fine move, sir.

Mr. ZABLOCKI. Thank you very much.

Mr. Broomfield?

Mr. BROOMFIELD. Yes, Mr. Chairman.

CBW STUDY SENT TO PRESIDENT NIXON

John, I, too, want to join with the chairman. I am very impressed with your comments and statement this morning. I think they have been extremely helpful to this subcommittee in their deliberation on this subject.

I was wondering, has President Nixon been given a copy of the study report made by a group of members working with you?

Mr. DELLENBACK. Yes, Mr. Broomfield, we have sent a copy of this to the Department of Defense. We have sent a copy directly to the President.

Mr. BROOMFIELD. It is my understanding that the United States did not use any kind of gas, even tear gas, in World War II or Korea. Do you know why this was so and why the policy was changed in Vietnam?

Mr. DELLENBACK. I don't know. Your understanding is like mine, that maybe with an isolated slip or two, there was no deliberate use of tear gas in the Second World War. Certainly, there wasn't in any of the theaters in which I was involved, or at least not to my knowledge. And I don't know why the change was made in connection with the Vietnamese conflict.

REASON FOR DELAY IN RATIFICATION

Mr. BROOMFIELD. I think the other thing that bothers me is the delay since 1925 in the consideration of the ratification of this protocol.

Do you have any comment on why this is delayed so long?

Mr. DELLENBACK. Well, I read with interest the newspaper article the other day that some of you may have seen, which made some remark about a tidy chairman of the Senate committee who is responsible for the fact that the issue isn't before the Senate at the present time, and made the point that at the time that Vandenberg was chairman of the Senate Foreign Relations Committee, apparently, he made it a point to look over the docket of the committee. And he found, apparently, that there were some 19 different treaties of some variant age that were there, and they weren't being acted on.

And so he said, "Well, let's sweep all these old things out of the way and let's clear the deck. Let's turn them back to the executive department and let's go forward with a clean docket."

And the 1925 Geneva Protocol was one of those, under those circumstances. And so it ended up back in the hands of the administration, not formally before the Congress at all, you see. And it has been in that position since then. No administration has turned around and handed it back to the Senate for ratification.

This is, at least, the thrust of this article, and I know nothing to the contrary that would apparently contradict that which was done at that time.

THE NATIONAL SECURITY COUNCIL CBW REVIEW

Mr. BROOMFIELD. I see. Thank you.

Have you any idea about the nature of the—or outcome of the review of this CBW policy which presently is being conducted by the National Security Council?

Mr. DELLENBACK. I don't have any hard information on it, Mr. Broomfield, of the nature on which we can rely. I have only a few rumors. And I don't know what the outcome will actually formally be, so far as they are concerned.

Mr. BROOMFIELD. Thank you, Mr. Chairman.

Mr. ZABLOCKI. Let me just pursue this matter a bit further. The National Security Council is carefully considering the CBW issue?

Mr. DELLENBACK. This is my understanding that they are considering it carefully and in depth, and it is my hope that they will continue to do it in very real depth.

Mr. ZABLOCKI. I am hopeful that these hearings will serve as a spur to those deliberations and that the Council will come up with some good recommendations.

Mr. DELLENBACK. There is precedent that a hearing on the part of one body or the other of the Congress has that effect. We hope that will be one of the effects.

Mr. ZABLOCKI. This subcommittee apparently has had some worthwhile effects on national security policies as a result of our hearings, even in this particular short period of 11 months. But we are hopeful that any positive action on the part of the Security Council will to some degree, at least, be affected by our activity in this subcommittee.

Mr. Fraser.

Mr. FRASER. Thank you, Mr. Chairman. I was just going to say I hope that there is more visible impact than our hearings on the MIRV seem to have had thus far, on the Helsinski talks.

Mr. ZABLOCKI. Well, I am not completely pessimistic, even in that regard.

Mr. FRASER. I hope not. I am sure they are thinking very seriously about it.

Mr. ZABLOCKI. The plane is still waiting.

Mr. FRASER. Right.

THE NONUSE OF GAS IN KOREAN CONFLICT

Mr. Dellenback, I want to commend you for a very thoughtful statement. I think that your work in making the study and involving the Members that you have will help to create a climate here in which there might be a chance of gaining widespread support for the position you are advocating.

On the use of gas in the Korean war, my understanding is that in part we were faced with the fact that we were alined with large numbers of other nations who are members of the United Nations, and who were also signatories to the protocol and had taken the view that any kind of gas would be a violation of the protocol, so that we were under constraints there that we apparently are not under in Vietnam.

Whether that is the full explanation or not, I don't know, but I understand that some of the field commanders did ask for the right to use gas in Korea, but that they were turned down, I suppose in part on those grounds.

Mr. Dellenback. It would make sense if that were the case, it would appear to me, Mr. Fraser. And, as you recall, one of the thrusts of my testimony, one of the comments which I made, was that so far as the practicality of the use thereof, we might well find ourselves in an ally situation with other ratifiers of the protocol, and it would be a very sticky situation, because common weapon policies would have to be followed, and it is the very type of thing to which you are now alluding.

CB WEAPONS VERSUS NUCLEAR WEAPONS

Mr. Fraser. Let me ask you a kind of a philosophical question. With four or five nations possessing nuclear weapons, with the enormous damage they can inflict, and the follow-on damage that occurs through the fallout and radiation, and so on, what do you see in the chemical and biological field that would suggest that we should address ourselves to this particular type of means of inflicting casualties or incapacitating people?

When we do have these nuclear weapons which have this enormous mass destructive capabilities——

Mr. Dellenback. Well, if I get the thrust of your question properly, Mr. Fraser, I am not advocating a turning to the use of these other weapons. I do feel—and it is part of the statement that we make in our study paper—that the very existence of that nuclear weaponry, however, is of such a nature that it is a strong reason why we just do not need this other field of weaponry.

We are talking about having a weapon which could be used as a retaliatory deterrent. We don't need this other field of weaponry, with all its tremendous potentials for worldwide devastation. I allude particularly to biological weaponry. I think it is a frightening weapon, and it concerns me that there is an apparent history of a policy feeling we need this in our arsenal of weaponry. These weapons are so horrible that we should not be using them. We have this other very powerful deterrent to which you have alluded.

It seems to me that is another reason why we do not need to move forward. In fact, we should be moving backward in the CBW field.

Mr. FRASER. You are saying that because we have two terrible weapons, and the latest weapon makes the first relatively obsolete, we ought to get rid of it?

Mr. DELLENBACK. No; not obsolete. I am not talking in terms of obsolescence.

Mr. FRASER. In terms of the security needs of the United States, though.

Mr. DELLENBACK. I think it makes it unnecessary. It is a second type of weaponry which has its own frightening possibilities. And the only justification that I could see from the standpoint of the nature for going forward with the stockpiling or the production would be if we absolutely had to have it for national defense.

Well, it seems to me that that reason just does not exist. This was part of the thrust of our study. That need is just not there. We don't need it for those purposes.

THE PROBLEM OF PROLIFERATION

Mr. FRASER. One of our other concerns about nuclear weapons, of course, is proliferation. It is a fact, is it not, that proliferation in the chemical and biological fields is probably lots easier and cheaper for countries than the nuclear field, which would be another reason why we should go along with the world opinion to try to get rid of those weapons, or at least to prohibit their use?

Mr. DELLENBACK. I am sure you are not reaching in this direction, Mr. Fraser, but I don't want even impliedly or indirectly to be standing with those who are advocating, if there are indeed any, the use of nuclear weapons. So I am not moving in the direction of saying we should be using these things—there is a better weapon, it is a more effective weapon than this one.

I am merely looking for the moment at the CBW field and saying my admittedly limited examination of the field has left me with the impression that we have little to gain, if any, that the gains are marginal from having his weapon in our stockpile, in view of everything else that exists in the world at the moment.

And I think that it would be a long step in the direction of permanent peace if we were to take the steps that we have suggested here of moving away from having this in our stockpile, and having it in production. I think we ought to be saying clearly we will not use this weapon.

I would like us to, see, go way beyond the protocol, Mr. Zablocki, but as a second step, not tied to the first step, because it is right here in front of us, and being relatively easily taken, then let's be ready to make it a first step and go on to the second and third steps.

Mr. FRASER. Thank you very much.

Mr. ZABLOCKI. Mr. Taft.

Mr. TAFT. Thank you, Mr. Chairman.

"THIN LINE" BETWEEN USES OF TEAR GAS

Mr. Dellenback, this tear gas thing bothers me a little bit. I wonder what you think about the use of tear gas at the Justice Department last week. Was this a justifiable use, or not?

Mr. DELLENBACK. Well, so far as the 1925 Geneva Protocol is concerned, Mr. Taft, let me say only that it doesn't deal with any nonmilitary use of tear gas. It deals only with military uses, and it is dealing with a first-use situation.

In my testimony, I have deliberately stayed away from the civilian use of tear gas.

Mr. TAFT. It is a pretty hard line to draw in a guerrilla warfare type situation. Let's get away from Vietnam for a moment and just discuss the reports of the Sino-Soviet frontier, where it is reported at times that great masses of unarmed Chinese settlers, in effect, were pushed over on the ice and told to go out there and settle, and the Russians tried to herd them back in or tried to hold them back in.

Whether these reports are true or not, I don't know, and it isn't important. As a hypothetical situation, under these circumstances, what should the armed forces of a nation faced with this type of aggression do? Should it use tear gas or not, or what should it use if no other method, short of far more repressive and/or dangerous methods, from the point of view of the safety of the people involved, is an issue?

Mr. DELLENBACK. Hard cases make bad law.

THE USE OF PHOSPHOROUS SHELLS

Mr. TAFT. I agree. I don't know exactly what the answer to that one is.

Let me go on to another hard case, I think, which hasn't been discussed, as far as I know.

What about the use of high-explosive, white phosphorous shells? Is this chemical warfare, or isn't it chemical warfare? We used them extensively all through World War II, as I am sure you know.

Mr. DELLENBACK. I would say two things, Bob, if I may, about this.

One, before you came I carefully sought to disqualify myself as a real expert in this field. And I am a deeply concerned Member of this body. We have done some studying, and we have done some thinking and some talking about it.

I would have difficulty drawing the sort of line you draw and that you touch on with that question. It is a hard one, and I am not prepared—I mean, without much more intensive study—to attempt to draw that line.

I would say the second thing, Mr. Chairman and members of the committee, if I may, that I am personally persuaded that the road to permanent real peace for the world doesn't lie down the road of developing newer and newer and more and more powerful weapons systems. I think this is a race that has a very real frightening possi-

bility of ending in Armageddon, or worldwide disaster. I think that the only real hope for us is to both eliminate causes of disputes between nations and engage in meaningful discussions with these nations, where we sit down and talk through, hard as that is, and lengthy as these procedures are, and come to agreements that are in the mutual interest of the nations involved and which will be made in the form of agreements that would be binding upon the parties involved.

So I am personally watching with the same interest that every member of the subcommittee is, that which is happening in the negotiations which have now begun with our friends from the U.S.S.R. I think those are very important for the future of the world, and I think that they can be another step, again which will not be the final step.

I may be idealistic, but I am not, hopefully, with my head completely in the clouds, so far as what this road can lead to. I think we must take these things a step at a time, but down that road of hard discussion, and realizing that for the sake of the people of the world, we must come to agreement, and we must be able to arrive at limitations of the weapons systems of the various powers of the world.

NEED TO LOOK AT DIFFICULT QUESTIONS ON CBW

Mr. TAFT. Well, let me say that I find myself very much in agreement with your general feelings. I also might say that I certainly share in the feeling that it is an excellent idea for this committee to go into this matter, and go into it very thoroughly. I think there are some awfully difficult questions on sides of it that people haven't been willing to face in the past. And perhaps the reason we haven't moved since 1925 is that these difficult kinds of questions keep coming up. The main thrust is lost when they get off into the side issues, discussing these difficult questions.

I don't think it should be lost. I think we ought to continue to direct attention toward it. In that regard I am not sure I should direct this question to you, but perhaps to the staff.

OTHER TREATIES SPECIFIED IN PROTOCOL

Mr. Chairman, the protocol refers to other treaties. I wonder what the other treaties are and to what extent the United States has or has not considered such treaties or may or may not be a party to such treaties.

I would like to get the full background on that before we move further, because I don't see how you can talk intelligently about it without knowing what the other treaties were.

Do you have any knowledge on that, Mr. Dellenback?

Mr. DELLENBACK. I do not, Mr. Taft. No, I do not.

Mr. ZABLOCKI. Bob, the staff will obtain the information to clarify the references in the second whereas clause.

(The requested information follows:)

STAFF MEMORANDUM ON "OTHER TREATIES" REFERRED TO IN 1925 GENEVA PROTOCOL

The "other treaties" referred to in the Geneva Protocol of 1925 refer to the Hague Gas Declaration of 1899, the Versailles Treaty and the 1922 Washington Treaty on Submarines and Noxious Gases. The Washington Treaty,

however, ultimately failed because of French objections to its provisions on submarines.

Mr. DELLENBACK. I would think, if I may, that the only knowledge I have, and it is very limited, is in this one article to which the chairman referred earlier, where they make reference to the Hague Gas Declaration, which goes back to the 19th century, and the 1919 Versailles Treaty.

There are a few of this nature. I don't know what else may be embraced by it, Mr. Taft.

Mr. ZABLOCKI. Bob. I think Mr. George Bunn, who is to be with us on Thursday, will be able to clarify those questions thoroughly.

Mr. TAFT. Very good. Thank you very much.

Thank you, Mr. Chairman.

POLICING A BAN ON BIOLOGICAL WEAPONS

Mr. ZABLOCKI. I have but one final question, which goes beyond your first priority about resubmission of the Geneva Protocol, which I think we all agree on. The suggestion is that the United States support the British proposal of eliminating biological weapons production.

I am reminded of the problems that weve spelled out before this committee during the MIRV hearings on banning testing of the MIRV's, that it would be very difficult to police and verify a MIRV ban.

How could a BW ban be policed and verified, so that we could be confident that no nation, particularly the Soviet, would be cheating if an agreement was reached on eliminating biological weapons production. Have you any idea?

Mr. DELLENBACK. That is an excellent question, Mr. Chairman.

Are there any other questions?

Obviously, it is a very difficult one, Mr. Chairman. You know, I don't have any specifics that I would put forward at this time. Again, if you will shift to this, which is a very important part of what you are talking about, I would want to do more research before I can say that I could give you something that was worth the committee's giving it the same serious consideration that I hope it will give to what I have had to say within this very limited scope of the protocol and the CBW this morning.

Mr. ZABLOCKI. Thank you, Mr. Dellenback. You have presented to the committee a very thoughtful statement, and your responses to the questions were most helpful.

I want to commend you for your presentation today, and I particularly want to express our appreciation to you for sharing with the subcommittee the recent study of CBW and national security, of which you were the principal sponsor, issued by a number of Republican Congressmen.

Mr. DELLENBACK. I certainly don't claim to be the principal sponsor of it. I was merely one of those involved, and I happened to occupy a particular role in connection with it. We are all equally involved in it, Mr. Chairman.

Thank you very much.

Mr. ZABLOCKI. Thank you, Mr. Dellenback.

Mr. ZABLOCKI. Our next and last witness for this morning is the Honorable Richard D. McCarthy.

Mr. McCarthy is the author and principal sponsor of the resolution which is before the subcommittee. He has achieved a national reputation, during the past several months, because of his work on issues relating to CBW.

STATEMENT OF HON. RICHARD D. McCARTHY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Mr. McCARTHY. Thank you, Mr. Chairman.

If I may, I would like your permission to have my valuable associate, Mr. Pigman, a member of my staff, join me at the table.

Mr. ZABLOCKI. If he will.

Mr. McCARTHY. Thank you, Mr. Chairman, members of the committee.

Rather than duplicate what has already been covered in these very good statements by our distinguished colleague, Mr. Fraser, from Minnesota, and Mr. Dellenback, I would like your permission to submit my full statement for the record.

Mr. ZABLOCKI. Without objection, your formal or prepared statement will appear at this point in the record.

STATEMENT OF REPRESENTATIVE RICHARD D. MCCARTHY

Mr. Chairman: I welcome the chance to testify to your Committee on House Resolutions 439, 444, 457, 490 and 549 urging President Nixon to resubmit the Geneva Protocol of 1925 banning the use of chemical and bacteriological warfare to the United States Senate for ratification. Ninety-eight other Members have joined me in co-sponsoring these resolutions, indicating some measure of the support for this action.

Although the United States took the lead both in 1922 at the Washington Arms Limitation Conference and at the Geneva Conference of 1925 in working for a ban on the use of chemical warfare, we remain one of the two major industrial nations not to have ratified the Geneva Protocol of 1925. It strikes me as strange indeed that this arms limitation agreement, one of the few that has worked, has not been ratified by us. Such action is long overdue.

It would be useful to recount some of the history connected with the Geneva Protocol at this time. The Washington Arms Limitation Conference of 1922 included a provision that banned the use of "asphyxiating, poisonous, or other gases, and of all analogous liquids, materials, or devices." The United States signed the Conference Treaty of 1922 and the United States ratified it unanimously. Unfortunately, the Treaty did not go into effect because the French failed to ratify the Treaty. Their objection was not to the prohibition on gas but rather to the limitation on submarines.

The United States delegation to the Geneva Conference of 1925 was led by the Chairman of the Foreign Affairs Committee, Theodore Burton. Chairman Burton proposed at the Conference that a Protocol banning the use of chemical weapons be included in the Treaty. Another delegation added bacteriological weapons to this ban. The language that was eventually adopted by the Conference was the same as that which had been used in 1922. The Protocol was signed by the American delegation and was submitted to the United States Senate by President Coolidge. Although the Senate Foreign Relations Committee reported out the Protocol in 1926 by the favorable margin of eight to one, the treaty was never brought to a vote in the Senate. The issue was debated during the lame duck session of Congress in 1926 and Senator Borah did not believe that he had the votes to pass the treaty. There are indications that the Executive Branch had taken too much for granted after the ratification of the 1922 Treaty and had not done its homework in the Senate.

The Senate did not consider the Protocol again. In the post-World War II period Senator Vandenberg sent back to the White House "without prejudice" a

number of treaties that had not been acted upon and which remained on the schedule. As a result, the Senate cannot act upon the Geneva Protocol of 1925 unless President Nixon resubmits it.

NO USE OF CBW IN WORLD WAR II OR KOREA

The United States did not use either gas or bacteriological warfare in World War II or the Korean War. The North Koreans and the Chinese Communists accused us, falsely, of using germ warfare in the Korean War. We went to great efforts to make it perfectly clear that we had not and would not engage in this form of warfare. We have also taken the position in the United Nations and in statements to the Congress that the United States supports the principles of the Geneva Protocol. We have even sponsored and voted for resolutions in the United Nations calling on all nations to ratify the Geneva Protocol.

Confusion arises, however, when we compare our actions in Vietnam with our professed policy. We now use tear gas on a massive scale, albeit under ambiguous policy guidelines, to help kill the enemy. We use anti-plant chemicals—defoliants and herbicides—both as anti-food weapons and against foliage. The widespread belief by most nations that have ratified the Protocol, that it applies to tear gas, makes the United States an exception rather than the rule. The recent information that the main ingredient of our defoliants, 2,4,5-T, is harmful to humans, means that these chemicals are prohibited by the ban on poisons in the Protocol.

PROBLEM OF TOXINS

There are several areas of possible controversy that may arise in the Senate Foreign Relations Committee and on the floor of the Senate should the Geneva Protocol be brought up for discussion. It should be clear that the ban on bacteriological weapons includes toxins, the deadly by-products of bacteria. These poisons are in some cases, such as bottulinus toxin, more deadly than nerve gas. They are produced with much of the same equipment that is used to produce germ weapons. In the early stages of discussion between the various agencies of the U.S. Government on chemical and biological warfare, some of the military argued that toxins are chemicals rather than bacteriological weapons. The problem with this approach is, first, that these toxins are biologically produced. Secondly, if we continue to produce toxins, we must keep the equipment necessary to produce germ weapons. This would call into question in the minds of other nations our intentions concerning germ weapons.

Mr. George Thomson of the United Kingdom shed some light on this problem when he recently commented on the British draft convention tabled at the Geneva Committee on Disarmament. This convention would bar development, production, storage or use of biological weapons. Mr. Thomson said of the convention:

"Provisions for inspection of biological installations has not been made because this would have been so intrusive as to be politically unacceptable to many states and would in any case provide no guarantee against clandestine production of biological warfare agents. Toxins, although produced by living organisms, do not themselves multiply and are usually regarded as chemical substances. However, if it was widely felt that toxins should be covered by our draft Biological Warfare Convention because of their biological origin, Her Majesty's Government would be very ready to consider appropriate amendments."

I have urged President Nixon to support the United Kingdom convention and to have the United States press to adopt an amendment clearly stating that toxins are included under the draft convention.

THE USE OF INCAPACITATING AGENTS

A second area of controversy that may arise should the Geneva Protocol be considered by the United States Senate concerns the use of incapacitating agents. I believe that the United States should not be the first to use gas, either deadly or incapacitating. According to most nations, incapacitating agents include tear gas. I believe that we should reaffirm our policy of only using the so-called tear gases in riot control or riot control-like situations. This has been United States policy over the years. We only used tear gas for this purpose in World War II and the Korean War despite the availability of large supplies in the United States and requests by field commanders in the Korean War to do so. Our top political leaders have also stated in the current conflict in Vietnam that we will only use tear gas in those situations where it is humane to do so. In the spring

of 1965, when it became known that the U.S. had used tear gas on a number of occasions in Vietnam, Secretary of State Dean Rusk said:

"We do not expect that gas will be used in ordinary military operations. The anticipation is, of course, that these weapons be used only in those situations involving riot control or situations analogous to riot control."

This was not a casual statement because in 1966 the United States Ambassador to the United Nations James M. Nabrit, Jr. said:

"It would be unreasonable to contend that any rule of international law prohibits the use in combat against an enemy, for humanitarian purposes, of agents that Governments around the world commonly use to control riots by their own people."

Most recently, in the discussions now underway in the Executive Branch, the top United States State Department legal authorities reiterated that tear gas could only be used in those cases involving humanitarian grounds.

THE ISSUE OF TEAR GAS

The controversy regarding tear gases—riot control agents—incapacitating gases—arises because the United States has been using a modern version of tear gas on a massive scale in Vietnam. Over 13.7 million pounds of CS–2 gas and its predecessors has been used as an aid to killing with conventional weapons. CS–2 is dropped on bunkers and fortified positions to drive the enemy out in the open where he can more easily be killed with artillery, bombs or bullets. Although we call CS–2 a tear gas it can more accurately be considered a lung gas. Another "miracle" of modern science, CS–2 is microminiaturized—made so small—that it penetrates into the deepest recesses of your lungs and makes it absolutely necessary for you to seek fresh air. This gas is a far cry from the tear gas that was known in the past.

This lung gas has been used in combat in Vietnam without clear policy guidelines. Although gas can only be used by U.S. forces with the permission of the President, I am unable to find an order from President Johnson authorizing its use in Vietnam. If such an order was given, it must have been given verbally. I believe that we must remedy this vagueness in policy and make it clear that gas is only to be used in riot control or riot control-like situations.

In all fairness it must be pointed out that there is some genuine ambiguity concerning the use of tear gas under the Geneva Protocol that may have provided our military with what they considered a reasonable justification for its use. The ambiguity lies both in the wording of the Protocol which some claim does not cover tear gas and in the fact that tear gas is permitted for riot control purposes. The argument has centered on whether the wording of the Protocol meant only gases "harmful" to man or whether it includes other gases.

LEAGUE OF NATIONS PREPARATORY COMMISSION

I believe that the question was resolved in a series of international conferences that occurred during the early thirties. Because some confusion had arisen on the question of whether the original treaty had included incapacitating agents, the League of Nations Preparatory Commission for the Disarmament Conference that met in Geneva on January 15, 1931, discussed the problem at some length. The nations that had ratified the Geneva Protocol generally agreed that tear gas was covered by the Protocol. Ironically, even then, the United States took an equivocal stand.

To briefly quote from the minutes of the Commission: ". . . the British Delegation. 'It may be recalled that during the first part of the sixth session, certain delegations assumed that the intention was to prohibit the use of all chemical methods of warfare of every kind. On the other hand there were some indications that this view is not shared by all States. It is at least possible that this difference in interpretation owes its origin to a serious ambiguity in the Geneva Gas Protocol of 1925, as well as in all Treaties and Conventions regulating gas warfare signed since the war. In the Geneva Protocol of June, 1925, though the relevant portion of the French text is identical with the article quoted above, in the English text the French word 'similaires' is translated by 'other'. Basing itself on this English text, the British Government has taken the view that the use in war of 'other' gases, including lachrymatory gases, was prohibited.' They also considered that the intention was to incorporate the same prohibition in the present Convention."

The French then commented, "The French Government therefore considers that the use of lachrymatory gases is covered by the prohibition arising out of the Geneva Protocol of 1925 or Chapter IV of the draft Convention." The Yugoslavian delegation said, "We fully agree with the interpretation given by the British delegation". The Spanish delegate said, "I agree with the British delegation's interpretation, because I think that the text approved at the second reading is so clear that it cannot give rise to any objections. It provides that the use in warfare of any kind of gas is prohibited—doubtless because it is very difficult to distinguish between lethal and non-lethal gases."

In 1932 the American delegation at the Disarmament Conference in Geneva, a delegation that included two representatives of the American armed forces, agreed to a recommendation that tear gas should be prohibited in war. The drafts for this Conference were signed by Ambassador Hugh R. Wilson. Unfortunately, rising war clouds in Europe prevented the adoption of this treaty by the participating nations.

NEEDED: A UNIFORM INTERPRETATION OF THE PROTOCOL

The most cogent argument against the use of tear gas or incapacitating agents in war is that most of the 84 nations that have ratified or acceded to the Geneva Protocol believe that tear gas is covered by the treaty. If the United States takes the position that tear gas is not included under the Protocol, we may well find that other nations will not accept us as a party to the treaty.

What is needed is a uniform international interpretation of when tear gases or riot control agents can be used. Can they be used to control prisoners as they were in the Korean war? Can they be used to handle a civilian riot in a war zone? Can they be used to subdue mixed combatant and civilian groups? The Swedish have a draft before the current session of the United Nations stating that tear gas is covered by the Geneva Protocol of 1925. I would prefer to see the United States back that draft. But if too many questions are unresolved by this draft, I would like to see the United States take the lead in seeking a uniform international interpretation of the Protocol for future guidance.

I recently learned that the British Government is being pressured by the United States to reverse the position it took on November 18, 1930, that the Geneva Protocol covers all cases including tear gas. I hope Britain will remain firm and not erode the one arms control barrier that has held up in war.

USE OF ANTIPLANT CHEMICALS IN WAR

A third area of controversy concerns the use of antiplant chemicals in war. Although the Geneva Protocol specifically did not deal with this subject, I believe that the Protocol does cover these chemicals.

In October I urged President Nixon to stop the use of all herbicides in Vietnam in light of the information that the major chemical in use may be highly dangerous to human life. Prior to October I had been primarily concerned about the environmental consequences of our use of defoliants against foliage. I had accepted the Defense Department's statement of March 9, 1965 that, "the herbicides used are nontoxic and not dangerous to man or animal life." I was wrong to do so.

Last Wednesday, October 29, 1969, the President's Science Advisor, Dr. Lee DuBridge, learned that the Washington Post would publish the results of a study conducted for the National Cancer Institute the following day. This study, conducted by the Bionetics Laboratory for the Institute, showed that all of the rat litters from female rats exposed to appropriate doses of 2,4,5-T, the major ingredient of the chemicals used for defoliants in Vietnam, were deformed. The tests further showed that the other major component, 2,4-D, is potentially dangerous and needs further study. Dr. DuBridge called the Washington Post to say that the White House was placing a ban on the use of 2,4,5-T on agricultural crops in the United States and would only use 2,4,5-T in areas in Vietnam remote from population.

To my concern, he said nothing about the use of 2,4-D, monuron which is a soil sterilant, bromocil, or cacodylic acid in Vietnam. And even the minor restriction on the use of 2,4,5-T in Vietnam was apparently unacceptable to the military who in a press conference at the Pentagon the next day refused to say that it would not be used against enemy training and regroupment centers. The main use of defoliants is to strip vegetation from areas where the enemy is believed to be con-

centrated and to destroy food that is being grown in areas outside of South Vietnamese control. Civilians, both male and female, are pressed into service in these areas by the North Vietnamese. And many Vietnamese outside of the South Vietnamese perimeter refuse to leave their land and are subjected to defoliants. The Pentagon's October 30, 1969 press conference suggests that there will be no halt in this program.

The United States first used herbicides for purposes of defoliation in Vietnam in 1961. That year a team from the Crops Division of Fort Detrick visited Vietnam to test ways to destroy with chemicals the jungle trees and foliage so successfully used by the Vietcong for concealment. In the same year, South Vietnamese President Ngo Dinh Diem argued that chemicals could be used more effectively against enemy rice fields. The team tested 2,4-D and 2,4,5-T because these compounds had been used extensively in the United States. They also tested cacodylic acid and recommended that toxicity tests be conducted so that it could be used in Vietnam. Although 2,4-D and 2,4,5-T were being used in the United States, Dow Chemical Company limited its use of a maximum of 1.8 pounds per acre on food crops. The Fort Detrick team wanted to do more than suppress weeds; they wanted to kill 50–70% of the vegetation. They recommended 11.1 pounds of 2,4,5-T and 12.2 pounds of 2,4-D per acre, a total of 23.3 pounds per acre.

WIDE SPRAYING OF VIETNAM FOREST AREA

Following the tests in 1961 and early 1962 the Air Force moved into high gear. C–123 aircraft were fitted with spray tanks and "Operation Ranch Hand" was launched. The 1,000 gallon spray tanks were filled with Orange, 50% 2,4-D and 50% 2,4,5-T, White, a combination of picloram and 2,4-D, Purple, 50% 2,4-D and 50% of a slightly different form of 2,4,5-T, or Blue, a combination of cacodylic acid and sodium cacodylate. By 1969 it was estimated by the Air Force that we had sprayed 6,603 square miles in South Vietnam, approximately 10% of its total land area. The general rate of treatment is three gallons per acre but many areas have been sprayed time and time again. It has also been pointed out that the C–123 aircraft sometimes must quickly dump its load, dropping a much higher concentration of herbicide in one area.

Professor Pfeiffer, from the University of Montana, reported after his recent trip that at least 20% of the forest area of Vietnam had been sprayed at least once. He also reported that there were a number of reports of spray drifting onto food crops of the South Vietnamese leading to complete destruction. It has been reliably reported that we have sprayed defoliants in Laos. And the Cambodians lodged a complaint at the United Nations that we had destroyed vegetation in their country as well. A team from the United States recently returned from Cambodia and reports that there was damage from herbicides.

One of the key requirements for an effective defoliant according to the Fort Detrick team that went to Vietnam in 1961 was that "the chemicals must be *nontoxic* to humans in handling, in exposure to dissemination in air or ground equipment (either by direct contact or by the respiratory route), or in the consumption of edible produce." This requirement was satisfied on the basis that both 2,4,-D and 2,4,5-T had been licensed for use in the United States by the Department of Agriculture. The compound 2,4-D had been licensed as Weedone first in 1945. Although there is no specific reference to toxicity tests on cacodylic acid, we do know that it has not been licensed for use on any food crop in the United States. It is used to clear brush under power lines or along highways. A second reference to tests for toxicity appears in the report prepared by Dr. Fred Tschirley on the basis of his trip to Vietnam in 1968. He cites the lethal dose for 2,4,5-T, 2,4-D, cacodylic acid and picloram in the Herbicide Handbook of the Weed Society of America.

DANGERS IN A MASSIVE USE OF HERBICIDES

In addition to the approval given by the Department of Defense, the President's Scientific Advisory Committee devoted considerable attention to the question of the use of herbicides in Vietnam between 1962 and 1969. The National Academy of Science also stated that a report on defoliation prepared by the Midwest Research Institute was competent and accurate. Despite a rising chorus of complaints from scientists as early as 1965, the American Association for the Advancement of Science would not adopt a strong resolution calling for a thorough evaluation of the consequences of our defoliation program in Vietnam. The government must be right, "the herbicides used are nontoxic and not dangerous

to man or animal life." Perhaps the comment of T. C. Myerly at the AAAS Convention was more revealing. He didn't believe that the AAAS should take a position on the issue because it wasn't in a position to do anything about it.

There was good reason to be concerned about the dangers of massive use of herbicides in Vietnam. As early as 1959 the National Academy of Science-National Research Council issued a report on the standards that were to be used in testing chemicals such as pesticides and herbicides for their carcinogenic effects, their teretegenicity, and their mutagenic effects—or in laymen's language—would these chemicals cause cancer, deform the fetus, or bring unintended developments in human growth. The government had regulations requiring that these factors be evaluated before a chemical was licensed for use. Unfortunately, they were not very well enforced.

TOXIC EFFECTS OF CHEMICALS IN ENVIRONMENT

In 1963 Rachel Carson drew the attention of concerned Americans to the dangers of pesticides and also herbicides. She pointed out that the effects of these chemicals on humans and animals were not well enough known. In the same year, an Ad Hoc Committee on Pesticides reported to the President's Scientific Advisory Committee on the need for further study of the effects of chemicals that might make their way into human beings and animals. It recommended that 120 compounds be investigated for all aspects of toxicity.

Most importantly, the 1962, Dr. Francis Kelsey of the Food and Drug Administration, found that the chemical compound thalidomide led to deformed fetuses. She had been drawn to thalidomide precisely because the lethal dose when taken in the mouth was so high. The mature body was able to throw off this chemical. She wondered whether the fetus could. As we all know too well, it couldn't. For our purposes, however, the point is that there is more than one form of toxicity. And the question that we must ask—and ask with force—is why weren't the herbicides that were to be used in Vietnam tested for their effects on pregnant mothers? How can Dr. Charles Minarik of Fort Detrick state that these herbicides are safe for man an animal without having performed these basic tests? How did the highly competent President's Science Advisory Committee manage to consider herbicides as defoliants without raising this question?

Although we don't have positive information from Vietnam, we now find evidence of deformed babies and fetuses. The June 26, 1969 issue of the Saigon newspaper, Tin Sang, reported that there was a fetal deformity catastrophe in one of the provinces caused by the use of defoliants. The paper carried pictures of the deformed fetuses. The paper, Hoa Binh, carried similar stories in June and July. The paper, Dong Hai, carried similar stories on June 26th and June 27. The paper, Tin Sang, was suspended by the Saigon Government at that time. Then in early July the papers, Xai Dung and Tin Tu Yen carried reports claiming that the malformed infants in that province were no greater than anywhere else.

WHAT CAUSED VIETNAM FETAL DEFORMATIONS?

We don't know positively that the deformations in Vietnam are caused by defoliants. We do know from the tests performed for the National Cancer Institute that rodents receiving 4.6 miligrams of 2,4,5-T per kilogram of body weight have deformed fetus in all their litters. And it has been estimated that a Vietnamese woman living in a defoliated area and drinking water collected in a catch basin on the roof—a common practice—would get 200 miligrams of 2,4,5-T per day. We also know that Dr. Chin at the Hung Vuong Hospital has reported that he found 47 malformations out of 5,870 pregnancies. And the National Cancer Institute hasn't tested cacodylic acid or completed their tests of 2,4-D.

I believe that we know enough to halt any further use of defoliants of these types in Vietnam until we know more accurately what we are doing. I also do not agree with Dr. DuBridge that we can wait until January, 1970, to stop using these herbicides for agriculture purposes in the United States. It has been reported that at least 3 million acres of range land in the United States have been sprayed with 2,4,5-T. The Department of Agriculture actually pays for half of the cost of applying these chemicals as a conservation practice. One report indicates that we use one gallon per acre for chapperal control in water sheds in Arizona. We have also planned to use the herbicide White or Tordon 101 to defoliate large sections of the United States-Canadian borderline. I have a mes-

sage to President Nixon urging him to halt the use of 2,4,5-T and other possibly harmful herbicides both in Vietnam and the United States.

Discussion of the Protocol by the Congress will serve to remove any of the ambiguities that exist in our policy governing chemical and biological warfare. I personally believe that the United States does not need biological weapons. I further believe that we would not want to use them even if we were attacked with a disease. I believe that for the time being we need to retain a defensive capability in poison gas. But I believe that we should devote more money and attention to finding effective inspection systems for these weapons so that we can add them to the list of weapons that do not need to keep.

The Geneva Protocol has been the one arms limitation agreement that has worked in war. I hope that the United States can act promptly to ratify this treaty.

Mr. McCarthy. Then what I would like to do is comment on some of the points that have been raised, so we don't duplicate, and hopefully I can enlarge upon the knowledge already presented here.

First of all, a question arose about the study now under way within the executive branch. I might say that this hearing couldn't be more timely, because it is my understanding that the National Security Council will meet tomorrow on the subject of chemical and biological warfare.

Second, a point was raised about the British treaty and research. I believe you raised it, Mr. Chairman. I support the British treaty. I should point out that it prohibits research for hostile purposes, but it would permit the production of limited amounts of agents for testing purposes. It would, of course, permit research for defensive purposes, such as vaccines, masks, and the like.

The gentleman from Oregon, in his very excellent statement, says on page 4, at the bottom of the page, and I quote:

> We should have discontinued the use and supply of these weapons prior to the time that Vietnamization of the conflict has been completed. The soundest time to begin with such a move is immediately.

The weapons he refers to, of course, are the so-called riot control agents.

UNITED STATES HAS GIVEN CS TO ALLIES IN VIETNAM

Unfortunately, I have been informed that we have made the decision, which I think is ill-advised, to supply these weapons to the South Vietnamese, the Thais, the Australians, and the South Koreans. So that they have them in their possession, available for use, which compounds the problem of control and possible future restriction on its use.

I might say that I think the use of tear gas is a generic term which does not precisely fit the type of gas that is being used today. The most widely used gas in Vietnam is called "CS," and there are variants of it, including CS–2. CS–2, if I were to use a biological term to describe it, would better be described as a lung gas than as a tear gas. Because of its microminiaturized size, it actually bypasses the nasal tract, and it enters the lung system. That is how it works. It doesn't produce a lachrymatory or crying reaction; it produces a lung reaction.

EFFECTS OF CS—RIOT-CONTROL AGENT

Now Edgewood Arsenal, where much of the research in our chemical weapons goes on, has produced an unclassified document with color pictures that show the very severe effect that CS has on the skin, very severe burns. It shows in a series of pictures just how acute these are, and how long it takes to remedy itself. One can readily imagine what the effect on the lungs would be, if it has this very severe effect on the exterior skin.

Now the issue was raised by Congressman Dellenback, about the United States seeking a reservation to the Geneva protocol to allow the use of tear gas. I share his view that this would be unwise. First of all, none of the 84 nations that have ratified the protocol have added such a reservation. In order for it to be valid, we would have to seek and communicate this to the 84 signatories. I believe that it would have the effect of eroding this fragile international agreement that has worked at least in one major war, to prevent the use of chemical and biological weapons. I think in a way, that while this is viewed as a military question, and it certainly is that, it is always a psychological problem. In this respect it isn't unlike the decision to use nuclear weapons. There is no such thing, for example, as being a little pregnant. There is no such thing, I think, in most people's view, of starting to use nuclear weapons, and have any assurance that they won't spread, and perhaps go into the intercontinental phase. I feel it is similar to the gas question. No gas is simple, clean, and clear. Once you get into the idea of tolerating some gases, well, how will you know how to police this?

CS AS LUNG GAS, NOT TEAR GAS

Now as I mentioned, the CS gas is really a lung gas, not a tear gas. It didn't exist when the Geneva protocol was first discussed and debated. I think in order to have a reservation, you would almost have to have actual scientific formulae to say which sort of gases would be permitted. Then, of course, you get into the danger of retaliation and escalation. There have been instances where the enemy in Vietnam has used gas against us, for example. American troops were caught without masks, and some form of riot control agent was used on them. It probably was American gas that they had captured. Fortunately, thus far, anyway, the people supplying the North Vietnamese have not seen fit to supply them with CBW weapons.

There was a report in Newsweek magazine last July that caused me grave concern. The report said that the Green Berets had found a cache of nerve gas. Well, of course, nerve gas is a lethal weapon that will kill you in a matter of seconds, and I was surprised that it was buried in this magazine. If it were true, it would have represented a major escalation of the war in Vietnam. It would have shown that they had chosen not only to retaliate, but to escalate in the type of gas. We consulted the editor of the publication, Mr. Osborne Elliott, and he quizzed his correspondent in Vietnam, Mr. Kevin Buckley. Upon doublechecking it, he found that it wasn't nerve gas. It was tear gas. Fortunately, the initial report wasn't true, but it raises the possibility that once you begin to use gas, you run the risk of retaliation and escalation. That is just what happened in World War I. We began by using tear gas, and soon it was escalated into deadly gases.

THE USE OF HERBICIDES

I feel very strongly that the United States should not seek to append a reservation to the protocol for tear gas.

Another point that is relevant here is the widespread use by the United States of so-called herbicides in South Vietnam. It is historically clear that no such substance existed in 1925 but the widespread use of chemical for defoliation in anticrop purposes in Vietnam, to me, is a clearcut violation of the spirit of the Geneva protocol. Let me cite some of the problems. First of all, in my view, an anticrop campaign is quite unprincipled. I don't think it is very effective. It has been shown by Dr. Jean Mayer, the President's nutrition adviser, who has studied the situation in Biafra, that the soldiers are the last ones to be hurt by any starvation campaign. It usually affects the infants and the old people first. So that the use of defoliants in Vietnam for that purpose, I think is not in our interests.

Mr. TAFT. Mr. Chairman, I wonder if we could interrupt the witness occasionally on some of these statements.

Mr. ZABLOCKI. Go right ahead.

ANTICROP CAMPAIGNS IN VIETNAM

Mr. TAFT. Are you implying that you know of uses of herbicides in an anticrop campaign in Vietnam?

Mr. MCCARTHY. Yes. This is well known. Dr. John S. Foster stated in a letter to me that we used herbicides on a limited basis against crops in South Vietnam

Mr. TAFT. Do you put it in the same category as the use for defoliant purposes, which is really, as I understand it, you know, what you see out there, when you go to look at it, is large areas that have been cleared, defoliated of jungle, in effect, for security purposes, apparently. Now would you make a distinction between the two?

Mr. MCCARTHY. Yes.

Mr. TAFT. And can you give us some idea of the order of magnitude?

Mr. MCCARTHY. Well, Dr. Foster discussed it as a limited program to destroy crops. I can supply for the record the total amount of defoliants that are available for use in Southeast Asia. Now some of that, and they don't break it down, is used in the anticrop campaign.

Mr. TAFT. I have never seen any. I didn't see any of it used in the anticrop campaign. I saw a great deal used in the other campaign, so my assumption that I start with, and I think anybody's, must be the other way around, and your testimony just gave exactly the opposite impression. I thought that is why I ought to interrupt you.

Mr. MCCARTHY. I am sorry, I didn't mean to imply that. I meant to imply that most of it is used the way you state, but some of it is used to destroy crops.

Mr. HAYS. Well, let me ask you, is it used to destroy crops deliberately, or is that a side effect of the other use?

Mr. MCCARTHY. No. It is deliberate use.

Mr. HAYS. Do you have any concrete evidence of that?

Mr. MCCARTHY. Yes. The Pentagon makes no bones about it.

Mr. HAYS. Well, they must have made some bones about it, because this is the first time I have ever heard of it.

Mr. TAFT. I think it is ridiculous, really. If we wanted to destroy all the crops in North Vietnam, we could blow the dikes any day.

Mr. MCCARTHY. It is in South Vietnam that it is used.

Mr. ZABLOCKI. I think the question here is, Mr. McCarthy, whether there is a military policy in South Vietnam in which crop destruction has been employed.

Mr. MCCARTHY. Yes.

Mr. ZABLOCKI. Not by accident, not as a result of defoliation process.

Mr. MCCARTHY. No. They have supplied that for the record. They don't make any bones about it.

Mr. TAFT. I wish the witness would, Mr. Chairman, if he would supply documentation for the record on this point. I think it is very important.[1]

Mr. MCCARTHY. Surely.

ACCOUNT OF CROP DESTRUCTION

Mr. FRASER. Mr. Chairman, if I may say, when I visited Vietnam one of the interests I had was to see the rural development and I went out to the rice-producing area where they were bringing the Philippine IRRI–9 miracle rice in there, it is IRRI something, but anyway, in talking then with our people, they indicated that they had a rather steady practice of trying to destroy crops in the Vietcong-held areas. This was a Province that was one of the safest Provinces in Vietnam I was in. This is where I got my eyes opened. All the outlying area around the district were held by the Vietcong, and one way they tried to starve them out, every time they would grow rice or other crops, they would then spray them in order to destroy them, and keep them from, you know, being usable. I am quite sure that our witness is right here.

Mr. MCCARTHY. I might say that in my meeting with Deputy Secretary of Defense Packard, where we presented our suggestions on what we thought the new CBW policy ought to be, that he stated to me that he did not agree with this anticrop campaign.

NEW EVIDENCE OF EFFECTS OF HERBICIDES

Let me enlarge on defoliants and herbicides, a little to say that the other defoliation poses problems also. A group of very distinguished scientists, including a number of Nobel Prize winners, presented a petition to President Johnson, and then they later presented one to President Nixon, expressing their concern about the widespread use of these defoliants, and the massive use of it on the long-range ecology of the country. Studies of the effects of defoliation in Vietnam have been made, but they have been inconclusive. The general conclusion seems to be that you can't make any permanent findings until the war is over, and you are able to assess what the damage has been. That is one thing, but now more disturbing information recently came out. The National Cancer Institute has conducted studies on a defoliant known as 2,4,5-T, which is widely used in South Vietnam. It is also used in the United States. The findings were so disturbing

[1] Documentation supplied on this point by Mr. McCarthy may be found on p. 355 of the appendix.

that Doctor DuBridge, the President's science adviser, announced that they would stop using it in the United States, after this year, but that it would continue to be used in Vietnam.

The findings that were so disturbing were that in a series of tests sponsored by the National Cancer Institute at the Bionetics Laboratory,[1] in one series of tests where amounts of this defoliant were given to rats that were expectant; 100 percent of the litters had malformed rats. Now that came on the heels of information that has been widely published in the Vietnam press about reports of malformed infants being conceived and delivered in areas where they have used these defoliants.

Now I believe that we should not use a substance like this any place, the United States or any place else, until we are sure that it does not have an adverse effect, not only on this generation, but most certainly on the next generation.

Now how do you resolve the defoliation question? This is a difficult one. I would not say that we should not use defoliants. As Mr. Taft pointed out, it undoubtedly has a military advantage. But I don't think we should use defoliants that haven't been thoroughly tested to see that they don't have an effect on civilians, particularly mothers, and on the next generation.

These are some of the issues that are involved. As I say, Mr. Chairman, I think this hearing is very timely.

INSPECTING FOR CHEATING ON A CBW BAN

I would just like to conclude by saying that you raise the question about how could you inspect to insure that a ban on biological warfare works. Let me say that I don't think it would be necessary to inspect . I don't think you would use a disease even in retaliation. If somebody were insane enough to use a disease on us or one of our allies, I don't believe that we would be equally insane as to retaliate with a disease that would be uncontrollable, and unpredictable, and could spread. As some biologists have said, you could create a pandemic, a worldwide epidemic by unleashing a disease. Well, I don't think we should use biological warfare under any circumstances. So that I think the question of policing the ban is really not relevant.

Let me say that my inquiries into this show me that the United States has no hard evidence that the Soviet Union has any offensive biological capability. But even if they did, I don't think that you would have to inspect for it, because I don't think we should use it, even in retaliation, and I would favor the British approach and place a total ban on biological warfare.

On that note, I will conclude.

THE EXTENT OF PERMISSIBLE RESEARCH

Mr. ZABLOCKI. Thank you, Dick.

As you know, I have propounded a question to Mr. Dellenback about inspection because of his suggestion that we support the British proposal, banning BW production. In his testimony, he stated to the committee that he would allow research in this area. I presume that

[1] See p. 375 in the appendix for an analysis of the Bionetics Research Laboratories, Inc., report.

you would not advocate that the United States cease all research into the chemical and biological warfare.

Mr. McCarthy. No.

Mr. Zablocki. The question then becomes how far do you continue with the research in order to have an understanding of the effects of chemical and biological warfare? Research must also include a certain amount of development and production.

Mr. McCarthy. I agree that that would be the case in chemical warfare. What the British treaty would permit would be continued research, no production for hostile purposes, and limited production for testing purposes on biological agents.

Mr. Zablocki. Well, you state that there is no hard evidence that the Soviet Union has any chemical-biological warfare capability.

Mr. McCarthy. Offensive capability in biological warfare. Offensive biological capability.

NO EVIDENCE OF "PINE BLUFF" IN U.S.S.R.

Mr. Zablocki. Do you have any information whether there are facilities similar to our Pine Bluff facility in the Soviet Union?

Mr. McCarthy. We have no hard evidence that they have that kind of facility.

Mr. Zablocki. Are you of the opinion they do not have any facility of that type?

Mr. McCarthy. I am not certain, of course. They may have some offensive capability. We know they have a large chemical capability. There is no question about that. Their chemical capability probably exceeds ours by a fairly sizable degree. In biological warfare we are just not sure. We have no hard evidence that they have any offensive biological capability.

Mr. Hays. Would you yield to me?

Mr. McCarthy. I would be glad to yield to the gentleman from Ohio.

Mr. Hays. Would you know about it if we did have?

Mr. McCarthy. Well, I think our people would.

Mr. Hays. I wouldn't. Well, our people would, but you might not. I don't know whether they have any hard evidence or whether they don't have any. You know, I have been around here a long time, and I find out the Pentagon doesn't tell Congressmen this kind of thing. In fact, if you asked them, I don't think they would tell you, so you really wouldn't know, would you?

Mr. McCarthy. I have asked a number of people, and I wouldn't want to go into specifics here, but I have asked a number of people in the executive branch, and they did give me an answer, and the answer is that we have no hard evidence that they have any offensive biological capability. They have a substantial defensive capability. It seems to me this is understandable. They have gone through mass immunization tests, and they are prepared to attempt to immunize their people against a biological attack. And I think this is understandable, when you figure we have got Pine Bluff, and Fort Detrick and Dugway Proving Grounds. I suppose it would only be prudent for them to prepare for the possibility that disease would be used.

THE SOVIET CBW CAPABILITY

Mr. ZABLOCKI. Wouldn't it stand to reason, from the fact that they have gone into an immunization program, that they must know about it and have the capability of waging chemical-biological warfare on their own?

Mr. MCCARTHY. Well, they certainly have the knowledge necessary to attain a capability——

Mr. ZABLOCKI. They wouldn't prepare defenses totally on information from us. Knowing the Soviet Union, it wouldn't just take U.S. data, if it was available, to start the immunization program. They must have their own CBW program. It is only logical to assume that.

Mr. MCCARTHY. Well, as I said, they have a very substantial chemical capability. But again, as I have been informed, we have no hard evidence that they have any offensive biological capability. However, they may have it.

Mr. HAYS. I would just point out to you, when you start using this business about no hard evidence, I have heard that a long time. Khrushchev had no hard evidence he was going to be booted out, until he walked into the meeting, so really, nobody has any hard evidence about anything the Soviet Union does. Let's face it. This is one of our weaknesses, and we have not been able to penetrate their organization to have any hard evidence about anything.

So I think we have to operate on the assumption that if they are preparing immunization, as the chairman said, then they must know a good deal about this, or they couldn't do that, and knowing their background, I suspect if they know a good deal about it, they have got some ready.

Don't misunderstand me. I am on your side, and I would like to see this protocol submitted, and all that, but I just think my experience has been don't discount these folks, because it doesn't pay.

PROBLEM OF COMMUNICATING RELEVANT INFORMATION

Mr. FULTON. Well, your comment that you talked with many people in the executive department.

Mr. MCCARTHY. Several, I think I said.

Mr. FULTON. This makes me wonder whether you were then not getting at the State Department level, the information directly in clear channels from the Department of Defense.

Mr. MCCARTHY. Let me just say to the distinguished gentleman from Ohio that I think this——

Mr. FULTON. And ignore the gentleman from Pennsylvania.

Mr. MCCARTHY. No. I wanted to add——

Mr. HAYS. Well, that would be a fair way to proceed.

Mr. FULTON. But not customary.

Mr. MCCARTHY. I wanted to add to the distinguished gentleman from Pennsylvania——

Mr. ZABLOCKI. I have noted earlier this morning we had a high sense of priority.

Mr. MCCARTHY. Just to say that while these points are, I think, very important, it doesn't really impinge directly on this question.

The Geneva Protocol of 1925 would be a no first use treaty, and under that, we could have all the biological capability we wanted.

I personally think we should give it up. I don't think we should use disease as a weapon, even in retaliation. I think it would be insanity. It would be the greatest boomerang weapon of all time. If they used it on us, we would retaliate in some appropriate weaponry, but not another disease.

Mr. ZABLOCKI. If I may return to the resolution.

Mr. FULTON. Let's not get diverted. The question is really serious, whether there is a direct line of communication with adequate firm information on subjects such as this between the Department of Defense and the State Department at any level which is responsible. I think there is the question of the transmission of adequate area of reference material upon which good judgments can be based.

Mr. HAYS. Would you yield to me?

As chairman of the State Department Subcommittee, let me say to you that I think there is probably some communication between the State Department and the Pentagon, but I don't think there is much communication between either one of them and the Congress about some of these sensitive subjects. I think there is where your problem is. I imagine that the State Department and the Pentagon know what each other is doing in this field, but I don't think they are telling the Congress, unless you pick it out of them, an item at a time. This has been, you know——

Mr. TAFT. If the gentleman will yield, perhaps what we need is a deplanting organization, as well as a debugging one, for defoliation.

Mr. HAYS. If we could get rid of foreign aid for a year or two, I would try to do some of this picking of information with my subcommittee.

Mr. ZABLOCKI. I think we should give the witness an opportunity. He was very generous in permitting these interruptions. I know that he is very anxious to reply to the gentleman from Pennsylvania's question, whether it will be in reference to bugging for intelligence purposes or bugging for biological purposes.

Mr. FULTON. We have enjoyed the exchange, Mr. Chairman.

PROBLEM OF GETTING INFORMATION ON CBW

Mr. MCCARTHY. Well, in reply to the distinguished gentleman from Pennsylvania, I think it is very clear that there is a variance between some of the information that was provided on CBW by the DOD and the State Department. We will also supply for the record an analysis of some of the differences.

Mr. FULTON. From or to where?

Mr. MCCARTHY. Well, information supplied by the Departments to me. I think the gentleman from Ohio hit the nail on the head when he said that they don't too readily come forward with this information. I think he said you have to pick it out, one item at a time. This has been one of the problems that we have had in trying to get information about CBW; that you almost have to become almost a scholar, and be so informed that you know the right questions to ask.

That is the toughest part, I think: to get yourself into a position where you know the right questions to ask, and as the gentleman says,

you have to pick it out, one at a time. They will provide it if you give them the right questions.

Mr. ZABLOCKI. Would it be a correct assumption that the gentleman from New York is able to supply for the record changes which have been made in CBW policy by the Pentagon as a result of your inquiries and your conferences?

Mr. MCCARTHY. Yes, we will be happy to supply the answers we received from DOD and State to a series of questions about CBW, and you will see what you point out, the disparity between the two.[1]

Mr. FULTON. I think the four of us have been commenting here on a basis of concern, mutually.

Mr. MCCARTHY. And I think that added to that, there is a disparity between the intelligence estimates that are made, by the various agencies and departments, and you might also add into that the CIA.

Mr. HAYS. Well, far be it from me to defend the CIA or the DOD or even the State Department, although I have been known to do it on occasion; but if they have any information which is vital to the national security, that they don't want the Russians to know about, they had better not tell it to a committee of the Congress, anyway, because it will be in the paper the next day. You can bet on that. I have been in any number of executive hearings, and so I think it is fair to point out that they probably don't want to make it any easier for the Soviet intelligence than they have to, so they have a natural reluctance, because you can have all the executive sessions you want to, but somebody goes to their favorite newspaper reporter right out of the hearing and tells him everything that happens, and he can find it in the press the next day. So I mean I criticize them for not being frank with Congress on the one hand, but I point out that there is some danger in it on the other hand.

ADEQUACY OF THE NSC REVIEW OF CBW POLICIES

Mr. ZABLOCKI. One role of the chairman is to bring in—although this, I might say, was most interesting—but to bring the hearing back on the purpose it was called for, and that is the resolution. If I may, I have just two more questions of you, Max.

Referring to your resolution, you have called for an intensive review of CBW policies. Now in your estimation, does the current National Security Council review satisfy that requirement? In other words, if the subcommittee should act on these resolutions, would you suggest a charge to eliminate or amend that section in the resolution?

Mr. MCCARTHY. I don't have any changes to suggest at this time.

Mr. ZABLOCKI. In the second resolved clause.

Mr. MCCARTHY. Yes. I don't have any changes to suggest in that today. I don't think that the present National Security Council review, from what I know about it, meets that second resolved. I just stand on that. We have been in touch with all of the people who have an input into this study, but it seems to me that it could go beyond the narrow confines that it seems to have addressed iself thus far. I wouldn't suggest any change in the second resolve.

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[1] See p. 352 in the appendix for the documentation from the Department of Defense; p. 359 in the appendix for the documentation from the Department of State; and p. 347 in the appendix for an analysis of differences in documents.

Mr. ZABLOCKI. In order to help out answering my own question, it wouldn't hurt if the second resolve remain as it is to encourage continuous review?

Mr. MCCARTHY. No.

EFFECT OF NEW CONGRESSIONAL RESTRICTIONS

Mr. ZABLOCKI. The military procurement authorization bill passed by Congress contains some new restrictions on the production of offensive CB weapons. What do you anticipate will be the effect of those provisions? For example, will they in any way restrict the use of CS in Vietnam? Do they contain any such restrictions?

Mr. MCCARTHY. None. None whatsoever. These restrictions that we passed relate, for example to secrecy. One, they would require semiannual report to Congress. Also, they relate to testing, transportation, and disposal. The one I think you are referring to is a provision that prohibits the development of a projectile, the sole purpose of which is the dissemination of a chemical or biological agent. That really doesn't mean much, because you can put chemical or biological agents in almost anything we have got. We have ICBM's, hand grenades, howitzer shells, just about anything, that could be used to disperse these agents.

Mr. ZABLOCKI. Then you contend the restrictions in the military procurement authorization will not really have any effect?

Mr. MCCARTHY. No, I think they will have a good effect, and I didn't mean to deprecate them. I think it is a good step forward, first of all, that for the first time the Congress has put any restraints on this, ever. It rips away the excessive secrecy. It puts safeguards on testing, which is very important, and this has come up over the past year and a half, transportation, that has come up, and disposal, so that I think these safeguards are very valuable, they are very much in the public interest, and I think that parting this curtain of secrecy is in the public interest, but they are limited.

THE PRIORITIES OF ACTION ON CBW

The basic questions revolve around these treaties, and what is our basic policy. For example, we say we abide by the Geneva Protocol, but we are conspicuous by failure to ratify it. Eighty-four nations have ratified it. We haven't.

Also basic to this is, I think, is the British convention recommending a total abolition of germ warfare.

Beyond that, I would hope a third international agreement could in time be developed, which would call for a verifiable ban on all chemical warfare. But unlike chemicals are biological warfare, where I wouldn't really regard as important the fact that another nation might have a biological capability, because I don't think we would use it even in retaliation, or that we should use it. Chemicals are something else, and I have felt that if we are going to have a total ban on chemical warfare, that we would have to have some system of verification

Now that is what I would see as a goal in the future, but I would say the first order of business should certainly be to ratify the Geneva Protocol, without reservations.

Mr. ZABLOCKI. Thank you.

Mr. Fulton.

Mr. FULTON. I was glad to have you here, and I think this discussion has been productive, Mr. Chairman. It has given points of view that I think should be considered, and the witness has done well.

Mr. ZABLOCKI. Mr. Hays.

WHY WAS RATIFICATION OF PROTOCOL DELAYED?

Mr. HAYS. I have no further questions, Mr. Chairman, except to say that I am in general agreement that this ought to be resubmitted, and I can't understand, No. 1, why it was sent back from the Senate when it was, and No. 2, why some President hasn't resubmitted it a long time ago.

Mr. MCCARTHY. Could I add something? My understanding of it was that there was intensive lobbying against this in 1926, when it came up. The national commander of the American Legion was also the lobbyist for the chemical industry. Senator Borah apparently felt he didn't have the votes. Senator Wadsworth from New York was a strong opponent, and a very influential Senator, apparently. His position was that if you had a weapon, and you got into a war, you would use it. He was wrong because while a million three hundred thousand persons were casualties from gas warfare in World War I, zero people were casualties in World War II—partly because of the Geneva Protocol. But we never ratified it.

Mr. HAYS. Well, I will disagree there. I think it was mainly because it wasn't an ultimate weapon, and there was no way that if you started it, to defend against it yourself. In other words, it became a thing that was probably as much of a handicap to us as it was an advantage.

Mr. MCCARTHY. I agree.

Mr. HAYS. Now I think we are in the same place, now, with nuclear weapons. When we first used it, it was the ultimate weapon. Nobody had it but us. But I think that is the reason we don't use it now, not because we have any great scruples about it.

Mr. MCCARTHY. Certainly the military men who have set down their views from World War II period indicated that they objected to the use of gas or germs on moral grounds; that was a big factor. I don't mean to imply that the Geneva Protocol was the sole reason, but it was a contributing factor. The treaty lay around for a number of years, and, as I understand it, when Senator Vandenberg was chairman of the Senate Foreign Relations Committee, merely as a housekeeping measure, the protocol was sent back to the White House. That is why now your committee and the other body is unable to take it up now, although I understand the chairman of the Senate Foreign Relations Committee has expressed himself as wanting to. Of course, what we have to do is persuade the President to send it back.

Mr. HAYS. Well, as a former teacher of history, I would just comment that there was a lot of lobbying against almost anything back in the 1920's, especially anything that had to do with American participation in any kind of an international organization of any kind, shape, or form. I imagine this got caught in the rush.

PROBLEMS IN TACTICAL USE OF GAS

The other thing I think I would like to point out, if my memory serves me correctly, when the Germans first used gas in World War I, it turned out to be about as much of a weapon against them as it was against the people they tried to use it against, because they weren't prepared to defend against it, and they fired some over, and the wind changed, and they got most of it back, and so it just never got to be a very reliable weapon, one way or another, and I think it is something that everybody, just about, was glad to decide, "Well, we won't use it, because really, it is not a very good weapon anyway."

Mr. McCarthy. Yes.

Mr. Hays. I think maybe they might decide the same thing about biological warfare. At least, I would hope so.

Mr. Zablocki. Mr. Fraser.

COMMENDATION OF REPRESENTATIVE MC CARTHY

Mr. Fraser. Thank you, Mr. Chairman.

I just want to express my very deep appreciation for the fine work you have been doing in this field in the last year. I think you have helped change public opinion, and created an awareness on the part of the public, as well as the Congress, of the urgency of this matter.

I had hoped, Mr. Chairman, when we will have some of the intelligence agencies, we could invite Mr. McCarthy to sit with us. I don't know what the rules are, but he could get a chance to find out what is going on.

Mr. Zablocki. I might say to the gentleman, if my memory serves me correctly, any Member of Congress is free to sit with the committee in open session, and executive session, I think, is limited to members. The hearings with the executive branch, State, and Defense, possibly CIA, to some extent will be in open, and then in executive session, so the executive session would probably be limited to members.

Mr. McCarthy. Well, thank you, Mr. Fraser. I would like to sit in, very much, if I am invited by the chairman.

I want to thank you, Mr. Chairman and members of the committee, for having this hearing. As I say, it couldn't be more timely, because some of the crucial decisions on the basic policy are about to be made. I hope this committee can have a major influence in what I would hope would be the right direction.

Mr. Zablocki. On behalf of the subcommittee, I want to thank the gentleman from New York for his thoughtful testimony, and his direct answers to the questions. We look forward to the information that you will supply for the record.

The subcommittee hearings on chemical-biological warfare stand adjourned until 9:30 a.m., Thursday, November 20, in this room, when we will hear Hon. George Bunn and Dr. Ivan L. Bennett. We are hoping to have the session with the executive branch prior to the Christmas holidays, either the second or third week in December.

The subcommittee is adjourned.

(Whereupon, at 12:06 p.m., the subcommittee was recessed, to reconvene at 9:30 a.m., Thursday, November 20, 1969.)

CHEMICAL-BIOLOGICAL WARFARE: U.S. POLICIES AND INTERNATIONAL EFFECTS

THURSDAY, NOVEMBER 20, 1969

HOUSE OF REPRESENTATIVES,
COMMITTEE ON FOREIGN AFFAIRS,
SUBCOMMITTEE ON NATIONAL SECURITY POLICY
AND SCIENTIFIC DEVELOPMENTS,
Washington, D.C.

The subcommittee met, pursuant to recess, at 9:45 a.m., in room 2255, Rayburn House Office Building, Hon. Clement J. Zablocki (chairman of the subcommittee) presiding.

Mr. ZABLOCKI. The subcommittee will please come to order.

Today is the second in a series of hearings by the Subcommittee on National Security Policy and Scientific Developments on U.S. policy concerning chemical-biological warfare.

Our more specific interest is in resolutions which have been sponsored or cosponsored by some 108 Members of Congress. These identical resolutions would express the sense of Congress asking the President to resubmit to the Senate for ratification on the 1925 Geneva Protocol on chemical-biological weapons.

On Tuesday, the subcommittee heard testimony from interested Members of Congress. Today we will hear two distinguished private citizens with expert knowledge in the field of CBW.

First, we will hear from Prof. George Bunn, visiting professor of law at the University of Wisconsin School of Law, Madison, Wis., and the General Counsel of the Arms Control and Disarmament Agency from the Agency's creation in 1961 until last year.

We are also pleased to have with us Dr. Ivan L. Bennett, Jr., the director of the New York University Medical Center in New York City.

Dr. Bennett is a former Deputy Director of the President's Office of Science and Technology and recently served as a consultant expert on the U.N. Secretary General's report on chemical and biological weapons, issued last July.

We are indeed grateful to both of you gentlemen for appearing here early today, in order that the subcommittee can conclude its hearings in time before the House goes into session to continue the consideration of the foreign aid bill.

Because Professor Bunn's testimony deals with historical aspects of the ratification of the Geneva Protocol, we will hear from him first.

Then, Dr. Bennett will discuss the recent U.N. report, its findings and its ramifications for U.S. policies on CBW.

Mr. Bunn, if you will begin, please.

STATEMENT OF PROF. GEORGE BUNN, UNIVERSITY OF WISCONSIN SCHOOL OF LAW, MADISON, WIS.

Mr. BUNN. Thank you, Mr. Chairman.

I appear in support of House Resolution 439 et al., by Mr. McCarthy, Mr. Fulton, Mr. Gallagher, Mr. Fraser, Mr. Dellenback, Mr. Nix, Mr. Broomfield, and others.

I have long believed that the Senate should be given an opportunity to reconsider its failure to ratify the Geneva Protocol of 1925. This morning, I would like to set forth for you a little of the history of the protocol, the differences of view over its interpretation, and the pros and cons of its ratification.

Let me first state as precisely as I can what the protocol covers and what it does not cover. It prohibits one, the first use in war of "asphyxiating, poisonous, or other gases, and of all analogous liquids, materials or devices" and two, the first use of "bacteriological methods of warfare."

It does not prohibit the use of poison gas or germs in war in reprisal against their first use by an enemy. It does not prohibit research, development, testing, production or stockpiling of poison gas or germ weapons.

It does not prohibit the domestic use of any weapons, including tear gases or herbicides.

It does not prohibit the first use in war of flame throwers, napalm or even chemicals such as "smokes" used for concealment.

HISTORY OF THE GENEVA PROTOCOL

Let me turn now to the history of the protocol. Its language banning "asphyxiating, poisonous, or other gases, and all analogous liquids, materials or devices" is drawn from the Versailles and other peace treaties of World War I.

In a 1922 conference convened by President Harding in response to legislation requesting the President to initiate international negotiations to achieve limits on shipbuilding, Secretary of State Charles Evans Hughes and Senator Elihu Root urged adoption of this language.

It became part of the 1922 Treaty on Submarines and Noxious Gases. The support in the country for this treaty was so great that it was approved in the Senate without dissent. The French, however, failed to ratify the treaty because of its provisions on submarines, and it never came into force.

A former chairman of this committee, Congressman Theodore Burton, was as responsible as any man for the subsequent American effort that produced the Geneva Protocol.

President Coolidge appointed him head of a 1925 delegation to a Geneva arms traffic conference. Before departing, Chairman Burton secured the President's approval to make a proposal to the conference on gas warfare.

After some discussion, the conference agreed on a ban on gas warfare in the language of the Versailles Treaty, with an additional prohibition on bacteriological warfare.

WHY THE PROTOCOL FAILED TO PASS

Probably because of the ease with which the similar 1922 treaty had passed the Senate, President Coolidge and Secretary of State Kellogg did not make the effort to gain support for the 1925 protocol that had been made in 1922.

The Army's Chemical Warfare Service, the American Chemical Society, veterans organizations and segments of the chemical industry all opposed it.

The arguments in the Senate were that the protocol would be ignored in time of war, and that poison gas was, in any event, more humane than bombs and bullets. The protocol was finally withdrawn from Senate consideration, presumably because the majority leader did not have the votes.

An American representative to the U.N. explained in 1952:

When the Geneva protocol was submitted to the Senate for ratification, America was retreating rapidly into isolationism and neutralism and feared any involvement with the League of Nations and any treaties originating from Geneva.

I understand from your meeting on Tuesday that you were particularly interested in why the 1922 treaty got through so easily, and the 1925 one didn't. Of course, all I have to go on is the historical records of the time.

I think there were a number of reasons. First of all, in 1922, the country was going through a period much like we are in today, a very antiwar, pacifist kind of period. There was a debate on the military budget in the Senate led by old Bob LaFollette. Instead of ABM's, it was naval shipbuilding. Instead of military procurement authorization, I think it was a naval appropriations bill. In any event, one of the products of that lengthy debate was a provision in the legislation requesting the President to call a conference with Japan and England and France, to deal with the naval shipbuilding problem.

And, it was at that conference that the conferees, after dealing with the submarines and some other things, turned to gas warfare.

NATIONAL MOOD OF ISOLATIONISM

Later in 1925 and 1926, I have a feeling that the country had gone even further into isolationism, and that there wasn't the same sentiment, that people had forgotten the sentiments that they had had just that few years earlier.

I think there were other differences, too, and part of it was the matter of presentation, or the matter of handling the protocol.

In 1922, Secretary of State Hughes went to great effort to appoint prominent citizens' advisory committees, and to involve the armed services. There was a considerable attempt to build up public support for the whole effort, with the result that, as you know, the treaty went through the Senate without a dissenting vote.

In 1925, Secretary Frank Kellogg apparently felt that there wasn't going to be any trouble, because the earlier treaty had gone through so easily.

No effort was made to rally public support, so far as one can tell from reading the records. There wasn't any citizen's advisory committee and the armed services weren't involved in the executive

discussions to the same extent. In fact, the original authority given Congressman Burton to make the proposal at the conference was gotten from the President at a meeting when the Secretary of State and Secretary of Commerce, but nobody from the War Department, were present.

And after that, I think the Chemical Warfare Service felt completely at liberty to attack the treaty. It did so, and stirred up a lot of adverse sentiment.

I think the congressional relations effort was better in 1922 in that Secretary of State Hughes appointed a Senator as Chairman of the American delegation dealing with the gas warfare problems. Indeed, there were a total of three Senators on the delegation. In 1925, there were none in the delegation. There was Congressman Burton, but however you fellows may feel, the other body may not regard a Congressman as a proper substitute.

Mr. ZABLOCKI. Let me interrupt to leave no doubt in your mind how we feel about it. [Laughter.]

PROTOCOL PREVENTED GAS USE IN WORLD WAR II

Mr. BUNN. Well, anyway, the protocol came into force without the United States. By 1939, it had been ratified by 44 countries, including all major European powers. Many credit the protocol with a major role in preventing gas warfare in Europe during World War II.

It symbolized the abhorrence for poison gas which even military men had after the first war. This abhorrence, and military skepticism as to the utility of gas warfare, both helped to prevent a repeat of the first war's gas attacks.

The threat of retaliation, of course, constituted a deterrent. But it was the protocol that placed poison gas and germs in a special class and provided a standard for the belligerents to follow.

At the beginning of our participation in World War II, the State Department became concerned that the Japanese, not being parties to the Geneva Protocol, would engage in chemical warfare.

The British, French, Italian, and German Governments had exchanged pledges to observe the protocol; they had all been parties; the British had made the same offer to Japan, but it had replied evasively.

The Chinese charged that the Japanese had used gas in China. President Roosevelt, therefore, announced that we condemned the use of poison gas as "outlawed by general opinion of civilized mankind."

He threatened swift retaliation by the United States if such gases were used against any of our allies. The Japanese replied privately that they would refrain from the use of gas if we and our allies would do so.

The Joint Chiefs gave some consideration to using gas toward the end of the island war in the Pacific but they never got as far as asking President Truman for authority to do so.

NO GAS USED BY UNITED STATES IN WORLD WAR II OR KOREAN CONFLICT

No gas, even tear gas, was used by U.S. forces in World War II or in the Korean war, although military commanders requested authority to use gases in both wars.

We were charged by the North Koreans with engaging in germ warfare, and there was quite a debate in the U.N., but as you will remember, we denied the charge, and the North Koreans refused to admit a U.N. team attempting to find the facts.

Since World War II, the United States has repeatedly declared its support for the no-first-use principle of the Geneva Protocol. In 1952, our representative at the United Nations Disarmament Commission declared our support for "the general objective of the (Geneva) treaty, the effective outlawing of poison gas and biological weapons against human beings."

When President Eisenhower was asked at a 1960 press conference whether he planned a change in our no-first-use policy, he said:

> No official suggestion has been made to me, and so far as my own instinct is concerned, it is not to start such a thing first.

During President Johnson's administration, the United States supported resolutions passed in 1966 and 1968 by the United Nations General Assembly, calling for "strict observance by all states of the principles and objectives" of the protocol.

UNITED STATES USED TEAR GAS FIRST IN VIETNAM

The United States, South Vietnam, and Australia have used tear gas in Vietnam as have the North Vietnamese and the Vietcong. Our side was the first to do so. Our use was justified on "humanitarian grounds"— that it would reduce the number of people killed, particularly noncombatants, and that it would be analogous to riot control.

The authorized justification given by the United States to the United Nations was that it "would be unreasonable to contend that any rule of international law prohibits the use in combat against an enemy, for humanitarian purposes, of agents that governments around the world commonly use to control riots by their own people."

Secretary Rusk said:

> We do not expect that gas will be used in ordinary military operations. Police-type weapons were used in riot control in South Vietnam—as in many other countries over the past 20 years—and in situations analogous to riot control, where the Viet Cong, for example, were using civilians as screens for their own operations.

Where Vietcong were protected by human shields or by tunnels or caves, the alternatives were machineguns, napalm, high explosives, or fragmentation grenades.

Tear gas certainly seemed a more humanitarian weapon. But, after the humanitarian justification had been made, reports began coming in from Vietnam that large numbers of tear gas grenades had been dropped on Vietcong strongholds from helicopters which were followed immediately by B–52's dropping high explosives or antipersonnel fragmentation bombs.

The purpose of such a combined attack would appear to be to flush out those hiding in tunnels—whether civilians or combatants, and, of course, you don't know from a B–52—to incapacitate them with gas, and then instead of capturing them, to wound or kill them with bombs.

This seems wholly inconsistent with the humanitarian justification given earlier by the United States.

In September, the Pentagon repeated this justification saying again that riot control agents were useful in "reducing civilian casualties" and "are used when they will help save lives." The following week, the New York Times described a report from the American command in Saigon which said that tear gases had rarely been used to save civilian lives.

RATIONALE FOR GAS DOES NOT FIT PRACTICE

Indeed, the very volume of the tear gas used in Southeast Asia indicates a widespread use in ordinary military operations. We have procured some 14 million pounds for Southeast Asia since 1964.

With an efficient dispensing device, this is enough to cover the entire area of South Vietnam. It is more than half the total weight of the mustard gas used by all parties in World War I.

Thus the political rationale given by the United States for using tear gases—that they were to be used for humanitarian purposes to protect civilians and not in ordinary military operations—no longer fits our military practice.

THE USE OF DEFOLIANTS IN VIETNAM

Somewhat the same thing has happened with the defoliants we are using in Vietnam. We justified their use "to control weeds and other unwanted vegetation," saying they involve "the same chemicals and have the same effects" as weedkillers used domestically in the United States.

At first, defoliants were used to destroy jungle trees and plants, particularly along roads, because this vegetation was used as a cover by enemy troops from which to attack American and allied soldiers.

This was not unlike the common use of herbicides to kill weeds along highways in this and other countries. Gradually, however, the South Vietnamese and then the Americans began using herbicides to kill rice crops in Vietcong held areas.

Although the chemicals remained the same as those used for certain domestic weedkillers, the use was no longer "to control weeds and other unwanted vegetation," the justification given by the United States to the United Nations. As with tear gases, our political rationale had been eroded by our military practice.

U.S. HISTORICAL POSITION ON TEAR GAS

The United States has never taken the view that it could use tear gas and defoliants in Vietnam because it was not a party to the Geneva Protocol of 1925.

Instead, we said that these agents were not prohibited by the protocol, adding that we supported the objectives of the protocol.

We sponsored and voted for a 1966 U.N. General Assembly resolution which called for "strict observance by all states of the principles and objectives of the protocol" and condemned "all actions contrary to the objectives."

A U.S. delegate stated at the U.N. that "while the United States is not a party to the protocol, we support the worthy objectives which it seeks to achieve."

In a 1967 statement, following this resolution, the State Department took the view that, by voting for the resolution, the United States reaffirmed its longstanding support for the protocol.

In this view, the "basic rule" set forth in the protocol "has been so widely accepted over a long period of time that it is now considered to form a part of customary international law."

This position, of course, assumes that the protocol includes no prohibition of the use of tear gases or defoliants in those kinds of cases covered by the justification made by the United States to the United Nations.

With this qualification, the 1967 State Department position was that we are bound to observe the rule of the protocol even though it was not approved by the Senate. This is consistent with decisions of the Nuremburg trials convicting Germany of violating treaty standards which Germany had not expressly agreed should be applicable to it—simply because these standards had become widely accepted by a great many countries over a long period of time.

DIFFERENCES OF PROTOCOL INTERPRETATION

Let me turn now to the differences of interpretation of the protocol.

Other countries generally disagree with our exclusion of tear gas and defoliants from the protocol. At a 1930 conference designed to clear up the difference of views on tear gases, 12 delegations, including the British, Chinese, French, and Soviets, disagreed with our view.

This year, the 12 nonalined members of the Geneva Disarmament Conference urged the adoption of a draft declaration which would condemn as contrary to international law the use in war of "any chemical agents of warfare" which "might be employed because of their direct toxic effects on man, animals, or plants."

The speech by the Swedish delegate who introduced this draft made clear that the declaration is designed to show that the protocol includes both tear gases and defoliants. This declaration will probably be considered by the General Assembly this fall.

I have studied the negotiating and legislative history of the protocol, and of the earlier treaties from which its language is derived, to find whether the drafters intended to include tear gases and defoliants within its ban.

The evidence, set out in an article which I understand you have, is inconclusive.[1] I might add at this point that, during the Senate consideration of the protocol, one of those attacking the protocol in the Senate, Senator Reed, said that one of his objections to the protocol was that it would prevent the use of tear gas.

Mr. ZABLOCKI. Mr. Bunn, would you advise the committee what page of your report?

[1] The text of the article is on p. 304 of the appendix.

Mr. BUNN. This is page 402, footnote 124.

Mr. ZABLOCKI. Thank you.

Mr. BUNN. During the Senate debate, an opponent of the protocol said that it "undertakes to protect us against all gases. The language of the treaty is not 'fatal gases' or 'deadly gases,' it is 'asphyxiating, poisonous, or other gases.' "

And then he goes on to say that this would emphasize, embrace "tear gas," which is used by police. The floor manager of the bill, Senator Borah, said, "This treaty would not interfere with that."

This question was thus raised during the Senate debate. An opponent said it would cover all gases. The chairman of the Foreign Relations Committee denied that it would, at least insofar as they were used domestically by police. This exchange left the thing unclear again.

In any event, I think the evidence is inconclusive. I believe that what we do about tear gases and defoliants in the future should, therefore, be given thorough consideration from a policy point of view.

RECOMMENDS COMMISSION TO STUDY GAS ISSUE

If the President decides to resubmit the protocol to the Senate, I would recommend that a national commission such as the Gaither Commission be appointed to advise the Executive and the Senate what our future conduct should be under the protocol with respect to tear gases and herbicides.

This would be a commission somewhat similar to the citizens advisory committee appointed in 1922 by President Harding, I assume, at the recommendation of Secretary of State Charles Evans Hughes. This committee recommended the total abolition of chemical warfare.

Our Armed Forces appear to have found tear gases and herbicides militarily advantageous in Vietnam. But, if other countries become proficient in their use, the advantage may no longer be with us.

In Vietnam, if we are not attempting to capture "Hamburger Hills," if our objective is no longer "search and destroy," we should have less use for tear gas.

If, as Secretary Rogers announced on October 12, the orders to our military commanders have been changed from "maximum military pressure to protective reaction," the need of those commanders for tear gas should be much reduced.

Moreover, if we hold open the option to use tear gases, countries which now have no gas capability will acquire gas masks, gas grenades, dispensers, projectiles and other delivery equipment, as well as expertise in gas warfare.

If many countries reach this stage of military preparedness, they will be far more likely to escalate to poison gas in time of war.

There are thus important future considerations to weigh against what may be a present military advantage. Before we attempt to perpetuate our loopholes for tear gases and herbicides, I think the future disadvantages should be thoroughly explored.

PROTOCOL A "LIVING DOCUMENT"

Despite the differences of view over the protocol's application to these two agents, tear gases and herbicides, it remains a living document with a growing list of signatories.

Some 84 countries have agreed to its terms. All members of NATO except the United States and all Warsaw Pact members, including the Soviet Union, are parties.

Indeed, all European states except Albania have joined the protocol. Of the major industrial countries, only Japan and the United States have failed to join. Of the five nuclear powers, including Communist China, only the United States remains outside.

And I might add to that, if we do ratify the protocol, it would become the first arms control treaty to which both we and Communist China were parties.

REASONS FAVORING RATIFICATION

Let me give you a few of the arguments pro and con on ratification. I will list first the reasons favoring the ratification.

1. To me, the best reason for ratification is that this would strengthen the protocol as a barrier to the first use of poison gas and germ warfare by giving increased attention to the protocol and stimulating other countries to join it.

Our failure to ratify has repeatedly been called to the attention of other nations by the Soviet Union and its allies. Since America and Japan are the only major industrial nations to remain outside, our accession would have an important impact on the conduct of other countries.

One might argue that, because the basic rule of the protocol has become a rule of customary international law, that rule applies to all of the countries which have not been ratified.

But as you gentlemen know too well, the existence of law and respect for it are two different things. Indeed, many emerging African and Asian countries refuse to be bound by rules developed by the practices of "colonialist" powers.

Only adherence to the protocol is likely to be regarded by them as producing a serious inhibition upon their first use of gas or germ warfare.

Yet these same countries could acquire chemical and biological agents with much less difficulty than they could acquire nuclear weapons.

CB weapons have indeed been referred to as the poor man's atomic bomb. The most recent use of poison gas was, after all, in Yemen. A number of smaller countries in Africa, Asia, and particularly in Latin America, remain outside the protocol.

In my view, U.S. adherence to the protocol would stimulate wider acceptance of it by countries in these areas, and would enhance its credibility as a deterrent to the first use of poison gas and germs in war.

RATIFICATION WOULD GIVE UNITED STATES "BETTER STANDING"

2. A second advantage of ratification is that it would give the United States a better standing to participate in the forthcoming international discussions of gas and germ warfare.

There is a great deal of interest in the field just now, and proposals have been made by Britain, the Soviet Union and Sweden, among others. I would suspect that at the U.N. this fall, and at Geneva next year, there will be a good deal of discussion on this subject.

These proposals would all supplement rather than substitute for the protocol, which would remain the basic instrument in the field. Not being a party to this basic instrument limits our effectiveness in talking about new measures which use it as their foundation.

U.S. interests would be better protected during the discussion of possible future agreements in this field if we became a full-fledged party.

At the very least, ratification would limit the effect of Soviet propaganda attacks which tend now to reduce somewhat our influence with other delegates.

MAIN OBJECTIONS TO RATIFICATION

Let me turn now to the main objections given to ratification:

1. The first is that the protocol is an imperfect instrument, that it needs revision, and that we should only adhere to it in revised form.

The imperfections include the ambiguities I have already talked about as to tear gas and herbicides, as well as the reservations which many parties entered when they ratified.

These reservations are described in the article which you have. They have not deterred other countries from ratifying the protocol in recent years, and they should not deter us. None of them limits the basic rule of the protocol against the first use of poison gas and germ weapons in war.

In the case of tear gas and herbicides, if we decide for the future to include them within the prohibitions of the protocol, we should have very little trouble securing the agreement of other countries.

If we decide to exclude them from the protocol, we will have trouble. It is possible, however, for us to ratify the protocol with an interpretation expressing the view that the protocol should not be taken to ban tear gases and herbicides.

Unless other countries treated our interpretation as a reservation going to the heart of the protocol, they would, in effect, accept our adherence to the protocol while continuing their differences of view with us with respect to interpretation as to just these two agents.

This is not a perfect solution. But it is the kind of compromise over ambiguous language which you gentlemen are familiar with in the legislative field.

The chances of achieving a more perfect instrument are not great. As I have indicated, the current proposals for new treaties would leave the protocol standing, warts and all.

And we have little chance of achieving a broad international consensus in the foreseeable future that tear gas and herbicides are legitimate weapons of war. Thus, waiting for a better treaty is not a realistic solution.

2. The second important objection is that, if we were parties, we would observe the treaty in time of war and other countries might not. By ratifying, some argue, we would give up our option to use poison gas and germs first but other countries might not.

By ratifying, however, we would not give up our option to retaliate if another country struck first with CB weapons. Nothing in the protocol precludes reprisals in kind, or readiness to engage in such reprisals.

Moreover, we no longer really have an option to use these weapons except in retaliation. Our publicly stated policy is that we will not be the first to use them.

We have said repeatedly that we would observe the principles and objectives of the protocol. We are probably bound by customary international law to its basic prohibitions.

Our principal allies would, if they could, restrain any desire we might have to initiate poison gas or germ warfare in a future conflict.

The sanctions for violating the protocol—retaliation against our allies or ourselves, and war crimes prosecutions if we should lose—apply whether or not we ratify.

Thus, ratification would simply acknowledge the fact that our options are already closed.

My view, in conclusion, is that we have much to gain and little to lose by ratifying.

We can increase the strength of the protocol as a continuing barrier to poison gas and germ warfare, and enhance our standing for influential participation in the upcoming Geneva negotiations.

On the other hand, if we insist on waiting until the protocol is perfected, we will not solve the problem of interpretation and we will have less influence on the revision process.

Finally, we give up no option now realistically open by ratifying.

In my view, the protocol is the best instrument likely to be achieved in the foreseeable future. The United States would be well advised to join it.

Thank you, Mr. Chairman.

(Biographical information on Mr. Bunn follows:)

George Bunn, visiting professor of law at the University of Wisconsin School of Law, Madison, was general counsel of the Arms Control and Disarmament Agency (ACDA) from the inception of the agency in 1961 until last year. A 1950 graduate of the Columbia University Law School, Professor Bunn was a partner in the Washington law firm of Arnold, Fortas and Porter from 1951 to 1961. As ACDA general counsel, Professor Bunn was a member of the U.S. delegation to the 18 Nation Disarmament Conference from 1962 to 1966 and served as deputy chairman of the U.S. delegation in 1966. He also was a delegate to the U.N. Disarmament Committee in 1965 and U.S. representative to the Western 4 Jurist Group, 1963–1966.

Mr. ZABLOCKI. Thank you, Mr. Bunn, for an excellent statement.

We will now hear Dr. Ivan Bennett.

STATEMENT OF DR. IVAN L. BENNETT, JR., DIRECTOR, NEW YORK UNIVERSITY MEDICAL CENTER, NEW YORK, N.Y.

Dr. BENNETT. Mr. Chairman, members of the subcommittee, it is a privilege to have this opportunity to appear before you to discuss chemical and biological warfare.

As I understand it, the immediate stimulus for your inquiry is a series of resolutions introduced into the House of Representatives calling on the President to resubmit the Geneva Protocol of 1925 to the Senate for ratification.

The resolutions then go on to point out that resubmission of the protocol would provide an opportunity for a comprehensive review of this country's policies in the fields of chemical and biological warfare and that ratification would constitute a clear and unequivocal reaffirmation of our traditional policy of no first use of CBW.

CHARACTERISTICS OF CBW

I will use this occasion to enumerate some characteristics of CBW that, in my opinion, should be clearly understood by all who are interested in international control of these weapons, whether by agreement to ban their use, as does the Geneva Protocol, or going even further and banning their very existence.

I will try to explain why I believe that the aspects of CBW that I have singled out are of key importance in deciding on what the next step should be and I will comment specifically upon resubmission of the Geneva Protocol to the Senate at this time.

The subcommittee's interest is particularly appropriate because of the possibility that the review of the U.S. stance on CBW, now underway in the executive branch under the National Security Council, may soon lead to the formulation and announcement of a clear and coherent national policy in this area.

U.S. POSITION "AMBIGUOUS"

The fact that we have had no agreed-on policy, the almost incredible failure of the Senate to ratify the Geneva Protocol when it was first submitted, and our use of tear gas and chemical herbicides in Vietnam have combined, in my opinion, to place this country in an international position which might be described, charitably, as "ambiguous."

During the first 6 months of this year, along with consultants from 13 other nations, I helped to draft a report on CBW for the Secretary-General of the United Nations.[1]

I can state at firsthand that American credibility in discussions of the control of CBW has been compromised and we are being subjected to increasingly vigorous and bitter criticism by the representatives of many nations, by no means only those of the Eastern bloc.

The lack of a coherent policy, the strong repugnance felt by most people for the concept of using poisons or diseases in warfare, and the dismal series of recent episodes such as the killing of hundreds of sheep with nerve gas at the Dugway Proving Ground in Utah, the

[1] The U.N. report may be found on p. 378 of the appendix.

controversy over the Army's plans to ship obsolete chemical munitions to the east coast and to dump them into the ocean in Operation Chase, the accident with nerve gas on Okinawa, the subsequent revelation that the United States also maintains stocks of lethal chemical munitions in West Germany, and the carrying out of open-air field tests of lethal chemicals in Hawaii without the knowledge of State officials, have all converged to mobilize public and congressional demands for reform.

I believe that our domestic political climate is more conducive to a revision of our policies on CBW than it has ever been before.

CBW DEFINITIONS

For the purposes of this discussion, I will abide by the definition contained in the U.N. report on CBW issued in July 1969:

> * * * chemical agents of warfare are taken to be chemical substances, whether gaseous liquid, or solid, which might be employed because of their direct toxic effects on men, animals, and plants.
>
> Bacteriological (biological) agents of warfare are living organisms, whatever their nature, or ineffective material derived from them which are intended to cause disease or death in man, animals, or plants, and which depend for their effects on their ability to multiply in the person, animal or plant attacked.

Although the possibility of using agents such as mosquitoes, potato beetles, or other insect pests has been suggested, the only living organisms that can presently be used in the warheads of biological weapons are micro-organisms which means germs or microbes.

These include bacteria, viruses, a few disease-producing fungi, and a group of organisms called rickettsia, which are intermediate between the viruses and the bacteria.

Diseases produced by rickettsiae include Rocky Mountain spotted fever, typhus, and the so-called Q-fever. The afflictions that might be caused by these agents range from such deadly epidemic infections as plague, which carries a high mortality and is very contagious, to exotic viral diseases, such as Venezuelan equine encephalitis, a prostrating, influenza-like illness which lasts only a few days, is not transmitted directly from man to man, and from which complete recovery is almost certain.

The knowledge of microbial genetics which has been acquired in recent years makes it possible to select particularly virulent strains of these micro-organisms for use in warfare and to assure that they will be resistant to antibiotic drugs or extremely difficult to identify by the usual laboratory techniques employed for diagnosis.

TYPES OF CHEMICAL AGENTS

The chemical agents available to the Armed Forces in this country include the organophosphorous G-type and V-type nerve agents which are closely related to some of the more potent insecticides, and which are far more lethal for man than the traditional chlorine and phosgene which were used in World War I.

GB (Sarin) is quite volatile and kills within minutes after inhalation. VX is less volatile, ordinarily would be disseminated as a liquid, can contaminate a target area for several days, is lethal when inhaled as a vapor, and also can kill when absorbed through the eyes or the intact skin.

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Mustard gas is actually a highly irritating liquid known technically as a vesicant or blister agent. It produces painful burns of the eyes and skin within hours after contact.

If mustard is inhaled in sizable quantities, it can cause a fatal outpouring of fluid into the lungs, so-called pulmonary edema.

Another class of chemical agents is the "incapacitating" chemicals or "harassing" agents. These include Adamsite (DM) and BZ which cause burning of the eyes, irritation of the throat and lungs, incoordination, headache, nausea and vomiting, and general debility lasting for many hours or days after contact.

The last category of chemical agents is the tear gases or lachrymators, CN (chloracetophenone) and CS (orthochlorbenzilidene malonoitrile). These have such transient effects that, "as riot control agents (RCI)," they are employed by police in many countries for the control of civil disorders.

The effects of other incapacitating agents such as DM and BZ are too severe and prolonged for use against civilians for this purpose.

CS is the agent which our troops are using in Vietnam.

PROPERTIES OF CB WARFARE

Chemical and biological weapons have specific properties which set them apart from conventional high-explosive and flame munitions and nuclear weapons in that they exert their injurious effects only on living matter.

An attack with these weapons would not damage or destroy buildings and other physical structures—excepting the possibility of residual contamination by the agents.

Present concepts of the use of these weapons in military engagements call for their delivery and dissemination by munitions which release the agent into the atmosphere as a vapor, aerosol, or spray so as to expose enemy personnel either by inhalation or skin contact.

The are looked upon as "area" weapons that can inflict casualties in a given region without the intelligence requirement for precise targeting that constrains the most effective employment of conventional weapons.

An attack with a biological agent could be expected to blanket a larger geographic area than could an attack using a comparable weight of a chemical agent.

PROBLEM OF UNCONTROLLABILITY

The release of a chemical or biological agent into the open air as a toxic or infectious "cloud," subject to the vagaries of wind and weather is often cited by opponents of chemical and biological warfare as a moral argument against the use of these weapons because of the danger to civilian noncombatants if the cloud should veer away from the battlefield.

This objection, based upon uncontrollability, has been quite persuasive, of late, in forcing limitations upon the peacetime testing of these weapon systems by the U.S. Armed Forces where the civilians at risk may be our own citizens.

Reliability of performance is highly desirable, from a military viewpoint, for any weapon system, and this moral objection can be used

analytically to argue that at least portions of the "chemical-biological option" which most defense establishments, including our own, desire to retain are unsound on technical grounds.

I do not put it in these terms merely to sound gratuitous about current expressions of moral indignation over CBW. Personally, however, I regret the implication that the only "moral" way to kill an enemy on the battlefield is with iron.

All war is immoral, whether waged with cold steel, iron bombs, poison gas, virulent microbes, or nuclear weapons.

Arguments based upon morality alone, until now, have had very little impact upon the Pentagon or ministries of defense anywhere. To a large extent, the political decisions here and elsewhere, that will be required to further restrict or to abolish these or other forms of weaponry, will be dependent upon convincing military establishments that they can relinquish an "option" by arguing within the framework of their responsibilities and missions as they view them.

The task of translating convincingly the moral argument of the threat to civilians implied by noncontrollability into a military argument of technical unreliability of a weapon system is an example, and a very simple one at that, of an analytical approach to problems of disarmament.

There now exist both chemical and biological agents and the systems to deliver them that can produce casualties in man ranging from transient disability with complete recovery, to rapid death.

THE LINE BETWEEN LETHAL AND NONLETHAL AGENTS

It has been stated emphatically by well-intentioned individuals that variations in resistance and susceptibility of populations—especially civilian populations—and of age groups within populations along with the uncontrollables of distribution and dosage entailed by atmospheric release of agents, makes it impossible to draw a dividing line between a category of nonlethal agents, intended to incapacitate, and a category of lethal agents, intended to kill.

Unfortunately, this is nothing more than a form of begging the real question. It is undeniable that there might be survivors after an attack with a lethal agent or that an attack with a nonlethal agent might result in a few fatalities.

There is not the slightest doubt, however, that these agents can be categorized accurately on the basis of the statistical probability of their effects if disseminated in a specific amount among a given target population.

Furthermore, and most importantly, the various military options for the use of chemical and biological weapons are crucially rooted in this distinction.

COVERT CB USE IN SABOTAGE

Both chemical and biological agents lend themselves to covert use in sabotage against which it is exceedingly difficult to visualize any really effective defense.

For example, a relatively small quantity of a culture of virulent bacteria introduced into the ventilation system of the New York subway or sprayed upon unsuspecting passengers at an airport could certainly play havoc with our public health system.

It has been calculated that the placing of only 5 kilograms of botulinum toxin, a poisonous material produced by a bacterium—which, though biologically produced, would be used as a chemical weapon—into a reservoir would result in the same degree of poisoning that would be achieved by dumping 10 tons of potassium cyanide into the water supply.

I will not dwell upon this use of CBW further because, as one pursues the possibilities of such covert uses, one discovers that the scenarios resemble that in which the components of a nuclear weapon are smuggled into New York City and assembled in the basement of the Empire State Building.

In other words, once the possibility is recognized to exist, about all that one can do is worry about it.

Leaving aside, for the moment, antiplant or anticrop agents or an attack directed against domestic animals, it can be assumed that the primary purpose of an attack with chemical or biological weapons would be the incapacitation or killing of human beings.

CBW IN A SURPRISE CITY ATTACK

A frequently mentioned scenario in discussions of these "horror" weapons is that of a surprise attack on a large city using a lethal chemical such as VX or GB or a lethal biological agent such as the microbe which causes plague.

Such an attack could be expected to produce massive casualties among an unsuspecting civilian population. It is in envisioning the human toll of an attack of this sort that many have referred to chemical and biological agents as "weapons of mass destruction" or the "poor man's nuclear bomb."

It should be realized, however, that the major monetary cost to an aggressor nation carrying out an attack on a city would not be for the high-explosive, the incendiary mixture, the gas, the bacteria, or the viruses used to fill the bombs, projectiles, or missiles, which might be employed for attack.

Rather, it is for the procurement and maintenance of the delivery systems—bombers, cannons, missiles—the logistical backup for these systems—fueling, radar—and their platforms—airbases, carriers, submarines, and so forth—and the investment in highly trained personnel that the major expenditures would be made.

Furthermore, a decision to attack a major city for strategic purposes as part of a campaign to erode the enemy's industrial or economic base would, in most instances, be better implemented by using munitions that would destroy factories, storage facilities, railways, highways, bridges, docks, and shipping as well as human lives.

What I am suggesting, rather bluntly, is that if it is decided to eliminate a city, it may be more cost-effective, from a military viewpoint, to blow it up or burn it down rather than merely to poison the residents or infect them with a disease.

It is not my purpose to deprecate the dangers of CBW, to allay fears about the consequences of the use of these weapons, or to lessen opposition to CBW on moral or other grounds. It is to demonstrate the possibility of questioning the technical base for the general military philosophy which says that our national security demands that we "keep all

options open" no matter how limited the need for, or the utility of, a given option may be.

Similarly, arguments of cost-effectiveness or maintaining an option because it is "cheap" should be countered by asking "Relative to what?"

The plain fact is that the acquisition and maintenance of an offensive chemical or biological capability by the military forces of any country is not a substitute for maintaining a conventional arsenal.

CBW is invariably a military "add-on" involving increased expenditures that cannot be offset by forgoing some other form of armament.

DIFFERENCES BETWEEN C AND B WEAPONS

Although by custom chemical and biological weapons have been lumped together as CBW, especially in political discussions, there are major technical differences between these two categories of weapons.

One of the most significant of these is the difference in the time required for the weapons to produce their effects. A chemical attack results in casualties within minutes or hours. Biological agents would require days or weeks to have an effect because the microbes must multiply before symptoms of the disease occur.

This is the so-called incubation period that elapses between exposure to infection and the first appearance of symptoms of illness. The situations in which it might be militarily preferable to carry out an attack and then to wait for a period of days for its effect to become evident are limited, to say the least.

Indeed, insofar as lethal chemical and biological weapons are concerned, all arguments for possessing them finally come down to the basic assertion that, if the Soviets or some other potential aggressor possesses them, then we must have them, too.

The crux of this thesis is that, if we have them, it will deter an enemy from using them against us because we will be able to retaliate in kind.

This argument deserves careful examination. If there is any single concept concerning CBW upon which there is universal military agreement, it is that the first use of lethal chemicals or lethal biologicals in battle will result in a large number of casualties if the side that is attacked has not been forewarned.

There exist effective defensive measures against CBW in the form of masks and protective clothing and after the introduction of CBW into a conflict, both sides could employ these measures to protect their troops and casualty rates in subsequent chemical or biological attacks could be expected to be strikingly reduced.

In essence, then, the real military effectiveness of lethal CBW, in terms of inflicting casualties, will accrue to the force that initiates use against an unwarned enemy; thereafter, the use of defensive measures could largely blunt the effectiveness of this form of armament.

VULNERABILITY OF CIVILIANS TO CBW

The foregoing statements concerning the effectiveness of defensive measures refer exclusively to military personnel. The vulnerability of civilians, as opposed to troops, is not specific for CBW.

Preparations to protect the civilian population against conventional CBW, or nuclear attack in most countries, including the United States,

are wholly inadequate. There are a few notable exceptions such as Sweden and Switzerland.

The Geneva Protocol which the United States signed but which our Senate failed to ratify, bans first use of lethal CBW and this country is on record in the U.N. as having agreed to follow the principles of the protocol.

Unless we abandon this stance and modify our policy so as to allow our forces to initiate use of CBW, a change which in my opinion would be politically unthinkable for the United States, we have already relinquished the option to employ lethal CW or BW in the most militarily effective fashion.

ADVANTAGES OF A RETALIATORY OPTION

What, then, are the advantages of retaining an option to retaliate in kind?

For biological weapons, it does not necessarily follow that the best military or political response to an attack would be retaliation in kind.

The attacker, being forewarned that biologicals might be used in return, could defend his troops by masking and largely reduce the effectiveness of second use of these weapons.

If the attack had imperiled our own military situation, it is questionable whether a counterattack against a forewarned enemy with a biological agent and the attendant delay during the incubation period would meet the needs of our forces.

Furthermore, national leaders who are not deterred by our nuclear capability from using BW against us are hardly likely to be deterred by our possession of a BW capability.

Indeed, if it were known that we possessed no offensive BW capability, an aggressor might be more deterred from initiating BW against us by the realization that our response might be escalation to nuclear weapons.

The situation with lethal chemicals is somewhat different from that with lethal biologicals. A military force attacked with lethal chemicals would suffer casualties but, as mentioned, by masking and donning protective clothing could protect itself against further attacks.

Gas masks and protective clothing, however, greatly impede normal physical activity of troops and would restrict the mobility of forces in the field.

Unless the opponent can be forced to suffer the same penalties of restricted activity, he is at great advantage and the advantage might be enough to turn the tide of battle.

Therefore, retaliation in kind, with lethal chemicals, could very well be the best military response, not in the hope of inflicting heavy casualties upon the forewarned enemy, but to impose upon him the handicap of operating in a toxic environment.

Here, again, however, barring first use, the only reason for possessing a lethal chemical capability is because the other side might have it.

Another possible response to a lethal chemical attack which imposed the handicaps of masking and other defensive measures upon U.S. troops might be escalation to tactical nuclear weapons to regain advantage over the enemy.

I will not attempt to portray what the consequences of such a response might be against an enemy with similar nuclear capability or what world opinion might be if the United States initiated the use of tactical nuclear weapons to regain advantage over the enemy.

In terms of the effects upon civilian populations, about whom so many opponents of CBW have expressed concern, however, the questions raised by a choice between retaliation to lethal chemical attack in kind or by escalation to tactical nuclear weapons offer small comfort.

Many scenarios could be conjured up to emphasize the two conclusions that I wish to suggest: first, the "option" of lethal CBW would be unnecessary if one's enemy lacked a similar option; and second, while it is extremely doubtful that the best military response to biological attack would be retaliation in kind, the arguments for retaliation in kind in case of lethal chemical attack are somewhat more convincing from a military viewpoint.

ESTABLISHED EFFECTIVENESS OF CHEMICAL WARFARE

One last difference, which is only partly technical, between chemical and biological weapons deserves emphasis. Chemical warfare was used on a large scale in World War I, and under battlefield conditions, proved to be capable of inflicting numerous casualties.

Its occasional use since then—in Ethiopia, China, and Yemen—has borne out its effectiveness as a weapon. Chemical warfare, then, is a proved and established concept. Biological weapons, in contrast, have never been used in modern warfare and judgments of their possible effectiveness are based upon naturally occurring epidemics, laboratory accidents with infectious microbes, and extrapolations from laboratory experiments and field trials.

The emotional and military commitment to biological warfare is nothing like as deep seated and fully developed as is that to chemical warfare.

THE TEAR GAS ISSUE

The language of the Geneva Protocol is equivocal, unfortunately, and it is not absolutely clear that it prohibits the use of incapacitating chemical agents such as tear gas.

This is a matter of opinion and, although many nations, including our allies as well as members of the Soviet bloc, have claimed that tear gas falls under the ban in the protocol, the United States has always held that the use of tear gas is not excluded by the protocol.

In July of this year, Secretary General U Thant, at the time he issued his report on chemical and biological weapons, called on all nations to affirm that "the prohibition contained in the Geneva Protocol applies to the use of all chemical, bacteriological and biological agents—including tear gas and other harassing 'agents'."

Laudable as the Secretary General's motives may have been, I regard this recommendation as unfortunate, in a U.S. domestic political sense, at this time.

This country is using the tear gas, CS, in Vietnam. To be sure, it was originally introduced with assurances—which I believe were genuine—that it would be used for humane purposes, to avoid civilian casualties, et cetera.

It is now being used in huge quantities and is believed by our field commanders in Vietnam to be an important addition to their weaponry.

It must be admitted that objective evidence of the effectiveness of CS has not been given by any operational analytic study but this lack does not change the way that our Army and Marine forces feel about CS.

At a time when the administration is trying to find a way out of Vietnam and trying, among other things, to hold American casualties to an absolute minimum, any move that might be interpreted as taking an effective weapon away from our forces in Vietnam would surely carry domestic political risks.

If our casualties should rise, for whatever reason, the withdrawal of permission to use CS would surely be blamed by someone.

CS NOT USED FOR "HUMANE" PURPOSES

There is no longer any pretext, incidentally, that CS is used primarily for "humane" purposes. It is an adjunct to conventional weapons and makes it possible to inflict more casualties on the enemy while holding down our own losses.

If the Geneva Protocol is resubmitted to the Senate without any reservation, I am fearful that the recent recommendation by the Secretary General will result in argument and debate over whether the protocol precludes the use of tear gas.

If it were ratified without reservation, the United States automatically would be guilty of violating it because we are using CS in Vietnam.

If it were ratified with the same reservation that we alone have always expressed about tear gas, this would fly in the face of other nations and the U.N.

I believe that if the result of resubmission of the protocol to the Senate were to shelve it again or actually to turn it down, this would be disastrous for our international stance.

I do not know the way out of this political dilemma unless the war in Vietnam can be brought to an end. I believe strongly that the "option" to use tear gas or other incapacitating chemicals is one that we should eventually be willing to relinquish in return for an effective international agreement banning not only the use but the possession of chemical weapons.

I have not discussed herbicides and their use for defoliation and crop destruction in Vietnam because this is another subject.

SPECIAL PROBLEM OF TEAR GAS, HERBICIDES

It is worth pointing out, however, that if the next step beyond the Geneva Protocol is to be an agreement banning the development, production, and stockpiling of chemical weapons, both tear gas and herbicides will pose special problems.

The manufacture and use of tear gas for nonmilitary purposes will surely continue. Similarly, the manufacture and use of herbicides for nonmilitary purposes will surely continue.

To devise controls upon their development or stockpiling for military use will require considerable political ingenuity.

In contrast, there is no reason other than military use that could serve as an excuse for developing or producing any biological weapon.

They have no place in quelling civil disturbances and they have no commercial use in agriculture or elsewhere.

Because chemical weapons are an established part of the arsenal of many nations and because of the complex situation surrounding tear gases and herbicides, I believe that it will require prolonged discussions to arrive at an international agreement banning production and stockpiling of chemical weapons.

None of these difficulties need apply to biological weapons.

It is my personal belief that our strategy should be to take advantage of the present climate of public opinion and agree to abolish biological weapons and to pursue vigorously the possibility of eventual abolition of chemical weapons.

SEPARATE THE B FROM THE C IN CBW

If we separate the B from the C in CBW, we have an opportunity to ban, for the first time, the very existence of a weapon.

This could be done without waiting to complete wrangling over retaliation in kind with lethal chemicals, the status of tear gas and of herbicides, both domestic and international, and the exact meaning of the mysterious phraseology of the Geneva Protocol.

Such a move would not arouse the same vigorous objections from most military establishments that come forth when their chemical "option" is threatened.

The journey toward the goal of general and complete disarmament will be long and hard. It is high time that we took this first step, no matter how small it might seem.

This completes my statement, Mr. Chairman. I will be glad to answer any questions that you or other members of the subcommittee might have.

(Biographical information on Dr. Bennett follows:)

Ivan L. Bennett, Jr., is director of the New York University Medical Center and a vice president of N.Y.U. After receiving his M.D. degree from Emory University in Georgia in 1946, Dr. Bennett was associated with several medical schools and teaching hospitals as a pathologist. In 1954 he joined the staff of the Johns Hopkins University where he was appointed pathologist-in-chief in 1958. In 1966 he became deputy director, Office of Science and Technology, Executive Office of the President. A member of the President's Science Advisory Committee, Dr. Bennett served as consultant expert for the U.N. Secretary General's report on chemical and bacteriological weapons, issued last July.

Mr. ZABLOCKI. Thank you, Dr. Bennett, for a very thoughtful, provocative—and I might even say frightening—statement.

The scenarios that you described for us should certainly indicate that U.S. action on the ratification of the protocol should not just be in the immediate future, but should have been yesterday.

ARMY AID TO U.N. REPORT

It is my understanding that an Army delegation accompanied you to Geneva.

Dr. BENNETT. That is quite true. During the time that I participated in this exercise, I had with me advisers from the Office of the Secretary

of Defense, I had one Army officer, I had an individual from the Arms Control and Disarmament Agency and an individual from the State Department.

Mr. ZABLOCKI. How did they assist you at Geneva?

Dr. BENNETT. Well, they were of very great assistance in that they were able to check on the technical statements that were made by other delegates, and they were able to supply me with information that I thought might be useful in the preparation of the report.

Furthermore, they were able to make sure that I didn't divulge any classified information, which is not unimportant in discussions of this type.

Mr. ZABLOCKI. There have been conflicting reports in the press about the attitude of the Army delegation. Some of the reports have indicated the members became progressively more disillusioned with the proceedings, and finally excluded themselves from the preparation of the report, and other press stories have commented on the cooperative spirit of the group.

Would you clear up this matter? You have to some degree.

Dr. BENNETT. I will be delighted to.

They were very cooperative, and indeed I would say that a report would not yet be in existence, had it not been for their help in writing and drafting.

The assertion that they became disillusioned and absented themselves is not at all true. I excused them because in the latter part of the last meeting, which was held in New York, they were commuting from Washington daily, and we had arrived at the point that we were simply arguing in the group over some of the wording, and I told these individuals that it would not be necessary for them to accompany me to every session.

Their work, in essence, was done.

U.N. REPORT SEPARATES B FROM C IN CBW

Mr. ZABLOCKI. Doctor, from your statement, you said that it would be most helpful to divide, to separate the C from the B, in CBW. Of course, they usually are treated together, including in the Geneva Protocol.

This issue was, I presume, a part of the discussion at the U.N. Conference.

Dr. BENNETT. It was, indeed, and the U.N. report separates the chemical and the biological, in terms of the military indications for their use and in terms of their characteristics, because technically they are actually quite different. I think it is important to understand, and my conclusion that we should separate these really is because I am in a hurry to see something done to ban some of these weapons.

And I do believe that the arguments for eliminating biological weapons are much stronger and much simpler than those for the elimination of chemical weapons.

Mr. ZABLOCKI. Then, in your opinion, it is necessary to separate them before any further progress can be made on control of CBW on the part of the United States?

Dr. BENNETT. If you are talking about the ratification of the Geneva Protocol, the step that I was talking about is one step beyond that.

Mr. ZABLOCKI. Beyond.

Dr. BENNETT. Which would be in response to some of the proposals that have been placed before the disarmament conference, and which will come up for discussion at the General Assembly in the U.N.

EFFECT OF PROTOCOL RATIFICATION ON SALT NEGOTIATIONS

Mr. ZABLOCKI. The SALT talks are finally underway. In your opinion, Mr. Bunn, what effect would U.S. ratification of the Geneva Protocol have on the SALT talks?

Mr. BUNN. Well, I don't think there would be any—I don't think the relationship between the two is close enough, Mr. Chairman, for it to have any particular impact on the SALT talks, one way or the other.

I would doubt that it would. It might be somewhat helpful, in that there would be another agreement.

Mr. BROOMFIELD. Mr. Chairman, could we reverse that question?

If the Senate somehow would move ahead on ratification of this protocol, would that have any impact on the talks presently going on with the Soviet Union and the United States?

Mr. BUNN. In Finland?

I don't think it would have any major impact; certainly, I suppose every time one gets another significant agreement between the United States and the Soviet Union, that is helpful toward later agreements.

Mr. BROOMFIELD. Well, certainly psychologically, it would show at least through world opinion that the the United States is interested in disarmament. That is my point.

Mr. BUNN. Yes.

Mr. ZABLOCKI. It would underline our sincerity, I would think.

Mr. BUNN. Yes.

"NEO-ISOLATIONISM" AFFECT RATIFICATION?

Mr. ZABLOCKI. This is a very difficult question, but since you have so eloquently elaborated historical developments in CBW, and have explained why the Senate did not ratify the Geneva Protocol of 1925, could you envision a repetition of history now, or in the future, as far as consideration of the ratification? Let me explain further.

You blamed Senate rejection on the isolationism of that period. There is a neo-isolationism developing in our country; particularly, it is quite noted in statements made by some Members of the other body.

Do you envision developments which would again set aside the protocol in the Senate?

Mr. BUNN. I guess if you are looking a long way ahead, you might. I think at the moment that the Senate would probably easily achieve a favorable vote on the protocol. The Senate's action on the amendments to the defense procurement authorization bill, those amendments having to do with chemical and biological warfare, were taken by a 91 to 0 vote. If that is any indication of the present sentiment in the Senate on this subject, you clearly have plenty of votes.

VIETNAM PROBLEM FOR RATIFICATION

The one qualification, one question I have, has to do with the problem of what we are doing in Vietnam, and this obviously could present problems.

If the submission of the protocol were used as a springboard to attack what we are doing in Vietnam, there might be an unhappy result.

I could see, I mean, I have some of the same concerns that Dr. Bennett mentioned on that score, and that is one of the reasons why I suggested that if the President decides to resubmit the protocol, that before there is a final vote in the Senate, it might be useful to have a commission of some sort study this very problem.

I say that should be an outside commission, not because I think that the executive branch hasn't studied all the pros and cons, but because it is sometimes easier when there are matters of loss of face and military practices of long standing which need to be changed—it is sometimes easier for outsiders to get you off the hook. If the President said that the protocol would be submitted, and an advisory committee were appointed, and perhaps that would take 3 to 6 months and perhaps the Senate wouldn't get to it until almost a year from now, things might be better as far as Vietnam is concerned. The same problems that Dr. Bennett foresaw and to some extent I am concerned with, too, might not happen—the same kind of reaction in the Senate Foreign Relations Committee and in the Senate.

PREFERABLE TO WAIT UNTIL VIETNAM WAR OVER?

Mr. ZABLOCKI. Do I understand that if at that time things would be better, there is a possibility we would not be employing CS tear gas in Vietnam?

In that case, then, the inclusion or the interpretation of the banning of tear gas would not be an issue?

Mr. BUNN. Well, I would hope that we would not be. I would hope that by that time it would no longer be militarily advantageous to us.

I think as we shift away from search and destroy type of tactics, that it seems to me that tear gas is of less utility. I don't say that it is of no utility.

Mr. ZABLOCKI. But should we wait until that time? I don't think that a cessation of hostilities or conclusion of the problems in Vietnam necessarily should be awaited, because I think it has been spelled out very clearly that the use of tear gas is not likely to be, in the long run, militarily advantageous. If there is a review or reassessment of its use in Vietnam and use is discontinued tomorrow, the stage could be set for ratification immediately.

Mr. BUNN. I agree with that. If it is possible to do that, I would certainly support it.

REPORTS OF U.S. INCONSISTENCY ON GAS ISSUE

Mr. ZABLOCKI. Now, on page 8 of your statement, Mr. Bunn, you state that in "a 1930 conference designed to clear up a difference of views on tear gases, 12 delegations, including the British, Chinese, French, and Soviets, disagreed with our view."

It has been reported, but the subcommittee has never seen actual documentation, that the United States agreed with other states in international conferences, held in the 1920's and 1930's, that tear gas was prohibited by the 1925 Geneva Protocol.

Could you clarify that point?

Mr. BUNN. Yes, sir.

What happened, we didn't agree that tear gas was prohibited by the protocol. In fact, at the 1930 conference, we took a position, our Ambassador, Hugh Gibson, took a position which is quite similar to the position which was later than taken in the U.N. in 1966.

But in the period between 1930 and the second world war, there were further disarmament conferences. They discussed at those conferences not the Geneva Protocol but new treaties, the prospect of new treaties—new treaties that never came into being, because the conference ended in failure, after the Germans walked out.

But during the consideration of those new treaties, we agreed that a treaty which banned the use and production of chemical weapons, subject to inspection, could ban the use of tear gas in war.

We agreed that tear gas could be banned in war, provided that it was permitted to be used in riot-control situations on our own population.

Now, this was not an interpretation of the Geneva Protocol of 1925. It was an agreement as to what a new treaty should contain.

That is where the confusion comes in. I think many people have looked to what was agreed in that period, and read it as the United States agreeing that the protocol prohibited the use of tear gas.

And as I read those records, I don't think that is accurate.

What we did agree to is if we could get a new treaty of this kind, then tear gas could be prohibited, its use in war could be prohibited, provided, of course, that it was permitted to be used by police departments at home.

EFFECT OF TEAR GAS ISSUE AT U.N. CONFERENCE

Mr. ZABLOCKI. What was the attitude on this particular issue as expressed or in evidence at the recent U.N. conference?

Was there any discussion on our part which would in any way clarify further the U.S. position on the desirability of recognizing that the tear gas should be prohibited at the conference that you attended, Doctor?

Dr. BENNETT. Well, Mr. Chairman, I think you should recognize that I was not an official representative of the United States and none of the other participants were official representatives. We limited our discussions to the technical aspects of CBW, and made a very great effort not to get into such political matters as how you interpret the Geneva Protocol.

But I will say this: That it was quite clear in corridor discussions and so on that my 13 colleagues felt very strongly that tear gas was included under the protocol, and they objected violently to the fact that the United States was using it in Vietnam. This posed no small difficulty, although I will say that these individuals with whom I was working were most courteous and they didn't mention Vietnam as much as they might have, particularly if this had been a more politically oriented meeting.

But it was not until I really tried to engage in this activity that I had the opportunity to see how American credibility in this whole area has been eroded—we simply had to reiterate point after point, and to prove things mathematically, and so one, before we were believed, and most of this was attributable to the fact that these other individuals felt that we were violating the Geneva Protocol.

OPINION DIFFERENCES IN U.S. DELEGATION

Mr. ZABLOCKI. You referred to your 13 consultant colleagues and, of course, those were representatives from other nations. Within your own U.S. group, was there any expression of opinion?

I might say from my own experience at the United Nations, and I am sure my colleague from Michigan will agree, that the work is really done, and agreements accomplished, in corridors and receptions, more so than in formal discussions in the General Assembly.

But I am sure the committee would be interested if within your own U.S. delegation there were any expression on this issue?

Not formal. We know how you felt.

Dr. BENNETT. Well, I would say that not only the delegation, but most individuals with whom I have had any opportunity to discuss this, who are in any way connected with it, deeply regret the fact that we ever initiated the use of tear gas in Vietnam. I think that we did it with good intentions; but I think that what is going on now is deeply regretted by all decent people.

Mr. ZABLOCKI. That is a very hopeful sign. Once we recognize our error, we can correct it. If we don't recognize it, then it is hopeless. To me, this is, I think, very encouraging.

Mr. Broomfield?

Mr. BROOMFIELD. Mr. Chairman, I would like to say that Dr. Bennett's statement and Mr. Bunn's statement this morning have been two of the finest that I have ever heard before the Foreign Affairs Committee.

I really believe it has been most interesting and most helpful to the cause. I couldn't help but think, while both of you were giving your statements, what a benefit it would be if the entire Congress could have heard you this morning.

I think it would have been extremely helpful. I have never heard two finer presentations made before this committee.

NEED FOR CONTINUED RESEARCH

If we could just pursue a little bit your feelings on research, assuming that the Senate would ratify this protocol, your attitude toward research in this field on a continuing basis.

Not necessarily a huge stockpile, and that is another subject, of course, that would have to be taken up, but research.

Dr. BENNETT. I will be glad to answer that question.

I think that no matter what happens in the future, this country should continue to maintain a research program in this field, to avoid what the Pentagon likes to refer to as technological surprise.

I think, however, that it should be clear that this is a research program, that there will be no engineering, no development of delivery systems, that it would be research without development that is usually attached to it, and that there would not be even any exploratory development. I do think that it is important to continue a research program, so that we will have some idea of what is technologically possible, or what might be used against us.

I think that particularly in the chemical field most individuals with whom I am acquainted who know this field far better than I do feel that there is still a broad possibility that some even more lethal agent might be discovered, if one set out to do it.

THE SOVIET CBW PROGRAM

Mr. BROOMFIELD. Is it known whether the Soviet Union is proceeding on a broad research and development program in this area at the present time?

Dr. BENNETT. As I understand it, our knowledge of what the Soviets are doing in either of these fields is rather incomplete.

Mr. BROOMFIELD. Red China?

Dr. BENNETT. I am simply unacquainted with what we know about that. But from what I have heard, we have relatively little reason to believe that Red China is particularly interested in this. There hasn't been any indication.

Mr. BROOMFIELD. Mr. Bunn, do you have any comment to make on the research aspect?

Mr. BUNN. On the intelligence point, I don't. I think that you would be well advised to get an executive briefing on this subject from the people who are responsible for finding out these things.

BRITISH PROPOSAL WOULD ALLOW RESEARCH

On the research, I think that even under the British treaty—the British proposed treaty—under which each of the parties would undertake not to produce—I am quoting now—"not to produce or otherwise acquire or assist or permit the production or acquisition of microbial or other biological agents of types and in quantities that have no independent justification for prophylactic or other peaceful purposes."

Now, that clearly would prohibit the production of any military stockpile. On the other hand, I don't think it would preclude the kind of research that Dr. Bennett is talking about, and the British delegate at the Geneva Conference said that by that provision, it was the British intention to allow the development of "passive defense measures," which would include in particular "vaccines for protection against possible biological attack." I suppose one can't develop vaccines without knowing what he is developing them against, which means that one has to do some research on the offensive weapon, too.

Mr. BROOMFIELD. Yes.

Mr. BUNN. Technically, is that accurate?

Dr. BENNETT. Yes.

VERIFICATION IN BRITISH PLAN

Mr. ZABLOCKI. If the gentleman will yield; Mr. Bunn, you have mentioned the British proposal to ban the stockpiling and production of biological weapons. What is your view on the verification procedures specified for such a ban?

Mr. BUNN. For the British procedure?

On the British plan, the verification procedures aren't very good, Mr. Chairman. There is a so-called complaints procedure provided for. Article III says that any party to the convention who believes that biological methods of warfare have been used against it may lodge a complaint with the Secretary General of the United Nations, submitting all evidence at its disposal in support of the complaint, and request that the complaint be investigated and that a report on the result of the investigation be submitted to the Security Council.

Then there is a paragraph that says:

Any party to the Convention which believes that another party has acted in breach of its undertakings under Articles I and II—

And that would have to do with production rather than use of biological weapons—

but which is not entitled to lodge a complaint under Paragraph I of this article, may lodge a complaint with the Security Council, submitting all evidence at its disposal, and request that the complaint be investigated.

There is thus a distinction made with respect to verification in those two paragraphs. When there is a complaint of use in violation of the protocol, the investigation is carried out by the Secretary General, and the British say that it is not to be subject to a veto in the Security Council.

When the complaint is that there has been production in violation of the protocol, production of biological agents, the complaint is to be submitted to the Security Council, and it is subject to a veto in the Security Council.

The British don't make any particular claims that this is a foolproof verification system. By no means. They do recognize that there are very great difficulties.

They do say that there would be some deterrent, particularly as to a use, a violation which amounted to a use of the biological agent in war. Usually, one would assume that that use would probably be made in someone else's territory, not the party against whom you are complaining, and therefore, the chances of being able to find it out are probably pretty good.

I think a use in war would be known, generally speaking. It would be pretty hard, probably, to use them in war to any great, any large degree without its being known.

On the other hand, on the question of production, a small amount of production, that might be very hard, and the technical part of it, Dr. Bennett can tell you much better than I.

I don't think that the verification system is what you would call adequate in the British plan. On the other hand, there is some deterrent in it. I think more important are the points that Dr. Bennett made, that if biological agents aren't useful to us anyway, if from a military point of view and from other points of view we don't really want biological agents, then it doesn't matter, and if we are not going

to retaliate with them against an enemy who uses them on us, then it doesn't matter if we don't know for sure whether other countries have them.

EFFECT OF DEFOLIANT ON UNBORN CHILDREN

Mr. BROOMFIELD. Dr. Bennett, on Tuesday, we had a Member testify, and he claimed that a defoliant which the U.S. forces are currently using in Vietnam may be causing malformation of unborn children.

In your work at the United Nations in the study group there, did anything come out on that?

Dr. BENNETT. That question was not raised at that time, because the information on which that statement was based was not available at that time.

That particular statement is based on a study which was done under contract to the National Cancer Institute by Bionetics,[1] and they did demonstrate that this material in rather large doses consistently produced malformations in newborn mice. As a result of that, a memorandum has been issued which not only calls for further investigations but which supposedly will limit the use of these materials in Vietnam to nonpopulated areas, which is largely the kind of area they are used in now.

But I think that that is simply part of a much larger problem that we have to face up to in this country about the effects of many, many chemicals that are used in the environment whether it be that they may be carcinogenic—that is, they may cause cancer—or whether they may have genetic effects.

PROBLEM OF TEAR GAS RESERVATION

Mr. BROOMFIELD. The other question that concerns me is this: you mentioned that if this proposal could be broken down, in other words, the C from the B, that it might be a good thing, but I believe it could be misread, if we have had a reservation in there on tear gas and herbicides.

Dr. BENNETT. Mr. Broomfield, I don't know the answers to these political questions. There is no one I know of, with the possible exception of Mr. Bunn, who would like more than I to see our Senate ratify the Geneva Protocol.

I am in favor of ratification, but the reservations that I expressed are about whether indeed it will be ratified promptly.

I would like to point out that this is unlike a number of things that may go to the Congress, where there may be long delay, or it may be modified without harm; but this is the second time around, and it has a significance, it seems to me, for our world stance. I feel that the best thing that could happen if it were submitted would be for it to be passed immediately, without argument.

And I simply tried to point out the reservations that I could see that should influence the decision to resubmit it, or recommendation to resubmit it.

I also said that I don't know the way out of the dilemma, but I tried to pose these problems that I see, because I truly feel that if it

[1] An analysis of the report may be found on p. 375 in the appendix.

went to the Senate again, and were shelved, as happened previously, or if it should be turned down, that this would be an absolute disaster for us in international circles. I would say it would be better not to try to get it ratified than to try to get it ratified and have it turned down.

Mr. BROOMFIELD. Yes.

Dr. BENNETT. I am in favor of ratification. I would just like to be sure it would be ratified with resubmitting.

Mr. BROOMFIELD. Of course, I am in complete agreement with you on it.

POSITION OF EXECUTIVE BRANCH IMPORTANT

Mr. ZABLOCKI. Will the gentleman yield?

I would pose the question to Mr. Bunn, because he had perhaps more experience in the political arena than Dr. Bennett. Does it not, in the final analysis, depend considerably on the enthusiasm of the executive branch as to how rapid or how expeditious any action is taken in either branch of the Congress?

Mr. BUNN. Yes, sir, it makes a big difference.

Mr. ZABLOCKI. The 1925 protocol would not have been shelved in the Senate—is my understanding correct of your eloquent review before the subcommittee—had the executive branch, back in 1925 to 1930, been more interested?

It would not have died, or certainly, there would have been action in the Senate, had the executive branch pushed the protocol more enthusiastically.

Mr. BUNN. Yes.

Mr. FULTON. Might I ask how many if's you put on that question before you make a presumption?

Mr. BUNN. Mr. Chairman, I think that I don't want to suggest that President Coolidge and Secretary of State Kellogg were uninterested in the protocol.

I think they were interested, but I don't think they foresaw.

Mr. ZABLOCKI. I think they were overconfident.

Mr. BUNN. That is right. They just didn't foresee the problems, and then when it hit them, it was too late.

Mr. ZABLOCKI. But in recent years, the executive branch can never be overconfident as to what the legislative branch will do.

Mr. BROOMFIELD. Mr. Chairman, you might as well say that it is pretty difficult, sometimes, dealing with the Senate. I think the President has been very vigorous in a number of areas.

In fact, right now, they have got a matter pending over there that he has worked awfully hard on.

Mr. ZABLOCKI. I make it very clear that I didn't intend to become political at all.

Mr. BROOMFIELD. Of course not.

UNILATERAL SENATE ACTION IMPOSSIBLE

Mr. FULTON. May I point out that in Truman's day, when the President made recommendations in several years, two-thirds of the recommendations were promptly turned down by the U.S. Congress after the Executive made them. So maybe the situation could be just the re-

verse; rather than helping, it might hurt to have an Executive recommendation.

Mr. Chairman, might I have a question, on resubmission?

There is a difference between the two bodies. The Senate is a continuing body. The House, however, is a new body in each Congress. Under the circumstances that the Senate is a continuing body, when the previous protocol resolution has simply been shelved, why talk about resubmission by the Executive?

Why doesn't the Senate just take the resolution out of committee, or off the shelf?

Mr. BUNN. It is not on the Senate shelf any more, Mr. Fulton.

Mr. FULTON. What happened to it?

Mr. BUNN. What happened was that it did sit on the Senate shelf for some years, until Senator Vandenberg became chairman of the Senate Foreign Relations Committee. There were a number of other old treaties there which the Senate had not acted on for one reason or another, and he wanted to sort of wipe the slate clean. He asked how to do that, and he was told by the executive branch that they would ask for the treaties back, and that is what happened.

They all went back to the White House, where, as far as I know, that is where they reside.

Mr. FULTON. So that it would take a resubmission, then, in order to get the resolution for the Geneva Protocol back for the Senate to consider the resolution at this time.

Mr. BUNN. Yes, sir.

Mr. FULTON. Thank you for your courtesy, and informative answers.

Mr. ZABLOCKI. The gentleman from Pennsylvania.

RESERVATIONS DEPRECIATE EFFECT OF TREATY

Mr. FULTON. Can I have a further question?

The question is, "How much in the way of reservations can there be in such a protocol, which has been pretty unanimously approved around the world by various countries, including North Vietnam, without first depreciating the effect of the Senate action and ratification, and second, moving into the area of where ratification under the circumstances would have a small or tremendously adverse effect?"

What is that point of judgment where that kind of action on ratification would have just the opposite result?

Mr. BUNN. Well, I think that if we did ratify with a formal reservation on tear gas and herbicides, it might have an adverse effect.

I think when people use the word "reservation," though, they sometimes use it quite loosely. There are other things that one can do, and to make one's position clear. If we submitted the protocol to the Senate, without any reservation, any formal reservation on herbicides and tear gases, but made clear during the course of the legislative history what our position was, then other countries would be forewarned.

This kind of an interpretation would not be circulated to them formally by the depositary government—France—as a formal reservation would be.

And when a formal reservation is circulated, the countries to which it is circulated are much more likely to feel that they have to take a position on it.

And if they disagree, as most countries do, with our position on tear gases and herbicides, then they might feel they would have to reject the reservation.

On the other hand, if we feel that we have to hold open this option, and we then say in the legislative history, before the Foreign Relations Committee and in the Senate, that this is our position, our position would not have the same reaction, I don't think.

The reaction would probably not be as adverse as if we made a formal reservation. I think it is also true that this would in a sense leave open the possibility for a later time—a later time in this administration, or in another administration—to say: "Well, the war is over. We no longer feel that we have to use tear gases and herbicides, and we will from this point onward interpret the protocol as prohibiting them."

That would still be a possibility. It is not a perfect solution, either, but it is a possible one.

Mr. FULTON. I refer you to an assumption that you gentlemen have made, that the Senate might ratify the B, the bacteriological, but leave out the C, the chemical policy or the Executive might submit the proposal in that divided fashion. However, wouldn't that mean that if the Executive submitted only one, it would be taken to mean that the Executive opposed any convention on the other point?

Mr. BUNN. I think what Dr. Bennett was suggesting when he said separating the C from the B was not that you would ratify half the protocol, but to leave the protocol as is for the time being, and support the British proposal, which only deals with biological and not with chemical.

Isn't that correct?

Dr. BENNETT. Yes, Mr. Fulton, I was not discussing the Geneva Protocol at that time. I was discussing really this British proposal, which would ban the existence of these weapons.

Mr. BUNN. So, under that system, you would then not resubmit the protocol, or if resubmitted just let it sit on the shelf, and then go to the British method. Is that what you mean?

Dr. BENNETT. No, I want to distinguish between a ban on the use of these weapons and a ban on the stockpiling or acquiring the weapons.

To ban the existence of weapons.

Mr. FULTON. We are talking procedure now. How would you implement that with procedures?

Dr. BENNETT. Well, the decision whether to resubmit the Geneva Protocol to the Senate is not one—I am glad to say—that I am called on to make.

My discussion went beyond the question that is contained specifically in this resolution that stimulated these discussions.

Mr. BROOMFIELD. Would you yield?

Mr. FULTON. I will be happy to.

PROTOCOL RATIFICATION AND VIETNAM

Mr. BROOMFIELD. Mr. Bunn, wouldn't you also agree that should the Senate move ahead on this fairly soon, that it might be a helpful weapon in our negotiations to bring about a just settlement in Vietnam?

It certainly wouldn't hurt.

Mr. BUNN. I think even more so that it might be helpful in terms of the domestic negotiations that are going on.

Mr. BROOMFIELD. Well, that is true, too.

Mr. BUNN. I think one should realize that there are risks of the kind that Dr. Bennett has raised, and that if one holds open the option to use tear gas and herbicides in Vietnam, then any advantage one might have hoped to have gotten internationally or domestically may be pretty well drained away.

On the other hand, if one closes the options, you may hear from the other side of the political spectrum.

Mr. FULTON. I don't accept your presumption that negotiations are going to lead to a peace——

Mr. BROOMFIELD. No; that is true, Jim. I thought in a long negotiation, it might be helpful in showing further good faith on the part of the United States to bring an end to this hostility.

Mr. FULTON. Well, I am questioning whether putting the proposal in that frame of reference, it makes the United States appear more in good faith.

Mr. BROOMFIELD. Well, some of us are pretty desperate to get it over, and anything we can do to help it along, I think, as the President says, we have got to sometimes take a few risks.

We don't always agree, either, as you can see.

Mr. ZABLOCKI. Mr. Fulton?

Mr. FULTON. I want to compliment both witnesses on their statements, because they do point directions which both this subcommittee as well as our Foreign Affairs Committee, and the House of Representatives as well as the Senate, should give very careful attention.

This discussion gives us an area of reference that has depth that I had not had before.

Thank you.

INTEREST IN SYNTHETIC BIOLOGICAL AGENTS

Mr. ZABLOCKI. I have but one further question of Dr. Bennett.

Recently in a House Appropriations Subcommittee hearing, Dr. D. M. MacArthur, Deputy Director of the Department of Defense Research and Engineering, expressed interest in a U.S. program leading to the production of a synthetic biological agent for which there would be no natural immunity.

Would you give the committee your views on such a program, its advisability and possible effects?

Dr. BENNETT. I would say that if we intend to continue a program that is aimed at the production of biological weapons, that the particular development referred to by Dr. MacArthur in that testimony, although I wouldn't agree with the way he described it, exactly, but after all, he is not a biologist, that I would say that if one continued to have a program where one was looking for more effective biological weapons, that that would certainly be one of the directions in which one should go. I tried in my testimony to indicate why I think that even the most effective biological weapon is not worth having, militarily.

EFFECTS OF CONGRESSIONAL RESTRICTIONS

Mr. ZABLOCKI. To end on a hopeful note, or on an optimistic note, I would like to ask both of you gentlemen your assessment of the inclusion in the recent military procurement authorization bill of certain restrictions in the area of CBW.

Would you share your opinion of these changes and their likely effects?

Mr. Bunn?

Mr. BUNN. I think they are very useful. I think that perhaps the most important one is the simple requirement of semiannual reports by the Department of Defense on research and development, testing, and procurement of lethal and nonlethal CB agents.

This will get the Congress informed, in this area, in a way that it hasn't been informed for a long time. I think in terms of civilian control and the appropriations process, that this is very important. I think that the scrutiny which has been given to our research and development in the nuclear area, through the things like the Joint Committee on Atomic Energy and Senator Jackson and Chet Holifield and others, has been very thorough. There has been nothing like it, nothing comparable, in the CBW field, and this may be the beginning of a very significant effort by Congress to find out what is going on and to exercise a little more control.

I think the other provisions are also quite useful.

Mr. ZABLOCKI. Would you agree, Dr. Bennett?

Dr. BENNETT. I think it is a very good beginning.

Mr. ZABLOCKI. Now, further, the very fact that over 25 percent of the Members of the House of Representatives have sponsored or cosponsored these resolutions calling for the ratification of the Geneva Protocol is a further indication of a promising trend, toward possible early consideration of a new CBW policy.

Would you agree?

Mr. BUNN. Yes, sir.

NO RATIFICATION VERSUS RATIFICATION WITH RESERVATION

Mr. ZABLOCKI. Now, finally, if we could have your assessment, to further amplify the question asked by the gentleman from Pennsylvania. If you gentlemen were faced with a choice of getting Senate ratification of the protocol, but only with a reservation on the use of tear gases, or no ratification, which would you choose or prefer?

Mr. BUNN. Well, if you changed one word to "interpretation" on tear gases and not "reservation," and if you are not using "reservation" in the formal sense that there is a written statement that would have to be circulated to every other government, I would say that I would take the half a loaf of the ratification and an interpretation on tear gases and herbicides of the kind I described, rather than nothing at all.

Mr. ZABLOCKI. Dr. Bennett?

Dr. BENNETT. Mr. Chairman, I don't know the answer to that question, because I don't know what the international effect would be of this half a loaf.

I would just suggest that there are many individuals who are in a better position than I to interpret what this reaction would be, favorable or unfavorable, internationally.

Mr. ZABLOCKI. Well, if we would, in an interpretation of some kind, say "mea culpa," or we have been guilty, or we are ready to come halfway, or we are willing to, and will certainly review and reassess our position in the future, I don't believe the international ramification would be harmful to our position.

It wouldn't cause any future problems in any of our peace or disarmament talks, such as peace talks in Paris or the SALT talks in Finland.

I would hope that we could at least have a half a loaf by ratifying the protocol. As you said it would be a beginning toward controlling CB weapons.

Now, in conclusion, let me, on behalf of the members of the subcommittee, express our deep appreciation for the time that you have spent with us today.

I am hopeful that at an early date you will be called to give testimony before the other body on the Geneva protocol, because you are so effective.

Thank you very much, gentlemen.

Mr. BUNN. Thank you, Mr. Chairman, it was, indeed, a pleasure.

Dr. BENNETT. Thank you, Mr. Chairman.

Mr. ZABLOCKI. The subcommittee stands adjourned until 10 a.m. on Tuesday, December 2, 1969, when we will resume hearings on the CBW resolutions and will hear from Dr. Joshua Lederberg, the Nobel Prize winning geneticist from Stanford University, and Mr. Han Swyter, formerly on the systems analysis staff of the Secretary of Defense.

(Whereupon, at 11:32 a.m., the subcommittee was recessed to reconvene on Tuesday, December 2, 1969, at 10 a.m.)

CHEMICAL-BIOLOGICAL WARFARE: U.S. POLICIES AND INTERNATIONAL EFFECTS

TUESDAY, DECEMBER 2, 1969

HOUSE OF REPRESENTATIVES,
COMMITTEE ON FOREIGN AFFAIRS,
SUBCOMMITTEE ON NATIONAL SECURITY POLICY
AND SCIENTIFIC DEVELOPMENTS,
Washington, D.C.

The subcommittee met, pursuant to recess, at 10:15 a.m., in room 2255, Rayburn House Office Building, the Hon. Clement J. Zablocki, chairman of the subcommittee, presiding.

Mr. ZABLOCKI. The subcommittee will please come to order.

Today the Subcommittee on National Security Policy and Scientific Developments continues its hearings on chemical and biological warfare, with particular emphasis on the ratification of the Geneva Protocol of 1925.

Since the subcommittee last met, there has, of course, been a major development. In a statement last Wednesday, President Nixon announced that he will resubmit the protocol to the Senate for ratification and that he has renounced the use of all methods of biological warfare for the United States and will dispose of existing stocks of biological weapons. Without objection, I will insert a copy of the President's statement in the record.

(The statement follows:)

STATEMENT OF PRESIDENT RICHARD M. NIXON, NOVEMBER 25, 1969

Soon after taking office I directed a comprehensive study of our chemical and biological defense policies and programs. There had been no such review in over 15 years. As a result, objectives and policies in this field were unclear and programs lacked definition and direction.

Under the auspices of the National Security Council, the Departments of State and Defense, the Arms Control and Disarmament Agency, the Office of Science and Technology, the intelligence community and other agencies worked closely together on this study for over six months.

These Government efforts were aided by contributions from the scientific community through the President's Scientific Advisory Committee.

This study has now been completed and its findings carefully considered by the National Security Council. I am now reporting the decisions taken on the basis of this review.

CHEMICAL WARFARE PROGRAM

As to our chemical warfare program, the United States:

Reaffirms its oft-repeated renunciation of the first use of lethal chemical weapons.

Extends this renunciation to the first use of incapacitating chemicals.

Consonant with these decisions, the Administration will submit to the Senate, for its advice and consent to ratification, the Geneva Protocol of 1925, which

prohibits the first use in war of "asphyxiating, poisonous or other gases and bacteriological methods of warfare."

The United States has long supported the principles and objectives of this protocol. We take this step toward formal ratification to reinforce our continuing advocacy of international constraints on the use of these weapons.

BIOLOGICAL RESEARCH PROGRAM

Biological weapons have massive, unpredictable and potentially uncontrollable consequences. They may produce global epidemics and impair the health of future generations. I have therefore decided that:

The U.S. shall renounce the use of lethal biological agents and weapons, and all other methods of biological warfare.

The U.S. will confine its biological research to defensive measures such as immunization and safety measures.

The D.O.D. has been asked to make recommendations as to the disposal of existing stocks of bacteriological weapons.

In the spirit of these decisions, the United States associates itself with the principles and objectives of the United Kingdom Draft Convention, which would ban the use of biological methods of warfare. We will seek, however, to clarify specific provisions of the draft to assure that necessary safeguards are included.

Neither our association with the convention nor the limiting of our program to research will leave us vulnerable to surprise by an enemy who does not observe these rational restraints.

Our intelligence community will continue to watch carefully the nature and extent of the biological programs of others.

These important decisions, which have been announced today, have been taken as an initiative toward peace. Mankind already carries in its own hands too many of the seeds of its own destruction. By the examples we set today, we hope to contribute to an atmosphere of peace and understanding between nations and among men.

Mr. ZABLOCKI. This action on the part of President Nixon deserves the highest commendation. It has the effect, however, of rendering moot the resolutions which the subcommittee has been considering.

Despite this, the subcommittee hearings will continue. Additional sessions are planned for this room at 10 a.m. on December 9, 10, and 11.

FUTURE OBJECTIVES OF HEARINGS

Our objectives will be several.

First, the subcommittee can help elaborate some of the factors which the Senate may find useful when making its decision on ratification of the Geneva Protocol.

Second, we can shed light on other issues which have been raised internationally on America's CBW policies, specifically, the use of tear gas and herbicides in Vietnam.

And lastly, we can look beyond the ratification of the protocol to new international agreements which may be required to control the spread and use of chemical and particularly biological weapons.

As a vehicle to bring some of those ideas to focus, I introduced a new resolution on CBW yesterday. I intend it to be a "lightning rod" during the coming hearings, designed to elicit illuminating comments from witnesses and from members of the subcommittee. Without objection, I would like to submit the resolution for the record at this point.

(The resolution follows:)

H. RES. 733

91ST CONGRESS
1ST SESSION

IN THE HOUSE OF REPRESENTATIVES

DECEMBER 1, 1969

Mr. ZABLOCKI submitted the following resolution; which was referred to the Committee on Foreign Affairs

RESOLUTION

Whereas the use of chemical and biological weapons in warfare has been a source of universal dread and abhorrence; and

Whereas the United States heretofore has failed to ratify the Geneva Protocol of 1925 banning the first use of chemical and bacteriological warfare; and

Whereas the United States has been criticized in numerous international meetings for its failure to ratify the Geneva Protocol of 1925; and

Whereas the President of the United States has announced the re-submission of the Geneva Protocol to the Senate and the unilateral renunciation of all methods of biological warfare: Now, therefore, be it

Resolved, That it is the sense of the House of Representatives that

(1) the President be commended for re-submitting the Geneva Protocol to the Senate and for his efforts to control chemical and biological weapons; and that

(2) the Senate is respectfully urged to ratify the Geneva Protocol as soon as possible and that ratification should be followed by a comprehensive review of United States policies in the fields of chemical and biological warfare; and be it further

Resolved, That the other nations of the world, following the example of the United States, act to ban the use, stockpiling or production of biological weapons, thereby achieving a meaningful step toward further arms control and disarmament leading to eventual world peace.

INTRODUCTION OF DR. LEDERBERG

Mr. ZABLOCKI. This morning we will hear from Dr. Joshua Lederberg, professor of genetics at the Stanford University School of Medicine, Palo Alto, Calif.

Dr. Lederberg received the 1958 Nobel Prize in physiology and medicine for his research into the genetics of bacteria. Much of his research, it should be pointed out, took place in my native State of Wisconsin, where Dr. Lederberg was a faculty member of the University of Wisconsin at Madison for 11 years, from 1947 to 1958.

The author of a nationally syndicated column on science and modern living, Dr. Lederberg has written and spoken frequently on issues of chemical and biological warfare.[1]

Our second witness today is Mr. Han Swyter, who served from 1966 to 1969 on the staff of the Assistant Secretary of Defense for Systems Analysis, where he was directly concerned with U.S. chemical and biological warfare policies and capabilities.

Mr. Swyter spoke on CBW at a recent meeting of the National Academy of Sciences in Hanover, N.H., and was a participant in a July symposium on the subject, sponsored by the American Academy of Arts and Sciences and the Salk Institute.

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[1] Columns by Dr. Lederberg relevant to chemical and biological warfare may be found on page 368 in the appendix.

Our third witness will be Dr. Arthur W. Galston, whose plane has been delayed. Dr. Galston is a professor of biology and forestry at Yale University and director of the Marsh Botanical Garden, New Haven, Conn.

A foremost investigator of the action of hormones and light on plants, he has made a careful study of environmental and other effects of the widespread use of defoliants in Vietnam.

Dr. Lederberg, Mr. Swyter, we are pleased to have you with us. Dr. Lederberg, if you will begin, please.

STATEMENT OF DR. JOSHUA LEDERBERG, PROFESSOR OF GENETICS, STANFORD UNIVERSITY

Mr. LEDERBERG. I am indeed very grateful for this opportunity to express my profound concern about the urgency of our need for an international system to restrain the development of biological warfare. For that reason, I am very gratified about the resolution that you have just introduced, the text of which is before me.

My only immediate comment is that I would advocate, on the third line from the bottom, where the resolution reads: "*Resolved*, that the other nations of the world, following the example of the United States, act to ban the use, stockpiling, or production of biological weapons * * *," I would add the word, "development," and that the text read, "to ban the development, use, stockpiling, or production of biological weapons," since research leading to the capability of biological warfare is in many respects as dangerous from the point of view of the considerations that I will elaborate, and will in fact help to encourage the possible use.

Mr. ZABLOCKI. A very good point, Dr. Lederberg. That is an oversight on my part.

Mr. LEDERBERG. I am grateful for this opportunity to express my profound concern about the continued involvement of this and other nations in the development of biological warfare.

This process puts the very future of human life on earth in serious peril.

It is all the more tragic because the great powers who should be hastening to institute international controls have very little to gain and much to lose in relation to the present balance of nuclear deterrence. Except for incidental contagion, chemical warfare presents many similar issues; but I cannot speak to them with the same immediacy of personal expert knowledge.

Our ratification of the Geneva Protocol would represent only the first small step toward the negotiation of international controls. However, so long as we have isolated ourselves as the only major power to refuse to enter into its commitment, this stands as an immediate distraction to further negotiation. It leaves on the record a very low and unconvincing reading, indeed, about our earnestness as a nation in seeking a world order for the management of this problem.

RESEARCH PRIDE "TURNED INTO ASHES" BY WAR USE

My own research career has centered on the genetics of bacteria. With Dr. E. L. Tatum, then at Yale, I had the thrill of discovering genetic recombination in bacteria. Later at the University of Wisconsin with my then graduate student Norton Zinder, like E. L. Tatum now a professor at Rockefeller University, I was again privileged to help unearth genetic transduction—the use of viruses to convey information from cell to cell. I have also studied bacterial mutation, for example to resistance against the action of antibiotic drugs, in work that complemented the pioneering studies of Drs. S. E. Luria and Max Delbrueck, named for the 1969 Nobel Prize in medicine.

Basic scientists who have worked in the genetics of bacteria and viruses believe that these discoveries have ever growing importance for the prevention and healing of serious human diseases. We live, in the present era, in an incompletely justified optimism about having "conquered infectious bacterial disease" as the fruit of the development of the antibiotics. However, viruses are in general still beyond the reach of antibiotic therapy. Even bacteria, believed to be under firm control with antibiotics, are continuing their own evolution and continue their assaults upon human health with renewed vigor. In the long run, only our continued vigilance over bacterial evolution can justify our hope of maintaining a decisive lead in this life and death race.

However, whatever pride I might wish to take in the eventual human benefits that may arise from my own research is turned into ashes by the application of this kind of scientific insight for the engineering of biological warfare agents. In this respect we are in somewhat the same position as the nuclear physicists who foresaw the development of atomic weapons.

There is, however, a crucial difference. Nuclear weaponry depends on the most advanced industrial technology. It has then been monopolized by the great powers long enough to sustain a de facto balance of deterrence and to build a security system based on nonproliferation. Nuclear power has thus, ironically, become a stabilizing factor tending to reinforce the status quo in parallel with established levels of economic and industrial development. Germ power will work just the other way.

The United Nations Study Report on chemical and biological weaponry has summarized some infectious agents that have served as points of departure for the development of biological weapons. Any knowledgeable virologist could suggest many more. I will not repeat these technical details, nor will I bludgeon you with the horrible diseases that some of these agents provoke. I will also leave to your own conscience the burden of moral judgments about using these kinds of weapons. Most Americans would be repelled by the thought, but perhaps no less by exposure to the human realities of any other form of warfare. Overriding such comparisons should be the grave moral issue in a policy that risks the lives of a world of innocent bystanders. Fortunately, these concerns actually converge with our self-interest in calling for a halt to BW before it becomes established in the arms traffic of the world.

MAIN FEARS ABOUT BW

My main fears about BW have to do with the side effects of its proliferation (1) as a technique of aggression by smaller nations and insurgent groups and (2) by the inadvertent spread of disease.

If the great powers could actually protect the secrecy of their BW work I would be much less alarmed. The chance of BW ever being used in a major strategic attack is essentially negligible in the face of the nuclear deterrent. The suggestion that we need BW or CW weapons for specific retaliatory purposes in order to deter their use aims at a ridiculous kind of precision. Will our deterrent missiles have to follow the same trajectories as those that might potentially attack us? Will they have to be launched at the same time of day? Will they have to have the same mix of explosive energy and radioactive fallout? If we are attacked with anthrax strain B27 must we reply with anthrax B27?

On the other hand, if I were a Machiavellian adviser to a would-be Hitler I might indeed advocate a considerable investment in biological weaponry as a desperate approach to the cheap acquisition of great power even if at a very great risk. And, of course, the first thing I would do would be to plant my intelligence agents in the existing BW establishments of the high budget powers in order to get the necessary scientific information at the lowest possible cost.

TIGHT SECURITY CANNOT LAST

However, if I were patient I would not bother to do even that. No security system, no counterintelligence system in the world expects more than a delay of 5 to 10 years in the leakage of vital information. We do not have, and I presume do not contemplate, a security reservation like wartime Los Alamos for the containment of BW research. If a high-level activity is to be maintained there will be frequent turnover of personnel. It is unreasonable to expect a tighter security barrier here than has prevailed in any other area, given the problems of reconciling security with a free society. Besides these channels for diffusion of information, there are also bound to be *Pueblo*-like incidents, and finally calculated leaks in the budget competition of the services. The American people might be the last to know. But we can hardly rely on more than a 10-year delay between many important discoveries in BW research laboratories and their availability to hostile and irresponsible forces outside.

As a matter of prudent self-protection, BW research laboratories in the United States and the United Kingdom have pioneered in the technology of containing dangerous microbes. I have great respect for the technical capabilities of the senior civilian management of these laboratories. They should be credited with the utmost diligence in protecting both their personnel and the surrounding community. They have also published a great deal of their work in the engineering of such protective facilities and this experience is unquestionably of great value in public health work. For example, the British laboratories, at Porton, were acclaimed for the safe handling of the very dangerous Marburg virus upon its first outbreak in Europe 2 years ago.

In spite of these precautions, disease organisms have nevertheless escaped from time to time and inevitably will do so in the future. Such escapes already constitute a breach of security. They also compromise public health, which is further complicated by keeping civilian physicians in ignorance of potential agents that might fulminate into large-scale epidemics. The intentional development of virulent strains resistant to conventional antibiotics obviously worsens the problem. We simply have no way of assuring ourselves that a BW development activity will not eventually seed a catastrophic worldwide epidemic that ignores national boundaries.

DEVELOPMENT IN MOLECULAR GENETICS

On the immediate horizon are modern developments in molecular genetics. These undoubtedly point to the development of agents against which no reasonable defense can be mounted. Because of the uncertain danger of retroaction, such agents are hardly likely to be used in consequence of any rational military decision, but would obviously play into the hands of aggressive insurgence and blackmail.

Finally, even the publication, albeit as a positive contribution to humanity, of the technology of safe containment insidiously helps solve a promblem that might have hindered a potential insurgent from dabbling in BW.

The problem of containing infectious agents being manufactured and stockpiled in large quantities, or tested in the open air, is a much more difficult technological challenge; and it is encumbered with even more official secrecy than the laboratory work. We have little better information than the Skull Valley incident to help judge the competence with which such matters are handled. The main effect of security has not been to deny information to an enemy but to protect an establishment from both destructive and constructive criticism at home. In this case, more open constructive criticism would be cruial for assurance that procedures for containing microbes are well conceived and correctly implemented.

BW agents for use against man can be expected to be far more capricious than any other form of weapon. For any strategic purpose they are essentially untestable since large populations would have to be held to an uncertain risk. With nuclear weapons we can at least be confident of the laws of scaling. The destruction of targets can be calculated from simple physical measures like the energy released. Nothing comparable to this can possibly apply to BW agents. For this reason again the United States and other nuclear powers have absolutely nothing to lose in disavowing their use in war. Our continued participation in BW development is akin to our arranging to make hydrogen bombs available at the supermarket.

EXPAND PUBLIC HEALTH PROGRAMS

Microbiological research must be expanded in programs of public health research for defense against our natural enemies. In fact, the public health bureaucracy has refused to give prudent thought to the recurrence of major pandemics of human disease, be they of spontaneous or human-intelligent origin. Perhaps this is simply a consequence

of their sense of futility about mobilizing the necessary measures of global health needed to protect the species. If we add to already urgent concerns the spread of dangerous diseases from large foci of infection established by BW attack, the prospects become even gloomier.

Our self-interest both as Americans and human beings urgently calls for the institution of improved measures of world public health and of international controls on the development and use of BW agents. Research related to BW perhaps should continue; but it is of the first importance that this be fear reducing rather than fear generating, for the latter can only lead to mutual escalation of antihuman developments.

It is difficult at this stage to detail the texture of new agreements subsequent to our ratifications of the Geneva Protocol. We cannot suddenly impose unilateral decisions on the international community; but no other issue can evoke such a unanimity of world opinion. New agreements probably should include (1) public legal commitments against secret BW research; (2) the establishment of central, international, laboratories to monitor the occurrence of threatening organisms and to help develop generally available means of protection against them; (3) a legal system to protect the freedom of information and communication of data on disease organisms to such central authorities an approach to self-inspection as part of the system of world security in an area where we can afford to test and develop it; (4) a general acceleration of research and health services to minimize the incidence of infectious disease, particularly in underdeveloped countries. No situation could be better designed for the evolution of serious new viruses than the existence of crowded, underfed human populations in which foci could spread with a minimum of medical control; (5) treaty commitments on BW development analogous to the nuclear nonprolifieration treaty; (6) preagreed sanctions by the civilized world against the release or development of BW agents, clearly invoking international law against such "offenses against mankind" as akin to war crimes.

HISTORICAL PRECEDENT FOR BW

Some of the expectations that I have outlined are speculations which I fervently hope will be proven false. Unfortunately, they already have a proven historical precedent. As many of you may already know, the Black Death—the epidemic of the bubonic plague in Europe between 1346 and 1350—was the immediate consequence of a primitive form of bacteriological warfare. Genoese colonists in the Crimea brought the plague back to Italy with them when they retreated from the fortress of Fyodosia after having been assaulted with the corpses from the attacking Tartar hordes who had been infested with the disease. This epidemic subsided only after killing approximately one-third of the population in Europe, as well, presumably as an equal toll in Asia and India. Unless we learn to apply our common energies against the common enemies of all mankind, we are foolish and arrogant to doubt that history will record "Black Death II," and more.

This testimony was prepared just prior to President Nixon's heartening announcement of new U.S. initiatives toward the regulation of BW. I am confident that the Senate will now promptly ratify the Geneva Protocol as a basis for the further measures needed to assure man's life and health on this planet.

(Biographic information on Dr. Lederberg follows:)

Joshua Lederberg, professor of genetics at the Stanford University School of Medicine, Palo Alto, California, received the 1958 Nobel Prize in physiology and medicine for his research into the genetics of bacteria. Dr. Lederberg obtained his Ph. D. in microbiology from Yale University in 1947 and was on the faculty of the University of Wisconsin, Madison, from 1947 until 1958 when he went to Stanford. The author of a nationally syndicated column on sicence and modern life, Dr. Lederberg has written and spoken frequently on issues of chemical and biological warfare.

Mr. ZABLOCKI. Thank you, Dr. Lederberg.

We will now hear Mr. Swyter, and then propound questions to both of you gentlemen.

Mr. Swyter.

STATEMENT OF HAN SWYTER, FORMER MEMBER OF THE STAFF OF THE SECRETARY OF DEFENSE

Mr. SWYTER. Mr. Zablocki, I am privileged to appear here this morning. I hope that what I have to say will be helpful.

Several weeks ago, I prepared a statement for presentation this morning. You have that statement before you. While the analytical concepts are still pertinent, the President's announcement last week has caused me to change the focus of my remarks.

Last week, President Nixon announced his policy on chemical and biological warfare. He abandoned all preparations for offensive biological warfare, committed us not to be the first to use chemical weapons, and submitted the 1925 Geneva Protocol to the Senate for ratification.

I support these actions. I am encouraged by the President's decisive policy. Nonetheless, we have the opportunity to do more.

The issue of tear gas and defoliants, and specifically how they relate to Vietnam and the Geneva Protocol, has become a critical matter.

In the eyes of most knowledgeable men, our use of these weapons constitutes chemical warfare. Ratifying the protocol would be a major step toward strengthening the barriers to chemical and biological warfare.

It appears inconsistent, however, to ratify the protocol and continue the use of these chemicals. On the other hand, stopping our employment of tear gas and defoliants, if improperly handled, could elicit both resistance and resentment from the military establishment. We are faced with a dilemma.

Rather than present my prepared statement verbally, I will leave it for you to read. Instead, I will stress the smaller, but now more relevant, issue of tear gas and defoliants and how they affect the protocol, and proliferation of chemical and biological weapons.

My prepared statement focused on the reasons why the United States might want to have or not have several different kinds of chemical and biological capabilities. A framework exists for examining that problem. The analytical framework is explained in my prepared address.

The framework has two elements: First, we must recognize our objectives—these are mainly nonproliferation and deterence; second, we must distinguish among five kinds of chemical and biological capabilities.

Four of these five are antipersonnel. They are lethal chemicals, lethal biologicals, incapacitating chemicals, and incapacitating biologicals. The fifth kind of capability is antiplant weapons. Of these, defoliants are the best known.

Breaking the problem into these five parts leads to a more reasoned conclusion about having or not having each of these capabilities.

I conclude in my prepared statement that the United States needs no biological capability of any kind, that we do not need incapacitating chemicals, and that we do have a marginal need for lethal chemicals. Our need for lethal chemicals stems entirely from their possible value in deterring the Soviets in Europe from initiating chemical warfare.

In coming to these conclusions, I have been heavily influenced by our nonproliferation objective. In light of the President's actions, proliferation has become a important issue. I want to dwell on that this morning.

Mr. ZABLOCKI. Mr. Swyter, without objection, your entire prepared statement will be made a part of the record at the end of your verbal testimony.

Mr. SWYTER. Thank you.

PROLIFERATION

Nuclear nonproliferation is one of our foreign policy objectives. Denying chemical and biological capabilities to other nations ought to be one, also. My reasons become clear in a moment.

The Geneva Protocol is a major step in the direction of nonproliferation. It has provided the norm for international law and practice for 45 years. Tear gas and defoliants, as we are using them in Vietnam, tend to weaken the protocol. Our use enlarges a loophole. It tends to allow one kind of chemical and not another. Distinguishing among chemicals is not practical, no matter how good the intention. Thomas Schelling, the nuclear strategist, stated it well. "Gas is gas," he said. The best distinction is not to use any kind. In the case of nuclear warfare, we employ the "nuclear firebreak" concept. The firebreak concept is equally relevant to chemicals and biologicals.

Specifically, excluding tear gas and defoliants from the protocol, as the President implied he might wish to, would draw more attention to them and perhaps legalize their use, thus condoning a form of chemical warfare. When one form is permitted, the distinction between that and other forms becomes vague, particularly under the pressures of war. When any form of chemical warfare is permitted, nations will begin to reexamine their own stockpiling policies. That is the first step towards proliferation.

Incidentally, use of chemicals in World War I began in a similar fashion. The French first used chemicals, in that case tear gas, which was alleged to be permissible because it was used domestically by the same police who brought it to the front with them.

The Germans first used phosgene, not because it was particularly lethal, which it was not, but because it could be disseminated from cylinders. The rules of war at the time prohibited gas projectiles. The rules did not specifically name cylinders.

The Geneva Protocol addresses using, not having, chemical and biological capabilities. The protocol does not address research and devel-

opment, production, or stockpiling. Nor does it prohibit the use of chemical or biological weapons. The protocol merely prohibits first use. A nation which abides by the protocol merely agrees not to be the first to use chemical or biological weapons.

WHY RATIFY THE PROTOCOL?

An obvious question is: Why ratify the protocol? Very simply our ratifying the protocol would give it increased attention and effectiveness as a barrier to chemical and biological warfare.

The concept of barriers is important. The barriers which exist today to chemical and biological warfare are political and psychological ones. Conventions, the rules of war, and historical precedent all have played important roles in keeping mankind from using chemical and biological weapons. These weapons are popularly viewed as repugnant instruments of war. Political leaders seem to believe using such weapons is wrong. Scientists everywhere seem strongly to dislike working on chemical and biological weapons. Curiously, this morality is very much less pronounced in the case of nuclear weapons. Military leaders see no major advantage in them.

This general opposition to chemical and biological weapons, especially by foreign governments, is not wholly warranted by the facts. My prepared statement sets out the reasons why the United States does not need chemical and biological capabilities. This logic does not necessarily apply to other nations. Chemical weapons are much more effective against unprotected troops, per dollar of cost, than conventional weapons. Biological weapons could, like nuclear weapons, be used for mass destruction. Secretary General Thant has called biological weapons the poor man's atomic bomb. A crude biological capability could cost much less than a nuclear one. Economics alone is reason enough for small, poor nations to take note.

Proliferation, consequently, is a serious hazard. It is a hazard because the economics of chemical and biological warfare appear potentially attractive to small, poor nations. Proliferation could affect the world's balance of power. It would increase the possibility of strategic war in which tens of millions of Americans could die. Strengthening and raising the barriers to proliferation of capabilities as well as to use would benefit us all.

Nations generally have little chemical or biological capability today in spite of economics. The rules of warfare prohibit the first use of chemical and biological weapons. As I said earlier, chemical and biological weapons are popularly regarded as horror weapons. Political leaders believe using them is wrong. Scientists resist working on their development. Military leaders see no major advantage in them. A mystique seems to have developed around this mode of warfare which, rationally or not, has caused nations not to build capabilities actively. The world has erected political and phychological barriers to chemical and biological warfare.

All nations have benefited by not spending resources on CB capability. The United States and the Soviet Union have benefited in particular from the lack of interest by other nations in chemical and biological weapons. The economics of conventional and of nuclear war

favors rich countries. We do not have that advantage as much with chemicals and particularly not with biologicals.

In conventional war, quantity alone counts heavily. The ratio of opposing manpower and firepower in conventional war in general and over the long run is a major indicator of the outcome, particularly where the major power's objectives are not limited.

BW REDUCES ADVANTAGE OF RICH NATIONS

Large, rich nations can afford more military force than small ones. Hence, the Soviets and we have an advantage over small countries in conventional war. The economics of chemical weapons significantly reduces this advantage. Moreover, we have become dependent on complex machines and an extensive logistics system, to wage war. In a chemical war in protective suits, our forces would be relatively more handicapped than a much less sophisticated force. In the war in Vietnam today, for example, the North Vietnamese occasionally fire a rocket into a city to harass. Think of the harassment a lethal chemical shell could cause.

A very large and effective strategic biological capability is probably not economically feasible for most countries. The necessary delivery systems and field tests are too expensive. However, a simple capability, enough to cover small neighboring countries, or several metropolitan areas in the Soviet Union or the United States, is within easy reach of most countries. Enough agent can be grown in a public health laboratory. Covert delivery is feasible in the ordinary course of commerce. With such a capability, a small country can wield power out of all proportion to its size, simply by the threat of small-scale biological attack.

The barriers to biological warfare are high today, relatively higher than to nuclear war. We think of biologicals as repulsive, politically unacceptable, and an illegal mode of warfare. Biological weapons have never been used. These precedents, conventions, and beliefs act as a restraining influence on political leaders considering use of biological weapons. The barriers to biological war could be broken down more easily than the barriers to nuclear war.

A crude biological capability is economically available to very many nations. A modest capability can be hidden from international inspection much more easily than a nuclear one. Hence, condemnation for having a capability can be avoided by small nations.

The barriers to biological warfare are closely intertwined with the barriers to chemical warfare. As we weaken the barriers to chemical warfare, we lower the barriers to biological warfare. The protocol is the legal basis for nations not using chemicals and biologicals. Our use of CS and defoliants in Vietnam is a deviation from historical practice. It could have serious consequences.

The proliferation of chemical and biological capability would tend to change the world's balance of power, reducing ours. We would lose some of the relative advantage of nuclear and conventional capability which wealth gives us and gives the Soviets. Consequently, we have strong incentive to discourage other nations from acquiring chemical and biological capability. Fortunately, many barriers already exist to them. Foremost among the barriers is convention.

The Geneva Protocol has contributed very substantially to these barriers. Actions to raise and strengthen the barriers will be steps in the right direction. Ratifying the protocol would be such a step.

REQUIREMENTS FOR CB CAPABILITIES

Let me turn to the issue addressed in my prepared statement. My prepared statement focuses on the reasons why the United States might want to have, or not have, several kinds of chemical and biological capabilities.

Today, I will limit my remarks to just two of those kinds; namely, incapacitating chemicals and defoliants. Tear gas, or CS, as the modern version is called, is the best known incapacitating chemical. More effective agents would increase the degree and duration of incapacitation.

I recognize that the President has attempted to separate CS and other so-called riot-control agents from other incapacitating chemicals. This is merely semantics. A rose by any other name is still a rose. CS is intended to incapacitate. It does. It is an unforgettable experience. That it has been used on our own population does not change its basic impact in combat.

Incapacitating chemicals are tactical weapons which make a person unable to function effectively. Almost all victims recover completely with no aftereffects. Defense against incapacitants is a gas mask. Incapacitating chemicals would theoretically make combat more humane, since few fatalities would occur. Humanitarian motives are not their main attraction.

Incapacitating chemicals enable us to attack unprotected enemy troops mingled with civilians. The "intermingled situation" is their main attraction. The alternative to using incapacitating chemicals is to kill civilians or not to attack the enemy. No other weapon gives us this option.

Situations in which the option is useful occur infrequently, because most enemy troops would be protected. Incapacitating chemicals would be effective only against unsophisticated troops, and only then if they did not expect to be attacked frequently.

Enemy forces, even insurgents, who considered incapacitating chemicals to be a serious threat, would protect themselves. This is true of CS. It is true of North Vietnamese troops.

"INTERMINGLED SITUATION" RATIONALE

Note that the "intermingled situation" rationale contemplates first use by us of these chemical weapons. We would derive the main benefit from incapacitating chemicals only by using them. Using them, of course, would violate international law. Also, their widespread use would almost certainly cause other countries to prepare a defense, thereby reducing the value of the weapons. To retain their effectiveness, we would be able to use the weapons only sparingly.

To summarize, the potential benefit from incapacitating chemicals is to attack unprotected enemy troops mingled with civilians. Such situations occur very infrequently. An incidental benefit is to spare civilians.

The real potential cost is not money but proliferation of chemical and even biological weapons. Recall that nonproliferation is one of our objectives.

The most persuasive cases for possibly wanting to use chemical incapacitants involve humanitarian motives toward small numbers of civilians. Each such infrequent situation typically involves the lives of tens or hundreds of civilians. In past wars, we have often killed them and proceeded with the war. The importance of discouraging proliferation very strongly suggests that an incapacitating chemical capability is not worth the cost in terms of not achieving our main objective; that is, nonproliferation.

There is another situation for evaluating the need for incapacitating capability. That is the most common one in Vietnam, where we are using 6 million pounds of CS this year. We are using CS against enemy troops to drive them into the open so that conventional artillery and bombs can kill them. These are not intermingled situations. CS is used in the hope that it will improve the effectiveness of our conventional weapons. In effect, we are using CS to kill enemy troops.

REDUCTION OF CASUALTIES RATIONALE

Another argument is also made in favor of CS. Increased effectiveness, the argument says, reduces our own troop casualties. Whether CS really makes our artillery and bombs more effective is an unanswered question. We need effectiveness analysis. I seriously question, however, whether a major increase in effectiveness occurs.

The major problem is target acquisition. Once our artillery has a good target, and uses modern fragmentation weapons, I doubt that the kill ratio improves substantially.

Moreover, we need to question whether the tactical missions are necessary in the first place. For example, we could choose to forgo attacking Hamburger Hill, rather than engage in chemical warfare. Not engaging the enemy would reduce casualties even more.

Even if CS does help kill more enemy soldiers, effectiveness is not the real issue. If effectiveness were the objective, lethal chemicals would be even more so. No one is seriously suggesting we use lethal chemicals. We would not use lethal chemicals because doing so would break down the barriers to chemical and biological warfare. If that is true, use of CS and defoliants also breaks down the barriers. While the breaking down is a matter of degree, they are coming down, nonetheless, as we use CS and defoliants in Vietnam.

I concluded in my prepared statement that the United States does not need incapacitating chemicals. The President came to the same conclusion. However, he seems to have excluded CS from his conclusion.

THE PROBLEM OF DEFOLIANTS

Let me turn to defoliants. Defoliants cause leaves to fall. While in many cases the leaves grow back, in some the plant dies. Defoliation over wide areas has extensive impact on ecology. Some evidence exists that the chemicals being employed cause malformation of children.

From a military viewpoint, removing leaves could have two benefits. First, foliage which provides possible cover to enemy troops could be removed from along roads and perimeters of outposts. In addition, since foliage provides cover in staging areas, removing it there also would be desirable. Commanders, naturally enough, see benefits in defoliating along post perimeters, along roads, and the countryside generally. If we look just at the benefits, we find reason to defoliate everything. The dollar cost to do that, incidentally, is relatively small.

The real costs are more subtle. They are political, not monetary. For these costs, we need to look at each type of use, that is, perimeters, roads, and countryside. We need to look at the specific benefits and costs associated with each use.

If ecology is the only hazard, a case could probably be made for defoliating outpost perimeters, since relatively little acreage is involved. Of course, when the area to clear is small, bulldozers and flamethrowers are as effective as defoliants. For perimeters, we have an alternate weapon. We would not need defoliants.

Roadsides can be less easily cleared with alternate methods. Roads, however, are not only places for ambushes. In Vietnam, roadsides are where a major fraction of the crops are grown. The costs of defoliating roadsides immediately mount, since destroying crops has political implications in a country where the cooperation of the peasants is important. Destroying their crops, however incidental to defoliation, alienates peasants by denying them their food and possibly threatening their unborn children. When one extends this to defoliating the countryside, the costs rapidly mount, while the benefits do not. Since there are innumerable staging areas for the North Vietnamese, we do not severely restrict them by reducing the value of certain staging areas while leaving others untouched.

ALLEGED BENEFIT IN FOOD DENIAL

The second general benefit alleged for defoliants is to deny food to the enemy. That is sheer nonsense. Enemy troops need only a small fraction of the total food supply. Since the troops are armed, they will be fed first, and the peasants will do without, if necessary. That is an old principle of warfare.

To conclude my remarks about defoliants, I want to relate a story about how we buy defoliants. Our procurement, like our use of defoliants, began in a small way. The Air Force has been buying defoliants for years in small quantities, out of its petroleum products budget, along with jet fuel. Presumably, the defoliants are either a petroleum product or are procured from petroleum sources. The defoliants probably were used for weed control on airbases.

During the course of the Vietnam war, some enterprising officer undoubtedly hit upon the idea of using defoliants in operations for attacking foliage.

The first flight was undoubtedly with jerry-rigged equipment. Usage grew. In 1968, the Air Force threatened to take the entire domestic supply of defoliant, leaving nothing for genuine agricultural weed-control needs. To solve this, the Defense Department built an entirely new plant, just to provide the Air Force with its own supply. During all this time, amusingly enough, the Air Force insisted on procuring chemicals from its petroleum, not its ammunition, budget—because it always had. That is how chemical warfare begins.

The close relationship between defoliants, lethal antipersonnel chemicals, and biologicals is worth noting. From a commander's viewpoint, the operations are all similar. Spray tanks are fitted to airplanes, micrometeorology is taken into account in flight plans; the difference is only a matter of degree. When we permit chemical agents in one situation, we have made the barriers ambiguous.

This is how chemical warfare began in World War I. Tear gas and defoliants started innocently enough in Vietnam. They grew, in one little innocuous step after another. That is why clear barriers are important.

The benefits of defoliation have not been established. Intuitively, reduction of foliage must be beneficial. If we measured the benefits ojectively, however, I suspect that we would find little incremental effectiveness from widespread use. The bulk of the benefits probably accrue from very limited use. For limited objectives, we have alternate methods.

The costs in terms of ecology, alienation of the South Vietnamese, and breaking down the barriers to chemical warfare, do not decrease. On the contrary, political costs probably increase as use becomes widespread. On balance, I conclude that the costs far outweigh the marginal benefits. We do not need defoliating capability.

THE PROTOCOL

Let me turn to the protocol itself. The President will submit the Geneva Protocol to the Senate for ratification. Ratification will draw attention to the use of CS and defoliants in Vietnam. To make the gesture of ratification genuinely meaningful, we would be obliged to stop using CS and defoliants.

Excluding tear gas and defoliants from the protocol will weaken it. Weakening the barriers may cause other nations to reexamine their lack of capability. In the long run, it may make chemical and biological warfare more likely.

The President left the matter of tear gas and defoliants vague. Perhaps that was wise last week. However, we ought not to leave it ambiguous too long.

The President might have had several reasons for not including CS and defoliants in his policy statement last Tuesday. I will explore these in a moment.

The United States has several courses open to it in handling the matter of CS and defoliants, both its use in Vietnam and its inclusion in the protocol.

We can ask ourselves: Why did the President not prohibit the use of CS and defoliants, as he prohibited the use of all other chemicals?

I suspect he did not simply because we are already using the weapons. Prohibiting them could be interpreted as a reprimand for the mili-

tary, as a restriction by civilians of military operations. The situation could become emotionally charged and bitter. Allegations could be made, however erroneous, that CS and defoliants save American lives. You can understand how sensitive the President would be to that.

This line of reasoning suggests that we need a facesaving way out of the problem. Several ways are available.

Use of CS and defoliants can simply be reduced over several months, and then quietly discontinued. The President can then direct, without publicity, that subsequent use occur only with Presidential authority. That authority never has to be granted.

Another option is to arrange for the Secretary of Defense to find the weapons ineffective and eliminate them from the budget. The stockpile would become depleted and employment terminated. Employment in other situations need never be authorized.

SEVERAL OPTIONS RE PROTOCOL

With regard to the protocol, we have several options. Each will have different impacts on our objective, namely, nonproliferation. First, the Senate could vote against ratification. That would be deplorable. Second, the Senate could do what it did in 1925, defer. It could defer, ostensibly, pending the end of the Vietnam war. That action would lose to us an important opportunity for a major step away from proliferation of these weapons. Deferral could call into question the President's policy against biological weapons, against incapacitating chemical weapons, and against first use of lethal chemicals. Such action would signal not only a dilemma about saving face, it would indicate that powerful Americans believe chemical and biological weapons could have a useful role in warfare. Other nations would certainly have to reexamine their own policies.

Third, the Senate could explicitly include riot-control and antiplant agents. While I would be delighted, this course of action might be resisted unnecessarily.

Several in-between options are available. Among these is: no acknowledgment of the tear gas and defoliants issue. Unfortunately, most nations are keenly aware of the issue. Our motives would be suspect. Worse, as a result, all nations would not interpret the treaty uniformly. Ambiguities would weaken the protocol. The barriers to proliferation would not be as high and as strong as they might be. To illustrate, the United States itself created the ambiguity about tear gas in the 1930's. The Defense Department some years ago coined the phrase, "riot-control agents," to distinguish one kind of incapacitating chemical from another. Part of the reason was to help justify its use in combat. The self-created ambiguity about tear gas led us to use it. Had the matter been clearer, I doubt that Secretaries Rusk and McNamara would have authorized it, even for humanitarian purposes.

Perhaps another option would be to ratify the protocol, recognize the potential ambiguity of tear gas and defoliants, and innocently direct the administration to seek a uniform interpretation to be established by the majority of adhering nations. This option could form the basis for prohibiting the use of tear gas and defoliants in the future, without calling into question the judgment of our leaders in the past. We can claim to have acted in good faith.

SUMMARY

Proliferation of chemical and biological capabilities is a major hazard. The Geneva Protocol, symbolizing all our political and psychological barriers to these forms of warfare, is a major barrier to proliferation. Our ratifying the protocol would increase its effectiveness as a barrier.

The use of CS and defoliants in Vietnam constitutes chemical warfare, in spite of the euphemisms to the contrary. That use is breaking down the barriers to chemical and biological warfare.

That use could create more domestic and international embarrassment, as the Senate considers the protocol. Our use of CS and defoliants draws attention to our potential hypocrisy and to ambiguities in the protocol. Exceptions, violations, and ambiguities all weaken the protocol. To make our ratification genuinely meaningful, we ought to stop using the two chemicals. We ought to agree to a uniform interpretation.

Facesaving means are available to avoid embarrassing the military, and still stop the use of chemicals. These methods involve unobtrusively reducing, then terminating, and then not authorizing for new use, CS and defoliants.

Mr. Chairman, thank you for your attention.

(Mr. Swyter's prepared statement follows:)

Political Considerations and Analysis of Military Requirements for Chemical and Biological Weapons

(By Han Swyter)

Note: This statement was prepared prior to President Nixon's November 25 statement on chemical and biological warfare. Practical differences between the position taken here and the President's policy are mainly regarding CS and defoliants.

INTRODUCTION

Resolutions have been proposed in the House calling on the President to resubmit to the Senate the 1925 Geneva Protocol. Adherents to the Protocol agree not to initiate the use of chemical or biological weapons. The treaty does not address research and development, production, or stockpiling. Nor does it prohibit *use* of chemical or biological weapons. The treaty merely prohibits *first* use. A nation which abides by the treaty merely agrees that it will not be the first to use chemical or biological weapons.

In 1925 the United States Government instigated, wrote, signed and pressured other nations into ratifying the treaty. Nevertheless, the Senate never ratified it. The United States is today, along with Japan, the only major industrial nation which has not ratified the treaty. The Soviet Union and practically all nations in the Communist Bloc have. So has China. So have all members of NATO, except the United States.

Biological weapons have never been used in modern times. Chemicals were used in World War I, first by the French and then by both sides extensively. They have not been used again until recently, except in a few isolated instances. George Bunn, former General Counsel of the United States Arms Control and Disarmament Agency, has summarized this history and particularly, the diplomatic history of the Protocol in a recent Wisconsin Law Review article.[1]

Recent events have caused the Protocol to reappear in our thinking. Egypt did use lethal chemicals against civilians in Yemen. For several years the United States has been using forms of tear gas and defoliants in Vietnam. Although some scholars argue that our chemical activity in Vietnam is technically not a

[1] "Banning Poison Gas and Germ Warfare: Should the United States Agree?" *Wisconsin Law Review*. Volume 1969, Number 2. See p. 304 in the appendix.

violation of the Protocol, the preponderance of legal experts believe we are violating the Protocol, certainly its spirit. Most foreign governments oppose our employment of chemicals in Vietnam and agree that use of CS and defoliants there is prohibited by the Protocol.

Other events have also helped focus attention on the Protocol. Chemical accidents have occurred, particularly the death of 6400 sheep in Utah. The President has indicated the Executive Branch is evaluating all our CBW policies. The United Nations has taken CB matters under consideration. The British have proposed a ban on all biological weapons. And finally, the Soviets have proposed a chemical and biological disarmament treaty.

An obvious question is why ratify the Protocol? George Bunn has studied this question extensively. I will quote him. "The best reason for United States ratification is the increased attention and effectiveness it would give to the Protocol as a barrier to the first use of chemical and biological weapons."

The concept of barriers, particularly political and psychological ones, to chemical and biological warfare is important. Convention, the rules of warfare, and historical precedent all have played an important role in keeping mankind from using chemical and biological weapons. These weapons are popularly viewed with repulsion as truly horrible instruments of war. Political leaders seem to believe using such weapons is wrong. Scientists everywhere seem strongly to dislike working on these nasty weapons. Military leaders see no major advantage in them.

The Protocol has contributed to these barriers. Actions to raise and strengthen the barriers will be a step in the right direction. Ratifying the Protocol would be such a step.

My introduction thus far has assumed that the use of chemical or biological weapons by any country is inconsistent with our national interest. I want to make that underlying thought explicit.

In your own deliberations about the House resolution calling on the President to resubmit the Protocol, you may wish to consider related questions. In particular you may want an analysis of the question, what chemical and biological capability if any does the United States need? This is the question of "military requirements". It is that question—whether to *have* a capability—that I will address.

Incidentally, a broad range of pertinent questions has been covered by Professor Matthew Meselson in his testimony to the Senate Foreign Relations Committee last April.[2] His testimony was partly intended to educate the Senators about technical aspects of CBW. In my statement today I assume you are generally familiar with Professor Meselson's testimony.

II. ANALYSIS

My objective today is, first, to describe a framework for analyzing whether to have chemical and biological capabilities. Second, by using that framework, to identify the key issue about which each of you must make a value judgment. And third, to convey to you my own conclusions.

The framework has two elements. First, we must recognize our objectives. These are non-proliferation, deterrence and limiting damage. We all benefit when few or no nations have these weapons. Failing that, we can seek to deter nations from using the weapons. Failing that, we can reduce our losses by preparing a defense. The analysis mainly uses the non-proliferation and deterrence objectives.

The framework's second element is distinguishing among four kinds of chemical and biological capabilities, that is between chemical and biological and between lethal and incapacitating. The framework's underlying premise is examining the problem in parts. I will examine four kinds of chemical and biological capabilities.

There is a fifth kind of weapon, which I will not cover. Defoliants, a form of anti-plant weapon, are being used extensively in South Vietnam today, covering thousands or perhaps tens of thousands of square miles each year. The analytical framework would still apply.

Incidentally, I hope you will not find my bluntness too unpleasant. Chemical and biological war is a grisly business. I am going to approach it unemotionally,

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[2] "Chemical and Biological Warfare," Hearing before the Senate Committee on Foreign Relations, 91st Congress, 1st Session, April 30, 1969 (Government Printing Office).

much as economists analyze the need for mythical widgets, rather than Dr. Strangelove gleefully plotting the destruction of millions by plague or anthrax.

The first kind of capability I will analyze is lethal biologicals. This one lends itself to a general, simple, and logical analysis.

Lethal biologicals

Lethal biologicals are population-killing weapons. In situations in which our national objective would be to kill other countries' population, lethal biologicals could be used. Please note, killing populations ought not to be an American objective. However, even if we want to make that our objective—to kill populations—we can do that with our strategic nuclear weapons—our B-52's, Minuteman, and Polaris.

We keep the nuclear capability whether or not we have a lethal biological capability. A lethal biological capability would be in addition and not a substitute.

Threfore, I conclude that we do not need a lethal biological capability.

The three other kinds of weapons—lethal chemicals, incapacitating chemicals, and incapacitating biologicals—are not as simple. For the three remaining kinds of capability I will describe scenarios which maximize the benefits obtainable from these weapons, thus making them look as attractive as possible. Logically, if you are not persuaded by these "best cases," other scenarios will persuade you even less to *have* a capability.

Lethal chemicals

Nerve gas is a modern example of lethal chemicals. Mustard gas was used extensively in World War I but is now considered obsolete. Lethal chemicals are for use against land forces. Incidental to chemical warfare between armies, cities could be attacked. In densely populated Europe, for example, tens of millions of civilians could be killed in a chemical war between armies.

Chemical weapons are very effective against unprotected troops. They are much more cost effective than conventional fragmentation artillery and bombs. Stated another way, they possess more killing power per dollar of cost. Against protected troops—with gas masks and protective clothing—chemical weapons are much less dangerous.

Protecting troops with gas masks and clothing seriously degrades their ability to operate. An infantryman in a rubber suit, for example, will experience heat buildup and inability to see or move freely.

Neither effectiveness nor cost, however, is the main objective of having a lethal chemical capability. Once both sides are defended and using chemical weapons, neither side would have gained a major advantage. Both sides would have seriously complicated their operations since troops would have to wear protective clothing. Both sides would incur large costs to have the capability, hundreds of millions to billions of dollars for the U.S. Hence, against a chemical-capable opponent there is no incentive to use chemicals.

Our real objective for having a capability ought to be deterrence. Defensive capability alone—gas masks and protective clothing—is not enough. An enemy with offensive capability would need to be much less protected and would thereby increase its maneuverability and thus its fighting advantage.

Having an offensive capability in addition to gas masks and protective clothing would enable us to force enemy troops into the same protective posture they had forced us. In summary, the ability to respond with chemical weapons to a chemical attack on our forces takes away from an enemy the incentive to attack us with chemicals in the first place.

This argument says that we should have a lethal chemical capability if a potential enemy has one. If the Soviets have one, we should have one. This reasoning by symmetry has often been used by proponents of military capability, often incorrectly. In this case, to some degree, the argument has merit.

We should not have a lethal capability simply because the Soviets have one. If we have a capability at all, it should be to achieve one of our objectives. That objective, presumably, is both important—that is, we are willing to allocate resources away from other objectives toward this one—and presumably it is achievable in no better way. That objective, in the case of having lethal chemicals, might be to deter the Soviets in Europe from using their lethal chemicals.

The preceding generalizations will become more vivid as we look at a specific European scenario. The European scenario is the most persuasive one. If that does not persuade you, perhaps nothing will.

Take, for example, a war in Europe. The Soviets have a lethal chemical capability. They could use it in an invasion of Germany.

If our forces had no chemical defense, our troops would be killed. The Soviets would occupy Europe. If we had only defensive capability, the Soviets probably still would occupy Europe.

With an offensive capability in addition, we offset the advantages the Soviets might hope to gain, thereby taking away the Soviets' incentive to use lethal chemicals. Hence, having an offensive capability might help deter the use of chemicals.

The preceding rationale, based on a European scenario, is the most persuasive one I know of for having a lethal chemical capability. I conclude that the United States ought to have a lethal chemical capability to deter the Soviets in Europe from initiating chemical warfare. The capability should be designed to take away the incentive the Soviets would have to initiate chemical warfare if we had no chemical capability. Since neither side would have incentive to initiate chemical warfare, when both sides have a capability, I see great opportunity for bilateral disarmament. We should pursue these opportunities with the Soviets.

Incapacitating chemicals

The next group of weapons we will analyze is incapacitating chemical weapons. The value of human life enters into this analysis. Again, I will describe the most persuasive scenario I know of for this particular capability.

Tear gas, or CS as the modern version is called, is the best known example of an incapacitating chemical. More effective agents would increase the degree and duration of incapacitation.

Incapacitating chemicals are tactical weapons which make a person unable to function effectively. Almost all victims recover completely with no after-effects Defense against incapacitants is the same protection needed against comparable lethal chemicals. These weapons would theoretically make combat more humane since few fatalities would occur. This is not their main attraction.

Incapacitating chemicals enable us to attack unprotected enemy troops mingled with civilians. The alternative to using the incapacitating chemicals is to kill civilians or not to attack the enemy. No other weapon gives us this option.

Situations in which the option is useful occur infrequently because most enemy troops would be protected. Incapacitating chemicals would be effective only against unsophisticated troops, and only then if they did not expect to be attacked frequently.

Enemy forces, even insurgents, who considered incapacitating chemicals to be a serious threat would protect themselves.

Note that the "intermingled-situation" rationale contemplates first use by use of these chemical weapons. This is in contrast to lethal chemicals, in which case our use would be in response. Moreover, with lethal chemicals, we derive the main benefit, that is deterrence, from having the weapon. We would derive the main benefit from incapacitating chemicals only by using them. Using them, of course, would violate international law. Also, their widespread use would almost certainly cause other countries to prepare a defense, thereby reducing the value of the weapon. To retain their effectiveness, we would be able to use the weapons only sparingly.

The potential benefit from incapacitating chemicals is to attack an unprotected enemy mingled with civilians. Such situations occur very infrequently. An incidental benefit is to spare civilians.

The real potential cost is not money, but proliferation of chemical and even biological weapons. Recall that non-proliferation is one of our objectives. I will digress a few minutes and examine proliferation.

Proliferation is a serious hazard. It could affect the world's balance of power. It would increase the probability of strategic war in which tens of millions of American civilians could die. Strengthening and raising barriers to proliferation of capabilities as well as to use would benefit us all.

Nations generally have little chemical or biological capability today. The rules of war prohibit the first use of chemical or biological weapons. Our use of CS and defoliants in Vietnam is a deviation from historical practice. It could have serious consequences. As I said earlier, chemical and biological weapons are popularly viewed as truly horrible instruments of war. Political leaders seem to believe using such weapons is wrong. Scientists everywhere seem strongly to dislike working on these nasty weapons. Military leaders see no major advantage in them. A mystique seems to have developed around this mode of warfare which, rationally or not, has caused nations not to build capabilities actively. The world has erected political and psychological barriers to chemical and biological warfare.

All nations have benefited by not spending resources on chemical and biological capability. The U.S. and Soviet Union have benefited in particular from the lack of interest by other nations in chemical and biological weapons. The economics of conventional war and nuclear war favors rich countries. We do not have that advantage as much with chemicals and particularly biologicals.

A very large and effective strategic biological capability is probably not economically feasible for most countries. The necessary delivery systems and field tests are too expensive. However, a simple capability, enough to cover small neighboring countries or several metropolitan areas in the Soviet Union or the U.S., is within easy reach of most countries. Enough agent can be grown in a public health laboratory. Covert delivery is feasible in the ordinary course of commerce. With such a capability, a small country can wield power out of all proportion to its size simply by the threat of a small-scale biological attack.

In conventional war, in contrast, quantity alone counts heavily. The ratio of opposing manpower and firepower in conventional war in general and over the long run is a major indicator of the outcome, particularly where the major power's objectives are not limited. Large, rich nations can afford more military forces than small ones. Hence, the Soviets and we have an advantage over small countries in conventional war. The economics of chemical weapons significantly reduces this advantage. Moreover, we have become dependent on complex mechanical devices and a very extensive logistics system to wage war. In a chemical war in protective suits, our forces would be relatively more handicapped than a much less sophisticated force. In the war in Vietnam today, for example, the North Vietnamese occasionally fire a rocket into a city to harass. Think of the harassment a chemical shell could cause.

The proliferation of chemical and biological capability would tend to change the world's balance of power, reducing ours. We would lose some of the relative advantage of nuclear and conventional capability which wealth gives us and gives the Soviets. Consequently, we have a strong incentive to discourage other nations from acquiring, chemical and biological capability. Fortunately, many barriers already exist to them. Foremost, among the barriers is convention.

Now let me return to incapacitating chemicals.

These weapons would give us the capability to fight in certain very unusual intermingled situations. As we use the capability, however, we lower the barriers to chemical warfare. Since chemical warfare is linked to biological warfare by popular concept and by convention, we also lower the barriers to biological warfare. As these barriers are lowered and the political cost to other nations of of having CB capabilities and using them is decreased, more nations will acquire a CB capability. Such proliferation and the weakened political and legal restrictions will increase the risk of chemical or biological war occurring. We gain nothing by that or even by its threat.

The most persuasive cases for possibly wanting to use chemical incapacitants involve humanitarian motives toward small numbers of civilians. Each such infrequent situation typically involves the lives of tens of hundreds of civilians. In past wars we have often killed them and proceeded with the war. The importance of discouraging proliferation very strongly suggests that an incapacitating chemical capability is not worth the cost in terms of not achieving our two main objectives, nonproliferation and deterrence.

There is another situation for evaluating the need for incapacitating chemical capability. That is the most common one in Vietnam today, where we are using six million pounds of CS this year. We are using CS against enemy troops to drive them into the open so that conventional artillery and bombs can kill them. These are not "intermingled" situations. CS is used in the hope that it will improve the effectiveness of our conventional weapons. Another argument is also made in favor of CS. Increased effectiveness, the argument says, reduces our own troop casualties.

Whether CS really makes our artillery and bombs more effective is an unanswered question. We need effectiveness analysis.

Moreover, we need to question whether the tactical mission is necessary in the first place. For example, we could choose to forego attacking Hamburger Hill rather than engaged in chemical warfare. Not engaging the enemy would reduce casualties even more.

Even if CS does help kill more enemy soldiers, effectiveness is not the real issue. If effectiveness were the objective, lethal chemicals would be even more so. No one is seriously suggesting we use lethal chemicals.

We would not use lethal chemicals because doing so would break down the barriers to chemical and biological warfare.

If that is true, use of CS and defoliants also breaks down the barriers. While the breaking down is a matter of degree, they are coming down nonetheless as we use CS and defoliants in Vietnam.

In doing this analysis we must recognize that the trade off is between the uncertainties of non-proliferation and the undefined value of human lives, perhaps even thousands of them per year of war. In spite of the difficulty in making that judgment. I conclude that the United States does not need an incapacitating chemical capability, including CS.

Incapacitating biologicals

The last group of weapons is incapacitating biologicals. Again, I will describe a scenario which provides a case for *having* these weapons. Again, the benefit derives from using them. The scenario again contemplates first use. The trade off again is human life compared to the dangers of proliferation and escalation.

These weapons incapacitate people in large areas following an incubation period.

A major danger in using these weapons is proliferation. Perhaps even having the weapons could lead to proliferation.

Rapid escalation is also a hazard. During an attack there is no certain way of determining whether the attack is lethal or incapacitating. An attack on a nation with a nuclear or biological capability incurs the risk of immediate lethal strategic war.

For this reason, I have chosen a situation not involving a nuclear power. A situation could occur in Southeast Asia, for example, in which our forces are about to be pushed off the peninsula. In this scenario we have insufficient time to reinforce or evacuate. The enemy has announced that it would take no prisoners. As a result, our forces are likely to be killed, perhaps by the tens of thousands. We would have three military options: fight on desperately and hope for the best; delay and gain time, perhaps 30 days, by using hundreds of nuclear weapons on enemy forces on the peninsula, if one fails to frighten them; or, delay by an incapacitating biological attack. In the nuclear and biological cases the delay we might achieve could become permanent, but not necessarily. A nuclear attack would kill a major fraction of South Vietnam's population. A biological attack would incapacitate them along with enemy troops.

This scenario is weird. It is designed, however, to present incapacitating biologicals in the most favorable light, not the most likely situation. As in the case of nuclear weapons, incapacitating biological weapons are intended for extremely rare situations.

Incidentally, there are many unresolved technical questions about whether the weapons would work as intended. For example, there is danger of unintended mutation, accidentally changing an incapacitating agent into a lethal one.

In spite of these technical questions, the issue to focus on is whether we should spend money today in order to have an incapacitating biological option should an extremely rare situation occur. Of course, if we are willing to decide today to forego that option, then we do not need to spend the money.

Our use of biological weapons, no matter how humanitarian our motive, would most probably make it a legitimate form of warfare. Proliferation would become the price of possibly achieving a humanitarian objective in Asia.

The barriers to biological warfare are high today, relatively higher than to nuclear war. We think of biologicals as repulsive, politically unacceptable, and an illegal mode of warfare. Biological weapons have never been used. These precedents, conventions, and beliefs act as a restraining influence on political leaders considering use of biological weapons.

The barriers to biological war could be broken down more easily than the barriers to nuclear war. A crude biological capability is economically available to very many nations. A modest capability can be hidden from international inspection much more easily than a nuclear one. Hence, condemnation for having a capability can be avoided by small nations.

A decision to have a capability, to have an option for that rare situation, requires weighing the uncertainties of non-proliferation with the value of human life, perhaps of tens of thousands of Americans. My own conclusion is that on balance we do not need an incapacitating biological capability.

Summary of analysis

One of the issues related to ratifying the 1925 Geneva Protocol is whether to have a chemical and biological capability. We ought to make that decision in a rational maner. The main concept I want to communicate is this. An analytical framework for examining that issue is feasible. Its main components are, first, a clear statement of our objectives. They are principally non-proliferation and deterrence. Second, distinguishing among the four kinds of CB weapons, that is lethal biologicals, lethal chemicals, incapacitating chemicals and incapacitating biologicals. The framework for evaluating our need to have a capability is different for each kind of capability.

I draw the following conclusion from the analysis. We do not need any biological capability. We do not need an incapacitating chemical capability, including CS. Our only need is for a lethal chemical capability. That one stems entirely from the Soviets having one. Consequently, we have a remarkable opportunity for disarmament.

III. CONCLUSIONS

Summarized below is my rationale for having only a lethal chemical capability. Also, following from my analysis are conclusions about ratifying the Protocol, about CS and defoliants in Vietnam, and about CB disarmament.

About the need for chemical and biological weapons

1. Lethal biologicals.—If we want to kill population, our strategic nuclear capability gives us that option. We keep the nuclear capability anyway. We do not need the lethal biological capability in addition.

2. Lethal chemicals.—The Soviets have a lethal chemical option in Europe short of nuclear war, if we are unable to respond in kind. We need some lethal chemical capability to deter their first use in Europe.

3. Incapacitating chemicals.—These weapons enable use to attack unprotected enemy troops mingled with civilians. This is a first-use capability. No other weapon gives us this option. The alternatives are not to attack the enemy or to kill civilians. Such situations occur infrequently because most enemy troops are protected. Using the weapons would break down the barriers to chemical and biological warfare and encourage proliferation of chemical and of biological capabilities.

The importance of discouraging proliferation is greater than the lives of ten to hundreds of civilians occasionally killed on the battlefield. Hence, we can proscribe the use of incapacitating chemical weapons and do not need the capability.

4. Incapacitating biologicals.—First-use situations in which we might consider using these weapons would be very much more serious. The lives of tens of thousands of United States troops, for example, might be involved. Proliferation would again be the main cost.

Because of the importance of discouraging proliferation, I conclude that we can proscribe the use of incapacitating biological weapons. We do not need the capability.

About ratifying the Geneva Protocol

International convention is a major factor influencing nations not to acquire or use chemical and biological weapons. Ratification by the U.S. Senate would strengthen the convention, and thereby the barriers to chemical and biological warfare.

Ratification would draw attention to the use of CS and defoliants in Vietnam. To make the gesture of ratification genuinely meaningful, we would be obliged to stop using CS and defoliants.

Opponents to halting our use would allege embarrassment to the United States, loss of face, even our becoming after-the-fact war criminals. They would allege shackling of the military, increased U.S. troop casualties, and other dire consequences. I question the validity and certainly the relevance of these arguments.

We should stop using CS and defoliants in Vietnam because continued use leads to proliferation. Ratifying the Protocol without reservation would strengthen the barriers to proliferation and to CB warfare.

About using CS and defoliants in Vietnam

Using CS and defoliants in combat amounts ot chemical warfare. Engaging in chemical warfare, if only with harmless irritants also used to suppress domestic

riots, breaks down the barriers to chemical and biological warfare. Maintaining these barriers discourages proliferation and use of all kinds of chemical and biological weapons.

The importance of maintaining these barriers is greater than the lives of tens to hundreds of civilians killed in intermingled situations. Correspondingly, even if CS could be shown to reduce U.S. troop casualties—CS does not necessarily reduce casualties—maintaining the barrier is more important. Therefore, the United States should stop employing CS and defoliants in Vietnam.

Employment could be halted by the Secretary of Defense, the Secretary of State, the President, or even the U.S. Ambassador to Vietnam or the U.S. Commander there.

About CB disarmament

We do not need any biological capability. We do not need incapacitating chemical capability. Our lack of need is independent of other nations' capabilities. Hence, we can publicly and unilaterally disarm. We should make that decision and announce it in a manner which will strengthen the barriers to chemical and biological warfare.

Our need for a lethal chemical capability stems from the Soviets having one. If the Soviets agreed to disarm, we should also.

(Biographic information on Mr. Swyter follows:)

Han Swyter served from 1966 to 1968 on the staff of the Assistant Secretary of Defense for Systems Analysis where he was directly concerned with U.S. chemical and biological warfare policies and operations. Mr. Swyter holds an A.B. in economics from Stanford University and an M.B.A. from Harvard University. From 1961 to 1963 he was on the Engineering Research Administrator's Staff at Stanford University and in 1964 became a staff member at Arthur D. Little, Incorporated, of Cambridge, Massachusetts. Presently employed by Macco Corporation, Newport Beach, California, Mr. Swyter recently spoke on CBW at a National Academy of Science meeting in Hanover, New Hampshire, and was a participant in a July symposium on CBW sponsored jointly by the American Academy of Arts and Sciences and the Salk Institute.

Mr. ZABLOCKI. Thank you for an excellent statement, Mr. Swyter.

Dr. Arthur Galston has arrived. Thank you, sir, for making a special effort. We welcome you, Dr. Galston, this morning.

As I advised the other two gentlemen, if you so desire, you may file a prepared statement, and if you wish to excerpt from it, or summarize, we are very happy to hear you at this time.

Proceed, if you will, Dr. Galston.

STATEMENT OF DR. ARTHUR W. GALSTON, PROFESSOR OF BIOLOGY AND LECTURER IN FORESTRY, YALE UNIVERSITY

Mr. GALSTON. Thank you, Mr. Chairman. I apologize for my late arrival, and also for not having a prepared statement. I was informed of this hearing just a few days ago, and have not had the opportunity to prepare one.

Mr. ZABLOCKI. Very good, sir.

Mr. GALSTON. I will, however, make some extemporaneous statements, with the aid of notes, if I might.

Mr. ZABLOCKI. You may proceed, Doctor.

USE OF HERBICIDES AS WEAPONS

Mr. GALSTON. I am a botanist, and I would like to confine my remarks to the use of herbicides as military weapons in Vietnam, with some overtones concerning the social and health implications of their use in the United States.

Since 1962, about 4 million acres of Vietnam have been sprayed with about 100 million pounds of assorted herbicides. This is an area about the size of the State of Massachusetts.

The agents which have been used in Vietnam may be classed into three types of chemicals: The first type, agent Orange, consists of two commonly used phenoxyacetic acids that go by the shorthand names of 2,4-D and 2,4,5-T.

They are used in Vietnam at about 27 pounds per acre, and I should say parenthetically that this is up to 10 times the usual domestic dose recommended.

Agent White is a mixture of 2,4-D and a fairly new chemical called picloram or tordon. This mixture is sprayed so as to deposit about 6 pounds of 2,4-D and 1½ pounds of picloram per acre.

The third agent, called Agent Blue, is known chemically as cacodylic acid. It is an arsenic-containing material, and is sprayed at the rate of about 9.3 pounds per acre.

As Mr. Swyter has already mentioned, the main object of our use of these chemicals is to defoliate around trails, estuaries and encampments to prevent ambush, infiltration and military buildups. By all odds, this use of these chemicals appears to have been militarily successful.

A secondary use has to do mainly with cacodylic acid, a chemical uniquely adapted to kill grass plants such as rice. We spray and kill rice in paddies of outlying areas which are suspected of being supply centers for bands of guerrillas. In some instances entire villages are suspected of being Vietcong sympathizers; killing their food crops prevents their use as a staging area for any sort of military operations and has in some instances led to complete abandonment of the village.

All of these chemicals are in use in the United States. Their use was initiated on a large scale at about the end of World War II. In fact, 2,4-D and its relative 2,4,5-T were developed in what is now known as Fort Detrick. The early formulations were made there, and the use of these chemicals as agriculturally important herbicides and plant growth regulators, stemmed in part from those early military investigations.

It has been assumed, because of the rapid breakdown of 2,4-D in the soil, that the massive use of this chemical does not constitute a health hazard. I shall have occasion to return to this point, because recent evidence indicates that not only 2,4-D, but, more importantly, its relative 2,4,5-T, may constitute an important health hazard, both at home and in Vietnam.

UNDERSCORE EFFECTS OF HERBICIDE USE

The kinds of undesirable consequences that flow from our massive use of herbicides can be summarized under three general headings. Some of these have been already alluded to briefly by Mr. Swyter, and I hope I may enlarge on them.

One is ecological damage; the second would be inadvertent agricultural damage, and the third involves direct damage to people.

I. ECOLOGICAL DAMAGE

Under ecological damage, it has already been well documented that some kinds of plant associations subject to spray, especially by Agent Orange, containing 2,4-D and 2,4,5-T have been irreversibly damaged. I refer specifically to the mangrove associations that line the estuaries, especially around the Saigon River.

Up to 100,000 acres of these mangroves have been sprayed. In a report published in Science about a year ago,[1] Dr. Fred Tschirley, who went to Vietnam at the behest of the U.S. State Department, confirmed that there was extensive killing of these mangrove associations by one spray of 2,4-D. Some of them had been sprayed as early as 1961 and have shown no substantial signs of recovery. Ecologists have estimated a minimum of 20–25 years for effective recovery to occur.

You might ask why we should be concerned with the mangrove associations. What are they to us? Ecologists have known for a long time that the mangroves lining estuaries furnish one of the most important ecological niches for the completion of the life cycle of certain shellfish and migratory fish. If these plant communities are not in a healthy state, secondary effects on the whole interlocked web of organisms are bound to occur.

So not only is there now likely to be increased erosion along the estuaries, and destruction of that stable environment, but in the years ahead the Vietnamese, who do not have overabundant sources of proteins anyhow, are probably going to suffer dietarily because of the deprivation of food in the form of fish and shellfish. I would assume that the United States will have to assume the major responsibility for making up the deficiency.

DAMAGE TO SOIL

Damage to the soil is another possible consequence of extensive defoliation. It has been minimized by some, but I think we will find, when we look at Vietnam in detail after the hostilities are over, that there has been considerable damage done to the soil in various parts of the country. I state this firmly, as a conviction which I have as a botanist.

We know that the soil is not a dead, inert mass, but, rather, that it is a vibrant, living community. Up to one-half of the total weight of some soils, can be micro-organisms who derive their food from the organic matter excreted from the fine roots of trees and other vegetation growing in any area. If you knock the leaves off of trees once, twice or three times, whether you kill them or not, you interfere with the excretion of organic matter into the soil; you cause an alteration in the level of activity of these microbes; you change the quality of the soil.

We know from our own soils that microbes are important in that they synthesize gummy substances which cement the soil particles together. This gives us the crumb structure that the agriculturalist knows is essential for good tilth, with good aeration, good water- and mineral-holding capacity and good quality for the growth of roots. Failing the microbial activity, we could have compaction of soil particles into hard clays, into which roots have difficulty penetrating. If

[1] Tschirley, F. H., "Defoliation in Vietnam," Science 163: 779–786, 1969.

this occurs agricultural productivity declines markedly, and recovery may be a very slow process.

Worse than this, certain tropical soils—and it has been estimated that in Vietnam up to 50 percent of all the soils fall into this category—are laterizable; that is, they may be irreversibly converted to rock as a result of their deprivation of organic matter. Many tropical soils are very weak in what the agriculturalist knows as base exchange capacity. The only thing that stabilizes the soil is its organic matter. If, as I have mentioned earlier, you deprive trees of their leaves and photosynthesis stops, organic matter in the soil declines and laterization, the making of brick, may occur on a very extensive scale. I would emphasize that this brick is irreversibly hardened; it cannot be made back into soil, short of breaking it up with a sledge hammer or similar device. Part of the Temple of Angkor Wat in Cambodia is made of laterized soil. The fact that this temple has been around for 11 centuries is a testimonial to the persistence of such material.

Another ecological consequence is the invasion of an area by undesirable plants. One of the main plants that invades an area that has been defoliated is bamboo. Bamboo is one of the most difficult of all plants to destroy once it becomes established where you don't want it. It is not amenable to killing by herbicides. Frequently it has to be burned over, and this causes tremendous dislocations to agriculture.

DANGERS OF PICLORAM

Finally, in the line of ecological damage, I would note that the recently introduced chemical picloram is one of the longest lived pesticides I know of in soil. I believe it to be a herbicidal analog of DDT. As we all know, DDT, introduced into our ecosystem, persists for years and years. Picloram is not quite that long lived, but it is very long lived, indeed, compared with any other herbicide.

In "Down to Earth," a publication of the Dow Chemical Co., which synthesizes this material, I have read that less than 3½ percent of the applied picloram disappeared from certain California clay soils in a field trial lasting 467 days. In other soils, the disappearance is up to 20 percent of the applied material in 467 days.

It is clear that picloram, once applied, could be around for years. I would suggest that its massive application to the soils of Vietnam is going to hamper agriculture, even after hostilities are over, for some time into the future.

II. INADVERTENT AGRICULTURAL DAMAGE

My second category of damage is inadvertent agricultural damage. There are many useful plants growing in all parts of South Vietnam. When one flies over a forested area that one wishes to defoliate, with a converted cargo plane carrying tanks of herbicidal liquid delivered through high-pressure nozzles, one hopes that one has gaged the meteorological situation accurately and that the fine droplets produced by these nozzles will, in fact, fall on areas whose spraying is desired.

It is understandable, weather being what it is, that winds come up occasionally, that meteorological patterns change drastically, and that pilots miss the mark. All sorts of inadvertent accidents can happen. Finishing a run with some gallons left in the tank, and jettisoning the

rest, may cause it to fall in areas not desired, as the Skull Valley accident made dramatically clear.

We have documentation of several very important accidents of this kind in Vietnam. For example, thousands of trees in the Michelin rubber plantation to the north and west of Saigon were injured a few years ago following a spray operation. Some trees were killed, some recovered slowly, but the United States has compensated the French owners of that rubber plantation at the rate of $87 per tree.

In Cambodia, we are now facing a lawsuit by the Cambodian Government to the extent of about $9 million, resulting from extensive spraying in the Tay Ninh Province of neighboring South Vietnam. The report of the investigation team, which included Dr. Fred H. Tschirley and Dr. Charles Minarik of Fort Detrick, concluded that only a part of the damage is due to inadvertent drift. Some damage appears to have been due to deliberate spraying over the Cambodian border. In any event some 700 square kilometers of territory were affected, and the outcome of this lawsuit is still to be determined.

There have been documented reports of extensive damage to truck crops grown along roads, trails, and canals near Saigon. This results, I believe, from the drifting of herbicide from regions where they were intended to be deposited, over to areas in which truck farms were being cultivated. I believe the extent of this damage has not been accurately calculated, but certainly must go into the millions of dollars.

III. DAMAGE TO PEOPLE

Finally, I would like to discuss the most recent danger of the use of these herbicides to come to light. I refer to their direct damage to people. It is a source of great distress to me to find that some 25 years after the first introduction of the chlorinated phenoxyacetic acids like 2,4-D and 2,4,5-T, which together constitute about a $40 million business in this country today, that there have not been published before this year adequate toxicological data to support their extensive use in agriculture.

We have depended upon the fact that 2,4-D is rapidly degraded in soil by micro-organisms. We usually say its half-life is just a few weeks. 2,4,5-T, with just one extra chlorine atom on the benzene ring, is substantially longer lived. It is this chemical which has now been shown to be harmful to animals, although 2,4-D is also suspect.

About 2 years ago, a toxicological study was commissioned by the National Institutes of Health, and carried by a private research organization called the Bionetics Research Laboratory in Bethesda, Md.

Three kinds of tests were made on a large number of commonly used agricultural chemicals. One involved mutagenicity; that is, do the chemicals cause mutations? This test was carried out against micro-organisms. Second, are the chemicals carcinogenic? Do they produce cancers when injected into test organisms such as mice? Thirdly, are they teratogenic; that is, do they cause malformations in developing embryos?

TERATOGENIC EFFECTS OF 2,4,5-T

The teratogenic chemical with which most of us are familiar is, of course, thalidomide. It has recently been divulged that 2,4,5-T is one of the most teratogenic chemicals known. In experiments by the Bionetics Laboratory in which 2,4,5-T was fed in the diet, in honey, from 4.6 up to 113 milligrams per kilogram body weight, extensive teratogenic damage was noted. Even at the lowest dose I have quoted, 4.6 milligrams per kilogram, there was marked enlargement of the liver of the mother. This shows that the body was trying to cope with this extra burden, trying to detoxify the chemical which was applied. This dose also produced a significant rise in abnormal births in rats.

If the chemical was injected subcutaneously, the damage was somewhat greater. At the highest concentration used, 113 milligrams per kilogram body weight, which is equivalent to only a few ounces, for a human, 100 percent of all of the litters born had at least one abnormality, and up to 70 percent of all the offspring were abnormal in some major respect.

The abnormalities include lack of heads, lack of eyes, faulty eyes, cystic kidneys, cleft palate, enlarged livers, and other types of damage which toxicologists and teratologists feel are very significant.

The results with mice were so striking that tests were conducted with rats, and the rat tests confirmed the teratogenicity. I suppose the next step will be to test this chemical in rabbits, dogs, and then in primates.

When the President's science adviser, Dr. DuBridge, was made aware of these results, he issued an order which restrained the use of 2,4,5-T, both domestically and in Vietnam. As I understand it, as of the 1st of January 1970, 2,4,5-T, which is used massively domestically will not be available for agricultural usage, and its use will be restricted to clearing the underbrush from around powerlines, railway embankments, and the like. In Vietnam, its use in populated areas is to be discontinued. The Department of Defense has announced that this is consistent with present use, and that operations involving 2,4,5-T will proceed as before.

I suggest that its teratogenicity is such that even its use in such apparently innocuous domestic manners as clearing brush near powerlines is undesirable. Such chemicals could find their ways into water supplies, and could be ingested in teratogenic doses.

EFFECTS OF 2,4,5-T IN VIETNAM

We have sprayed 2,4,5-T exhaustively in Vietnam. Have we caused any damage to people there? One can't know for sure. All that one can do is put together various bits of evidence. We know that 27 pounds per acre are sprayed. Let us assume that 2,4-D is completely nontoxic, although the Bionetics report indicates that it, too, is suspect, and should be further investigated.

If you consider only the 2,4,5-T sprayed and assume that a 1-inch rainfall, which is quite common in South Vietnam, has occurred after the spray, then you can calculate that there are about 50 miligrams per liter of 2,4,5-T in the water. Most of the drinking water and cooking water in South Vietnam is gathered in two ways—either from very shallow wells, or from catching the rainwater from the rooftops and depositing it in cisterns.

If one assumes that a pregnant woman drinks a liter of water a day, which is certainly conservative, then she consumes about 1½ milligrams per kilo of body weight per day. While this is a little bit below the lowest level tested in the Bionetics survey, I would recall to you that even those lowest levels indicated some damage in the form of oversized livers and abnormal births. Furthermore we cannot be sure that humans are not more sensitive to the 2,4,5-T than are these test animals.

I would also like to suggest that if the rainfall were less or water consumption more or if there were uneven deposits of 2,4,5-T, then significant teratogenic events could have occurred among Vietnamese women.

REPORTS OF ABNORMAL BIRTHS FROM SAIGON

Is there any evidence that such damage has occurred? If one looks at the Saigon newspapers, one finds that since late 1967, which would coincide with the end of the first year of our massive spray operations, there have been numerous reports, in the Saigon newspapers, of the incidence, especially in two hospitals in Saigon, of a completely new kind of birth abnormality. It is called the "egg bundle-like fetus," pictures of which have been published on the front pages of some of the Saigon newspapers.

We do not know, of course, what is causing these abnormal births. There are many traumatic events occurring in South Vietnam, and we cannot say that 2,4,5-T is the trauma which is giving rise to these abnormal births. But I would say that the entire spectrum of events compels me, as a biologist, to examine current restrictions on the use of all of these chemicals, none of which has been tested adequately for effects on humans and animals close to humans. I would hope that further restrictions would be placed on the use of these chemicals until we are sure that they are not causing adverse effects on people at home as well as in Vietnam.

Like Mr. Swyter, I would hope that the herbicides would be included in those "asphyxiating, poisonous, and other gases and analogous liquids, materials, and devices" whose use is banned in the Geneva Protocol, which will shortly be resubmitted to the Senate for ratification.

I would hope that the Senate, and all others concerned with this problem would do all they can, in the light of the evidence which I have presented, to include herbicides in the ban.

Thank you very much, Mr. Chairman.

(Biographic information on Dr. Galston follows:)

Arthur W. Galston is a professor of biology and lecturer in forestry at Yale University, and director of the Marsh Botanical Garden, New Haven, Conn. A foremost investigator of the action of hormones and light on plants, he is the author of *The Life of the Green Plant* and co-author of *Principles of Plant Physiology*. Dr. Galston is a past president of the Botanical Society of America and the American Society of Plant Physicologists. He has written and spoken frequently on the use of herbicides and defoliants in Vietnam.

Mr. ZABLOCKI. Thank you, Mr. Galston. I want to apologize to all three of you gentlemen for scheduling three such excellent witnesses, with such profound and penetrating statements, at one and the same time. Many questions, particularly technical questions, rise in our minds, but we are particularly and more specifically interested and

taking into consideration the political implications of CBW. But it will be difficult for us to contain our questions to the area and sphere which is of our prime interest.

I do want to thank all three of you for excellent statements, and we will now try to stay within the 5-minute rule.

Mr. Broomfield, if you have to leave, go ahead with your questions. I will defer to you.

Mr. BROOMFIELD. No questions.

CAPABILITIES FOR BW

Mr. ZABLOCKI. Well, Dr. Lederberg, if I may ask a question of you, on page 2 of your statement you warned that biological weapons could proliferate and be used as a technique of aggression by smaller nations or insurgent groups. What kind of infrastructure is needed for a nation to have a biological warfare capability?

Mr. LEDERBERG. I think that depends on precisely what you mean by capability. No nation has the capability of assured achievement of a military objective with biological weapons. They are inherently untestable, and until they have become part of the arms traffic of the world, which I earnestly hope they will not, an assured military result is beyond the capacity of any nation. So it is chancey even for the best of us.

The possibility of an aggressive act, which is uncertain in its consequences, but has the potentiality for great damage, is within the capacity of any group that has the technical insight to know what to do. It is not a question of industrial resources; it is a question of a rather limited amount of scientific know-how, and I would say that means any country has this capacity.

MONITORING A BW BAN

Mr. ZABLOCKI. Then a question rises, and we would appreciate your answer from particularly a technical standpoint: Do you know any way in which a worldwide ban on the production and stockpiling of biological weapons could be monitored without onsite inspection?

Mr. LEDERBERG. Well, I think onsite inspection is particularly futile here unless we had such pervasive inspection that you would have the equivalent of a single world state. You would actually have to have the equivalent of the police power.

Mr. ZABLOCKI. But if every nation, even the smallest, can have a capability, how would you suggest such a ban be policed if it is put into force?

Mr. LEDERBERG. I would suggest it be policed in the same fashion that we use the police power within the sovereignty of a given nation, namely, by the application of sanctions against even minimal use of such agents. We find it very difficult, for example, to police the possession of dangerous weapons, but we have the sanctions of the criminal law against people who improperly use such weapons.

I think it is not beyond the capacity of the world community, even within our present general framework of international law, as limited as it is, to apply such sanctions to the use of biological agents. In order to do so would require the most urgent and earnest and honest com-

mitment on the part of the stable powers that any such use of biological weaponry really is a crime against mankind, and I allude in section 6, I believe, of my numbered recommendations, the definition of a biological attack as a war crime.

Mr. ZABLOCKI. Do either of the other witnesses wish to comment? Feel free to do so.

Mr. SWYTER. What you can monitor to some extent is large-scale testing. For example, the United States has done and has considered extraterritorial testing, which is something the Russians would be well aware of, because they have their trawlers around the world. We could monitor the same thing for the Russians and other nations.

That aspect of it, which would contribute to making it a high-assurance weapon, can be checked.

THE SOVIET CHEMICAL WARFARE CAPABILITY

Mr. ZABLOCKI. That leads me to another question. In earlier testimony it was pointed out that the Soviet Union has signed the protocol, the Geneva protocol, yet there was no apparent evidence that the Soviet Union has stockpiles of chemical-biological warfare. Yet in your statement, Mr. Swyter, you say the Soviets have a lethal chemical capability for Europe, which implies that you have some information as to the capability and the stockpiling of the Soviet Union.

Could you enlighten the committee on the knowledge you have as to the extent to which the Soviet Union has entered into stockpiling production of biological and chemical warfare weapons?

Mr. SWYTER. I am very limited in that, because the numerical aspects are classified. Let me say this about biological stockpiling: You need a relatively small amount, measured in tens to hundreds of pounds of agents, to do a tremendous amount of damage. I would think that something like 10 pounds could easily cover the New York Metropolitan Area, to give you some idea of magnitude. This amount can be grown over a period of months in very simple-minded laboratories. You don't actually need to stockpile the biological agents over periods of years. That is, if some country decided over the next 6 months that it wanted to get its capability ready, it could begin production at that point, and no one would need to stockpile this for longer than a period of months.

EVIDENCE OF SOVIET PRODUCTION

Mr. ZABLOCKI. Do we have hard intelligence on the Soviet Union's capability and its production?

Mr. SWYTER. The Soviet production capability is probably very similar to ours. We have Pine Bluff Arsenal, which is one plant, sufficient to produce over a reasonably short period of time more agent than would be needed to cover the world.

Mr. ZABLOCKI. Is there any intelligence as to the "Pine Bluff Arsenals" that the Soviet Union has, their location and capacity?

Mr. SWYTER. The intelligence community thinks it does, and what I have seen makes me confident that the intelligence community does know.

Chemical agents are an entirely different thing. They have a shelf life of years, tens of years. They will last forever, essentially.

During World War II, there was a great deal of evidence of the Soviets having manufactured some themselves, having stolen a great deal from the Germans who had stockpiled it. You see, the German stockpiles which the Allies captured were largely destroyed. Evidence indicates that the Russians took the German stockpiles which they captured, and shipped them East.

We have a great deal of classified evidence that the Russians have manufacturing plants which from time to time over the past 25 years have operated. We have some evidence of storage locations. These are buildings. You can't tell what goes on inside the building. But attachés can walk around the fence, the outside of the building, and look at it, and they can see the trucks go into the building, and trucks come out of the building, and things go on in these buildings.

Mr. ZABLOCKI. The trucks don't carry vodka.

Mr. SWYTER. It is doubtful that they would need that kind of security for the vodka.

That is evidence which the intelligence community can provide. They have provided it to me, on a classified basis, and that is the better source to look to get the information, because they are the experts.

Mr. ZABLOCKI. The purport of my question, of course, is not to reduce the desirability of U.S. ratification of the protocol. Nevertheless, when a signatory of the protocol like the U.S.S.R. continues to produce and stockpile chemical and biological weapons, there is a reason for doing so.

THE DECISION TO USE GAS IN VIETNAM

Let me go to another point. I wondered if you could shed some light on your role with the Assisant Secretary of Defense for Systems Analysis. Did you concentrate particularly in this field of biological and chemical weapons?

Mr. SWYTER. No. My specialty was tactical nuclear warfare. I spent most of my time working on that. Chemicals and biologicals were a very small part of my effort, largely because they take very little money, and when it comes right down to it in the Pentagon, what they are concerned about is the money.

Mr. ZABLOCKI. But it was my understanding that you are concerned with biological warfare policies and operations.

Mr. SWYTER. I was concerned with the problem the Secretary faced of how much of this capability, if any, should we have; the question of requirements.

Mr. ZABLOCKI. Apparently the original decisions to allow the use of certain gases in Vietnam were made before you joined the staff of the Assistant Secretary of Defense.

Mr. SWYTER. That is correct.

Mr. ZABLOCKI. Nevertheless, could you give the subcommittee some idea of how the original decision was made to allow the use of certain gases in Vietnam?

Mr. SWYTER. Yes.

Mr. ZABLOCKI. How was the issue put to the Secretary of Defense? Didn't the people who were making these decisions foresee the widespread use which has resulted?

THE ORIGINS OF GAS USE IN VIETNAM

Mr. SWYTER. I don't know what Mr. Rusk and Mr. McNamara foresaw, but I don't think they foresaw what has happened. As I recall the situation, which I think was in 1966, we had a cave full of women and children in Vietnam and there were in that cave several suspected Vietcong who were holding these women and children captive and there was a Marine Lieutenant Colonel there whose mission was to get the Vietcong out.

He did not particularly want to use the standard methods, which are very lethal to women and children. These will range from simply going in with machineguns, which also risks the American troops, to pumping the cave full of methane and igniting it. Those didn't appeal to him, for very humanitarian reasons. He would kill a lot of innocent civilians.

He got the bright idea of tossing some tear gas grenades, which the military police normally have anyway, just like the Washington police have, into the cave, and everyone came running out, including the Vietcong.

This created some uproar, and it got back to the Secretary of Defense, and Secretary of State, and the press raised questions about whether this was gas warfare, what the justification was for doing this. The military, probably from the Saigon command, requested authorization, after the fact, for that incident, and I suppose, authorization to use this tear gas in the future for the particular situation, or it was couched in terms of a particular situation in which the enemy is intermingled with civilians. The only effective weapon at that point is the incapacitation chemicals, particularly tear gas, CS.

The alternatives are either not to attack the enemy, and military officers generally don't like to let the enemy go free, or to take the risk of killing civilians, which the military abhors as much, I think, as we civilians do.

PRACTICE CONFLICTS WITH POLICY INTENT

As far as I can tell, no one really thought about how this would get out of hand, which I think it has, and the intention, I suspect—although, of course, I don't know—was that the use of tear gas would be authorized for these particular situations.

The way the authorization was written, the phrases used, I don't think limited it specifically to intermingled situations. Although I am quite convinced that was the intent. What happended was that these situations did occur as they do in war, and military commanders found how effective the tear gas was for that situation. You could, in many cases, get a dispersal of the enemy mingled with civilians without harming the civilians, so that you could get to the enemy with a rifle.

Mr. ZABLOCKI. Of course, using CS and driving people out of caves and then bombing them afterward, killing them, civilians, children, and military as well, that was not the original intent.

Mr. SWYTER. I am sure it wasn't. I am sure it wasn't.

Mr. ZABLOCKI. But it has happened.

Mr. SWYTER. But that is the natural outgrowth of saying, "Yes, you can use this chemical" and then somebody gets the bright idea that there is an enemy bunker full of North Vietnamese that is just immune to bombing.

DECISION TO USE HERBICIDES

Mr. ZABLOCKI. What was the justification, then, at the time you were with the Assistant Secretary of Defense for the use of herbicides and defoliants. At that time was the political cost taken into account? The ecological damage? The agricultural damage? The damage to people? Do you recall?

Mr. SWYTER. I don't recall at all.

Mr. ZABLOCKI. The decision was made at the time you were in Defense. This was in 1967.

Mr. SWYTER. I wasn't consulted on the tear gas issue. I think that occurred before I came, but I am not sure.

Mr. ZABLOCKI. And on the defoliants and herbicides?

Mr. SWYTER. I wasn't consulted on that, either. Ordinarily, the Systems Analysis Office would not provide input for "operations"—decisions to use certain weapons. Systems Analysis provided analytic assistance only in the area of requirements, of establishing force and capabilities levels.

Mr. GALSTON. Could I add a historical note here? There was some use of defoliants in the waning days of the Korean war. Very minor use, but I saw a film which detailed some of the damage done in the last year of the war in Korea, so that precedent had already been set years before.

Mr. ZABLOCKI. What I am trying to get clear in my mind is whether the Defense Department and the State Department, or any of the officials who were in the position to make the decision, gave full consideration to the political costs, and the damage to people and agricultural damage and ecological damage. Can any of you gentlemen shed any light on that?

Mr. GALSTON. I am sure that there was no anticipation that there was any damage to people, because there were no data indicating that these chemicals could damage people. But that was simply because there hadn't been adequate testing, and I suspect this is true of a great many chemicals that we use in our everyday life.

TESTING CHEMICALS BEFORE USE

Mr. ZABLOCKI. Doctor, you have also mentioned adequate testing in your testimony. How can we get adequate testing of these substances? Must Vietnam be a testing ground? I would hate to think that. Cannot we test domestically?

Mr. GALSTON. No. I would say that we have the capability for doing adequate testing right here in the United States. I would suggest, for example, that if Fort Detrick were turned into a national testing center for mutagenicity, carcinogenecity and teratogenicity for the

numerous chemicals that we use as food additives and for agriculture it could become a national shrine.

Mr. ZABLOCKI. So that to people that would today say that Vietnam is only one place these chemicals are used, you would advocate we stop the use of these herbicides here at home and in Vietnam immediately. We don't need to use them.

Mr. GALSTON. I would certainly have that point of view, although I would not say that these chemicals could not be usefully employed in domestic agriculture. There certainly are legitimate uses for them. This is one of the addenda I would make to Mr. Swyter's answer about how you inspect them.

You see, in the case of herbicidal chemicals, you couldn't possibly make any decisions on the basis of inspection because these are chemicals that have the potential for being constructively used. The fact that a country had a capability for making tons of 2,4-D could not be taken as any indication of intent to use it militarily. It is a legitimate domestically usable chemical, and a constructive chemical, which could, of course, be misused in time of war.

Mr. ZABLOCKI. Mr. Rosenthal.

Mr. ROSENTHAL. I am an interloper here. Go right ahead.

Mr. ZABLOCKI. You are most welcome. I welcome my colleague.

POSSIBLE USES FOR 2,4,5-T DOMESTICALLY

On the basis of your testimony on the apparent damage of 2,4,5-T, what useful purpose would 2,4,5-T have domestically?

Mr. GALSTON. Well, I would say that any chemical that is as harmful as 2,4,5-T to animals and to humans should probably not be used at all. But we are ingenious enough to devise chemical substitutes for that molecule. For example, 2,4-D will do whatever 2,4,5-T does, but somewhat less efficiently with woody plants, for reasons we don't understand.

Mainly 2,4,5-T is used to eradicate woody shrubs, especially under powerlines. I would say there are probably cases where one could use this compound safely for such purposes. If there were no populated areas for many miles around, and you wanted to kill shrubs under a powerline, you could apply 2,4,5-T and expect that within several months there would be rather small residues in the soil. The chances of that getting into anybody's drinking water would be very slim indeed.

I would not use 2,4,5-T as it is now being used, in populated areas such as where a powerline goes right through a town and you spray the 2,4,5-T all around the line to kill the shrubs. I am sure some of the 2,4,5-T so applied is being consumed by people.

I would say that if I were defining policy, I would stop the use of 2,4,5-T entirely and look around for a substitute. We can find one. But if one had to use it, there are instances in which one could employ it safely away from populated areas.

Mr. ZABLOCKI. Do you gentlemen agree that some chemicals and biological materials used in warfare have a peaceful purpose?

THE INSTANCE OF MACE

Mr. Lederberg. Well, there is no question that many of them do. I believe there is a considerable argument for riot control agents, properly used, as much more humane methods of dealing with civil disturbance than physical trauma. The trouble is that there is a tendency in using things like Mace, for example, to relax on the supposition that they can't possibly harm the insurgents, and they therefore tend to be used quite indiscriminately.

You end up with a situation where almost every agent is used just to the margin of acceptable damage to the population against which it is being applied, and that requires that we have more information than is usually available on what harmful effects might be.

You are well aware, I am sure, of the flap that there has been about unsuspected harmful effects of Mace, particularly the fact that it may induce an allergy to a second exposure to the same agent, which is something that was just not thought about when attention was first directed to Mace as a riot control agent. Given an adequate amount of testing—and this has to be intellectually aggressive testing, looking for trouble, not trying to cover it up—I think there are important applications, even for rather grisly sounding and rather harmful kinds of agents, and that is why I have referred to tear gas first. You may be aware that Mace is a dilute form of CN, of tear gas, and I think there is a place for it, if properly used.

The herbicides obviously have a place in agriculture. There wouldn't be the large economic market for them that there has been were this not the case.

ARE CHEMICALS BEING USED WISELY?

The question is, are they being used wisely? As this new crisis—but it is one that we are going to see many, many examples of in the future, when we do adequate testing—illustrates, not enough work had been done to find out what the possible side effects of 2,4,5-T might be.

I am a little afraid that if we go about this too spasmodically it will be like chopping off Hydra's head; you will chop one off only to have another one come by. I don't know exactly what alternative agent Dr. Galston has in mind as an alternative to 2,4,5-T, about whose safety we have such magnificent assurance that we would want to advocate its indiscriminate use.

The rigorous application of existing rules on pesticide and herbicide residues could be extended to keep it from getting out in our food supplies, and I think it is better to have an agent that we suspect to be dangerous an be keeping a very close watch on it than have other agents which are almost always not adequately tested and to have a very bland and unsuspecting and complacent approach to them.

This is true down the line. Agents labeled as biological warfare agents are, in fact, the next thing to being vaccines, to being stockpiles of micro-organisms that would be used for immunization purposes and so forth, and again, there is the civilian counterpart of materials that can be used aggressively, in warfare.

So I don't think we can think in terms of abolishing our knowledge of our experience with these kinds of materials. We need a rule of law that defines the ways in which they can be applied for a reasonably humane benefit.

DELUSION: HUMANE USE OF CHEMICAL AGENTS

I would like to advert to the question that Mr. Swyter brought up about the argument for the humanitarian application of certain chemical agents. I think this is almost entirely a delusion. I do not believe that we have the agents that can make warfare more humanitarian, and I believe they will never be used in circumstances where, in fact, they are so. Every weapon that is available for military use will be used in order to accomplish military objectives, and humanitarian issues are side issues to that.

However, a case can be made, and you refer to the mingling of civilians and military, and so forth, and I think one has to pay some compassionate attention to considerations like it. I would like to suggest the following approach:

Politically, I think we get ourselves in very serious difficulty when we announce that we are the sole bearers of ethical insight for the world, and that we understand what is humanitarian and what is not, and, therefore, proceed according to our own devices. I think we should ratify the protocol; I think we should take it very seriously.

SUGGESTS INTERNATIONAL CONFERENCE ON WAR

I think we might then, if we wished, undertake an international conference on the humanization of warfare, namely, what specific measures might be universally or near universally agreed upon that would mitigate the impact of war upon civilians.

We might introduce the proposition that under certain circumstances that the conference would help to spell out that the use of specific chemical agents, under specific restrictions, might have the effect of tempering the impact of war on civilian populations. That is something that might be agreed upon, with sufficient unanimity, that our moral conviction that it is the humanitarian approach was shared by others, and we might then agree to have an amendment to the Geneva protocol that says the use not of gas in general, but of CN in particular, or CS in particular, within such-and-such amounts, and such-and-such circumstances, might be a universally agreed upon exception to the general rule of the use of poisonous gas.

I think that approach minimizes the odds of unlimited proliferation of the capability for and the development of new kinds of agents which would be excited by a unilateral invocation of the idea of the humanitarian use.

RULES OF WARFARE IN THE WORLD COMMUNITY

Mr. ZABLOCKI. Thank you.

I would be happy to have your views on it, Mr. Swyter, because I recall that in your testimony you stated that any use of gas, and even if it is limited to certain circumstances, would, as you have stated in your testimony, encourage proliferation, or wider use. As I remember, you mentioned the World War I incident where France began gas warfare by using tear gas.

Mr. SWYTER. Yes.

Mr. LEDERBERG. Unilateral uses, without the framework of a system of international agreement and control about what those uses are.

Mr. SWYTER. I think what Dr. Lederberg is suggesting, that the world community could devise rules of warfare in which certain agents can be used in certain situations might be an achievable ideal. If he thinks it is worthwhile, we ought to pursue it. But as a practical matter today, with the rules of war that we seem to be able to live by, I think it is impractical to expect field commanders—and we are talking about lieutenants and sergeants—to differentiate between one situation and another.

Either you can use a weapon or you can't. You can use dumdum bullets or you can't. You can use tear gas in combat or you can't. Those rules both help the lieutenants and sergeants and make it much easier for everybody, because they then don't ever have to worry about whether a situation which they can't see—you know, somebody is shooting at them—whether it fits a particular situation. They simply know that this is a weapon which can be used, and this is a weapon which can't be used.

We have some clear rules, which are getting into the press right now, about shooting civilians. It is a very clear rule. You can't shoot civilians. To try to refine those rules, I think, is just getting us into a lot of difficulty.

The problem occurs that once a force uses a gas, a chemical, the other side may take defensive measures just in case. As long as the second side has taken defensive measures, it is much better prepared to use chemicals itself. It is an on-going process.

What happened in Vietnam was that we said, "Well, there are a few situations in which we can use tear gas." So we used them, and then somebody thought, "Gee, maybe there is another situation," and the thing has grown until now we are simply using tear gas in an attempt to make conventional weapons designed to kill soldiers more effective.

What is so heartbreaking is that there is serious question whether this tear gas used against enemy soldiers in conjunction with bombing and artillery actually improves the efficiency or the effectiveness of our artillery and bombing.

A "NO GAS" POLICY

I think Thomas Schelling's idea is that you distinguish by kind of weapon; we either use nuclear weapons or we don't, but we make it very clear. We don't use small nuclear weapons instead of big ones. You don't use them outside of cities instead of inside cities. You just don't use them. Chemicals are the same way. You just don't use them.

This doesn't have anything to do with possibly using tear gas domestically as an alternative to clubs and machineguns. I think it is quite possible to say to police forces, "Yes, you may use tear gas if that is your only alternative," and at the same time tell the military, in combat, "You may not use tear gas, just like you may not use lethal chemicals, and you may not use biologicals."

It is possible to formulate such a policy, and I think the military would have no difficulty understanding and applying such a policy. You could make it clear and they could exist with it quite easily.

Mr. ZABLOCKI. Of course, a general rule on the use of tear gas could be that it could not be used in conjunction with, or followed by, any lethal weapon.

Mr. SWYTER. But there is a much easier rule, because the fellow in the field, with a rifle, who is being shot at, doesn't want to and doesn't have time to think about whether this is going to be followed by more bullets or not. He simply thinks about the things he has with him as a weapon.

If you tell him he can't use it, he won't take it with him and then he won't use it.

Mr. ZABLOCKI. Mr. Rosenthal.

PROPOSED FUTURE USE OF FORT DETRICK

Mr. ROSENTHAL. Thank you, Mr. Chairman.

Dr. Galston, I was intrigued by your idea which was passed over very quickly for a proposed use for Fort Detrick. Could you tell us in greater detail what your thoughts are?

Mr. GALSTON. Well, we know that Fort Detrick is the major research center for the development, formulation and testing, of many chemical and many biological weapons. We have figures on the number of professional people employed there. I don't have those figures in my mind at the moment, but it is certainly a very considerable research establishment, with people professionally qualified in many of the important areas related to microbiology, biochemistry and public health.

Now that we are prepared to renounce the use of biological weaponry, although we retain the option for the use of chemical weaponry, I would say that a large part of the staff at Fort Detrick may find itself technologically unemployed, and my compassion for these unemployed colleagues compels me to think of ways in which they might regain a useful role in society.

I would think that we desperately need some national center where even the apparently most innocuous chemicals would be given thorough-going tests before being introduced into our ecosystem and bodies. You see, many of our chemicals have never been tested for mutagenicity and carcinogenicity and certainly not for teratogenicity.

I think we need to start all over again and, in an orderly manner, reinvestigate all the chemicals which have become major contaminants in our foods and in our ecosystem.

What better way to do this than to convert an already established center? I think it would be most appropriate to have such a center under the supervision of the National Institutes of Health, and to have a taxpayer-supported facility that will give the people honest answers regarding the toxicology of chemicals that are to become part of their environment.

A GOVERNMENT CENTER TO TEST CHEMICALS, DRUGS

Mr. ROSENTHAL. You would call this the Rachel Carson Center?

Mr. GALSTON. It could be so called. May I add just another note: When a new chemical is developed for potential use in agriculture, that it is the burden of the manufacturer who wishes to sell that chemical to perform the tests which will satisfy such agencies as the

Federal Drug Administration and the U.S. Department of Agriculture that the chemical is not harmful to people and animals.

So they perform certain tests, usually in their own laboratories, or they farm these tests out to private consulting labs who report the results to them in private. Now, I suppose that——

Mr. ROSENTHAL. That is true of all our drugs, too, isn't it?

Mr. GALSTON. I think it is.

Mr. ROSENTHAL. All the commercial drugs sold in the United States?

Mr. GALSTON. I believe so. I think it is asking an awful lot to expect a manufacturer who has invested a few million dollars in the development of a chemical, and has now added another quarter of a million dollars for testing to be dispassionate about the results. If the results are a bit on the iffy side, what does the manaufacturer do? Does he throw this money down the drain? Does he do more tests? Or might he say, "Oh, well, nobody is ever going to ingest that quantity anyhow, even though the chemical has only been tested in rats or dogs, and you don't know exactly what toxicity it has in humans, it is probably going to be all right."

I would think that in the public interest there ought to be some higher court of appeal, or better still, a routine screening which is part of the machinery of Government, having to do with the safeguarding of the health of the people.

RESEARCH FOR DEFENSES AGAINST BIOLOGICAL THREATS

Mr. LEDERBERG. On that, Senator Nelson has introduced a bill for the establishment of the National Testing Center under the auspices of FDA. I am in general very sympathetic with that approach. I think the need for independent testing is absolutely manifest.

This is not the place to go into detailed discussion. I think there may be some arguments against having that as a Government bureau, but, rather, an independent body which would then be subject to review by the regulatory agencies. But if a regulatory agency does its own work in examining the qualities of materials, it faces its own conflicts of interest in trying to make decisions, and in trying to protect itself against every conceivable contingency, regardless of the costs of the testing, and I think that has to be taken into account as well.

I would like to put in a counter-bid for the utilization of Fort Detrick, which may be even closer to its present mission, and that is simply to open it up. I think we still need BW research. But we do not need secret research for the development of BW agents. We need open, public research that is available to the international community for defenses against biological attack, both natural and potential from other sources.

This is what I mean by fear-reducing rather than fear-generating activities. I think we coud have this staff in situ change its assigned mission very, very slightly, indeed, but open it up as an international laboratory.

EFFECT OF PRESIDENTIAL CBW STATEMENT

Mr. ROSENTHAL. Everyone applauds the President's proposal and submission, Dr. Lederberg. How much is it impaired in the scientific community by the exclusions of CS and defoliants?

Mr. LEDERBERG. Well, I think Mr. Swyter has made the most cogent remarks about the impact on the prospects of proliferation in trying to maintain those exceptions, and I fully agree with him. I don't have any quarrel at all with your criticisms of my suggestions.

Any unilateral action that we take that attempts to discriminate between some agents and some other agents opens it up to every other country to take their unilateral action about where they choose to draw the line, and you end up with the usual story of escalation in a system of mutual fear and concern.

Mr. ROSENTHAL. I can't resolve in my own mind how significant an act it was. Was it a great act of tremendous significance, or was it substantially impaired by the exclusions? Should I hail it completely, or should I half-hail it? I can't reach a decision.

A MAJOR REVERSAL OF GOVERNMENT POLICY

Mr. LEDERBERG. Well, I can certainly say it was rather more than I had expected, given the climate of discussion from various officials of the administration up to this point. It was certainly a major reversal of the basic direction of administration policy.

Mr. ROSENTHAL. Of this administration, the last administration, or the Washington bureaucracy?

Mr. LEDERBERG. I think the Washington bureaucracy would be the best characterization of it. I think one of the worst things, one of the reasons that we have been so slow in developing sound policy in this area, is that the whole issue has simply not been taken very seriously. There has always been something else more important to preoccupy the attention of ACDA and the State Department, and of the DOD in formulating policy for international negotiations, and so forth.

Something else has always been put ahead of the need to regulate the proliferation of B. & C.W. I think we have had a considerable amount of public ventilation of the actual magnitude of these activities. We have had deployment in Vietnam of chemicals on a large scale. We have had, I think, the growing appreciation of the potential side effects of the hazards that we have talked about before.

We had the accident at Skull Valley, which brought the matter to intense public attention for the first time, and made individual people worry about their own health and security in the face of these activities, and very legitimately, I believe.

I think this has brought about an awareness that there was a problem. I don't think there can really be very much of an argument about the answer to it, certainly none in the biological warfare sphere, but it has simply not had the attention of the highest level of the administration for many, many years.

Mr. ROSENTHAL. So as you say—and I do want Mr. Swyter to comment, if you would—we can be overjoyed with moderation. This should be our attitude?

Mr. LEDERBERG. I feel blessed with small favors. Let's put it that way.

PRESIDENT WENT "MOST OF THE WAY"

Mr. SWYTER. I think the President went most of the way and we should support him. I think that the diplomatic thing to do is to tell him he did very well, and then remind him that he has got a few things to take care of.

I can see, from his viewpoint, a very good reason for, last week, not associating tear gas and CS with these horrible nerve agents and anthrax and plague, because the military did act under civilian authority, and we shouldn't try to make them scapegoats of something which, in fact, the civilian authorities made the mistake with.

If we, over the next few months, find ways of stopping that use without getting people emotionally upset and without getting allegations of "This saves American lives," we are all much better off.

I think George Bunn, who was a witness here, pointed out, I believe in his testimony here, and certainly in his article in the Wisconsin Law Review, that other nations are very, very conscious of this exception that we are taking. The British have bent over backward not to say anything nasty to us, because they like to think of themselves as our friends, but officials in the British Government really feel very strongly that the way we have been using tear gas in Vietnam simply constitutes chemical warfare; that it is wrong and that in international conferences not all nations are as thoughtful about our feelings as the British are.

Since Dr. Bunn has been our representative, he has personally felt this pressure from the representatives of other governments; that they feel our action in Vietnam, particularly with regard to tear gas and also to defoliants, is just plain deplorable.

Mr. ROSENTHAL. Thank you, Mr. Chairman.

PROTOCOL NONRATIFICATION OBSTACLE TO FURTHER ACTION

Mr. LEDERBERG. May I add a comment?

Mr. ZABLOCKI. Please do, Dr. Lederberg.

Mr. LEDERBERG. I think it is important to point out our haughtiness from the Geneva Protocol, and we were the only major power to refuse to sign it, has been an impossible obstacle to getting the level of discussion to a meaningful point on the development of methods of control.

Every time the matter was even hinted at, the Russians had the unavoidable temptation to just tweak our nose about our not signing the protocol, you know, "Why should we even bother to consider the matter further?" since we had isolated ourselves. We were outlaws, by comparison to the rest of the world, by not signing the protocol, and that is all that one ever heard.

That was not a very meaningful level of dialogue, but we were so vulnerable to the political impact of having isolated ourselves in this way that we just couldn't get any further.

In a sense, it is a great step that was taken here, because it removed an important negative obstacle. It is not really very much of a positive step. The work lies ahead now, but it is now possible to do it.

I have outlined in my testimony six specific measures that I think we should proceed with. We ought to attempt to negotiate. They are

technically very complicated issues. I am not sure I presented the right answers to them, but they are the kind of path we have to go down. It is now possible to do so, and I certainly hope that we will.

ANTI-ENVIRONMENT WEAPONS

Mr. GALSTON. I wonder if I could add a note or two, Mr. Chairman.

Mr. ZABLOCKI. Please do.

Mr. GALSTON. Up until very recently, and this has been true not only of people with whom I have argued about this matter, but also of friends with whom I have discussed it, there has been a distinction drawn between antipersonnel weapons and what I would call anti-environment weapons. People were will to talk about a ban on CS, even though it wasn't lethal, because it was antipersonnel. But they were not willing to consider seriously a ban on defoliants, because that just killed a plant.

I think in view of our changing attitude toward the importance of maintaining in some sort on an intact state the only environment we will ever have, we must change that point of view.

I would think that doing damage to a large piece of real estate on the surface of this earth which might convert it from a fertile plain into a barren desert should be considered a crime against all people. I would hope that in our discussion of weaponry we would come to recognize the ecological impact of chemicals that are dumped massively into an unknown climatic and botanical complex, chemicals whose effects might not be known for many, many years.

DEFENSE STATEMENT ON MOLECULAR GENETICS

Mr. ZABLOCKI. Dr. Charles MacArthur of the Defense Department, recently in testimony to the House Appropriations Subcommittee, expressed an interest in beginning a program of weapons research in molecular genetics. I gather from all three of you that if any agency does such research, it should be an agency outside the Department of Defense.

Mr. GALSTON. One would hope.

Mr. ZABLOCKI. At the present time, all of our CBW research is being done in Defense, is it not?

Mr. GALSTON. I believe there might be some in the various NIH branches, but I am not certain of the details.

Mr. LEDERBERG. BW defense is essentially the same as public health defense. There are very few features—there are some, but they are not worth spending much time to discuss—that would distinguish the spread of a natural epidemic from the response to a concerted attack. So one could argue that a large amount of public health work, is, in fact, defensively applicable to biological warfare.

DANGERS OF WORLDWIDE EPIDEMIC

Mr. ZABLOCKI. Doctor, on page 3 of your statement you recommend more public health research against our microbiological enemies. And in reply to a question earlier, you stated the reason much has not been done in this area was because of a certain amount of apathy and lack of priority.

Is this the complete answer why we haven't done more in this field up to now, in public health research on epidemics?

Mr. LEDERBERG. That is a complicated question. I was referring to the apathy and lack of attention that had more to do with the development of high level policies with respect to biological warfare, such as eventually came to fruition with the President's statement.

I think this was the first time that the basic issues of BW ever had the kind of review, which then culminated in the President's statement. I may be arrogant in this belief, but I just don't see how it was possible to come to any other conclusion, once the policy was examined, than that the development of BW and the maintenance of capacity for it was severely detrimental to our own interests; and that was the area where apathy had played a large part in preventing an earlier fruition of this kind.

You also remind me that I raised another issue, and this is a failure on the part of the public health bureaucracy, and I mean here the world as well as the American bureaucracy, to be sufficiently sensitive to the possibility of devastating worldwide epidemic.

EXAMPLE OF HONG KONG FLU

I think there is a considerable amount of self-delusion that the antibiotics will take care of any bacterial infection; we need never worry about the plague again; the plague has been conquered by medicine; that virus infections will somehow be taken care of, although when you see a pandemic like the Hong Kong flu, you have a foretaste of what really can happen.

That was a worldwide epidemic. The attack rate was something like 20 to 30 percent of the world's population that was infected by this virus. It was not a particularly lethal one, but it is only a minor accident that it is not a lethal virus.

Such events are undoubtedly going to occur in the future that will be very much nastier, and we have simply not been oriented to take a sufficiently aggressive and sensitive view about this matter.

I think many public health authorities are reluctant to arouse public alarm, and they are afraid that this would happen if they properly exposed the dimensions of the problem. I think there is a certain amount of self-delusion that we are taking care of it, we haven't had a major smallpor outbreak in many years, and so forth.

This is a totally inadequate view of the situation. I do think that we have the opportunity to combine many motives in a constructive way in the furtherance of a very high level of microbiological research, partly dedicated to the international multinational defensive measures that each country would like to know are available to it (so that some neighboring small country that can't just take a pot shot at them on a purely random basis); but we also need exactly the same measures against worldwide disease.

This was the basis of my advocacy that we not dismantle an establishment like Fort Detrick's laboratories, but put it to a more constructive purpose.

ROLE FOR U.N. AND W.H.O.

Mr. ZABLOCKI. Doctor, on page 4 of your statement you mentioned the need for an international approach to this problem. On page 4 you list some of your recommendations; for example, the establishment of central international laboratories to monitor the occurrence of threatening organisms and to help develop generally available means of protection against them; a legal system to protect freedom of information on the subject, et cetera, et cetera.

I presume that you would advocate that this be under the auspices of an international organization, and the only one which comes to mind at the present time is the United Nations.

Mr. LEDERBERG. Yes, and WHO, I think, would be very appropriate, the World Health Organization.

Mr. ZABLOCKI. Is WHO fully equipped to undertake the recommendations you espouse?

Mr. LEDERBERG. I think they have the managerial capability. I think they have the technical interest. The WHO, in fact, prepared the technical sections of the U.N. Report on Biological and Chemical Weapons that was referred to here before.

They would be an appropriate body, beyond question. They have already developed, you might say, the political style of being able to manage some of the complicated issues that arise when you have independent sovereignties bargaining with one another on health issues. You couldn't afford not to use them as the agency for this purpose, but they haven't had very much money.

PROBLEM OF ENFORCEMENT AND INSPECTION

Mr. ZABLOCKI. In this field, however, there would be some need for enforcement and inspection. You nevertheless feel that a United Nations agency would be fully equipped with only additional funding.

Mr. LEDERBERG. The WHO would be the most appropriate agency. Certainly their powers would have to be beefed up, but you have a lot going for you when you are talking about a health issue. The kind of communication that would go on very naturally and would be called health cooperation would be called espionage and inspection if it were applied in the industrial sphere, or anything that directly related to things that could be nothing else but armaments.

The community that you have to deal with is a medical and biological community that is dedicated to human life, that does recognize its patriotic obligations, and works within the framework of the national system, but also recognizes its obligations to man. There is certainly no area where it would be more likely to be able to achieve a level of effective international cooperation than this one, and since all of our lives are mutually dependent upon it, we have that further reinforcement for it.

BIONETICS RESEARCH LAB REPORT ON 2,4,5-T

Mr. ZABLOCKI. Dr. Galston, if I may ask you another question, you have referred to the Bionetics Research Lab. I am sure you are familiar with its report on 2,4,5-T.

Mr. GALSTON. Yes, I have a copy of it here.

Mr. ZABLOCKI. The subcommittee has been provided a copy for its file, and an analysis of the report will be included in the record.[1]

Would you give the benefit of your observation and your understanding of that report's significance for the benefit of this committee, and the political impact it may have?

Mr. GALSTON. Yes. Parts 1 and 2 on mutagenicity and carcinogenicity I will not refer to, since those were published about a year ago and have been generally available in the Journal of the National Cancer Institute. In fact, they didn't show any particularly marked consequences of the administration of these chemicals.

It was in the teratogenic area where I think the political and biological impact is most marked, for they deal with chemicals which we are using in our agriculture in massive quantities. As I said earlier, 2,4-D is used in excess of $25 million worth a year; 2,4,5-T about $10 million worth a year. These chemicals have found their way into the ecosystem, and some of them persevere for quite some time.

Now the question is asked, what do they do to animals which consume them in the diet? It suddenly turns out that our previous observations of toxicity are completely inadequate; that if you consider only the animal getting a dose, and not worry about the next generation, you are not looking at the whole picture at all.

When pregnant female mice or rats consumed quantities which I think are moderate, from 4.6 up to 113 milligrams per kilogram of body weight, the offspring did not develop normally. This means that if what is true for mice and rats is also true for higher animals, including man, the possibility exists that some human malformations are traceable to contaminating quantities of these chemicals in our diet, as well as in the Vietnamese rainwater and diet. I think this leads to all sorts of public health ramifications which can only be guessed at.

CASE OF 2,4-D

I should also mention that 2,4-D, which was not taken off the list of approved chemicals in the DuBridge announcement of a couple of weeks ago, turns out in the bionetics report to be suspect, and in need of further investigation.

I think no action was taken against 2,4-D partly because such massive quantities of it are used in agriculture. That it is a little bit like the DDT story: "We know DDT is bad, but what do we do without it?" lots of people are saying, and I think the same question is being raised about 2,4-D. It kills weeds so effectively. How are we going to cultivate our fields if we don't have this tool?

What I am suggesting is that it may be necessary to back up, to go back again to mechanical means of killing weeds for a while, until we develop safe chemicals, if there are such things. It may turn out

[1] An analysis of the report may be found on p. 375 in the appendix.

that there aren't any such things, as safe chemicals, in which case the consequences for our whole technology associated with agriculture is going to have to be revamped considerably.

We won't go back to the man with the hoe, but we may have to go back to large mechanical devices that ride between the rows and kill weeds without chemicals, by the use of either mechanical cultivation of weeds, or little jets of flame, as we used to do a few years ago, before massive chemical intrusion into agriculture became the rule.

I would say that there is another moral here: There is another chemical named as dangerous in the bionetics report. This is pentachloronitrobenzene, which is used as a soil fumigant to kill insects and fungi. It turns out to be about as bad as 2,4,5-T. Now, in the DuBridge announcement nothing was said about pentachloronitrobenezene, and I asume this was true because it is not used in any way in Vietnam. It is purely a domestic issue, and is considered to be less pressing because of that, I would assume that something will ultimately have to be said about it, since it does constitute, a clear and present danger to the public health, being used in massive quantities as it is.

So I see this report as being dynamite in its implications for the future. Again, I would say that I think that we ought to start taking a systematic and close look at all of the chemicals which, in the last two decades especially, have found their way into our agriculture, into our foods and into our drugs.

RESEARCH TEAMS TO VIETNAM

Mr. ZABLOCKI. Let me ask another question. It is my understanding that a research team recently has been sent to Vietnam to study the effects of defoliants there. Can you enlighten the subcommittee on the scope and purpose of this study? Are you familiar with it?

Mr. GALSTON. I am familiar with three teams which have made visits. About a year ago, in Science magazine, there was published a report by Mr. Fred H. Tschirley, who is Assistant Chief for the Crops Protection Branch of the Agricultural Research Service of the USDA.

1. THE TSCHIRLEY MISSION FINDINGS IN VIETNAM

Tschirley went over at the behest of the State Department to survey the damage being done to the Vietnamese ecology, largely, I think, in response to some questions which were raised by the U.S. scientific community. Tschirley had exactly 30 days from door to door, to go to Vietnam, make his observations, write his report, and file it.

He was sent over in the midst of the dry season, when a lot of natural defoliation occurs, so he was under the worst possible conditions for making a good, systematic observation. I heard him give an oral report on his trip at the Dallas meeting of the American Association for the Advancement of Science in December of 1968 at which he showed some pictures. He was forced to admit that he could make no ground observations that were worth anything because it just wasn't safe to walk around where ecological investigation was needed; there was not that degree of security. I would emphasize that no survey from the air is really going to tell the story of what has

happened to the ecology of Vietnam. We are going to have to have a ground team go in.

So that was the first survey. Tschirley did publish his statement, and much valuable information came out of that, including for the first time the admission that the mangrove associations were seriously affected by our spraying operations.

On the whole, the Tschirley report tended to gloss over very many of the ecological difficulties. I don't know whether that is because he was sent over by an official agency or whether he did not have the time to develop an insight into many of the questions raised.

II. THE PFEIFER-ORIANS MISSION

The second mission of which I am aware consisted of two men, Prof. E. W. Pfeiffer of the University of Montana, and Prof. Gordon Orians of the University of Washington, who went over as individuals, supported by a small organization called the Society for Social Responsibility in Science. A report of their trip has recently been made in Scientific Research, a magazine distributed by the McGraw-Hill Co.

They support a good deal of what Tschirley says, but they document further kinds of damage, including massive ecological damage, which he did not emphasize in his own report.

III. THE CAMBODIAN INVESTIGATION

The third mission that I know about was one of which Tschirley was a part, and Charles Minarik, the head of herbicide research at Fort Detrick was also a party, that recently went to Cambodia to adjudicate the claims for damage resulting from this massive spray accident that started out in Tay Ninh Province. I have a copy of that report, too, which does acknowledge massive damage to a wide variety of plants, including many important crop plants.

Those are the three trips that I know about. The American Association for the Advancement of Sciences has said that it would like to send an investigating team over when hostilities cease, so that an adequate ecological survey can be made. It is my understanding that Prof. James Cantlon of Michigan State University, a very well known plant ecologist, is going to be part of that team, or the head of it.

I would think that we can't do anything really worth being called a scientific study until ground operations have diminished to such a point where we can get in and take a look.

THE SUBCOMMITTEE ADJOURNS

Mr. ZABLOCKI. Well, gentlemen, this has been most enlightening, and at the same time most frightening, testimony we have received. I want to, on behalf of the subcommittee, thank you for your statements, your testimony, and the direct answers you have given to our questions.

Thank you very much, gentlemen.

The subcommittee will meet next at 10 a.m. on December 9 in this room, when the witnesses will be Representative Robert Kastenmeier of Wisconsin and representatives of several organizations, including the Women Strike for Peace, and the Women's International League for Peace and Freedom.

The subcommittee stands adjourned until December 9.

(Whereupon, at 12:40 p.m., the subcommittee recessed, to reconvene at 10 a.m., Tuesday, December 9, 1969.)

CHEMICAL-BIOLOGICAL WARFARE: U.S. POLICIES AND INTERNATIONAL EFFECTS

TUESDAY, DECEMBER 9, 1969

HOUSE OF REPRESENTATIVES,
COMMITTEE ON FOREIGN AFFAIRS,
SUBCOMMITTEE ON NATIONAL SECURITY POLICY
AND SCIENTIFIC DEVELOPMENTS,
Washington, D.C.

The subcommittee met at 10:15 a.m. in room 2255, Rayburn House Office Building, Hon. Clement J. Zablocki (chairman of the subcommittee) presiding.

Mr. ZABLOCKI. The subcommittee will please come to order.

This morning the Subcommittee on National Security Policy and Scientific Developments, continues its hearings on international aspects of the U.S. chemical and biological warfare policies.

Our first witness this morning will be my friend and colleague from Wisconsin, the Honorable Robert W. Kastenmeier.

Bob Kastenmeier has been widely recognized for his studies and statements on chemical-biological warfare. He was the first Member of Congress to take up the issue, over 10 years ago; is that right, Bob?

Mr. KASTENMEIER. Yes, Mr. Chairman.

Mr. ZABLOCKI. That was in the late 1950's, when there was little interest in the country on such questions as the ratification of the 1925 Geneva Protocol, or U.S. policies on the use of certain kinds of gases.

Today, when there is nationwide concern about U.S. policies on CBW and when the President has taken significant actions toward the control of CBW weapons, Congressman Kastenmeier deserves a significant share of the credit.

Bob, the subcommittee is pleased to hear your testimony on CBW, a subject in which you have so long been interested.

You may begin.

STATEMENT OF HON. ROBERT W. KASTENMEIER, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WISCONSIN

Mr. KASTENMEIER. Thank you for the most gracious welcome. This is my first opportunity to appear before you in the years I have been in Congress, notwithstanding the fact you have been a very close

friend and my senior colleague from my own State, and I am most pleased to come here today and to state that I am also pleased to read the text of your resolution, House Resolution 733, recently introduced on the subject for the House of Representatives.

Mr. Chairman, as you are well aware, there has been a most significant and welcome development directly affecting the legislative proposal under consideration since these hearings got underway. The President's announcement November 25 on our future chemical and biological warfare policy has uniformly been well received throughout the Nation and the world. I think this is an important step on the road to disarmament, and its timing at the commencement of the SALT talks is particularly appropriate. Our total renunciation of the use of biological warfare is a practical demonstration of a reversal in the trend toward harnessing our technological skills for more efficient means of destroying ourselves. I fully agree with the President's statement that "these steps should go a long way toward outlawing weapons whose use has been repugnant to the conscience of mankind. * * * Mankind already carries in its own hands too many of the seeds of its own destruction. By the examples that we set today, we hope to contribute to an atmosphere of peace and understanding between all nations."

I think that the Congress through the efforts and interest of individual members should share some of the credit for bringing about this important step in the pursuit of a safe and saner world.

However, one very basic problem which the Senate will have to decide during its debate on ratification of the Geneva Protocol has been spotlighted by the administration's interpretation that it does not prohibit the use in war of tear gases and herbicides. I think it would be useful to the committee if I were to review some of the background to the President's statement on the use of chemical and biological weapons in order to show how far we have come in recent years, and also how much further we still have to go.

FEARED WIDER CBW ROLE IN 1959

In September of 1959, after vainly seeking official reassurances with regard to our CBW policies, I introduced House Concurrent Resolution 433, a very short resolution, stating "that the Congress hereby reaffirms the long-standing policy of the United States that in the event of war the United States shall under no circumstances resort to the use of biological weapons or the use of poisonous or noxious gases unless they are first used by our enemies." That is the text of Resolution 433 in the year 1959.

At that time, I was motivated by the fear that our military was seeking a wider future role for CBW weapons along with a change in our traditional policy of non-first-use. Through magazine articles, and other published reports, this became quite apparent 10 years ago. This apprehension was unfortunately realized in subsequent years by the extensive development and production of offensive chemical and biological agents, and by the widespread use of potent herbicides and very powerful tear and lung gases in Vietnam.

Back in 1959 and 1960, the American public, the media, and the Congress were much less aware than today of our Nation's CBW plans, capabilities, and expenditures. Congressional hearings at that

time, in the House Committee on Astronautics and Science, provided the first bare clues in this obscure area. My own resolution was assigned to the Foreign Affairs Committee, but no action was taken on it. However, during the interval, Presidential support of a kind for an official non-first-use policy was enunciated fortuitously at an Eisenhower press conference. On January 13, 1960, a reporter representing a Madison, Wis., newspaper brought up the subject citing my apprehension that the military was seeking the removal of restrictions on the initiation of CBW, and asked the President if this were true. The President replied: "I will say this: No such official suggestion has been made to me, and so far as my own instinct is concerned is to not start such a thing as that first." With the benefit of hindsight and the opportunity I have had these past 10 years to wince at the independent spirit of our armed services, it appears obvious that nothing less than a very specific order, in triplicate, would have sufficed to dampen the ardor of the Army in pursuing a freer hand in using offensive chemical and biological agents. An indication of this dedication actually misfired as public concern in this country largely has grown out of disclosures as to the extent and lethality of some of the agents stockpiled in such abundance, and I might add, unconcern for the public for whose defense these were manufactured.

At the time of the President's brief statement, however, I welcomed even this informal reassurance that we were still following our traditional policy of self-restraint, and I did not consider a further restatement of policy as being a practical possibility, which had earlier been enunciated by President Roosevelt during World War II, at the time when we were in a war for national survival. Parenthetically, I might add, that while the possibility of using chemicals against the Japanese crops was discussed, it was decided that we would not do so because it was contrary to the President's policy and earlier forms of herbicides were not then used.

My experience with the disarmament aspects of CBW, however, did lead me into the wider field of arms control later that year, particularly into the establishment of the Arms Control and Disarmament Agency concerning which the chairman played such a major role in 1961.

PROTESTED USE OF GAS IN VIETNAM

The subsequent events in Vietnam illustrated the error of not having an unequivocal high-level declaration of policy in this area of CBW. They also provide an example of how events shape policy as our military took advantage of the lack of clarity in policy to employ gas, thus breaking the precedents of nonuse in World War II and Korea. This stealthy introduction of chemical warfare into Vietnam represents a lowering of the international barriers against CBW, and to my mind, could also be considered another appropriate example of why war is too important to be left to the generals. In March 1965, I addressed the House after the first reports of the use of gas in Vietnam in the course of military operations became known. I noted Defense Department confirmation that we had supplied South Vietnamese forces with three types of tear gases, including DM, which induces nausea and vomiting and which incapacitates its victims up to 2 hours. It was also established at the time that the actual introduction of gas was au-

thorized at the area commander level without prior White House or Pentagon approval.

The next day, on March 26, 1965, 15 of my colleagues joined me in writing to President Johnson asking for an investigation of this matter. We emphasized that the use of gas not only violated traditional U.S. policy, but also set an unfortunate precedent for its use by other nations. The original justification for the use of riot control agents on humanitarian grounds to avoid civilian casualties have by now been amply proven to be largely irrelevant. Previous testimony before you, Mr. Chairman, in these hearings, and evidence presented elsewhere lead to the conclusion that the principal use of gases in Vietnam has been to drive the enemy, and I must add anyone else in the vicinity, into the open where they could be killed by more conventional means. It is also questionable whether some of the more potent types we have used could qualify as riot control agents in common use by law enforcement authorities throughout the world. Just a few of the available figures are sufficient to debunk the humanitarian argument and to demonstrate that gas has been used extensively and systematically as part of regular military operations. For example, in fiscal year 1969 alone, the Defense Department spent $81 million on riot control munitions. Since 1964 we have used over 15 million pounds of CS tear gas in Vietnam, which gives an indication of a growing addiction to its use. There should scarcely be a dry eye left in the entire country. According to testimony last June before the House Appropriations Subcommittee on Defense, the Army has developed a total of 11 new types of weapons for chemical dissemination since we started using gas in Vietnam.

THE CHEMICAL CREDIBILITY GAP

Another indication of the chemical credibility gap is found by examining the other horn of our present dilemma—the use of herbicides. The scope of our defoliation operations rebuts the contention that this has been a highly selective process without appreciable ecological damage. We have been dumping millions of pounds of herbicides on Vietnam annually. An estimated 4 million acres have been affected, including close to half a million acres in food production. The official line is still that we are not using herbicides to kill crops. I wrote to Secretary Laird at the end of October querying the wisdom of the widespread use of a particular defoliant, picloram, based on the concern of plant physiologists as to the grave ecological risks involved. I am not reassured by the vague promise contained in the response I received of some future assistance to undo the damage. Nor am I convinced that picloram is as harmless as the Director of Defense Research and Engineering would have me believe. With your permission, Mr. Chairman, I would like to have this exchange of correspondence included in the record.

Mr. ZABLOCKI. Without objection it is so ordered.

(The information referred to follows:)

OCTOBER 31, 1969.

Hon. MELVIN LAIRD,
Secretary of Defense, The Pentagon,
Washington, D.C.

DEAR MR. SECRETARY: I was pleased to hear of the recent announcement by Presidential Science Advisor DuBridge applying restrictions on the use of the herbicide 2,4,5-T. I had hoped this safeguard would apply as well to its use in Vietnam, but apparently this course has been ruled out for the time being by your Department.

According to the White House announcement, the decision on 2,4,5-T was made because of the possibility of dangers to animals and man caused by this chemical. I am also concerned over the apparent lack of restrictions on the use of still another herbicide extensively used in Vietnam—picloram (4-amino-3,5,6-trichloropicolonic acid). The widespread use of this herbicide, designated as WHITE by the Army, may be incalculably and permanently damaging extensive areas in South Vietnam, according to knowledgeable scientists. I would be most appreciative if you could provide me with the following information regarding the use of picloram in defoliation operations in Vietnam:

Have any studies been made on the persistence and drift of picloram? (I have been informed that its life span may be as long as ten years.)

Has due weight been given to the fact that picloram has not been licensed by the FDA for use on any American crops?

Are there any estimates as to the effects picloram might have on rice, the major South Vietnamese crop?

What plans are there for the continued use of herbicides in Vietnam and in what quantities?

Has a survey been made of the extensive ecological damage already done in Vietnam, and what steps will be taken to correct the situation?

I am fearful that the use of picloram could ruin large areas of Vietnam for agricultural purposes for many years to come and I hope that due consideration has been given to this possibility.

I would appreciate having your response to the questions I have raised, as well as any other comments you may have on the utility of our defoliation operations and the safeguards deployed.

Sincerely,

ROBERT W. KASTENMEIER,
Member of Congress.

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING,
Washington, D.C.

Hon. ROBERT W. KASTENMEIER,
U.S. House of Representatives,
Washington, D.C.

DEAR MR. KASTENMEIER: This letter is in reply to your recent inquiry to Secretary Laird concerning herbicides.

First, I would like to correct your misapprehension of the Department of Defense action with regard to 2,4,5-T. We have taken exactly the same course as the Department of Agriculture and Department of Interior, namely, to restrict its use to areas remote from populations. I am enclosing a copy of the directive implementing this action signed by the Deputy Secretary of Defense.

Your specific questions are answered in the following paragraphs.

There have been numerous studies done on picloram. Before using this material, DoD funded work by the Department of Agriculture in Texas and Puerto Rico to determine its persistence and other factors. It was found that picloram, applied at rates 18 times as much per acre as we are using in South Vietnam, would allow growth of agricultural crops, or of natural vegetation in the area, within one year after application.

The legal status of picloram is that it has been registered by the Department of Agriculture for use on non-food vegetation, but not for food crops. Because the questions of registration for food crops has not arisen, the FDA has not established tolerances for residues on raw foods. The FDA only establishes tolerance levels of residues for herbicides; it does not license them in the sense that it licenses drugs for administration to humans. Picloram is one of the safest of

herbicides to mammals, being about one-tenth as toxic as aspirin or one-half as toxic as ethyl alcohol.

Picloram has been used experimentally to control weeds in rice fields, and does so without damage to rice. At higher doses it would kill young rice plants, or damage the crop. It has not been used to attack rice crops in South Vietnam, and drifting spray from defoliation operations up-wind would pose no hazard to rice crops.

Use of herbicides has declined since 1967, which was the year of highest use. The area sprayed in 1968 was 22% less than in 1967, and a slight reduction is projected for 1969. It is planned to continue herbicide use, especially for jungle defoliation, as it may be necessary to reduce ambush, clear base perimeters, and disclose enemy hiding places. The quantities which will be used are dependent on the level of enemy activity, the rate at which we are able to disengage U.S. forces, and other factors which cannot be predicted.

Several surveys have been made of possible ecological damage in South Vietnam, within the limits of trying to do scientific work in active combat zones. The most recent survey, in 1968, was conducted by Dr. Fred Tschirley of the Department of Agriculture at the request of the State Department. To date we have found no reason to believe that serious or irreversible sociological or economic harm has been done to South Vietnam or its people by the use of herbicides. The Department of Defense and State have stated their intention to conduct extensive surveys and assist in lumbering, agriculture and other activities when combat conditions permit.

I can assure you that the possibility of long-term damage to agricultural areas of South Vietnam by use of herbicides, including picloram, has been given careful consideration. We do not believe that this will occur.

Sincerely,

DONALD M. MACARTHUR,
(FOR JOHN S. FOSTER, JR.).

Mr. KASTENMEIER. I am also concerned with the recently applied domestic restriction on another potent herbicide 2,4,5-T, is actually being followed in Vietnam. This herbicide was found to produce cancer in laboratory animals. The directive to the Joint Chiefs still permits its intensive use in areas "remote from population." How this is applied in practice is not known to me, but based on past performance, I have doubts. If I were a Vietnamese peasant subjected to this chemical diet along with my family, livestock, and land, I would not be reassured, but probably more concerned with the more immediate threats to my existence.

PROBLEM OF ADHERENCE TO PROTOCOL

It seems to me, Mr. Chairman, what we have accomplished through our use of gas and defoliants in Vietnam is to put ourselves in a neat little box with regard to our adherence to the Geneva Protocol. Although there is some historical evidence for the decision to exclude the use of such chemicals, the administration's present stance is for the most part dictated by the Vietnam experience and by our military's arguments for its retention. What was, as far as we know, originally a low-level military decision to first use gas in Vietnam is now accepted policy by our Government. This is so despite the contrary interpretation of almost all other ratifying states and the widespread disapproval of our gas and defoliation activities. If we are to take seriously the contentions of the present administration that we are seeking to end our direct participation in the war, and that we genuinely desire a decrease in the level of violence, the military arguments for the continued use of gases and defoliants in Vietnam are marginal at best.

I believe that Australia is the only other nation to have taken a public stand in agreement with our own in this regard. If our ratification is to have real significance in the context of world peace, why must we draw our own line as to what is permissible under the protocol? The question that must be asked is, How important to us as a nation is the retention of the option to employ a form of warfare that is universally abhorrent? Is it worth subjecting the rest of the world to the increased risk that chemical warfare will be used in the future?

By ratifying the protocol with a formal reservation, or with an informal interpretation excluding some forms of gas, we are lowering the threshold for the employment of chemical warfare in the future. We are saying that each nation should be the judge of what gases it can use in warfare, or to put it another way, what degree of incapacity it wishes to inflict on an enemy. Instead of a clear guideline we will have confusion, conflicting interpretations, and undoubtedly extensive development of the "permissible" types by many nations.

UNITED STATES HOLDS MINORITY VIEW ON GAS USE

Back in 1965, when I protested against the introduction of gas warfare in Vietnam, the point was made in the press that although the gas may not be poison, the word is. Against the backdrop of the overall morality of this Nation's role in the Vietnam conflict, our official interpretation in disagreement with the vast majority of the signatory states and of the United Nations' position, will further do damage to our stature abroad and diminish the effectiveness of the treaty. What we will be gaining in return is extremely difficult for me to see.

I think that it is incumbent upon those of us who have sought more rational and humane CBW policies in this country not to regard the submission of a 44-year-old treaty to the Senate as a signal achievement by itself. The decision to seek ratification is more in the nature of atonement for past errors and inaction. If our Nation's adherence to the treaty is to be a commitment to the future, we must demonstrate by our ratification that we are prepared to follow the spirit of the agreement, not only its letter. We cannot demonstrate our faith in the treaty unless we include the agents we have been using in Vietnam, and we will not gain the full rewards commensurate with our ratification unless this is done. In ratifying the Geneva protocol, the Senate has the opportunity of breaking with a dubious tradition of relying on the advice of the military on essentially political matters, I urge it to do so.

Mr. Chairman, I would like to commend you and your committee for giving this serious policy matter a public hearing, and for taking the interest and initiative in it.

Thank you, Mr. Chairman.

POTENCY OF GAS

Mr. ZABLOCKI. Thank you, Mr. Kastenmeier, for your excellent statement. Again, I want to commend you for all of the efforts you have exerted in the past in calling public attention to this very serious policy matter.

I note in your statement that on several occasions you referred to the very powerful, more potent type of tear gas used in South Vietnam. Would that indicate that if the agent were, in your opinion, a less potent or not as powerful gas as CS, its use would be permissible?

Mr. KASTENMEIER. An excellent question, Mr. Chairman, and I must say that my own adjectives were unnecessary.

No; I have long drawn the distinction, whether a nation uses riot-control gases against its own population is one thing, but it is quite another to open "Pandora's box" and to use it in the context of war or combat operations, because among other things, there is no limitation as to where it might end.

NO RATIFICATION VERSUS RATIFICATION WITH INTERPRETATION

Mr. ZABLOCKI. In view of your views as stated on page 5, relative to the ratification of the protocol, if it came to a choice between ratification of a protocol with an interpretation allowing continued use of tear gas and herbicides in Vietnam, within limitations, versus no ratification of the protocol, which would you choose?

Mr. KASTENMEIER. That, for me, is somewhat of a dilemma, although I think insofar as we apparently have approved use of herbicides and tear and nauseating gases in Vietnam, as a policy matter presently, that we would have more to gain by ratification with reservations than no ratification whatsoever—and may I say in the hopes that in the future we would negate the reservations.

Mr. ZABLOCKI. You will agree, then that our first step should be ratification promptly?

Mr. KASTENMEIER. Yes.

Mr. ZABLOCKI. Prior witnesses said if we would try to add even the British proposal on biologicals to our interpretation we would be causing some concern, and that it would be best just to ratify the Geneva protocol and then take subsequent other steps internationally to outlaw the production and stockpiling of chemical and biological agents.

Mr. KASTENMEIER. While I haven't considered this at length, I think I would agree with that statement.

IMPROVING HOUSE RESOLUTION 733 ON CBW

Mr. ZABLOCKI. You did very kindly refer to the resolution that I introduced as a result of the President's resubmission of the Geneva protocol to the Senate. House Resolution 733, as you know, provides some encouragement to the Senate. It states that the House respectfully urges the Senate to ratify the Geneva protocol.

Because I hold your judgment in such high esteem, I would like your suggestions, if any, for strengthening and improving it.

Do you have any suggestions?

Mr. KASTENMEIER. None, other than to suggest that there be no reservations as to their herbicides and tear gases, but I can understand why it does not include such language.

The only phrase that I wondered as to what the chairman had in mind was on page 2, line 8. It should be followed by comprehensive review of U.S. policies in the field of chemical and biological warfare.

Other than that I can see no verbiage in the resolution whatsoever that I have any question about.

Mr. ZABLOCKI. Well, the purpose of the language at the beginning on line 8, page 2, was to further attempts for new studies and review, to take into consideration, for example, the British proposal, and the proposal of President Nixon to abolish the production and stockpiling of biological agents or even the development. My resolution's purpose in the resolve clause on page 2, line 12, was that our Government should develop a policy which would work toward abolishing any chemical and biological uses in war.

Mr. KASTENMEIER. Well, with that in mind I would certainly support his resolution.

Mr. ZABLOCKI. I want to thank you for your excellent statement. Mr. Fulton.

PHILOSOPHY BEHIND U.S. VIEW OF WAR

Mr. FULTON. We are glad to have you here and I think you made an excellent statement. As Congressman, you always are in the forefront of progress. I believe that the United States must take the lead in progress in moving against chemical and biological warfare.

My question comes as to the philosophy behind the way we look at a war.

War is for the purpose at present, of killing or permanently injuring with enough property destruction on the side that the people on whom the war is waged, give in and do what the other winning side says. They bow to the will because of destruction of persons and physical resources. That is the war, as we know it with weapons.

Then there is the economic-type war which can be fought either aggressively or it can be fought negatively through trying to starve people into submission through methods that are called nicely sanctions, backed up by blockades.

My feeling is that we should move against every kind of war in this world as a method of settling our disputes among nations, among peoples, and really, among individuals.

Within the various groupings of the world, there is generally a ban on this kind of action. It is pretty uniform through every country that violence will not be tolerated by the ruling power within a particular economy or a people, as a means to change that ruling power or its policy.

But my question is: If we are ever to move through to the peaceful solution on disputes on these various levels, shouldn't we be moving away, really voluntarily, rather than reciprocally? The United States is the most powerful, and as a corollary to that, the greatest power often causes the greatest fear.

Would you agree to that?

Mr. KASTENMEIER. I think I would agree with the gentleman's statement, and I know his own devotion to world peace and rule of law predates even my earliest days in Congress.

I think, politically, however, I understand why some people interested in national security and international security tend to think of the military traditionally as absolutely necessary to assure defense.

In fact, I think we all must agree, even though we are at the SALT talks today, this still pertains. Therefore, it is a question of how we harness the great military force that we have and how we can persuade other nations to do likewise.

We have always felt that if it is rational for us to do something, it is rational for adversaries to do the same, and we might do this reciprocally, the Soviet Union—with others, through the SALT talks, for example, or through international agreements as the Geneva Protocol of 1925.

Sometimes this Nation has not taken a proper lead. As I indicated in my statement, I had an early interest in chemical biological warfare and even considered its disarmament aspects, but I moved toward more comprehensive arms control and disarmament as a subject, and away from CBW as a more narrow area. But I have also been concerned about the use of technology by the military without strong policy controls; without international agreements. While I would be in agreement that we might take the initiative and not necessarily always rely on reciprocal accord. Nonetheless, his practically seems the best way to proceed at the present time in the nuclear field.

I would think, however, in the CBW we could proceed unilaterally by adherence to the Geneva Protocol, by giving up some of the herbicides and gas uses we presently employ in Vietnam. So, I think I am in agreement with the gentleman from Pennsylvania, at least I am in agreement with the major thrust of his views, and I am well-acquainted with them.

METHODS OF ARMS CONTROL AND DISARMAMENT

Mr. FULTON. I think we are fairly in agreement.

My point is that possibly the method of doing it, of striving for arms control and disarmament, starts at the point where each nation has a loaded pistol or nuclear weapon at the other's temple. Then the question is: How do nations get size of force moved down and away without being taken at a disadvantage or by surprise? That method so far and historically has been, by treaty, public or private, or by agreement; by balance of power; by maneuvering in a diplomatic field that is a mass of boobytraps.

The trouble with that kind of approach is each operator looking for the other fellow to have him back into a boobytrap when he doesn't watch too closely, or lets down his military guard.

Mine is a completely different start. Because at one time I feel we must decide that we are going to treat everybody in the world as human beings. Once we take that premise, we do not start with the premise that each one has a pistol at the other one's temple.

That makes me look at what these arms control and disarmament conferences really are—I remember the first one that I really took cognizance of was the Kellogg Treaty as a student. I was utterly entranced by the fact that it was going to be the end of all war. War was going to be renounced, the arms were to be reduced and this was the beginning of the end. Unfortunately I found myself in so-called World War II on a Navy carrier fighting a war.

Maybe the premise, the point in the area of reference upon which we start is wrong. Maybe the fact that we are able to destroy and pos-

sible enemy 20 times over and they can destroy us eight times over in nuclear warfare, is the wrong premise.

Couldn't we switch our U.S. premise, that we are going to say that we are going to have to start out on a confidence basis, even if it simply means we get one person to go to a field and take a rifle and hand a representative our single rifle—we hand him ours and he hands us one. Maybe the nations are starting arms limitation talks at the wrong end, too. Nations are always in these agreements talking about permanent, total, and complete disarmament, and the alternative of complete destruction; not only of ourselves, but of our possible enemies in the world.

How can the world and its nations get out of this terrible dilemma? Because otherwise nations are just picking around on the icing and the decorations of the cake. The balance of terror remains, even if nations do have a disarmament and arms control agreement, the balance of terror is there.

What do you say to that?

HESITANCY IN ARMS CONTROL NEGOTIATIONS

Mr. KASTENMEIER. Well, I find the gentleman from Pennsylvania very persuasive. I have very little argument with him. As a matter of fact, when we went into a number of negotiations, the nuclear test ban, for example, I was appalled at the grave reservations so many had in terms of its affecting our own security.

They said we ought not have a ban because our adversaries might cheat in some form. With such a preoccupation and obsession with that word security, we are fortunate to have, indeed, any progress at all in that field, and so I certainly agree with what the gentleman is saying.

I would be for a more direct approach than some of the more formal approaches that we have made and some of them have not been, in the historical sense, very successful.

Mr. FULTON. Could I make a point here? Are the nations and people so afraid of each other, as the military people think we are, and so much at the trigger with each other, among these large nations? If this had been really the fact, it was really the most simple-minded thing in the world for Khrushchev to come to this country as the head of the U.S.S.R., because on this basis, the United States had the most wonderful hostage for us to hold or to do in. And likewise when President Nixon visited Rumania. Were this true, he could very well have been held as a prime hostage and there would have been a tremendous price to free him.

But the answer to it was President Nixon was perfectly safe in Rumania, and so was Khrushchev in the United States.

The question is: When nations are able to guarantee safety for certain prime individuals, why can't the security of all of us be guaranteed in the same measure? Why don't we start working in various fields to develop the constructive approaches so that the animosities and disputes do not become major, overshadowing everything?

Is the philosophy wrong here? Are we in this generation just starting again to go through a whole generation series of so-called limitation agreements that in the end are really not anything but a surface foam and subterfuge?

BELIEVES PROGRESS IS BEING MADE

Mr. KASTENMEIER. I must say to the gentleman from Pennsylvania I think we are making progress, though. I think we are now tending to put military recommendations in proper perspective.

Ten years ago on this subject when the gentleman was a senior member of the Science and Astronautics Committee, he remembers the testimony before his own committee.

Mr. FULTON. I am glad you brought that up; that is very fine of you to point out our progress in philosophy in America.

Mr. KASTENMEIER. General Creasy testified, "What do you expect us to do?" when asked whether we should ban first the use of chemical-biological weapons, said, literally a quote, "What do you expect us to do, fight the war with one hand tied behind our back?" And this was very persuasive with the gentleman's committee and with the Congress at that time.

I think we have broken out of that shell and I think we are making progress.

Mr. FULTON. What are the dangers to this line of approach in your judgment?

Mr. KASTENMEIER. The arguments are used that not only is chemical and biological warfare humane, it can be the most humane, if we use a lysergic acid compound; for example, we can put enemy soldiers out of action for a long period of time without causing any great injury to them.

This really opens Pandora's box to a world in which I am not sure we want to live. If the technological extension of that is to, indeed, put whole populations under one's control for hours or days, or periods of time, I think this is as dreadful as some of the injury that one can conceive.

Mr. FULTON. I don't like the alternative that we then kill them or maim them piecemeal over a period of time. There must be some way to get security and world progress on constructive lines, that gets the world's peoples out of these unwanted alternatives that must be chosen. We are thinking of what the dilemma is and that the world's peoples continuously have to pick maybe the best of two evils or the least injurious; what do you think of that?

Mr. KASTENMEIER. That is not my alternative, I say to you gentlemen. I personally favor not making a choice there. My choice, still, incidentally, goes to proscribing or prohibiting areas of weapons and making progress internationally, or, as the gentleman suggested, unilaterally where it is quite possible to make concessions in world peace without really injuring national security.

I prefer to limit use of weapons, not to add to the arsenal of weaponry; notwithstanding the fact that some weapons are newer, cleaner, more sophisticated, and less harmful, because when you open Pandora's box you get many things, and the sort of lysergic acid gases and other things that might be used are only a part of a rather dreadful whole, and just as I say, I would prefer not to have them available.

THEORIES OF WAR

Mr. FULTON. In examining these philosophies, which neither of us likes or accepts there is the theory of war of a person against a person. Could you have a war of people against things? For example, if you don't bomb the people of North Vietnam could you bomb the dikes; that is the means of the support of their bodies, without hurting the bodies? Could in reality war be reduced down to things against things, rather than people against people?

What do you think of that?

Mr. KASTENMEIER. No: I think that, too, has problems for me.

We in Vietnam already attack things as we did not in World War II. We attack the crops and foliage of millions of acres.

Mr. FULTON. You would not do that either?

Mr. KASTENMEIER. I would not.

Mr. ZABLOCKI. I would like to comment. In bombing the dikes you would not really save the people, because not only would their crops be put under water, but the people would be drowned. They might be drowned by the millions. I think we have to bear that in mind. That is more inhumane than anything we have done in Vietnam.

Mr. FULTON. I believe that when adverse actions are instituted by peoples against peoples, there are no degrees of inhumanities, is what we come to as a basic philosophy.

I believe even so-called economic warfare between two peoples is outdated, and dangerous to world security and progress.

Mr. ZABLOCKI. As we seek peace, we can try to be more humane in warfare.

Mr. FULTON. Thank you very much. I enjoyed your appearance.

CORRESPONDENCE WITH DOD ON PICLORAM

Mr. FRASER. I have read your statement, which is excellent. I was interested in the letters which would be made a part of the record, in which the Army or the Defense Department is taking the official position that we are not using herbicides to destroy food crops.

Is that recent correspondence?

Mr. KASTENMEIER. The correspondence I have made available, I think, to the committee was relative to the picloram.[1] It doesn't go to that point, as I recall, although that point has been made elsewhere.

I have the correspondence here. The Defense Department says that picloram as used would allow the growth of agricultural crops in the area within 1 year after application. So they do talk about it but they don't say it hasn't been used at all. They do say it has not been used to attack rice crops in South Vietnam.

Mr. FRASER. Which leaves the suggestion that it has been used to destroy other kinds of crops?

Mr. KASTENMEIER. Yes.

Mr. FRASER. When I was in Vietnam, my recollection is that the practice was freely discussed of destroying crops in areas that were considered under the control of the Vietcong or Liberation Front. And this, too, troubles me because it seems to me there are uses of chemicals

[1] See p. 139 for documents.

in warfare which would seem to be within the proscription of the Geneva Protocol.

Mr. KASTENMEIER. And indeed, if I may say, I think goes beyond what heretofore has been our own policy.

In 1944 or 1945, the Chiefs of Staff at that time considered its use against the Japanese rice crops and decided that the national policy proscribed its use and they did not use it against the rice crops of Japan. But we do find it is being used in this war. So there has been a new interpretation of our policy permitting its use. It has been a lowering of our standards.

ROLE IN CREATION OF ACDA

Mr. FRASER. Well, I hope that the Senate action on the protocol is undertaken in such a way that we will not have established a formal reservation of qualification to the ratification of the protocol.

I might add that I know you are one of those who very early were pushing for the establishment of the Arms Control and Disarmament Agency. That is right; isn't it? That is before I came to Congress.

Mr. KASTENMEIER. Yes. In 1960, a number in the House and in the Senate had a prototype; a peace agency, or I think as then Senator John Kennedy proposed, had an Institute for Arms Control. And in 1961 this was again introduced and the chairman of this subcommittee and the chairman of the full committee of the Foreign Affairs Committee were instrumental, along with many others, in getting it passed in September of 1961. And the Arms Control and Disarmament Agency was created. But its seeds were a couple of years earlier than that.

Mr. FRASER. I have been impressed with the importance of that Agency as we moved into the nuclear era. Of course we were in it at the time the Agency was created. The need for rationality in discussing strategic forces and the maintenance of some kind of reason in this field cannot be overstated.

This leads me to have considerably more confidence in our Government, knowing that the Arms Control Agency is there; it provides a point of view which is separate from that of the Pentagon.

I want to congratulate the gentleman on this statement. I think it is first rate.

IMPLICATIONS OF DOD CORRESPONDENCE

Mr. ZABLOCKI. I can ask another question on picloram: you presented in your testimony the correspondence from the Department of Defense. About the letter from Dr. Foster, you pointed out that you were not reassured by the vague promises contained in the response that there wasn't grave ecological risks involved, and that Dr. Foster's reassurance that some future assistance would be given to Vietnam to undo the damage did not satisfy you. In my opinion, that letter implied at least that picloram had been used in Vietnam and that there was some damage, not necessarily limited to areas other than rice paddies.

Mr. KASTENMEIER. I think that is true.

Mr. ZABLOCKI. Is my interpretation correct?

Mr. KASTENMEIER. Yes. The Defense Department uses it extensively. One, of course, has to appreciate the restraint in the language and read

between the lines, but the language is: "To date we have found no reason to believe that serious or irreversible psychological or chemical harm has been done to South Vietnam or its people by the use of herbicides."

The Departments of Defense and State have stated their intention to conduct extensive surveys and to assist in lumbering, agriculture, and other activities when combat conditions permit, which indicates that they recognize that some assistance will be required to undo the harm.

Mr. ZABLOCKI. So there was damage.

FUTURE USE OF CBW FACILITIES

My final question is: Earlier, if you recall, the members of the committee will recall, there was a very unique suggestion for the future use of Fort Detrick and Pine Bluff. The suggestion was that these facilities be used for research and development but to have some defensive research on chemical and biological agents, but not under the military. Have you any suggestion or ways in which the biological warfare facilities at Fort Detrick and Pine Bluff might be beneficially used?

Mr. KASTENMEIER. No, Mr. Chairman, I do not; although I do think that insofar as they are laboratories, they can be converted to study, particularly in the biological field, under the programs of the National Institutes of Health or the Public Health Service, the Surgeon General, against diseases and illnesses that are caused by bacteria and whether in a hostile fashion or otherwise. I think they could still be used for this purpose.

HOW THE USE OF GAS BEGAN IN VIETNAM

Mr. FULTON. You have made a statement that I was going to refer to on page 5 of your statement, Bob: "what was, as far as we know, originally a low-level military decision to first use gas in Vietnam is now accepted policy by our Government."

Could you supply for the record when you think this became our U.S. Government policy; what actions back that up, when there is no direct statement at any particular point of time to this effect?

With the chairman's permission, just supply it for the record.

Mr. KASTENMEIER. May I submit for the record, an exchange of correspondence I had with the Secretary of the Army in 1965 relating to this, some of the background material we have? It was my understanding that at the time the use as such had not been cleared at the White House or the very highest levels, the State Department or Pentagon, but was considered at some point a low level and put into instructions to area commanders. And I was dismayed that the person responding to this in March 1965 was the Secretary of State, after the fact and supporting the area commanders. I thought it was really gratuitous for the Secretary of State, in a sense, to involve himself approvingly, and after the fact. This did give approval at a high level. And, as I say, I think thereafter established it as national policy, although I do have some correspondence, I think, touching on this point that I could make available.

Mr. FULTON. With the chairman's permission could we have the staff member then help document this policy with the witness so that we have a point of time where we can see how this policy develops? I think it would be very good historically to have this reflected in the record.

I believe the witness pointed out that the policy has been developing over a long period and how it developed I think is a very good example of how events make policy.

Mr. KASTENMEIER. Mr. Chairman, I hope I can document this. This goes back a number of years.

Mr. ZABLOCKI. It would be most helpful if your correspondence would shed some light on this particular situation. Apparently gas was approved at a low level for a limited use and then was escalated and used beyond the purpose agreed upon. There was, indeed, no formal Government policy accepted by tacit approval or by formal decree that it could be used for the purpose of flushing out and killing.

Mr. FULTON. I would request our professional committee staff member from the point of view for the Government should likewise supply for the record how this policy was developed, because this is the same way Vietnam developed.

Mr. ZABLOCKI. I might say to the gentleman from Pennsylvania we will have a representative of the Army Chemical Corps here on December 16 in open session for a statement, and for classified questioning in closed session, so we can go into the matter in depth.[1]

Mr. FULTON. May I say, Mr. Chairman, I agree with the witness and with you that we must ban chemical-biological warfare; secondly, that when we are looking into a subject like this, I think it would be better in the context of what has happened to have information for the record rather than being in a tug of war, either in secret or open session, with the Chemical Warfare Division of the Army.

Mr. ZABLOCKI. I agree with the gentleman and I intentionally didn't comment on his earlier philosophical discussion of war because my own personal view is that if we can only reinstate the constitutional provision that only Congress can declare war, we might have the answer. But let's not discuss that this morning. I want to again thank my colleague from Wisconsin for an excellent statement and a fine presentation and we are deeply grateful for taking so much of your time.

I might also advise the gentleman that the Library of Congress is now doing a study for the subcommittee on this very matter. We will go into it in depth.

Thank you, Bob.

The subcommittee will next hear the remaining witnesses scheduled for today. We will hear from Dr. Judith S. Bellin, of New York, representing Women Strike for Peace. She will be followed by Mrs. Patricia A. Samuel, of Washington, D.C., who will present a statement on behalf of the Women's International League for Peace and Freedom; and Dr. E. James Lieberman, representing the Scientists' Committee on Chemical and Biological Warfare.

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[1] This material was provided in the testimony of Rear Adm. William Lemos, spokesman for the Department of Defense; see p. 224.

LETTER BY THE HONORABLE CHARLES CONRAD

I would also like to bring to your attention at this time a copy of a letter to President Nixon which the subcommittee has received from the speaker of the California Assembly, the Honorable Charles Conrad. Mr. Conrad was not able to appear personally today, but has asked that his letter be made part of the record and that it be distributed at this time. Copies may be found on the press table and, without objection, the letter will be placed in the record at this point.

(The letter referred to follows:)

ASSEMBLY, CALIFORNIA LEGISLATURE,
Sacramento, Calif., November 27, 1969.

RICHARD M. NIXON,
President of the United States,
White House, Washington, D.C.

DEAR MR. PRESIDENT: You may perhaps recall conversations in which I mentioned my interest and concern over our capabilities in the field of chemical and biological warfare.

For nearly a decade I have tried to help initiate honest and balanced debate so that any decision would be based on fact rather than propaganda. Now, with your announcement of November 25, it would seem that the die has been cast.

Those who oppose our involvement in Vietnam never cease talking of their "moral" compunction to demonstrate their beliefs. I feel the same necessity, as this debate ends, to at least place in the record my feeling that we have chartered a dangerous course, a mistake this nation may *not* live to regret.

With these opening remarks may I respectfully submit the following points in answer to your pronouncement of November 25, 1969.

1. WE ARE SIGNING A TREATY THAT IS IMPOSSIBLE TO POLICE

We should not ratify the Geneva Protocol or limit our capabilities in the field of chemical and biological warfare *until* the scientists advocating this policy can produce a *specific* method of inspection.

In the past decade I have read literally scores of articles seeking to outlaw chemical and biological weapons. This includes such reports as the Pugwash Conference sponsored by Cyrus Eaton and attended by Linus Pauling and other scientists of his political persuasion.

Not one of these articles has ever produced a *workable method* of inspection. Instead, we have been presented with such inane suggestions as the one mentioned by Congressman Richard D. McCarthy, recommending an "open inspection system," one in which "all biologists would report, by word of mouth, any suspected violations."

Can any intelligent American actually believe a Soviet biologist, working for the Red Army, would attempt to sneak out of a closely guarded military base to report "by word of mouth" any Communist activity in this field?

The simple truth is, inspection of chemical or biological agents is impossible. A beer factory or fertilizer plant could be converted to military use within hours.

Chemicals used in every day commerce can be changed into lethal military agents almost overnight. Laboratories designed to produce vaccines to improve the health of a nation can covertly produce biological warfare agents.

May I call to your attention the article in The Periscope Newsweek, December 1, 1969, entitled "Nerve Gas: Just Mix and Serve" which contained this statement "the Army hopes this development will enable it . . . to buy the components from commercial plants."

While this story contains some inaccuracies, it points out the fact that *any* nation can manufacture chemicals ostensibly for commercial purposes and transform them overnight into chemical weapons.

In addition, chemical and biological weapons do not require military hardware, i.e., war planes, submarines, guided missiles, etc., to deliver them upon an enemy target.

Thus the Soviet Union could propose *complete disarmament* together with inspection, and then at a later date utilize fishing vessels, commercial aircraft or saboteurs to attack us with chemical or biological agents.

2. GRAVE LEGAL QUESTIONS ARISE FROM YOUR SUGGESTION THAT WE RATIFY THE GENEVA PROTOCOL, BUT WITH THE RESERVATION THAT THIS DOES NOT APPLY TO RIOT CONTROL CHEMICALS OR TO OUR DEFOLIATION PROGRAM

I have not had the time to secure a legal opinion from the California Legislature's Legislative Counsel, but you, as an attorney at law, must recognize the problems that will arise. Suppose, for example, the Soviet Union proceeds to utilize *incapacitators*, explaining, that *they* have adopted *this* reservation. There are even those who would classify mustard as an incapacitator because, although it produced the greatest number of gas casualties in World War I, the mortality rate was only 2% and this could easily be reduced by manufacturing a diluted form of mustard.

There is the additional question of what will happen if the United Nations refuses to accept this reservation? May I call to your attention the report of the Secretary General U-Thant titled "Chemical and Bacteriological Weapons and the Effects of their Possible Use," transmitted to the United Nations on 30 June 1969.

On page xii of the Foreword Mr. U-Thant states:

"2. To make a clear affirmation that the prohibition contained in the Geneva Protocol applies to the use in war of *all chemical, bacteriological and biological agents (including tear gas and other harrassing agents)* which now exist or which may be developed in the future;"

Ratification may even hamper those in the field of law enforcement. Traditionally whenever tear gas is used to disperse a crowd, one of the agitators will claim "chemical warfare is being used in violation of the Geneva Protocol." Occasionally reference is made to the Nuremberg Trials. At best we will see a rash of lawsuits aimed at restricting the use of tear gas by law enforcement.

3. THE GENEVA PROTOCOL IS AN EXAMPLE OF HYPROCRISY AND CYNICISM UNWORTHY OF RATIFICATION BY THE UNITED STATES

World War I saw the development of a number of new weapons capable of inflicting great loss of life . . . the submarine, the airplane, the dirigible, the flamethrower and the tank, to mention but a few. The United States clearly demonstrated its willingness to support *real* disarmament then, as we did following World War II. But our allies were unwilling to deny themselves any of the aforementioned weapons of war. France, for example, destroyed the Washington Disarmament Conference by refusing to give up the submarine.

Finally, with complete cynicism our allies voted to outlaw only chemical warfare because, at that time, Germany had the most advanced chemical industry.

It is to the credit of the United States Senate of that day that they refused to sanction this hypocrisy and voted to return the measure to committee.

In fact, for 70 years the United States has taken an intelligent and logical attitude toward chemical and biological warfare. At the Hague in 1899 a United States Naval Officer, Captain Alfred T. Mahan, said that it was illogical to say it was inhumane to asphyxiate a man with gas, but permissible to blow a hole in his ship casting hundreds of men into the sea to be choked to death by water.

More pertinent to present conditions was the statement by General Amos Fries who told the Senate in 1925 "an outlaw nation would always use this weapon against us if it felt it could gain victory by so doing." That admonition is as true today as it was 44 years ago.

5. THE DEPARTMENT OF HEALTH, EDUCATION AND WELFARE IS NOT QUALIFIED TO CONDUCT RESEARCH IN THE FIELD OF BIOLOGICAL WARFARE

Just as I challenge any scientist to develop a system for inspection of chemical and biological warfare, so I challenge the ability of the medical profession to develop a "magic" antitoxin or toxins that would provide for protection against any biological weapon the Soviet Union might utilize.

Even assuming it were possible to do so with all known potential biological warfare agents, it would be a comparatively simple matter for the Soviet Union to develop entirely new biological strains or mutations of known biological agents.

There has been an unfortunate tendency of those in government to rely on the theory put forth by such scientists as Dr. Meselsohn of Harvard. These scientists picture a biological attack as a move of desperation by an enemy in an all-out war in which we would respond with nuclear weapons.

This theory fails to take into account the flexibility of the biological weapon.

Suppose, for example, the Russians launched a covert attack in the metropolitan areas of our great cities, releasing an agent such as VEE (Venezuelan equine Encephalomyelitis) in such areas as subways. This virus is non-contagious and rarely fatal, yet its victims are incapacitated for a period of from three to ten days.

Question: Would you, Mr. President, as Commander-in-Chief, order retaliation with nuclear weapons when few, if any, American deaths had occurred?

Yet our country might be so weakened through panic that the Soviet Union could force great concessions from us.

While it is true it is difficult to predict the effect of an attack by biological agents, we should credit any enemy with the intelligence to utilize agents that are non-contagious and at least partly controllable.

6. IT IS DANGEROUS TO OUR NATIONAL SECURITY TO EITHER EXPOSE OUR HAND OR RESTRICT OUR ARMED FORCES BY SAYING IN ADVANCE WHAT WEAPONS WE WILL OR WILL NOT USE

As one who has played football, you know a coach does not tell the other team what plays he will use. Security prevents a full discussion of the successful Communist propaganda during the Korean War in which our forces were falsely accused of utilizing biological warfare.

It can, however, be recalled in open correspondence that when our forces were suffering heavy casualties and when commanders in the field begged to be allowed to use even tear gas, this request was denied by those in authority in Washington. Yet those same people *praised* the commander of an American prisoner of war camp who put down a riot by Communist prisoners with tear gas and cited that humane treatment in comparing our treatment of prisoners of war to that of the Communists.

7. WE MUST BE PREPARED AGAINST THE POSSIBILITY OF SABOTAGE THROUGH CHEMICAL AGENTS

This subject has been completely ignored in the current debate possibly because of security regulations. However, the Congress and the public should, at least, be informed that our most vital instruments both of peace and war . . . nuclear reactors, guided missiles, atomic submarines, commercial aircraft . . . could be sabotaged in a matter of seconds and this action go undetected unless our security people had been alerted to the point where they were conducting an intensive investigation of every individual in the vicinity.

8. CHEMICAL AND BIOLOGICAL WEAPONS MAY BE A GREATER THREAT TO OUR NATIONAL SURVIVAL THAN THE ATOMIC BOMB

Ever since wars of aggression have been waged, they have been waged with the idea of seizing the wealth and territory of another country.

Why then would the Communists risk the destruction that would accompany an atomic attack even if they were successful, when by temporarily immobilizing our population and defenses by using chemical and biological weapons, they might seize our civilization complete with slave labor?

I realize that your statement of November 25 does not eliminate our defensive capabilities, but I very much fear, that had we not been *first* to utilize the atomic bomb, we never would have developed such a weapon and would have had to face, unarmed at a later date, a Soviet Union with a monopoly on nuclear capabilities.

Thus I feel that Congress should give honest consideration to the *first* use of chemical and biological weapons by our forces for the following reasons:

9. THE INCAPACITATOR IS POTENTIALLY THE MOST HUMANE OF WEAPONS

Mr. President, you have in your statement eliminated the first use of incapacitating chemical agents. At the same time you, as Commander in Chief, are facing the agonizing charges that some American soldiers have massacred women and children.

We cannot disregard the terrible fact that modern guerrilla war frequently will see women and children utilized to kill American soldiers.

But for the atomic bomb, you and I might have faced a similar situation. I recall the statement of a Japanese businessman, brought to America under one of Mayor Yorty's projects, where he related that, as a boy, he was told to be ready to wrap hand grenades around his body and throw himself before the advancing American forces. I think that under such circumstances the Armed Forces of our generation might well have found themselves shooting down women and children.

Here the incapacitator can play a vital part. Had we been able to immobilize the people of My Lai, is it not possible that the massacre . . . if it did occur . . . might have been avoided?

I recognize the technical problems in the use of incapacitators and the difficulty of finding a dividing line between temporary incapacitation and permanent injury or death.

However, it can be stated, without violating security, that we have reached a point where such agents could be used on a trial and error basis because any small number of casualties that might occur as we developed the technique would be far less than now suffered by the enemy with the use of our conventional weapons.

10. CHEMICAL AND BIOLOGICAL WEAPONS MAY BE NECESSARY FOR SURVIVAL IN AN ALL-OUT WAR

Those in public office, particularly at the national level, must have the courage to admit publicly that we face a possible all-out attack at some future date from Red China or the Soviet Union.

In the case of Red China, particularly, we must also admit that they may be better able to survive a nuclear attack than we. They do not have the vast industrial complex that we and the Soviet Union possess, and they have a disregard for human life which could make the two or three hundred million deaths from nuclear warfare acceptable to them.

But Red China *cannot survive* the destruction of her food supply. Thus we should never deny ourselves the one weapon Red China fears above all others, namely, a chemical or biological agent that will destroy their rice and wheat crops.

I realize that in a letter such a proposal sounds inhumane. May I call to your attention however, that it was an American President noted for his humanity, Abraham Lincoln, who developed the campaign of destruction of crops in the war against the Confederacy. This type of war was successfully waged even over the objection of some of Lincoln's military leaders, particularly General Meade.

In addition, unlike conditions that existed a century ago, our nation has surplus food and a record of humanity toward our defeated foes.

Certainly our nation would do its utmost to alleviate the suffering of the Chinese that would follow such a war, just as we did in the instances of Japan and Germany.

As I said at the beginning of this letter, I realize that in all likelihood the die has been cast. If so, this may be my last statement on the subject. I know my position is an unpopular one, but I also know this attitude has been created, at least to some extent, by the falsehoods disseminated through the news media.

Therefore I have made these remarks for the record and with that await the judgment of history.

Rarely does anyone, especially a politician, hope to be wrong, but in this case I would rejoice in being in error.

On the other hand we may be facing another Pearl Harbor from chemical and biological weapons and I wonder as to the ability of our nation to respond to such an attack if the proposals outlined on November 25, 1969 are adopted.

Respectfully,

CHARLES J. CONRAD.

Mr. ZABLOCKI. Dr. Bellin, Miss Samuel, and Dr. Lieberman.

STATEMENT OF DR. JUDITH S. BELLIN, NEW YORK, REPRESENTING WOMEN STRIKE FOR PEACE

Dr. BELLIN. Thank you for the opportunity of appearing here today. I work in the area of photochemistry and photobiology, which means I am involved in research in an area where biology chemistry and physics overlap, so I have kept my statement intentionally brief, hoping that perhaps you may direct more technical questions to myself and I hope to Dr. Lieberman, as well.

Chemical and biological weapons present a threat to mankind, perhaps surpassing in potential global effects the destructive capacity of nuclear weapons. Bacteriological weapons are capable of causing worldwide epidemics which could engulf friend and foe alike. The use of chemicals as biological weapons could set in motion irreversible ecological changes which might well destroy the basis for human life forever. These weapons can be produced far more cheaply and easily than can nuclear weapons. Any country, however small, could produce and stockpile these weapons, thereby creating a major threat to mankind.

The use of chemical and biological weapons has long been regarded as abhorrent to civilized opinion and is prohibited by the Geneva gas protocol of 1925. This protocol has been signed by 84 countries, including the United States.

We remain the only major power which has failed to ratify it. Nonetheless, the protocol is considered, by our Government, to form a part of customary international law.

STATEMENT OF WOMEN STRIKE FOR PEACE

Women Strike for Peace, a national organization of women banded together in the interests of peace, calls upon the United States to ratify the Geneva Protocol. We call upon the United States to stop the research and stockpiling of these weapons. We consider that the Geneva Protocol prohibits the war use of riot control agents and of herbicides and defoliants.

Women Strike for Peace urges our Government, as recommended by Secretary General U Thant in the United Nations report on chemical and bacteriological warfare, to make a clear affirmation that the prohibition contained in the Geneva Protocol applies to the use in war of all chemical and biological weapons (including tear gas and other harassing agents) which now exist or which may be developed in the future.

Women Strike for Peace urges our Government to conclude an agreement with all other countries to halt the development, production and stockpiling of all chemical and bacteriological (biological) agents for purposes of war and to achieve their elimination from the arsenals of the world.

Women Strike for Peace welcomes President Nixon's statement of November 25, 1969 as constituting a first step on the road leading to effective disarmament in the area of chemical and biological weaponry. It should be clearly understood, however, that renunciation by the United States of development, stockpiling and use of biological wea-

pons alone potentially weakens the actual area of application and policing of the Geneva Protocol. It is for that reason, Mr. Chairman, that we are a little chagrined to see the resolution which you introduced applying to biological weapons alone.

Mr. FULTON. Would you say that again?

Dr. BELLIN. I don't think we would go along with the idea that only biological weapons should be renounced. If you like, I would be pleased if we could go into that during the questioning.

The announced intention of confining biological research to "defensive measures" is vague: Will such activity be carried out under the aegis of the Department of Defense? If so, this would leave a king-sized loophole for continued research as "medicine turned inside-out." The Department of Health, Education, and Welfare, notably the Communicable Disease Center in Atlanta, does effective research on immunization and safety measures; there seems no reason to have the Department of Defense do so. Women Strike for Peace would hope that the extensive biological facilities of the Department of Defense will be turned into Public Health facilities to serve life rather than death.

A further question remains regarding the renunciation of the biological weapons. Will the Department of Defense classify toxins, which are chemical products, of living organisms exerting powerful physiological effects as biological incapacitants, lethal or otherwise, and therefore, prohibited, or will they be classified as chemical weapons whose use would still be sanctioned? So, this is another loophole which we would like to warn you gentlemen of.

With regard to chemical weapons the President's statement reaffirms renunciation of first use of lethal chemical weapons and extends this renunciation to cover incapacitating chemicals. The classification of chemical agents into lethal, incapacitating and harassing agents, is by no means as foolproof as the Department of Defense would have us believe. A particular chemical, shown to be merely a temporary incapacitant for well-nourished healthy persons, may permanently and perhaps lethally incapacitate malnourished adults, weakened by endemic diseases, the old, or the very young. How shall we classify tear gases when they are used in such a way as to make the subsequent killing of their victims an easier task; are they then temporary or permanent "incaps"? And what about defoliants and herbicides—should we classify them as harmless on a short-term basis, and can we ignore the fact that some can act as teratogens and kill the unborn in utero? Will the malformed newborn and the long-term cancer victims they may produce not be rendered permanently incapacitated?

The Geneva Protocol is regarded by many of its signatories to cover the use of nonlethal chemical agents such as tear gas, harassing agents and incapacitating chemicals, defoliants, and herbicides. Indeed, the language of the protocol, citing "* * * asphyxiating, poisonous or other [sic] * * *" agents, it seems to us clearly carries this implication.

Women Strike for Peace feel that in addition to bacteriological and lethal chemical agents the use of all other chemical agents in war (and in domestic situations as well) should be prohibited. Their use opens up a Pandora's box of evils which, once unleashed, can lead to escalation and which will be difficult to control.

I would like to thank you gentlemen for the opportunity of appearing before you, for your interest in this matter, and I would like to be able to answer some technical questions, if possible.

Mr. ZABLOCKI. We will ask the questions after we hear all three of the witnesses.

Dr. Lieberman.

STATEMENT OF DR. E. J. LIEBERMAN, REPRESENTATIVE OF THE SCIENTISTS' COMMITTEE ON CHEMICAL AND BIOLOGICAL WARFARE

Mr. LIEBERMAN. I am a physician with a specialty in psychiatry and public health. I have been interested in the question of chemical and biological warfare for almost 10 years and wrote an article on psychochemicals as weapons for the Bulletin of Atomic Scientist in 1962.

Last year at the meeting of the American Association for the Advancement of Science, a scientists' committee was formed on chemical and biological warfare. The chairman is Dr. J. B. Neilands, professor of biochemistry at the University of California, and the executive secretary is Prof. E. W. Pfeiffer, Department of Zoology, University of Montana. I am a member of the executive committee, and represent the group here in Washington.

Mr. ZABLOCKI. If you would just briefly also include some additional background about yourself.

Mr. LIEBERMAN. I would be glad to. My home State is Wisconsin. I grew up in California and attended the University of California and its medical school and trained at Harvard in Boston for 3 years in psychiatry and then took a master's degree in public health. Then I came to Washington and served in Public Health Service here for over 4 years.

Mr. ZABLOCKI. While in the Public Health Service were you involved in matters relevant to the subject before the committee today?

Mr. LIEBERMAN. No; that is entirely separate. This is an activity of mine as a private citizen.

Mr. ZABLOCKI. Have you had any past activity in the area being discussed this morning?

Mr. LIEBERMAN. I have been interested in it for almost 10 years and I followed very closely the hearings that took place in 1959 and subsequently I participated in one research study on LSD at Harvard during the time I was a psychiatric resident there, so I am aware of the effects of psychochemicals and have some technical competence in that area.

My training in public health is technically relevant because I studied epidemiology and environmental pollution and issues of that kind which are certainly relevant. I have been asked to present the following statement today.

The Scientists' Committee on Chemical and Biological Warfare is gratified to note that President Nixon has seen fit to submit the Geneva Protocol to the U.S. Senate for ratification. Unfortunately, the President's statement, as reported on November 25, contains serious deficiencies from our point of view.

Apparently the ban on use of biological agents will not apply to organisms which destroy crops. It is a fine and essentially meaningless distinction to prohibit the military application of human pathogenic organisms without, at the same time, banning the use of agents which destroy those food sources essential for human survival. We trust that in the debate on this measure the Congress will make it clear that plant, as well as animal, pathogenic organisms are prohibited in military operations.

"MASSIVE PROGRAM" OF CHEMICAL WARFARE IN VIETNAM

We are mindful of the massive program of chemical warfare now in progress in Vietnam, and we do not see how the United States can morally and legally justify this program. Ratification of the Geneva Protocol, which we strongly support, would compound the infraction now committed in Vietnam. This treaty, which has been signed by more than 60 nations, does not exempt "tear gases" or "riot control agents." On the contrary the text is comprehensive in scope and prohibits the military use of all asphyxiating, poisonous, or other gases."

The use of CS gas in Vietnam has accelerated at an alarming rate. According to figures published in the Congressional Record (H4775) on June 12 of this year the amount of this antipersonnel gas requisitioned for Vietnam has increased from 367,000 pounds in 1964 to 6,063,000 pounds in 1969. The agent is applied in a lethal-in-effect manner for "flushing the enemy out of bunkers preceding high-explosive fire or infantry assaults." (Army, October 1969, p. 152). It is also employed in underground and other confined spaces where it acts as a lethal asphyxiating agent.

We are disappointed also that the new policy apparently does not apply to the military uses of herbicides. The U.S. Air Force annually sprays millions of acres of crops and cover in Vietnam. Arsenicals are used to destroy rice. Picloram (Tordon), a main herbicide of the defoliation operation known as Ranch Hand, has never been authorized for application to a single American crop. The toxic properties of 2,4-D and 2,4,5-T have never been properly evaluated and, although the latter will soon be withdrawn from the domestic market because of its known teratogenic (thalidomidelike) activity, their use in Vietnam continues unabated. In 1967–68 the Department of Defense commandeered the entire U.S. production of 2,4,5-T for Vietnam, an amount estimated as 13 to 14 million pounds.

ENVIRONMENTAL EFFECTS: WHOSE CONCERN?

I would like to make one final remark about this; that is: whose concern is it that environmental and long-range human effects, such as genetic effects, do not occur? We have heard some responses from the Defense Department about how they are concerned about the matter but one wonders whether we aren't dealing with an issue which is beyond the scope of defense; it is not their primary concern, and to illustrate from the public health point of view, one of the most striking things I learned in the school of public health was that there are three major categories of phenomena that can injure the fetus: biological, chemical, and physical. The known physical example is radiation. We

know that can damage the fetus. The infamous chemical is thalidomide and the biological is the German measles virus.

The environment contains countless biological, chemical, and physical agents. We know that agents in each category can cause irreparable damage and, therefore, the biologist and public health scientist is going to approach with great caution any new agent that might possibly wind up in approximation to a fetus. I would hope that the Foreign Affairs Committee would see itself as having a responsibility to, shall we say, mitigate the narrow mission of defense by looking also at the larger issue of public health and the total image of the United States in Asia in the decades to come.

Mr. ZABLOCKI. I might say, Doctor, only the latter is a subject matter before this committee.

Thank you very much for your statement.

I will now call upon Miss Patricia A. Samuel.

STATEMENT OF MISS PATRICIA A. SAMUEL, LEGISLATIVE DIRECTOR, WOMEN'S INTERNATIONAL LEAGUE FOR PEACE AND FREEDOM

Miss SAMUEL. I am Pat Samuel, legislative director of the Women's International League for Peace and Freedom. I am neither a scientific expert nor legal expert, nor any other kind of expert. I represent a group of women who share Congressman Fulton's premise that everyone is a human being and should be treated like a human being. We are deeply disturbed by the apparent erosion of this principle in the world today and by the development of practices and policies which seem to discourage people from treating each other like human beings. The Women's International League is composed of 145 branches across the United States and sections in 19 countries abroad. Founded during World War I, the Women's International League has always advocated complete and universal world disarmament. We have supported the Geneva Protocol since its inception in 1925 as a concrete step toward preventing the use of weapons of mass destruction.

The 1925 Geneva Protocol is the world's oldest and most effective arms control treaty. In more than three decades it has been violated only two or three times. Poison gas was employed against the people of Ethiopia by Italy during the thirties and has been used in Yemen more recently. The use of so-called riot control gases by the United States in Vietnam is considered by many to be a violation of the protocol. There have been no verified instances of bacteriological warfare.

The widespread indiscriminate killing of people, both civilians and military, which would result from the employment of chemical and biological weapons is a phenomenon few are willing to sanction even during time of war. The moral revulsion against such mass killing has been raised to a principle of international law in the 1925 treaty ratified by more than 60 nations. The Geneva Protocol, by banning the first use of chemical and biological weapons, attempts to prevent the more horrible manifestations of man's inhumanity to man. By outlawing certain forms of violence, it encourages nations to develop and use more pacific means to settle their disputes.

The President's announcement that he will resubmit the Geneva Protocol to the Senate for ratification is to be commended. Ratification by the United States would go a long way toward reassuring the world that the United States intends to be bound by prior policy statements that it would never be the first to use chemical and biological weapons. By ratifying the protocol, the United States would make manifest the sincerity of its desire for arms control limitation and would proclaim that it is part of "the civilized world" whose general opinion has justly condemned the use of gas warfare. Ratification would also show our respect for the U.N. by implementing a 1966 resolution—which the United States supported—calling for strict observance of the principles and objectives of the Geneva Protocol and inviting all states to ratify it.

THE USE OF TEAR GAS IN VIETNAM

I would now like to discuss the bearing of the Geneva Protocol upon certain of our activities in Vietnam. The intensive use of tear gas by the United States in Vietnam has been widely criticized abroad as inhumane and as a violation of the protocol. While the United States contends that tear gas is not lethal and hence not prohibited by the Geneva protocol, there are many reports of deaths, especially among children and the elderly trapped in confined spaces during a tear gas attack. There are widespread reports that U.S. troops saturate an area with tear gas to force the inhabitants who have taken shelter in bunkers out in the open where they will be excellent targets for subsequent bombing attacks. After one such incident in 1966, the New York Times quoted Washington officials as saying that this tactic "was designed to flush Vietcong troops out of bunkers and tunnels before the attack of B–52 bombers." Such use of tear gas cannot be justified as "nonlethal" and "humane."

EVIDENCE THAT TEAR GAS IS BANNED BY PROTOCOL

Historically, there is evidence that tear gas was included among those gases banned by the protocol. In 1930, in preparation for the Geneva Disarmament Conference, Great Britain circulated a memo declaring her belief that the protocol prohibited the use of tear gas and requesting the reactions of other governments. Eleven nations replied that they interpreted the protocol as banning tear gas. Only the United States indicated that tear gas might be exempt from the protocol's prohibition against the first use of gas. Tear gas was not used in the Second World War nor in Korea. There is evidence that U.S. military commanders requested permission to use tear gas in both these wars and permission was denied, indicating that the United States recognized that there was some validity to the argument that tear gas is prohibited under the protocol.

The wording of the English version of the protocol, "asphyxiating, poisonous, or other gases," is clearly broad enough to ban tear gas. Proponents of tear gas point to the fact that the French text, also official, bans "similaires" which is arguably of narrower scope than "other" gases. However, the French Government, in 1930, declared that it believed the English and French texts to be equivalent and that tear gas was prohibited by the protocol.

It is generally agreed that the Geneva Protocol bans the use of lethal gases in warfare. The United States argues that tear gas is nonlethal and hence not subject to the ban. However, a report just released by the World Health Organization questions whether any such distinction between lethal and nonlethal gases can be drawn. It points out that prolonged exposure to so-called incapacitating agents can be lethal.

CS–2 SEEN AS LUNG GAS—NOT TEAR GAS

There is a further very practical reason for interpreting the protocol to prohibit tear gas. A ban on all gases is easily understood and enforceable. If some gases are exempted from the prohibition, such exemption will inevitably entail long arguments as to whether a particular gas falls in the exempt or the banned class. Such an argument has already arisen in regard to CS–2 now being used in Vietnam. The U.S. position is that so-called riot-control gases which are used domestically are not banned by the protocol. On the basis of this interpretation, the United States concludes that the use of CS–2 in Vietnam does not violate the protocol. However, some experts argue that CS–2, which is composed of minute particles which can penetrate the lungs and can linger in an area for some time, has such severe effects that it cannot properly be classified as a riot-control agent and belongs in the category of incapacitating or lethal gases which are admittedly banned by the protocol.

The argument that CS–2 is not a true riot-control gas is strengthened by the fact that it is not used within the United States to control riots. It is just such arguments about the correct classification of a particular gas which illustrate the need for a simple, complete ban on all gases. If the Geneva Protocol is interpreted to ban all gases except "riot control" agents, a dangerous loophole is left open. Nations at war will be subjected to great pressure to expand this loophole to encompass an increasing number of gases. The existence of such a loophole can only weaken the effectiveness of the protocol as an arms control treaty.

The fact that certain gases are used domestically by law enforcement agencies does not mean their use is permitted in warfare under the Geneva Protocol. The standards governing the use of particular weapons domestically and in a war zone are not necessarily the same. To illustrate, in Vietnam tear gas is often used as a prelude to bombing attacks in order to flush out people hidden in bunkers so that a later attack with conventional weapons will be more effective. Such a use of tear gas is quite different from the domestic police practice of releasing limited quantities of tear gas in order to disperse a crowd. Furthermore, tear gas is employed in Vietnam on a scale unknown domestically, by means of large gas-filled shells and mortars.

Even if it is assumed that the United States use of tear gas in Vietnam does not violate the Geneva Protocol (an assumption which the Women's International League does not share), it should be questioned whether the military advantages gained from using tear gas are worth the price of adverse world criticism directed at the United States. When the use of tear gas in Vietnam was first revealed, the reaction of the world press was harshly critical. The deep-seated

horror of any use of gas in warfare was illustrated by cartoons such as one printed in Germany showing the Statue of Liberty wearing a gas mask. A Japanese newspaper carried a cartoon of Hitler's ghost hovering over Vietnam with a bag labeled "Vietnam" in his hand. The United States has been criticized on the floor of the U.N. for its use of gas in Vietnam. Several countries, while lauding the President's recent decision to resubmit the Geneva Protocol to the Senate for ratification, expressed disappointment that the President reserved the right to use tear gas.

WIDESPREAD USE OF HERBICIDES IN VIETNAM

Another critical area of U.S. chemical and biological warfare policy is the wide-scale use of herbicides in Vietnam. I would like to quote from a report made by Professor Pfeiffer of the University of Montana after a trip to Vietnam to study ecological effects of the war. Based upon figures from chemical operations officers in Saigon, Dr. Pfeiffer states:

> In 1967, 1,486,446 acres were sprayed with defoliants and 221,312 acres of crops were destroyed. In 1968, 1,297,244 acres were sprayed with defoliants and 87,064 acres of crops were destroyed. It is estimated that over 20 percent of the total forested area of Vietnam has been defoliated at least once.

The announced reason for destroying crops is to deprive the Vietcong of food supplies. However, the primary victims of this policy of crop destruction are the Vietnamese people. As Dr. Jean Mayer, nutrition consultant to the President, stated in the June 29, 1966, issue of Christian Century, destruction of food supplies inevitably affects children and the aged most severely. Adolescents are likely to survive and adult men are far less affected. "Thus the bands of armed men who make up the Vietcong are not likely to starve; being unhampered by family ties with people in the communities where they rove, they feel entirely justified in seizing any available food in order to have the strength to continue to fight." The point is "not that innocent bystanders will be hurt by such measures but that only innocent bystanders will be hurt."

The chemical 2,4,5-T is an especially dangerous herbicide being used in Vietnam. A recently released report by the World Health Organization discloses that when administered in large amounts, this chemical has caused deformities similar to those caused by thalidomide in mice and rat fetuses. A South Vietnamese newspaper article described hideously deformed children being born to women living in defoliated areas.

ECOLOGICAL EFFECTS OF HERBICIDES

In addition to destroying crops and possibly causing the birth of deformed babies, the widespread use of herbicides is having an unknown effect on the ecology of Vietnam. Mangrove trees are particularly susceptible; one application of the normal strength defoliant used in Vietnam is sufficient to kill most of these trees. Professors Orians and Pfeiffer report that most of the areas they visited by boat on the Rung Sat Peninsula were completely barren of mangrove trees even though some of these areas had been sprayed several years earlier. In

the upland tropical forests, two or three applications of defoliant may kill approximately 50 percent of the commercially valuable timber. One danger resulting from repeated defoliation in Vietnam is that treated areas will be invaded by bamboo which might retard the usual progression of the forest back to its natural state.

Since it takes about 20 years for a mangrove forest to regenerate itself, it is clear that the United States defoliation practices will have a long-lasting effect on Vietnam. The long-range effects of herbicides on the soil are unknown, although several of them are considered too dangerous for use in Britain and the United States. Nor is it known at present precisely how widespread deforestation may affect animal life and future vegetation. However, recent studies in the United States have underscored the interrelatedness of nature and the disastrous consequences that can result from interfering with one link in the chain of life. Will our herbicide policies result in a future Vietnam whose flora and fauna bear little resemblance to the present ecology? No one knows, but it is a possibility. The United States has embarked on widespread defoliation in Vietnam in complete and reckless disregard of the possible future consequences of its actions.

While the framers of the Geneva Protocol did not have herbicides in mind when drawing up the treaty since they were not invented until World War II, the language of the protocol is broad enough to prohibit their use. The protocol bans asphyxiating, poisonous, or other gases, and "all analogous liquids, materials, or devices." Herbicides are analogous to gases and germs in that they affect only living matter and they are poisonous. Not only are herbicides poisonous to vegetation; they are also poisonous to people, both directly, since rubber gloves and other protective devices must be worn by personnel handling them, and indirectly, by damaging food and future generations.

The calculated use of herbicides as an instrument of war should be prohibited, either under the Geneva Protocol or under a separate agreement. The use of herbicides, like the ancient technique of poisoning wells, is too repugnant to the countenanced. The widespread use of herbicides must inevitably damage the civilian population and may, like biological warfare, have disastrous and uncontrollable future effects on the ecology of the country victimized by their use.

VIEWS ON HOUSE RESOLUTION 733

Mr. ZABLOCKI. Thank you, Miss Samuel. I would like to ask all three of our witnesses one question, and I am sure all of you have had opportunity to study the resolution, House Resolution 733 which I introduced. The other resolutions became moot since they had requested or urged the President to resubmit the Geneva Protocol to the Senate. Since the President had done so, some of us, certainly I, thought we should urge the Senate to ratify the protocol as early as possible. I also intended to comment on the President's action going further than ratification of the Geneva Protocol, as he did in urging that there be a cessation of development, stockpiling, production of biological weapons.

Now, Dr. Bellin, you have said that your organization, and I presume, you, too, were chagrined with the resolution 733, since it did not go far enough, did not include biological weapons.

Therefore, I would like to inquire of all three of you, have you any suggestions for the strengthening and improving of House Resolution 733? Dr. Bellin if you would, tell us where you specifically find the greatest shortcomings of the resolution.

Dr. BELLIN. Among all disarmament treaties, all disarmament treaties that the world has achieved so far, the Geneva Protocol is the most workable one. As Miss Samuel pointed out, there have been only two known instances of its being circumvented.

It would be regretful if each country started specifying, "This chemical is what we consider to be covered and this chemical is not covered"; or, "we will only cover biologicals and we will leave the so-called more innocuous chemicals alone."

I think the broadest interpretation is the one we should follow and in a sense, if we start saying right now we will only apply the protocol to biologicals, we are weakening our ground.

The attempt—perhaps I am misinterpreting the intent——

Mr. ZABLOCKI. The last resolve merely expresses the sense of Congress that other nations should follow President Nixon's announced policy in the field of biological weapons, since the Geneva Protocol, as I understand it, did not include production of stockpiling biological weapons.

Dr. BELLIN. Yes, its amendment does. Bacteriological weapons are covered by the Geneva Protocol.

The second resolve is the one that bothers me. Line 13, "that the other nations of the world, following the example of the United States, act to ban the use, stockpiling, or production of biological weapons." That, to me, carries the implication that your committee is concerned about biological weapons alone.

Mr. ZABLOCKI. No.

Dr. BELLIN. Maybe because I am not a lawyer.

Mr. ZABLOCKI. I am not either.

Dr. BELLIN. I think the soundest ground is to say: "We support; we would like to see the Senate ratify the Geneva Protocol." The Geneva Protocol explicitly states both bacteria and biological weapons are covered.

Mr. ZABLOCKI. First use. And I think that the Nixon statement went further; that it did not stop at barring first use, it said we should not produce or stockpile biologicals, and this is what we had intended to express in the resolution.

Dr. BELLIN. Ban the use, stockpiling, and production of biological weapons.

Mr. ZABLOCKI. Going further than first use——

Dr. BELLIN. Other than that I am—I think the thing I would like to see added, perhaps, is another resolution or resolve that would state that the use of all chemical weapons is prohibited, not just lethal or incapacitating, because I think most scientists would agree it is impossible to draw a line and say "these chemicals are lethal, and those are merely incapacitating, and these are merely harassing." There is no such one. It depends on the individual and circumstances and the dosage and wind direction and many other factors. So that perhaps this is my greatest area of concern.

I would like to see less ambiguity but maybe this is not politically feasible.

NEED FOR AMBIGUITY

Mr. ZABLOCKI. I appreciate the suggestion. Some earlier testimony suggested ambiguity might be necessary in expressing our interpretation of the Geneva Protocol. So we get it both ways.

Dr. BELLIN. To me it is not ambiguity because the Geneva Protocol says "other gases, asphyxiating, poisonous, and others." "Poisonous" is not necessarily lethal. Funk & Wagnall's defines a poison as something which "harms or destroys," and Websters says "any agent which may chemically produce an injurious or deadly effect; to injure or to kill." So, a poison is not necessarily a lethal weapon.

So, I think the distinctions that are being made now are very dubious and most nations of the world——

Mr. ZABLOCKI. Do the other witness have any comments?

"NO FIRST USE" AND PROTOCOL

Mr. FULTON. Don't leave that for a minute.

How do you get first use in the Geneva Protocol on chemical and biological and bacteriological warfare? How do you read the words "first use" into the Geneva Protocol?

Dr. BELLIN. If I can find my copy of the protocol.

Mr. FULTON. I have it here. My point is I thought it was a complete ban in warfare of the use.

Dr. BELLIN. I think the signatories obligated themselves or contracted not to be the first to use the chemical against other signatories only, and this, by the way, is a limitation and severe one on the Geneva Protocol.

A country may use biological weapons against another if it is not a signatory.

Mr. FULTON. I am trying to put the language in the proper context because it is not in either the title nor the whereas clause nor the protocol itself. It might be a limitation by any or all countries.

Mr. FRASER. I understand it arises out of the reservations which most of the signatory countries expressly made at the time of ratification so it has had the effect of making the protocol a first-use ban.

Mr. ZABLOCKI. And mentioned "use" several times throughout its text.

Mr. FULTON. It is the use generally, not first use. That is what I am pointing out.

Mr. ZABLOCKI. All the witnesses before this subcommittee, as the gentleman from Pennsylvania will recall, before this subcommittee did give that interpretation.

Mr. FULTON. The point I make is: could we have the countries as they have ratified, have the staff prepare for us at some point in the record to show what the various, either reservations or interpretations, have been so that we may at some point be able to look and see what the present status of the Geneva Protocol is.[1]

Dr. BELLIN. There were several conference subsequent to the signing of the protocol which further tried to delineate and refine the language and the interpretation of the language of the protocol.

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[1] Reservations and interpretations of the protocol by other nations may be found on p. 271.

INTERPRETING THE PROTOCOL

Mr. FULTON. I would like to point out to you that when we are talking language with this witness, that in the title of the protocol the protocol states: "A protocol prohibiting the use in war of asphyxiating, poisonous or other gases and bacterial methods of warfare, Geneva, June 17, 1925."

The first whereas clause, however, has different language. The first whereas clause says, "Whereas the use in war of asphyxiating poisonous or other gases and all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world."

Does the word "devices" give you any more room to broaden the interpretation of the protocol?

I would like to hear what you think of the language. I am trying to see what the language means rather from a technical point of view what the general language would mean.

Mr. LIEBERMAN. It seems to me "other gases" is sufficiently broad, and that if you want to talk about analogous liquid materials or devices, he might even find some people feel this includes napalm, which is a chemical, and, who knows, "devices" could even include some projectile weapons.

Mr. FULTON. Of course, in this day and age a gas is only a gas when used. It is a liquid until used.

Dr. BELLIN. A liquid becomes a gas.

Mr. FULTON. Only on use.

Dr. BELLIN. On certain temperatures.

Mr. FULTON. So, what you get when it is under compression you are manufacturing it as a liquid.

Dr. BELLIN. Not necessarily. It depends on the particular substance in question. If the boiling point is high, then it is a liquid, and if the boiling point is low, as with some of our agents, things like mustard gas——

Mr. FULTON. But I am saying that we might have a broadened interpretation by getting a few points under all analogous liquids or devices, and to me, devices is a very broad generic term.

How within the limits of the protocol itself we could, by interpreting the language, get a broad meaning.

Dr. BELLIN. Don't you think that you would be giving sufficient latitude if you focused on "poisonous or other gases"; those words?

Poison is not necessarily lethal and "other" really makes it very broad.

INTERPRETATIONS OF OTHER NATIONS

It is interesting to note, by the way, that in one of the conferences that preceded the adoption of this treaty, the Spanish representative was specifically willing to accede to this language because, he said that it meant to him that nonlethal chemicals were included. This is specifically cited and I will be glad to dig it out for you and send it in.

Mr. FULTON. I would like to have that in the record with the chairman's permission.

Mr. ZABLOCKI. Without objection.

(The requested information follows:)

Minutes of the League of Nation's Preparatory Commission for the 1932/33 Disarmament Conference, meeting in Geneva on 15 January 1932. The following remarks were made:

(*a*) The British Delegate stated: "The British Government has taken the view that the use in war of 'other' gases including lachrymatory gases was prohibited. They also considered that the intention was to incorporate the same prohibition in the present convention".

(*b*) The Spanish Delegate remarked: "I agree with the British delegation's interpretation because I think that the text approved at the second reading is so clear that it cannot give rise to any objections. *It provides that the use in warfare of any kind of gas is prohibited*, doubtless because it is very difficult to distinguish between lethal and non-lethal gases".

(*c*) The French delegate commented: "The French Government . . . considers that the use of lachrymatory gases is covered by the prohibition arising out of the Geneva Protocol of 1925 or chapter IV of the Draft Convention."

(*d*) The Yugoslavian delegate: "we fully agree with the interpretation given by the British delegate".

In the 1932 Disarmament Conference the American delegate (ambassador Hugh Wilson) agreed to the recommendation that tear gases should be prohibited in war.

Similar facts are admirably set forth by Philip Noel Baker, M.P. in a letter to the Editor of the N.Y. Times of Dec. 9, 1969.

Mr. FULTON. We go on to the second whereas clause, "Whereas the provision of such has been declared in treaties to which the majority of powers." There is a reference by which you can determine what is meant by the language.

Do you have any reference so that we would have a treaty or the treaties of the major powers showing this has been the customary use of the language in such treaty provisions?

Dr. BELLIN. I think they referred to the Hague Convention and subsequent conventions, but we will be glad to dig this out.

(The information follows:)

Concerning conventions and agreements predating the Geneva Protocol (the Hague conventions of 1899 and their revisions of 1907).

1. A Declaration adopted by the 1899 Hague Conference had forbidden the use of ". . . asphyxiating and deleterious gases".

2. Article 23 of the Hague Convention prohibits "the use of poison or poisoned weapons . . ."

3. All these conventions and agreements were declaratory of the Martens Clause (a preamble to the Hague Convention), which recalls the principles of humane conduct that exist independently of codified texts, being derived from usage and from universally accepted precepts (Customary International Law).

Mr. FULTON. Maybe the staff could help us on that. I would appreciate it.

I agree with the chairman that if there is language put in the resolution which specifically refers to a type of a ban, that it doesn't particularly limit it so that you are negating every other type of ban by not mentioning it.

The chairman had said one word did not have a negative connotation on everything else.

I wonder about an interpretation that puts such a strict limit on the chairman's words in his resolution. What do you think of that?

Dr. BELLIN. I don't mean to restrict the interpretation. I would rather broaden it. I think it is admirable and we are grateful that the President has banned the use and stockpiling and production of

biological weapons, but the great concern is in interpreting what are biological weapons; and the second concern is that there is a whole category of chemical weapons which can be lethal and which are not included in the ban and whose use will be misinterpreted.

RESEARCH IN BW UNDER PRESIDENTIAL BAN

Mr. FULTON. May I point out one further thing: in the resolution, House Resolution 733, it says:

Resolved, That the other nations of the world, following the example of the United States, act to ban the use, stockpiling or production of biological weapons.

That doesn't say anything about research and development, does it? What do you think of that?

Dr. BELLIN. I think I have pointed out in my testimony that under this research and development you can drive a truck through that little loophole right there, because in point of fact you cannot do defense research on biological weapons without producing strains which can be used in an offensive manner or which can be used to make weapons.

Mr. FULTON. I am recommending to you that the words "research and development," then be put in this last resolution. Is that correct?

Dr. BELLIN. Might I point out it would be very nice if you would put in: "To ban the use, stockpiling, production, research, and development of biological and chemical weapons." That would be even nicer.

Mr. FULTON. We are seeing what directions to go.

Mr. ZABLOCKI. At that point, would the gentleman yield? Should we not then include so-called death rays and electronic equipment and other new and unforeseen weapons that might be employed in future warfare?

Dr. BELLIN. These are governed by these other devices.

Mr. FULTON. On space vehicles or on the super planes that are well up in the stratosphere, you could use a laser with a light beam which will simply drill a hole in the plane or capsule. The operation would be to fasten a laser beam onto it by radar control, and drill a hole in it and destroy everybody just by a light beam.

Dr. BELLIN. If there is no house in the way.

Mr. FULTON. You see, if you are talking devices, maybe you have to get into the light beams.

PRESIDENT'S STATEMENT AND BRITISH CONVENTION ON BACTERIOLOGICAL WARFARE

Miss SAMUEL. May I comment on the resolution and Mr. Fulton's point about research and development?

I think when the President called upon the Nation to ban the use, stockpiling, and production of biological weapons, he was thinking of it with particular reference to the proposed British convention on bacteriological warfare, and I thought perhaps you might have had that in mind when you drew up this resolution.

And I noticed that the British convention calls upon the signatory nations not to conduct, assist, or permit research aimed at production of the kind prohibited in subparagraph A, which refers to microbiological and bacteriological type of weapons. So that perhaps if we

do wish to take the British proposal seriously, which is an attempt to limit biological weapons, not just their use, but to get rid of them entirely, it might be that we should consider banning the research also.

Mr. FULTON. You would then recommend that the language be put in in the form of the British protocol, rather than adopt any other language which might be similar and therefore, have to be subject to outside interpretation?

Miss SAMUEL. I don't think that would make too much sense at this point, since the British proposals are still in more or less working paper form, and I am sure the particular wording will be changed somewhat before it is ever signed by various nations.

So, it would seem sort of premature to try to copy their wording exactly now and attempt to get ratification before it is signed, or something.

Mr. ZABLOCKI. I might point out that the British convention does not preclude defensive bacteriological warfare research.

I believe that if we would include research and development in a resolution, this would probably make passage impossible. Because the question would be raised: where, then, would NIH, if it took over this particular area of bacteriological and biological research, would it be hampered in research and development in any type of health problems that we must continue for our own people's sake?

EFFECT OF BAN ON HEALTH RESEARCHERS

Mr. LIEBERMAN. If I may respond, being somewhat acquainted with NIH and with medical and public health research, I would say that the bona fide health researchers would not be encumbered, that they would simply have to make it clear the research they were doing was in the health area and not the military area.

I am afraid you are right, arguments would be raised by people who are afraid to let go of all research and development of these weapons for military reasons. That is, they are using the argument that other nations might be doing it, therefore, we have to. But this is not a public health research argument. This is a different kind and in my judgment I think the scientists who are concerned with health research could very nicely live with a prohibition against military-related research.

I would also like to ask whether the introduction of the word "chemical" along with biological here would run into the same difficulty, in your opinion, because I join with Dr. Bellin in suggesting that that be introduced. Your resolution is a resolve that the nations of the world take this step; it presumes that the United States is taking it also, and I recognize that there is a commitment here that we act first. Since we are considering the image of the United States in the world, even if these agents have some military usefulness—and I think biologicals don't, absolutely—this usefulness has to be weighed against the harm done to the country in acting as though we are moving ahead while having reservations which are so large as to further detract from the whole effort.

Mr. ZABLOCKI. Well, I think the gentleman's statement or observation would be in order if there would be something added to the resolution that went beyond what is now announced U.S. policy.

The last resolve was in reference to Nixon's statement and President Nixon did not include a ban on production and stockpiling of lethal chemicals. We cannot ask the world to follow the example of the United States if we have not as yet set the example.

WORDING OF HOUSE RESOLUTION 733

Mr. FULTON. On that: First, I don't like the words, "follow the example of the United States." That, to me is really wrapping the garments around you and standing on a soap box trying to tell the world what to do. And I don't think we should really be trying to act as a self-anointed savior of the world. I don't think we were ever anointed. And this is a position that I think the United States gets itself into.

There is one point of the discussion with the chairman here that I think should be brought out. The question is: Who makes the decision on research and development, whether it is for weaponry or wartime purposes or for peacetime research purposes; for health, welfare, or anything of that type?

If it is going to be somebody in the military, it is having the person making the decision, such as when you say to the boy, "Don't put the bean in your ear," and he decides then whether to put the bean in his ear. Because, who should make this decision? Should this be under the military that they decide that this is their kind of research, or should it be in some outside agency?

You see, where do we get that decision made?

As of now, you can see there has been a creeping form of decision that the military then just made more and more decisions which then became a pattern and that then became U.S. policy.

Mr. ZABLOCKI. In the case of the boy who put the bean in the ear, you take the bean away from him.

Mr. FULTON. Who does that? Where in our Government should this decisionmaking power be, on a scientific basis, not just in the political area of reference? Somebody has to make some decisions as to scientifically, is this or is this not research and development for a weaponry or military destructive purpose?

FUTURE BACTERIOLOGICAL RESEARCH

Miss SAMUEL. Well, I am not an expert in medicine, but it seems to me that an approach might be followed that the President emphasized in his statement about defense research—that is immunization. The facilities at Fort Detrick and so on could be turned over and the money that is currently being spent there, to the National Institutes of Health or the Health, Education, and Welfare Department to be used on such things as immunization, protection against diseases, and let's first solve all of the current diseases before we go inventing odd strains of anthrax to defend ourselves against. There are already so many diseases that need more work on. The cancer funds have been cut this year and so on.

Mr. FULTON. But who makes the decision? Would the President do that or would the Secretary of Defense do it? Or the head of the Health, Education, and Welfare Department?

Mr. ZABLOCKI. Congress.

Mr. FULTON. We can't make the decision, you see, on the point of a particular group of molecules and our research program that it is or is not for destructive purposes.

We can outline and say generally it's not wise for the boy to put the bean in his ear, but who is it that takes the bean away from the boy and says "Don't do it?"

Mr. LIEBERMAN. If I may respond. In part, first of all, I just read that the Defense Department has been ordered to turn over all nonmilitary research in certain areas to NSF and NIH because they had been conducting research which would fall in those areas. So, the question is not to determine whether it is destructive or not, but simply to say that the Defense Department will do no further biological or chemical research because there is no need for it.

Mr. FULTON. You put that at the Presidential level. I might say that the Department of Defense is to do no research and development unless it is militarily directed for a military use or a development of a weaponry system. That is already Congress' general direction.

Mr. LIEBERMAN. And our feeling here unanimously is that it would be well for the military to cease and desist efforts in the chemical and biological areas and, therefore, that would mean that there would be no funds allocated for research in this area.

"BEAN-IN-THE-EAR" PSYCHOLOGY

Mr. FULTON. Should Congress then have a resolution saying this as a policy? How do we do it?

Mr. LIEBERMAN. Well, we are going, I think, beyond President Nixon's statement, as the chairman indicated. But if it was the will of Congress, I am sure that it would be done.

The question is: Is it politically feasible?—and this goes into questions which I suppose go beyond the present discussion. It gets into the psychological area. What are the gains for deliberately limiting the Defense Department in this way? What are the gains in the foreign affairs areas and humanitarian areas?

And, as far as the bean-in-the-ear psychology is concerned, I think if you prohibit without a good relationship with the child and without an explanation to the child, then he may be more likely to do the thing. But, if the prohibition is based, first of all, on a relationship of respect so that it is not arbitrary authority, and secondly, the child sees it as as in his own interest, or at least that the adult is acting to protect the child, then I think one would get discipline in which one can have confidence. If the bean-in-the-ear psychology has a bearing on international relations, then clinical psychology has something to contribute to an area such as disarmament.

Mr. ZABLOCKI. Mr. Fraser.

Mr. FRASER. I have no questions.

Mr. FULTON. I thought the discussion was very interesting.

Mr. ZABLOCKI. I certainly want to associate myself with the gentleman from Pennsylvania in his last remark. The discussion was most interesting.

I might point out, from a technical standpoint if we did put in a resolve clause that Pine Bluff and Fort Detrick should be transferred to NIH control, it would not be germane to the scope of this committee. Such a provision would have to be a separate resolution.

Mr. FULTON. That is correct.

Mr. ZABLOCKI. However, the statements that were made and the testimony that was developed this morning and on December 2 certainly would indicate that it might be a desirable transfer.

If there are no further questions on behalf of the subcommittee, I would like to thank the witnesses for their excellent statements and their direct answers to the questions that were asked by the subcommittee.

Dr. BELLIN. Thank you for the opportunity of having this exchange.

Mr. ZABLOCKI. The subcommittee will stand adjourned until 10 a.m. on Thursday, December 11, when we will hear representatives of the State Department and the Arms Control and Disarmament Agency in open session and later from the Department of Army in open and closed session.

(Whereupon, at 12:15 p.m., the hearing was adjourned.)

CHEMICAL-BIOLOGICAL WARFARE: U.S. POLICIES AND INTERNATIONAL EFFECTS

THURSDAY, DECEMBER 18, 1969

HOUSE OF REPRESENTATIVES,
COMMITTEE ON FOREIGN AFFAIRS,
SUBCOMMITTEE ON NATIONAL SECURITY POLICY
AND SCIENTIFIC DEVELOPMENTS,
Washington, D.C.

The subcommittee met, pursuant to adjournment, at 10:10 a.m. in room 2255, Rayburn House Office Building, Hon. Clement J. Zablocki (chairman of the subcommittee) presiding.

Mr. ZABLOCKI. The subcommittee will be in order.

This session of the Subcommittee on National Security Policy and Scientific Developments marks a continuation of hearings on international aspects of chemical biological warfare with particular reference to the Geneva Protocol of 1925.

Our witnesses today, representatives of the Department of State and the Arms Control and Disarmament Agency, are Mr. Thomas R. Pickering, Deputy Director, Bureau of Politico-Military Affairs, Department of State; Mr. John B. Rhinelander, Deputy Legal Adviser, Department of State; and Mr. Howard Furnas, the Special Assistant to the Director, Arms Control and Disarmament Agency.

Accompanying State Department witnesses are Mr. Peter Day and Captain George Birdt of the U.S. Navy. Officials of the Arms Control Agency who are witnesses, Mr. Furnas, Mr. Charles Van Doren, and Mr. Bowman Cutter.

We will hear the witnesses in open session and if questions from the subcommittee touch on classified matters, we will ask the witnesses to withhold their answers during open session and we will clear the room and go into executive session to discuss those questions as soon as all unclassified questions have been answered.

Mr. Pickering, if you will begin.

STATEMENT OF THOMAS R. PICKERING, DEPUTY DIRECTOR, BUREAU OF POLITICO-MILITARY AFFAIRS, DEPARTMENT OF STATE

Mr. PICKERING. Before I go into my statement, I would like to add that Mr. Rhinelander is appearing here with me in order to answer questions and he will have no statement to offer, but he has collaborated with me on my statement.

Mr. ZABLOCKI. I see.

You may proceed.

Mr. PICKERING. Mr. Chairman, I am pleased to appear before you this morning as the first administration witness to testify before your subcommittee since the President announced his far-reaching decisions on chemical and biological warfare. As the Deputy Director of the Department of State's Bureau of Politico-Military Affairs, I participated in the review which led up to the President's decision. Previously, I spent about 4 years (1960–64) with the Arms Control and Disarmament Agency (ACDA) in Washington and Geneva.

As you said on December 2, the President has decided to resubmit the Geneva Protocol to the Senate for its advice and consent to ratification. We note that you, Mr. Chairman, have introduced House Resolution 733 which commends the President for announcing this decision to resubmit the Geneva Protocol to the Senate and supports further initiatives in this area.

We also note that you indicated the subcommittee would be interested in pursuing three objectives during the remaining sessions. Let me repeat them:

First, the subcommittee can help elaborate some of the factors which the Senate may find useful when making its decision on ratification of the Geneva Protocol.

Second, we can shed light on other issues which have been raised internationally on America's CBW policies, specifically, the use of tear gas and herbicides in Vietnam.

And lastly, we can look beyond the ratification of the protocol to new international agreements which may be required to control the spread and use of chemical and particularly biological weapons.

I understand that a Department of Defense representative will appear before the subcommittee tomorrow to discuss the use of chemical herbicides and riot control agents in Vietnam.

After discussions with Mr. Howard Furnas, of ACDA, we have decided that I should concentrate on the overall thrust of the recent National Security Council review and the President's decision, including the scope of the Geneva Protocol, and the international ramifications of these decisions.

PRESIDENT'S DECISION OF NOVEMBER 25

Let me turn now, Mr. Chairman, to the President's decision of November 25.

Shortly after President Nixon took office, he directed that a comprehensive study be undertaken of our policy and programs both in the biological and chemical areas. There had been no broad review of this area for over 15 years. Consequently, policies were unclear and programs lacked definition. This was part of a broader policy of this administration to examine all of our defense policies, programs and capabilities. Everyone agreed, as did a number of Members of Congress, that a thorough and unprecedented presidential-level review was necessary.

Under the auspices of the National Security Council, the Departments of State and Defense, the Arms Control and Disarmament Agency, the Office of Science and Technology, the Intelligence Community and other agencies worked closely together on this study for over 6 months. These Government efforts were aided by contributions from the scientific community through the President's Scientific Advisory Committee.

During the course of the study, it became readily apparent that there were major issues outstanding that required presidential consideration and decision. These issues centered about the overall questions of U.S. policy on biological warfare, U.S. policy on chemical warfare, and the U.S. position on the Geneva Protocol. The review carefully considered the various policy options along with the possible advantages and disadvantages of these courses. In addition, the report weighed the merits of proposed initiatives in the CBW field, particularly the draft United Kingdom Convention on the Prohibition of Biological Methods of Warfare.

I believe the President's announcement of November 25 has made clear his decisions. They are far-reaching and have generally been widely applauded both domestically and internationally.

I will briefly summarize here the policy decisions announced by the President on November 25.

BIOLOGICAL RESEARCH PROGRAM

Noting that biological methods of warfare would have massive, unpredictable and potentially uncontrollable consequences and may produce global epidemics and impair the health of future generations, the President announced:

The United States shall renounce the use of lethal biological agents and weapons, and all other methods of biological warfare.

The United States will confine its biological research to defensive measures such as immunization and safety measures.

The Department of Defense has been asked to make recommendations as to the disposal of existing stocks of bacteriological weapons.

CHEMICAL WARFARE PROGRAM

As to our chemical warfare program, the President announced that the United States:

Reaffirms its oft-repeated renunciation of the first use of lethal chemical weapons.

Extends this renunciation to the first use of incapacitating chemicals.

GENEVA PROTOCOL

Consonant with these decisions, this administration has decided to resubmit to the Senate, for its advice and consent to ratification, the Geneva Protocol of 1925 which prohibits the use in war of "asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, * * *" and of "bacteriological methods of warfare."

The administration believes the ratification of the Geneva Protocol together with the President's policies will:

(*a*) Further strengthen the prohibition against the use in war of lethal and incapacitating chemical and all biological agents;

(*b*) Strengthen the legal force and principles of the protocol and international restraints on the use and on the proliferation of CW and BW agents;

(*c*) Be interpreted as a positive step by the members of the international community;

(*d*) Reinforce past U.S. policy statements on no-first-use and

reaffirm past U.S. votes in the General Assembly in favor of strict adherence to the principles and objectives of the protocol; and

(*e*) Enhance the U.S. position on and possible initiatives relating to further arms control and disarmament measures in the CW and BW area.

Our ratification without specifically asserting the right of retaliation in the area of biological methods of warfare would establish a constructive U.S. initiative and move us a step ahead of many of the other ratifying states. We hope it will lead to international support for a convention on the prohibition of biological methods of warfare.

With respect to both chemical and biological warfare, the Geneva Protocol, as qualified by reservations of many states which are parties, is for them a prohibition on first use. The President's initiative with respect to biological warfare, however, went beyond a no-first-use policy. The President renounced retaliatory as well as first-use. He also renounced all preparations for offensive use of biological agents as well as production and stockpiling. He announced that existing stockpiles of biological agents would be destroyed. These are truly significant steps toward reason and restraint.

The President noted, in the spirit of these decisions on biological agents, that the United States associates itself with the principles and objectives of the United Kingdom Draft Convention which would prohibit any use of biological methods of warfare. He added, however, that we will seek to clarify specific provisions of the draft convention to assure that necessary safeguards are included.

The President concluded that neither our association with the draft convention nor the limiting of our program to defensive research will leave us vulnerable to surprise by an enemy who does not observe these rational restraints. Our intelligence community will continue to watch carefully the nature and extent of the biological programs of others.

SIGNIFICANCE OF PRESIDENT'S DECISION ON CW

With regard to chemical warfare, the President's decisions are also very significant. They should be read in the context of his message of July 3, 1969 to the U.S. delegation at the Eighteen-Nation Disarmament Conference at Geneva in which he said:

> The delegation of the United States is prepared to examine carefully, together with other delegations, any approaches that offer the prospect of reliable arms control in this [CBW] field.

While these statements by the President have been enthusiastically welcomed by a wide spectrum of international and domestic opinion, some, including Members of Congress and earlier witnesses before this subcommittee, have expressed regret that the President did not also renounce all use in war of riot control agents and chemical herbicides.

I can assure you that all of these matters received very careful study and consideration during the comprehensive review conducted prior to the President's decision. In the end it was decided not to renounce the use of riot control agents which can be used to reduce U.S. and friendly military, civilian, and enemy casualties.

This decision with respect to riot control agents and chemical herbicides is based, of course, on a prior determination that their use is not

prohibited by the Geneva Protocol which the President will resubmit to the Senate for advice and consent to ratification.

In view of the interest which has focused on the issue of riot control agents and chemical herbicides, it might be well for me to outline briefly the reasons for these legal and policy conclusions.

DEFINITION OF TERMS

First, let me define, generally, certain terms:

"Incapacitating agents" may be defined as those producing symptoms—such as nausea, incoordination and general disorientation, etc.—that persist for hours or days after exposure to the agents has ceased.

"Riot control agents" may be defined as those (*a*) producing transient effects—such as lachrymation, etc.—that disappear within minutes of removal from exposure and (*b*) are widely used by governments for domestic law enforcement purposes.

"Chemical herbicides" may be defined as those chemical compounds which are (*a*) designed to be plant growth regulators, defoliants and desiccants, and (*b*) are used domestically within the United States in agriculture, weed control, and similar purposes.

Mr. ZABLOCKI. May I interrupt, please?

Mr. PICKERING. Yes, sir.

Mr. ZABLOCKI. The other material that you have referred to will be made a part of the appendix.[1]

Mr. PICKERING. Thank you, Mr. Chairman.

The operative language of the 1925 Geneva Protocol relating to its prohibition is as follows:

> Whereas the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilised world; . . .
>
> That the High Contracting Parties, so far as they are not already Parties to Treaties prohibiting such use, accept this prohibition, agree to extend this prohibition to the use of bacteriological methods of warfare and agree to be bound as between themselves according to the terms of this declaration.

Those who believe that tear gas is covered by the protocol argue that it is comprehended by the words "other gases" in the phrase "asphyxiating, poisonous or other gases * * *." For 40 years states have recognized, but not resolved, the ambiguity of whether the phrases "other gases," or in the equally authentic French text "*gaz similaries*," include nonlethal riot-control agents widely used for domestic law enforcement purposes.

AMBIGUITY OF PROTOCOL TEXT

It is quite obvious that the text of the protocol itself is not clear. Applying normal rules of construction to the phrase, the adjective "other" would seem to mean gases similar in nature or effect to "asphyxiating or poisonous" gases. Definitions of "asphyxiating" refer to suffocating or suspended animation due to deficiency of oxygen; definitions of "poisonous" refer to venomous or injurious or deadly effect. Accordingly, it would appear that riot-control agents, whose

[1] See appendix for copy of the English text of the protocol (p. 269), the French text (p. 275), a current list of the parties (p. 270), and the texts of reservations (p. 271).

effects are transient and temporary, are not included in the phrase "asphyxiating, poisonous or other gases." Examination of the negotiating history of the Geneva Protocol itself, and treaties from which the exact language of the Geneva Protocol is derived, supports the view that riot-control agents were not intended to be covered by the protocol.

I believe, Mr. Chairman, it would be useful for me at this time to discuss for a few minutes the Geneva Protocol in historical perspective.

THE HISTORY OF PRIOR TREATIES ON GAS

The first significant attempts to forbid the use of poisonous gas in war date from the first and second Hague Peace Conferences held in 1899 and 1907.

The Hague Gas Declaration of 1899 prohibited between contracting parties "the use of projectiles the sole object of which is the diffusion of asphyxiating or deleterious gases." The United States participated in this conference but refused to sign the declaration.

Both the first and second Hague Peace Conferences adopted conventions relating to the law of land warfare. Under the annexed regulations, it was "especially forbidden to employ poison or poisoned weapons" and "arms, projectiles or material calculated to cause unnecessary suffering."

As we all know, these efforts did not prevent the use of poisonous gases, by either side, during World War I. The declaration and conventions were narrow in scope or vague, and not all the belligerents were parties.

The first post-World War I attempt to regulate gas warfare is found in the disarmament section of the Treaty of Versailles. Article 171 provided:

> . . . the use of asphyxiating, poisons or other gases and all analogous liquids, materials or devices being prohibited, their manufacture and importation are strictly forbidden in Germany.

You will note, Mr. Chairman, that the operative language in this article—and the French text—is the same as that later incorporated in the 1925 Geneva Protocol. While there is no record that the drafting committee, which prepared this article, discussed tear gas, and no record of the significance of the word "other", we do know that neither the French nor British believed the 1899 Hague Gas Declaration, which used the phrase "asphyxiating or poisoning gases," encompassed tear gas. In addition, no authority has suggested that the 1907 Hague Convention rules applied to tear gas. Finally, the French rapporteur at Versailles who analyzed this provision at the conference stated that the Germans were being prohibited from importing or manufacturing "poisonous gas."

The Versailles formula on use, manufacture, and importation was adopted in bilateral treaties entered into by the United States with Germany, Hungary, and Austria in 1921.

THE TREATY OF WASHINGTON, 1922

This brings us to Treaty of Washington of 1922 on submarines and noxious gases and the Geneva Protocol of 1925. I mention these two in the same sentence with good reason.

Article 5 of the Treaty of Washington of 1922 contained a prohibition on the use in war of gases in language identical to the Versailles Treaty—the phrase is again "asphyxiating, poisonous or other gases, and all analogous liquids, materials or devices" in the English text.[1] This prohibition on use is described in terms of "having been declared in treaties to which a majority of the civilized powers are parties * * *."

The U.S. delegation proposed the use of the Versailles Treaty language since 30 to 40 states had already accepted this language in treaties. Mr. Elihu Root, who was a member of the delegation and who proposed the Versailles formula at the conference, said that it was a statement of the previous rules adopted in the course of the Hague Peace Conferences.

The Treaty of Washington was signed on February 6, 1922, received the advice and consent of the Senate without dissenting vote on March 29, 1922, and was ratified by the President. Great Britain, Italy, and Japan also ratified. It soon became clear, however, that the French might not ratify, and that the Treaty, which required ratification by all five signatories, might never come into effect because of French opposition to the provisions dealing with the use of submarines against merchantmen.

HISTORICAL SETTING OF GENEVA PROTOCOL

The Geneva Protocol itself was proposed by the United States in May 1925 at an international conference called to control the international trade in arms, munitions, and implements of war. The U.S. delegation proposed a separate protocol and suggested the operative language of article 5 of the Treaty of Washington of 1922 which had already been ratified by four major states. The Polish delegation suggested extending the scope of the protocol to "bacteriological methods of warfare."

The resulting Geneva Protocol—which combines article 5 of the Treaty of Washington of 1922 and the Polish proposal—has two operative provisions.

The first provisions, using the exact language of the Treaty of Washington and the Versailles Treaty, prohibits "the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices." There is no recorded discussion of tear gas by the delegates. For reasons which I will discuss later, the United States has consistently interpreted these phrases in the protocol as not prohibiting the use in war of riot-control agents—tear gases—which are similar to those widely used for domestic law enforcement purposes. The United States also maintains that these provisions do not prohibit the use in war of chemical herbicides.

The second operative provision prohibits "bacteriological methods of warfare." While this provision is not without ambiguity, the

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[1] The complete English text of article 5 is as follows:

The use in war of asphyxiating, poisonous or other gases, and all analogous liquids, materials, or devices, having been justly condemned by the general opinion of the civilized world and a prohibition of such use having been declared in treaties to which a majority of the civilized Powers are parties.

The Signatory Powers, to the end that this prohibition shall be universally accepted as a part of international law binding alike the conscience and practice of nations, declare their assent to such prohibition, and agree to be bound thereby between themselves and invite all other civilized nations to adhere thereto.

United States took the position before the U.N. General Assembly in December 1966, and later at the Eighteen-Nation Disarmament Conference, that the term "bacteriological methods of warfare" includes all "biological" methods of warfare. More specifically, this prohibition applies to all antipersonnel, antianimal, and anticrop biological agents. This position is supported by the negotiating history at Geneva in 1925.

As I have indicated, Mr. Chairman, the United States proposed the protocol in 1925 and signed it at Geneva. The protocol was submitted to the Senate for its advice and censent to ratification in January 1926. It was favorably reported out by the Committee on Foreign Relations on June 9, 1926. The temper of the times, however, had changed. While the Treaty of Washington had received unanimous approval from the Senate 3 years previously, floor debates in the Senate in December 1926 revealed the considerable opposition which had developed.

The protocol was never submitted to a vote, and it was returned to the Executive with certain other treaties in 1947.

RIOT-CONTROL AGENTS AND THE PROTOCOL

At a meeting of the League of Nations Preparatory Commission for the Disarmament Conference in 1930, the United Kingdom sought to obtain a uniform interpretation that the use of "other" gases prohibited by the Geneva Protocol included "lachrymatory gases"; that is, tear gases—which by then were in use for domestic riot control. The French and 10 of the 27 states represented agreed with the United Kingdom. The U.S. representative to the Preparatory Commission, Mr. Hugh Gibson, who had cosigned the protocol at Geneva in 1925 on behalf of the United States, openly disagreed:

> [W]e seek a maximum prohibition of inhumane agencies, but, at the same time, we should not be led to bring into disrepute the employment of agencies which not only are free from reproach of causing unnecessary suffering, but which achieve definite military or civil purposes by means in themselves more humane that those in use before their adoption. I think there would be considerable hesitation on the part of many governments to bind themselves to refrain from the use in war, against any enemy, of agencies which they have adopted for peacetime use against their own population, agencies adopted on the ground that, while causing temporary inconvenience, they cause no real suffering or permanent disability, and are thereby more clearly humane than the use of weapons to which they were formerly obligated to resort to in time of emergency.

The remaining 14 states stayed silent. As a result, the Preparatory Commission reported in 1931 that "it was unable to express a definite opinion on this question of interpretation."

All of this is early history, but I believe it is relevant to an understanding of the background of the recent studies and decisions. In summary, on the question of tear gas under the 1925 Protocol, neither careful textual analysis nor the history of the negotiations and pertinent interpretations of prior treaties reveal a clear intent to bring tear gas with the protocol's prohibitions. The only firm conclusion is that the protocol is ambiguous on this point. This is the conclusion of Prof. George Bunn, the former General Counsel of the Arms Control and Disarmament Agency who has studied this subject in detail and who appeared before this subcommittee several weeks ago.

While it is true that numerous states have expressed a desire to prohibit the use of tear gas in war and have, in support of this purpose, subsequently given the protocol this interpretation, the relevant materials do not support the conclusion that this result was intended. The protocol and prior treaties were framed to prohibit the use of poisonous gases, particularly those which are indiscriminate and would endanger civilians and noncombatants and indeed entire cities. Looking broadly at the purpose of the protocol, it is the conclusion of the administration that the prohibitions were not designed to cover tear gas.

CHEMICAL HERBICIDES AND THE PROTOCOL

With respect to chemical herbicides, the administration does not believe that the language and scope of the protocol is unclear. The argument that the protocol prohibits the use of chemical herbicides apparently rests on the phrase "all analogous liquids, materials or devices." Neither the language of the protocol nor the negotiating history indicates that this phrase was intended to cover antivegetation chemical agents.

The protocol now has 84 parties and is thus one of the most widely adhered to treaties in the arms control field. France, which was the first to ratify on May 9, 1926, made its ratification subject to a reservation on no-first-use and expressly limited its obligations on nonuse to other contracting parties. Thirty-eight other parties, including the United Kingdom and U.S.S.R., subsequently ratified subject to similar reservations.

VIEWS OF OTHER STATES

At the U.N. General Assembly this year, chemical and bacteriological warfare has been the subject of extensive debate—attracting more interest, indeed, than any other single disarmament topic. This interest stems, in large part, from the introduction at the Geneva Disarmament Committee and the General Assembly of several draft conventions and resolutions aimed at restricting, and in some cases prohibiting, the production and use of chemical and bacteriological weapons. The most detailed and well thought out of these instruments, in our view, is the British Draft Convention on the Prohibition of Biological Methods of Warfare, with whose principles and objectives the United States has associated itself. The Soviet Union has also submitted a draft convention, which would prohibit the development, production, and stockpiling of all chemical and biological weapons, and provide for their destruction. This proposal, which contains no provision for verification, seems to us less constructive than the British approach of dealing with complex arms control questions on a step-by-step basis, taking the most urgent and most manageable problems first.

It was widely recognized at the U.N. that President Nixon's policy decisions in the chemical warfare and biological research fields provided the opportunity and atmosphere for important new arms control measures. The great majority of delegations which addressed the General Assembly's First Committee after the decisions had been announced warmly welcomed them. The United Kingdom representative, Lord Chalfont, remarked of the President's statement during the

General Assembly disarmament debate on November 25 that "it cannot fail . . . to give great impetus to our work in the field of arms control and disarmament. . . . The U.S. initiative is a great encouragement to all of us who want to make it impossible to contemplate using this kind of weapon as an instrument of war."

REASONS FOR OPPOSING U.N. RESOLUTION ON CW

I have already spoken about the ambiguities of the Geneva Protocol. The 1966 and 1968 debates at the U.N., when the protocol received overwhelming support, did not remove those ambiguities. The same can be said of the Swedish resolution, also voted on yesterday by the General Assembly which purports to state that the principles of the protocol apply to tear gas and chemical herbicides. The United States opposed this resolution for two basic reasons:

First, we do not believe that the General Assembly should purport to interpret or declare principles of international law embodied in treaties where the rules are ambiguous and where universal consensus is lacking; and

Second, we disagree with the substance and scope of the resolution for reasons previously stated.

While in the General Assembly, 80 U.N. members voted for the Swedish resolution, 36 others, including Canada, New Zealand, Japan, the United Kingdom, most of the Western European states and several others abstained. Australia and Portugal, like the United States, voted against the resolution, and five states were absent. In the First (Political) Committee, the Australian representative explained that his government believed it was for the parties to the Geneva Protocol, not the General Assembly, to determine what the protocol means, and added that his government found it difficult to accept the proposition that riot-control agents widely used by national police forces were prohibited by the protocol. Most of those abstaining explained that, like the United States, they do not believe the General Assembly is a proper body to seek to resolve disputed questions of treaty interpretation by majority vote.

Of the 90 states who are parties or signatories to the protocol, 82 are members of the United Nations. Thirty-nine of these voted yesterday in favor of the Swedish resolution, three were opposed and 27 abstained.

SUBMISSION OF THE PROTOCOL TO THE SENATE

In accordance with the President's November 25 statement the executive branch is currently preparing to submit the 1925 Geneva Protocol to the Senate for its advice and consent to ratification. We expect the formal transmittal papers will be submitted to the White House in the near future and that they will include a reservation on "no-first-use" limited to chemical weapons.

The proposed U.S. reservation would be more limited than those of many other states in that it would apply only to chemical weapons and would not assert the right to use biological agents in retaliation. This is, of course, in complete accord with the President's November 25 announcement.

The report of the Secretary of State to the President, and the President's message to the Senate, will make clear the administration's view of the scope of the protocol. For instance, the administration will indicate that it believes the phrase "bacteriological methods of warfare" covers all biological methods of warfare. While this is the generally accepted view, our position leaves no room for uncertainty or ambiguity on this point. The administration will also make clear that it does not believe the use in war of riot-control agents or chemical herbicides is covered by the prohibitions of the protocol.

In this connection I would like to add a further point or two. As you may know, the use of riot-control agents and chemical herbicides in Vietnam received Presidential review. In regard to chemical herbicides, the specific use is approved by authorities of the Government of the Republic of South Vietnam. Of course these matters have been and are continually under review.

At this point, Mr. Chairman, I would like to end my statement with the suggestion that Mr. Furnas might discuss next the ramifications of the President's decision on arms control measures. Following his prepared comments, both he and I are prepared to respond to questions.

Mr. ZABLOCKI. Thank you, Mr. Pickering.

Mr. Furnas?

STATEMENT OF HOWARD FURNAS, SPECIAL ASSISTANT TO THE DIRECTOR, ARMS CONTROL AND DISARMAMENT AGENCY

Mr. FURNAS. Mr. Chairman, the Arms Control Agency has been following with great interest the probing, comprehensive hearings you have been holding on the Geneva Protocol and our general policies with respect to chemical warfare and biological weapons. The expert testimony you have heard during the past month provides an impressive background for understanding both the need and the possibilities for arms control in this field.

Mr. Chairman, one of the purposes you announced for these hearings is to "look beyond the ratification of the protocol to new international agreements which may be required to control the spread and use of chemical and particularly biological weapons." As part of its responsibilities with respect to the arms control policies of the United States, the Arms Control and Disarmament Agency is charged with developing, coordinating and negotiating arms control measures in a manner that will promote the security interests and objectives of the United States.

As an Agency representative, I believe my most useful contribution to these hearings would be to discuss the prospects for possible future international measures in the field. In doing so, I, of course, start with the governing premise, which is set forth in the Arms Control and Disarmament Act, that arms control and disarmament policy is an important aspect of foreign policy and must be consistent with national security policy as a whole.

IMPORTANCE OF GENEVA PROTOCOL RATIFICATION

But first, I would like to stress the importance we attach to the President's decision to resubmit the Geneva Protocol to the Senate for

its advice and consent to ratification. The Arms Control and Disarmament Agency participated actively in the review that led to that decision.

The Geneva Protocol is one of the great milestones in international arms control, and it seems only fitting that the United States, which originally sponsored it, should join the 84 other nations which have ratified it.

In addition to the advantage of our adding to the universality of the protocol itself, our ratification could greatly facilitate further progress toward arms control in this field. In disarmament talks in recent years, the fact that we had not ratified the protocol had been used by others as an obstacle to such progress. Thus the President's decision to resubmit the protocol—a decision which should be welcome to you in light of the resolutions that gave rise to these hearings—is certainly of immense importance for the work of our Agency.

We hope for favorable Senate action on this matter that will permit completion of the ratification process promptly, and that our actions will encourage those other states who have not already done so to follow our example.

But important as it is, one should recognize that the Geneva Protocol does not cover all aspects of the problem. It has the effect of prohibiting the first use in war of poison gas and biological weapons. But it does not attempt to deal with the development, production, testing, stockpiling, deployment or proliferation of these weapons. These aspects of the problem present the challenge for future work in this field.

Our determination to meet this challenge was expressed in the President's message to the Geneva Disarmament Conference last July, when he said:

> The specter of chemical and biological warfare arouses horror and revulsion throughout the world.
>
> The delegation of the United States is prepared to examine carefully, together with other delegations, any approaches that offer the prospect of reliable arms control in this field.

In meeting this challenge, we believe it is important to recognize that there are basic differences between chemical and biological means of warfare that indicate the desirability of dealing with them separately. The technical differences relate to their toxicity, speed of action, duration of effects, controllability, and residual effects.

Moreover, in an age of nuclear deterrence, the question has arisen whether biological warfare has any military utility and whether, therefore, it makes military sense to maintain a capability to retaliate in kind with biological weapons.

As the President pointed out, biological weapons have massive, unpredictable and potentially uncontrollable consequences. They may produce global epidemics and impair the health of future generations. These factors, plus widespread abhorrence of this method of warfare throughout the world, makes the prospects for progress in eliminating this form of warfare especially significant and especially promising.

I hope that this background will prove helpful in understanding the President's historic decision of November 25. As you know, at that time, in addition to his decision to resubmit the Geneva Protocol, he announced that:

First, in the field of chemical warfare, I hereby reaffirm that the United States will never be the first country to use chemical weapons to kill. And I have also extended this renunciation to chemical weapons which incapacitate.

Second, I have decided that the United States of America will renounce the use of any form of deadly biological weapons that either kill or incapacitate.

Our bacteriological programs in the future will be confined to research in biological defense, on techniques of immunization, and on measures of controlling and preventing the spread of disease.

I have ordered the Defense Department to make recommendations about the disposal of existing stocks of bacteriological weapons.

The United States positively shall associate itself with the principles of the draft convention prohibiting the use of biological weapons of warfare presented by the United Kingdom [at] the U.N. Eighteen-Nation Disarmament Conference on August 26, 1969.

The United States, as of today, now indicates its support of this initiative and we hope that other nations will follow suit.

IMPORT OF PRESIDENTIAL DECISION ON BW

I would like particularly to emphasize the importance of the President's decision on biological weapons. We hope that other nations will follow this historic step. It is obviously in our interest, as well as their interest, that they do so. Thus it would be clearly to our advantage to have an international agreement under which other nations would bind themselves to do away with biological weapons. The British draft convention, referred to by the President, is such an agreement. Let me summarize it for you briefly.

Each party would undertake never to engage under any circumstances in biological methods of warfare. To that end, each party would renounce the production or acquisition of biological agents of types and in quantities that have no independent justification for prophylactic or other peaceful purposes. Existing stocks would be destroyed or diverted to peaceful purposes. Research aimed at the production of biological agents for hostile purposes would be prohibited. Complaints of violation would be investigated under United Nations auspices, and parties would provide appropriate assistance, such as medical aid, to any party that had been attacked with these illegal weapons.

Mr. Chairman, I have with me the text of this draft convention for insertion in the record, if you so desire.

Mr. ZABLOCKI. Without objection, it will be made a part of the record.[1]

Mr. FURNAS. We are hopeful that the general soundness of this initiative, together with our support of it, will lead to successful international negotiations. But such negotiations will not be free of difficulties. We think certain aspects of the United Kingdom draft may need clarification or further refinement. A number of nations have already criticized the British proposal for dealing exclusively with biological weapons, rather than seeking to cover chemical weapons as well. As indicated above, we consider this separation of biologicals as one of its merits. In contrast to chemical warfare, the biological problems may be more susceptible to early progress, and we hope others will come to see these problems in this light.

[1] See appendix, p. 276, for the British draft convention.

WORK TOWARD CONTROL OF CHEMICAL WEAPONS

While our main effort will now lie in advancing the principles of the British draft convention, we must, of course, continue working toward the control of chemical weapons. Frankly, an adequate ban on chemicals beyond the Geneva Protocol may be difficult to attain. Lethal chemical weapons have been used in past wars.

A number of states have chemical warfare capabilities, and they will presumably be reluctant to eliminate such capabilities without firm assurances and safeguards that other states are doing likewise. Thus, further progress in controlling chemical warfare at this time appears to call for developing reliable and negotiable verification measures.

At present, we could not verify compliance with a ban on production and possession of chemical weapons by national means alone. This presents both technical and political problems. We believe that major progress can be made toward resolving the technical problems involved in verification by direct observation, and we intend to devote greater efforts to this end. However, on the political side, as you know, the negotiation of arms control measures in which compliance is assured by means of direct observation has proven exceedingly difficult.

Recently the Soviet Union introduced at the United Nations a draft treaty which would prohibit the development, production, and stockpiling of both chemical and biological weapons. This proposal may satisfy the desire of some states to treat chemical as well as biological weapons in a single agreement. On the other hand, this proposal has serious deficiencies, including a lack of any system whatsoever for verifying complaints of violation and dependence on self-policing only. We do not consider this to be an adequate means of assurance.

Given the need which I have described for additional work on verification studies on the chemical side, we intend to continue to explore interim measures to curb chemical weapons, including, for example, the possibility of a mutual suspension of production of lethal chemicals for a limited period of time while the problem of verifying a comprehensive prohibition on chemical weapons could be worked out.

Within the U.S. Government, ACDA has been sponsoring studies on the verification problem for several years and intends to continue the search for effective controls. To date, some of our analysis of this problem indicates that the technical issues involved in this search may not be beyond resolution.

DEVELOPMENT OF DIRECT CW SURVEILLANCE TECHNIQUES

We are encouraged by our studies of direct observation techniques and now believe that they can be developed to create unacceptable risks for any potential violator.

For example, under an agreement in which all lethal chemical weapons facilities were declared and broad rights of direct inspection were provided, it would appear that a party would have great difficulty in the clandestine conversion of its commercial pesticide factories to produce nerve gas in violation of the treaty without being detected. Our studies indicate that such factories lack many essential facilities

and equipment to produce nerve gas. These deficiencies include necessary safety facilities, waste disposal systems and agent processing buildings. Thus, any substantial clandestine attempt to convert pesticide factories for nerve gas production would have a high probability of detection.

We believe that not only is there a potential risk of arms competition among major powers, but there is also a possibility that less developed countries may acquire a chemical warfare capability. Therefore, other measures that should be explored include nonproliferation agreements in which states possessing chemical or biological weapons would agree not to transfer them to states not possessing the weapons, and those states would agree not to acquire them. There are other concepts which could be explored, such as chemical and biological weapons-free zones and some sort of atmospheric test ban.

The recent actions regarding our own military testing, transportation, and disposal of chemical and biological weapons may set an example which other states will follow.

A further means of assuring that countries' efforts in research and development in this field are devoted to peaceful purposes may be the establishment of an exchange in scientific personnel and literature in this field. Under appropriate conditions, exchanges of the results of defensive biological research—for example, the development of new vaccines—could help reduce human suffering from naturally occurring diseases.

In summary, Mr. Chairman, the Arms Control and Disarmament Agency sees many opportunities and challenges ahead for devising measures, consistent with national security requirements, to restrict the chemical and biological warfare efforts of all states. Our immediate goal is to ratify the Geneva Protocol and associate ourselves with the principles of the British treaty on biological weapons.

As opportunities emerge, we hope to sponsor constructive initiatives of our own that will advance the cause of arms control. As the President stated, "Mankind already carries in its own hands too many of the seeds of its own destruction."

Thank you.

Mr. ZABLOCKI. Thank you, gentlemen, for your excellent statements.

You know the committee operates on the 5-minute rule during the questioning period.

TIMETABLE FOR PROTOCOL RESUBMISSION

Mr. Pickering, in reviewing President Nixon's decision to resubmit the Geneva Protocol to the Senate on page 20, you state that the President will resubmit the Geneva Protocol to the Senate in the near future. The President's announcement was made more than 2 weeks ago. At that time the Senate majority leader, Senator Mansfield, expressed the belief that ratification could be accomplished before the end of this session.

Of course, this is no longer possible since the President has not thus far resubmitted the protocol and apparently is not going to before the end of the year unless he does it tomorrow or the next few days. So certainly Senate action will not occur before the end of the year.

What is the reason for the delay? Apparently, from the testimony

here today and from earlier witnesses, this subject matter was thoroughly discussed in the executive branch. The decision must have been made and the presentation must have been discussed. Why the current delay? Will you discuss that?

Mr. PICKERING. I am assured, Mr. Chairman, there is every intention on the part of the administration to resubmit the Geneva Protocol——

Mr. ZABLOCKI. I am not questioning that.

My question is not to be interpreted as in any way critical of the President. I wanted to know why the delay——

Mr. PICKERING (continuing). In the very near future. I must say, as you know, the President's decisions were broad and general and very far reaching. I brought out in my statement one difference between our ratification process of the protocol with respect to biological agents, for example, and the reservations of other states. This required a certain amount of implementing work in both the Department of State and other government departments concerned in order to prepare the papers for review by the White House, and then decision by them as to when they think it is best fit to submit these to the Senate. So that I would say there are distinctions and differences as a result of the President's broad and far-reaching decisions and these obviously have required time for implementation and this is the reason why several weeks have elapsed between the President's statement and the situation as it is now.

COMMENDATION OF THE PRESIDENT

Mr. BROOMFIELD. Will the gentleman yield?

Mr. ZABLOCKI. I will be glad to yield.

Mr. BROOMFIELD. In my judgment the President should be commended. There has been no undue delay and certainly if the protocol was submitted the day he made the statement, the way the Senate operates I doubt if it would have acted until after the first of the year.

I commend President Nixon for his position on this matter. I think the administration is moving in the right direction. I certainly hope the Senate, when they do get it, will move expeditiously.

REASONS FOR OPPOSING U.N. RESOLUTION ON CW

Mr. ZABLOCKI. I think there is something to be said about moving in the right direction slowly. But if you want to demonstrate sincerity, I think you follow your words with action. Since the President's statement we had an opportunity to verify our position at the United Nations. I think it is a rather weak excuse we give that the United Nations is not the place to seek international consensus on the Geneva Protocol.

I think this weakens our position and I further think it undermines the President's sincerity when we have an opportunity to demonstrate at the United Nations our sincerity in curbing chemical-biological warfare, and we do not follow through in our actions. What was the reason for the decision to oppose the U.N. vote?

Where is a better international body in which we can get a consensus on this issue than in the United Nations?

Mr. PICKERING. I think what we have stated with respect to the U.N. is that it is not the place to seek international consensus on disputed points of treaty law by majority vote. I think that is our point. I do not think there is any attempt in our statement or by our position to disparage the seeking of an international consensus at the United Nations.

Mr. FRASER. We have not ratified it. What is our standing then to complain on that account?

Mr. PICKERING. I think all of the states who are members of the United Nations were asked to vote on the issue.

Mr. FRASER. You are saying that when we are not a party to it, we have not ratified it, we take the position, although not a party to it because we have not ratified it that as a matter of principle we do not think the U.N. should interpret and try to give meaning to or resolve ambiguities in these international agreements.

Mr. PICKERING. We are a signatory to the Geneva Protocol. We did play a very instrumental part in raising the question.

Mr. FRASER. I understand, but we do not claim it is binding upon us at the present time, do we?

Mr. PICKERING. That is right. We have said we support the principles and objectives through various United Nations resolutions in 1966 and 1968. But with respect to the binding quality of the Geneva Protocol, that has to await the ratification process before the Senate.

FINDING A FORUM FOR DEFINING PROTOCOL MEANING

Mr. ZABLOCKI. If I may pursue it further, granting that your reason for the U.S. position at the United Nations has some merit, what steps has the United States taken to take this matter to a forum that you feel is a proper forum for a determination? What steps has the United States taken to get clarification if we feel the United Nations is not the place to get a consensus?

I am trying to be helpful.

Mr. PICKERING. Yes, I understand.

We feel, with respect to the Geneva Protocol, that our position on the treaty and its prohibitions is clear and we believe, while it may be subject to some ambiguity as between the parties, our feeling with respect to the prohibitions is that it does not cover the use in a war of riot control agents and chemical herbicides. Other parties feel differently with respect to this particular point.

I think this, unfortunately, as in the case of other treaties in other areas, is the subject of a certain amount of ambiguity. We believe that the treaty as it now stands ought to be ratified by the Senate. It covers the prohibitions of lethal chemicals and incapacitating chemicals, which are the kind of things we think would bring the world advantages to have covered, and therefore we are supporting the ratification on the basis of the treaty as it is.

The outstanding question of ambiguities—I think this is a point that must perhaps be focused on, but it is a question with respect to all treaties, as to how each of the parties views the particular treaty in question.

Mr. ZABLOCKI. It is the position of the executive branch that it will take no further steps until the Senate ratifies the Geneva Protocol

which has not yet been resubmitted? Only after the Senate ratifies it will the executive branch take further steps. Is that the position?

Mr. PICKERING. I don't think we have focused on that issue at this point. The President has said the next step will be the ratification of the Geneva Protocol. What may happen after that is not a subject the administration has taken a clear position on.

RECOMMENDATION OF ACDA ON GENEVA PROTOCOL

Mr. ZABLOCKI. In your statement you have indicated there were differences of opinion in the National Security Council, including perhaps interpretations of the Geneva Protocol.

Mr. Furnas, what was the recommendation of the Arms Control and Disarmament Agency to the National Security Council on the question of the advisability of continued use of chemical agents in Vietnam? I refer to your reference on page 2 on this subject.

Mr. FURNAS. The Arms Control Agency participated completely in the intensive examination of these problems from the very beginning. The proposal which went forward to the National Security Council and which was considered by the President was not a disagreed recommendation. There were options and pros and cons for options. Positions were not identified by agencies. As you well know, Mr. Chairman, our position for a long time has been in favor of ratification of the Geneva Protocol so that it would give impetus to progress which we hoped to make and which we have been working on for many years in the field of bacteriological and chemical warfare.

Mr. PICKERING. In my statement I think I made clear there were differing international views with respect to the cover of the prohibitions or the effect of the prohibitions of the Geneva Protocol. I don't think I indicated different internal views within the U.S. Government or within the National Security Council.

Mr. ZABLOCKI. Prior witnesses have made statements about internal differences in the Government, and certainly differences as to the recommendation for continued use of chemical agents in Vietnam.

You addressed yourself, Mr. Furnas, to the Arms Control and Disarmament Agency's recommendation to the National Security Council on the protocol. What was the recommendation on the use of chemical agents in Vietnam?

Mr. FURNAS. This study did not address itself directly to the question of the use of riot-control agents and chemical herbicides in Vietnam. We were concerned with the overall question of biological and chemical warfare. Our study took into account all kinds of considerations relating to this particular problem; foreign policy considerations, military considerations, domestic political considerations and so on. Our recommendation was that the Geneva Protocol be ratified, that the question of what reservations were necessary be carefully studied, worked out, and recommended at the time that the President resubmitted the protocol to the Senate for advice and consent to ratification.

ACDA ROLE IN DECISION ON VIETNAM USE OF CW

Mr. ZABLOCKI. When the policy decision was made to use tear gas in Vietnam, the Arms Control and Disarmament Agency was not in the discussions between the State Department and the military.

Mr. FURNAS. The decision to use certain kinds of weapons in Vietnam, of course, was made a long time ago. The Secretary of State and the Secretary of Defense participated fully in Presidential decisions.

Mr. ZABLOCKI. To what extent did the Arms Control and Disarmament Agency participate?

Mr. FURNAS. Arms control considerations to the best of my knowledge, were taken fully into account at the time these problems were being considered and at the time Presidential decisions were being made.

Mr. ZABLOCKI. Perhaps we had better pursue this into executive session.

Mr. Broomfield.

Mr. BROOMFIELD. I pass.

Mr. ZABLOCKI. Mr. Fraser.

U.S. POSITION ON BANNING USE OF ALL CHEMICAL AGENTS

Mr. FRASER. There are two questions, it seems to me, that are involved in the question of herbicides and the use of tear gas. One is whether the Geneva Protocol covers them, to prohibit their use in war. The second question is what the long-term position is of the United States with regard to that issue independent of the protocol? In other words, if we were sitting down with other nations to discuss whether or not their use in war should be banned, what our position would be.

Let me just ask on the last point, do we have a position on that question at this time? In other words, let's suppose other nations were prepared to accept a convention or international agreement to ban the use of all chemicals, whether lethal, incapacitating, or not. What would the U.S. position be?

Mr. PICKERING. If I might start with the answer that I think Mr. Furnas would probably elaborate on, I think he has indicated that verification plays a significant role in the whole problem of bans on chemical warfare production, stockpiling and so forth.

Mr. FRASER. I am now talking only about use.

Mr. PICKERING. Talking about its use in future conflicts or in future positions, we would want to know what kinds of political and military considerations were involved. I think the problem of, we might say, independent renunciation of this particular use depends upon a lot of circumstances which I think, speaking in sort of in vacuo here, are difficult to sketch out. I would think the administration would want to consider these and do so in relation to any proposal people would want to make, very carefully, and then decide, on the basis of the character of the proposal, and the kind of circumstances prevailing, as to what position it would want to take.

I think in the absence of a specific proposal on this before the administration, the question of what position we might take is sort of an academic question and it is difficult to get a handle on it.

Mr. FRASER. Let me see if I can restate what I understand you to say.

We don't now have a position on whether or not we would agree to a ban on tear gas and herbicides because we don't have that question before us at the moment. Is that your position?

Mr. PICKERING. I think it is correct to say this: I think the President made clear with respect to the Geneva Protocol he did not feel that as a result of his review, which presented the question clearly, that the

prohibitions of that instrument include the use of riot-control agents.

Mr. FRASER. In your statement you said the U.S. position has consistently been that the protocol does not cover tear gas and herbicides, is that right?

Mr. PICKERING. Yes.

U.S. POSITION ON GAS AT 1932–33 CONFERENCE

Mr. FRASER. In a letter to the New York Times from Mr. Noel-Baker, he says "At the Disarmament Conference of 1932–33 and during later stages, a new U.S. delegate, Hugh R. Wilson, declared that the U.S. Government agreed that the use of all tear gas was banned by international law." [1]

Do you know whether or not that is a fair characterization of the fact?

Mr. PICKERING. It is my understanding that that is a characterization out of context, if you like, because the context, as I understand it, of the 1932–33 negotiations was that of a completely new agreement which involved a specific prohibition on tear gas. Therefore, in effect, entering into a completely new agreement with this specific prohibition was what Philip Baker had in mind when he spoke of the position of the U.S. delegation, rather than the Geneva Protocol which, as you know, came before it, and on which we took a very firm position, I think, in 1930, that the prohibitions of the Geneva Protocol on use of those gases did not prohibit the use of tear gas or riot-control agents commonly used in domestic law enforcement.

Mr. FRASER. The way this statement appears in the New York Times, Mr. Noel-Baker says that the U.S. Government agreed that the use of all tear gases was banned by international law.

Mr. PICKERING. I understand.

Mr. FRASER. His statement is not prospective in terms of possible agreement.

Mr. PICKERING. I understand the nature of the quote. It is also my understanding that the position of the U.S. delegate on that question was taken on the basis of the prospective draft treaty or protocol—I don't know what the correct title was—which was then under consideration and in which that specific language related to the use of tear gas.

Mr. FRASER. Can we get something for the record to show exactly what his position was?

Mr. PICKERING. We will get that and submit it for the record.

Mr. FRASER. Can we get the full context in which the statement was made and what the statement was?

Mr. PICKERING. Yes.

(The following memorandum was submitted:)

CONFERENCE FOR THE REDUCTION AND LIMITATION OF ARMAMENTS, GENEVA, 1932–34

I. CONFERENCE PROCEEDINGS

The Conference for the Reduction and Limitation of Armaments was convened under resolutions of the League of Nations Council in 1931. The Conference was

[1] Text of the Noel-Baker letter can be found on p. 346 of the appendix.

the culmination of work done by the League over a period of years pursuant to the obligations of Article 8 of the League Covenant calling for the reduction of national armaments in accordance with plans formulated by the Council and adopted by the Governments. In December 1925, the Council set up a preparatory commission for a general disarmament conference. Working under the direction of the Council, the preparatory commission met from May 1926 until December 1930 when it submitted its final report and draft convention to the Council.

When the disarmament conference convened on February 2, 1932, it had before it the preparatory commission's draft convention which provided in Article 39:

"The high contracting parties undertake, subject to reciprocity, to abstain from the use in war of asphyxiating, poisonous or similar gases and of all analogous liquids, substances or processes. They undertake unreservedly to abstain from the use of all bacterial methods of warfare."

Several delegations submitted supplementary proposals going further than Article 39.

On May 10, 1932, the General Commission of the Conference appointed a Special Committee on chemical and bacterial warfare. The Special Committee submitted a report to the General Commission on May 31. The following resolutions were included in its report:

(1) Chemical weapons and means of warfare: ". . . [T]here should be included in qualitative disarmament the use, for the purpose of injuring an adversary, of all natural or synthetic noxious substances, whatever their state, whether solid, liquid or gaseous, whether toxic, asphyxiating, lachrymatory, irritant, vesicant, or capable in any way of producing harmful effects on the human or animal organism, whatever the method of their use."

(2) Bacterial methods and means of warfare: ". . . [A]ll methods for the projection, discharge or dissemination in any manner, in places inhabited or not, of pathogenic microbes in whatever phase they may be (virulent or capable of becoming so), or of filter-passing viruses, or of infected substances, whether for the purpose of bringing them into immediate contact with human beings, animals or plants, or for the purpose of affecting any of the latter in any indirect manner—for example, by polluting the atmosphere, water, food stuffs, or any other objects—should be included in qualitative disarmament."

The General Commission, in a resolution adopted on July 23, 1932, declared that "chemical, bacterial and incendiary warfare should be prohibited under the conditions unanimously recommended by the special committee." The resolution further provided that "rules of international law should be formulated in connection with the provisions relating to the prohibition of the use of chemical, bacterial and incendiary weapons and bombing from the air, and should be supplemented by special measures dealing with the infringement of these provisions."

On September 22, 1932, the Bureau, an organ established to assist the President of the Conference in directing its work, requested a report from the Special Committee. The report, filed on November 8, 1932, recommended that contracting parties renounce as against any state and in any war the use of chemical and bacterial weapons for the purpose of injuring an adversary.

Discussion then turned to the question of whether the prohibition on chemical warfare could be extended to cover preparations for such warfare in peacetime and to the problems raised by possible violations of the prohibition. The Bureau met on Janaury 25 and 30, 1933, to consider the Special Committee's views on these issues. It also had under consideration a series of draft conclusions prepared by the Rapporteur to serve as the basis for articles to be embodied in a disarmament convention. In part the draft conclusions provided "that the use in warfare of chemical, incendiary and bacterial weapons should be prohibited." On January 30 the Bureau instructed a drafting committee to frame articles on CWB for a draft disarmament convention. The drafting committee articles were taken as a basis for provisions on CBW included in a draft disarmament convention submitted to the General Commission by the United Kingdom delegation on March 16, 1933. Article 47 of the draft convention provided:

"The following provision is accepted as an established rule of international law: the use of chemical, incendiary or bacterial weapons as against any state, whether or not a party to the present convention, and in any war whatever its character, is prohibited.

"This provision does not, however, deprive any party which has been the victim of any illegal use of chemical or incendiary weapons of the right to retaliate, subject to such conditions as may hereafter be agreed.

"With a view to the application of this rule to each of these category of weapons, the high contracting parties agree upon the following provisions:

"Article 48. The prohibition of the use of chemical weapons shall apply to the use, by any method whatsoever for the purpose of injuring an adversary, of any natural or synthetic substance harmful to the human or animal organism, whether solid, liquid or gaseous, such as toxic, asphyxiating, lachrymatory, irritant or vesicant substances."

The UK draft convention provisions on CBW were read a first time in the General Commission on May 30, 1933. The President of the Conference noted that several points had been raised with regard to these draft articles and invited delegations to submit amendments with a view to a second reading of the draft convention at a later stage.

The General Commission adopted the following recommendations submitted by the Bureau on June 8, 1933:

"That the draft convention submitted by the United Kingdom delegation and accepted as a basis of discussion by a formal decision of the General Commission should be accepted as the basis of the future convention. This acceptance would be without prejudice to amendments or proposals submitted before or during the second reading."

A second reading never took place. Political events, such as the departure of Germany from the Conference on October 14, 1933, impaired the work of the Conference. The General Commission held its last meeting in 1934 without reaching agreement on a disarmament convention.

II. THE POSITION OF THE AMERICAN DELEGATION AT THE CONFERENCE

On February 9, 1932, Ambassador Hugh Gibson, U.S. Ambassador to Belgium and Head of the American delegation, presented the American position to the Conference. He stated: "We advocate the total abolition of lethal gases and bacteriological warfare." On April 2, this proposal was expanded. New instructions provided that the United States was prepared to accept not merely the abolition of lethal gases, but also the abolition of the use of all toxic gases in war.

In a message to the Conference on June 22, 1932, President Hoover stated:

"In order to reduce the offensive character of all land forces as distinguished from their defensive character, I propose the adoption of the presentation already made at the Geneva Conference for the abolition of all tanks, all chemical warfare and all large mobile guns."

When detailed discussions on CBW began in the Bureau on November 8, 1932, the U.S. delegate, Mr. Wilson, noted that tear (lachrymatory) gases were included in the list of agents which were to be prohibited in a new disarmament convention. He pointed out the advantages of the use of tear gas by police, for whom it was an effective and humane weapon. He said "there was no question of its use in time of war," but the U.S. delegation would have difficulty in undertaking to give it up for local police purposes. Consequently, lachrymatory substances for police use were not prohibited in the draft convention.

On May 16, 1933, President Roosevelt submitted a message to the Conference. He called for the complete elimination of all offenseive weapons. With regard to the UK draft convention, President Roosevelt stated that the "program for immediate reduction of aggressive weapons, now under discussion at Geneva, is but a first step toward our ultimate goal. We do not believe that the proposed immediate steps go far enough."

Thus, the United States was prepared as of April 1932 to accept a prohibition on the use in war of all chemical weapons as part of a comprehensive general disarmament convention.

RATIONALE FOR USE OF GAS IN VIETNAM

Mr. FRASER. Now, in your statement at page 7 you say in the middle of the page that—this was at the end of the review—

It was decided not to renounce the use of riot-control agents which can be used to reduce United States and friendly military, civilian and enemy casualties.

I find that statement unclear. If it is stopped with "reduce the United States and friendly military and civilian casualties," then I

would understand that it was all right to use it if it helped save lives on our side, but the sentence goes on to suggest it is to reduce enemy casualties as well. Where riot-control agents are used to reduce enemy casualties, then the United States regards that as a proper use.

Our testimony Wednesday would suggest that riot-control agents have been used to increase enemy casualties.

First, let me ask if you agree with that testimony, that we have in fact used these agents to increase enemy casualties?

Mr. PICKERING. I am not familiar with that testimony. I believe that representatives of the Department of Defense will be here tomorrow to discuss in detail the use of riot-control agents in Vietnam and its ramifications. At this point I really don't feel qualified——

Mr. FRASER. Let me suppose we were using tear gas to flush out the enemy from protected places in order to render them more vulnerable to our bombs and artillery. Would that use of tear gas be consistent with this sentence?

Mr. PICKERING. This sentence is not designed to set up standards for use. I think it is designed to make clear that with respect to these particular riot control agents, their use has not been renounced by the United States because they can be used for these purposes. I think it is not designed to provide a standard for the use, but it is designed to provide some explanation as to why the decision was made not to renounce their use.

THE 1965 RUSK STATEMENT ON TEAR GAS USE

Mr. ZABLOCKI. Mr. Pickering, you say that the Defense Department will be here tomorrow and will go into detail as to the use and application of chemical agents in Vietnam. I believe we should also have from you whether the State Department gave their views as to the political ramifications involved in the use of these agents in intragovernmental discussions.

Mr. PICKERING. I think, on this particular point, the State Department was involved in the discussions. These took place, as you know, over a few years. The major statement on the subject, if I could just turn to it for a moment, was a statement by Secretary Rusk in March 1965, in which he discussed from his own point of view the political, if you like, ramifications of the Presidential review which I spoke about in my statement of the use of riot-control agents in Vietnam.

If I might just quote a few paragraphs to give you some of the thinking which he expressed on this point, he said:

> Some of you have asked me for some comment as to the policy aspects as to the use in Vietnam of gases of the tear gas family back in December and January, and I am very glad to respond to those questions. The shadow of gas warfare has been raised in connection with these incidents. That is not involved. We are not embarking upon gas warfare in Vietnam. There has been no policy decision to engage in gas warfare in Vietnam. We are not talking about agents or weapons associated with gas warfare in the military arsenals of many countries. We are not talking about gas that is prohibited by the Geneva Convention—

I think in this case he meant Geneva Protocol—

> of 1925 or any other understandings about the use of gas.
>
> I can understand the concern around the world and in this country about the spectre of gas warfare. These go back to World War I when tens of thousands were killed or maimed by what might be called military gases. This is not in-

volved here. We are talking about a gas which has been commonly adopted by police forces of the world as riot control agents; that are available commercially and everybody used, some in this country and upon many occasions in other countries.

This would be Secretary Rusk's thinking at the time these decisions were made and his consideration of the political ramifications.

STATE DEPARTMENT POSITION ON GAS CHALLENGED

Mr. FRASER. Are you saying now that you don't know how the tear gas has been used in Vietnam?

Mr. PICKERING. I am saying, Mr. Congressman, that that is a subject upon which I cannot give you authoritative testimony. I think that this is an area in which the Department of Defense has been involved in its particular uses.

I have seen newspaper stories and all sorts of other kinds of things, but again, this is an area which I am not, as a witness, qualified to discuss in authoritative detail.

Mr. FRASER. I understand that, but we don't want to fall between the slats here. When we have the military tomorrow, we are not going to have a representative of the Department of State. You do understand that the allegation has been made rather generally that tear gas is used in the manner that I set out.

Mr. PICKERING. Yes.

Mr. FRASER. In your judgment, does the use of tear gas in that fashion present any problems under the protocol?

Mr. PICKERING. No; it does not in my judgment present any problems under the protocol.

Mr. FRASER. Even though it is used to increase casualties?

Mr. PICKERING. The position with respect to the protocol that we have taken is that the use of tear gas in war is not prohibited, that the use of riot-control agents in war are not prohibited by the protocol.

Mr. FRASER. Despite the fact that the term "riot control" in this case really doesn't describe the use of a gas?

Mr. PICKERING. I think "riot control" is a characterization of the gases I referred to in the definition that I gave here.

Mr. FRASER. If it is true that these riot-control gases are used to increase casualties, then that use does not fit within that sentence I was asking you about on page 7.

Mr. PICKERING. My paper says they can be used to reduce casualties. I did not say that there is any other standard that applies to the use of riot-control agents. I am only saying this describes the kind of riot-control agent which it was decided in this review of the National Security Council not to renounce.

Mr. FRASER. In other words if, theoretically, it could be used to reduce casualties, the fact that it is used to increase casualties is of no account as long as it could be used to reduce them?

Mr. PICKERING. That is the implication of my sentence; yes.

Mr. FRASER. As a practical matter, this kind of argument doesn't seem to make much sense, if I may say so.

Mr. PICKERING. As a practical matter, I think war is a very difficult and unpleasant business and I agree that perhaps this particular argument here is, from your point of view, not sound, but there are also

many cases of which I am aware, that tear gas has been made use of within the instances I have cited here—and again I think I would prefer to leave this to the Department of Defense to explain its use of tear gases—that tear gases can and have been used to reduce casualties.

HOW HAS TEAR GAS ACTUALLY BEEN USED?

Mr. FRASER. Let me perhaps pin down one point: Is it your impression, based on your conversations within the executive branch, that my hypothesis, in fact, is the case that the tear gas is being used in the way or has been used in the way that I described?

Mr. PICKERING. This is again a very difficult thing to discuss; the possibility of tear gas having been used in an instance where casualties have taken place is always a possibility in a situation like Vietnam. In effect, you are asking me to say that tear gas is used only in cases where no shooting takes place and obviously this is not the case and I think that tear gas has been used in many instances where casualties have taken place and you are certainly correct in that. I think part of the business of war unfortunately is to produce casualties and this, whether you like it or not, is the situation.

Mr. FRASER. So in those cases the tear gas has been used to increase the casualties, or that has been the effect of it?

Mr. PICKERING. It may have been the effect. I cannot speak of the intent; it may have been the effect of this.

USE OF HERBICIDES TO DESTROY FOOD CROPS

Mr. FRASER. On the question of herbicides, is it a fact herbicides have been used to destroy food crops?

Mr. PICKERING. It is my understanding chemical herbicides have been used with the permission of the Government of the Republic of South Vietnam and with the appropriate clearances of the military and other authorities of the United States in Vietnam in an anticrop role. This use, I understand, has taken place after a very thorough review of the areas involved and very careful conclusions about the fact that the crops involved were destined for the use of Vietcong and North Vietnamese military forces.

Mr. FRASER. So that it is, or has been a practice to use herbicides to destroy food crops where it is thought that the food otherwise might become available to the enemy?

Mr. PICKERING. I would say that where it is believed that the food crops involved are for the use of the Vietcong and the North Vietnamese military forces in the area.

STATUS OF CAMBODIAN DEFOLIATION CLAIMS

Mr. ZABLOCKI. Perhaps Mr. Pickering could advise the subcommittee as to the status of the Cambodian claim of some several million dollars for damage done by herbicides.

Mr. PICKERING. This is a question I would like to take, because it is an area I am not personally familiar with, and if we could send you something on it, Mr. Chairman, I would appreciate being allowed to do that.

Mr. ZABLOCKI. I am sure the committee would agree that the situation could be brought up at a later date to see if we can work out the loose ends on this topic after hearing the military.

Mr. PICKERING. Surely.

(The information follows:)

DEFOLIATION DAMAGE IN CAMBODIA

In May 1969 the U.S. Government was informed by the Cambodian Government that rubber plantations and fruit trees in Kompong Cham province had been seriously damaged by U.S. defoliation operations. The Cambodian Government subsequently claimed $8.7 million (recently raised to $12.2 million) in compensation. In early July, with the cooperation of the Cambodian Government, a team of USG technical experts visited the affected areas to report on the nature, extent, and cause of damage. They were satisfied that defoliation damage occurred, substantially as described by the Cambodians, though not permanent; that a small part near the border was due to drift from defoliation operations in northern Tay Ninh; and that the greatest part of the damage was caused by a deliberate and direct overflight of the rubber plantations. There were no U.S. missions targeted for the Cambodian areas involved, nor were the investigators able to determine that any U.S. aircraft were directly involved in spraying these areas. The experts concluded that an accurate final assessment of damage could be made in July or August 1970.

A copy of the experts' report was transmitted to the Cambodian Government November 6. In doing so, the U.S. Chargé d'Affaires stated that the report was still under consideration by the USG, and that we hoped to present comments and suggestions for further action to the Cambodian Government in the near future.

DEFINITION OF AN "ASPHYXIATING" GAS

Mr. ZABLOCKI. You refer to the use of tear gas on page 9 as follows:

Accordingly, it would appear that riot control agents whose effects are transient and temporary are not included in the phrase "asphyxiating or poisonous or other gases."

Earlier testimony indicated that gases used in Vietnam can indeed asphyxiate people or poison them under certain conditions. Do you understand that such effects have been noted of chemicals used in Vietnam?

Do you contend there is no evidence of tear gas asphyxiating people or doing them other serious injury?

Mr. PICKERING. I am aware of the testimony and I am aware of the statement. Again, I am not aware of the details of the use in Vietnam and would have to defer on that to people who are familiar with it. At this point, I just am not prepared, because of the limitations of my own experience, to comment on that question, sir.

Mr. ZABLOCKI. I am a bit puzzled about the legal interpretation of what is and what is not an asphyxiating or poison gas. Tear gas, if thrown into an enclosure, a bunker, a cave, could certainly asphyxiate the people that were in it.

Mr. PICKERING. Yes; I think, Mr. Chairman, we are working with general definitions. It may be that in some circumstances people in weak states of health and who are a very small minority might feel the effects of riot control agents more seriously than others and I think that the scientists all recognize that there are borderlines on all definitions.

I think that the definitions which I have given in my statement are

obviously designed to relate to the large majority of circumstances and I think they are general definitions. The scope of the definitions includes a large majority of all the cases that might be involved rather than being singled out as a particular test. It relates to any one of the effects, if you like, of the gas, in the terms in which I have defined it.

THE STATUS OF DM UNDER PRESIDENT'S ORDER

Mr. ZABLOCKI. In your definition and in your testimony this morning, incapacitating agents are those which produce systemic symptoms which persist for hours or days.

Does the Government consider DM as an incapacitating agent? We have heard that DM can incapacitate for up to 4 hours. It has been used, according to reports, in Vietnam. It brings in the question: Does the President's announcement mean that DM will no longer be used in Vietnam?

Mr. PICKERING. It is my impression, Mr. Chairman, that this question has become in a sense an academic one because I have been informed that we no longer intend to use or acquire or to export DM so that the position on whether it is an incapacitating agent or riot control agent falls away.

I think with respect to the particular definition it might lay more closely to the incapacitating agents than it does to the riot-control agents. Again, my ability to testify on this is one of a layman and not a biologist or someone intimately familiar with the types of effects of each of these weapons.

Mr. ZABLOCKI. You did say we do not intend to obtain any additional DM or send any more to Vietnam. May I repeat the last question: Is our Government's position in line with the President's announcement, that DM will no longer be used in Vietnam?

Mr. PICKERING. This is my understanding from what I have been told, that we no longer intend to use, acquire, or export DM.

Mr. ZABLOCKI. My first question was related to the time element. You say "will no longer be used." Does that mean tomorrow, next week, next year, or some day?

Mr. PICKERING. I think there is an implication here that the United States has used DM in Vietnam. I understand also from my conversations that the United States has not used DM in Vietnam.

Mr. ZABLOCKI. We did send DM to Vietnam?

Mr. PICKERING. I understand quite possibly there was DM in the hands of the South Vietnamese forces.

Mr. ZABLOCKI. How did they get it?

Mr. PICKERING. This is a question I think perhaps we could take on the classified area if you would agree.

Mr. ZABLOCKI. We certainly will go into this in executive session.

STATE DEPARTMENT REVIEW OF LEGALITY OF CW

May I ask a question of Mr. Rhinelander? It is my understanding you have prepared for the Department of State a study on the use of chemical agents in Vietnam as they relate to the Geneva Protocol. Is that correct?

STATEMENT OF JOHN B. RHINELANDER, DEPUTY LEGAL ADVISER, DEPARTMENT OF STATE

Mr. RHINELANDER. Not as agents related to Vietnam. I have worked on the legal side of the questions involved in the policy study, particularly the scope of the Geneva Protocol.

Mr. ZABLOCKI. Not specifically as to its use in Vietnam?

Mr. RHINELANDER. Not specifically on that. The review has been by many lawyers from any agencies who have worked on the scope of the protocol.

Mr. ZABLOCKI. What conclusions did you draw in your report?

Mr. RHINELANDER. Mr. Pickering, in his oral statement, did not read pages 10 through 13.

Mr. ZABLOCKI. Is that your part of the statement?

Mr. RHINELANDER. That is one of the parts. This discusses the scope of the Geneva Protocol, particularly the context of the prior treaties.

Mr. ZABLOCKI. I am sorry, I didn't read it. I will withdraw my question.

Mr. Fraser.

Mr. FRASER. Let me go back to Mr. Noel-Baker's statement. Does international law prohibit the use of tear gas in war?

Mr. PICKERING. It is my understanding that international law does not prohibit the use of riot control agents in a war. The relative international law in this case is the treaty, the Geneva Protocol.

Mr. FRASER. Let's not confine it to protocol; let me ask about it generally.

Mr. PICKERING. It is my understanding that accepted or present international law does not.

Mr. FRASER. Do you know whether or not there have been legal opinions given within the Department of State by any of its legal advisers which reach different conclusions?

Mr. PICKERING. Since Mr. Rhinelander is the Deputy Legal Adviser of the State Department, I would ask him to cover that point.

Mr. RHINELANDER. I think really there are two aspects to your question: (1) Does the Geneva Protocol cover it, and (2) would customary international law, perhaps beyond the scope of the Geneva Protocol, cover the use of tear gas in war?

I think on the first one we have indicated that we have examined the language of the protocol, the negotiating history, the language of the prior treaties which led to the protocol and concluded that it was not intended to.

The next question would be whether customary international law prohibits the use of riot-control agents in war, and our position on that is that it clearly does not. There are many elements to the development of customary international law. One of the most important is state practice and the belief of the states whether or not their conduct is limited by rule of customary international law. I think the U.S. position has been quite clear on this—since 1930 when Mr. Gibson's statement was made and statements in the U.N., in 1966 and 1968—that we do not believe that customary international law prohibited the use of tear gas.

HUGH WILSON STATEMENT AT 1932–33 CONFERENCE

Mr. FRASER. I asked Mr. Pickering about the 1932–33 conference and the statement of Mr. Hugh R. Wilson. Are you familiar with that as well?

Mr. RHINELANDER. Yes, sir.

Mr. FRASER. I take it the statement the U.S. Government agrees that all tear gas was banned by international law does fairly characterize the position of the U.S. representative.

Mr. RHINELANDER. No, sir. I don't have the documents with me but there were extensive discussions in the early 1930's. There was a draft convention prepared which was a very comprehensive disarmament convention. There were at least two articles which covered CBW—one article covered chemical warfare and another biological warfare—and very clearly the one which covered the chemical warfare would have included the use of tear gas.

Mr. FRASER. This isn't what the statement says.

Mr. RHINELANDER. I realize that. I think the statement of the U.S. representative was in the context of what that treaty would have covered.

Mr. FRASER. Would have covered?

Mr. RHINELANDER. Yes. We can submit something for the record. I don't have the statements with me and I can prepare a statement for you which would put it in the proper context.[1]

U.N. VOTE ON PROTOCOL INTERPRETATION

Mr. FRASER. Is it fair to characterize our position on the protocol that whether or not the protocol bans the use of tear gas is an unresolved question, that there is an ambiguity in the protocol, or is it our position that it clearly does not cover that use of tear gas? Which is our position?

Mr. RHINELANDER. Our position is that it does not cover it. This has been the U.S. position consistently. I think we would say there is an ambiguity because other states, parties to the protocol, take a contrary position.

Mr. FRASER. Is it true the United States is in a very small minority in its interpretation?

Mr. PICKERING. I think the relevant evidence we have is the vote yesterday on the Swedish resolution which I spoke about in my statement and which covered other subjects besides the Geneva Protocol; that is, whether the resolution makes customary international law, and this relates to your earlier question on this point.

On that particular resolution there was a vote which involved 39 parties and signatories to the treaty, people who had relationships, if you like, to the Geneva Protocol, and who disagreed with the United States. We had three who opposed and 27 who abstained. I believe one could interpret that vote as an indication of at least the fact that there is ambiguity on this particular point. This is the lineup, if you like, of international opinion.

It is our feeling——

[1] See p. 192.

Mr. FRASER. Now, Mr. Pickering, for that to be true, it would have to mean no other nation was persuaded by the United Nations that this was not the right forum to make a judgment on this question.

Mr. PICKERING. No, I agree there are other issues involved. There is only an indication—and I think I tried to make that clear in the early part of my response. It is an indication there is not unanimous consent for the views expressed in the Swedish resolution or the goals which the Swedish resolution wanted to accomplish.

Mr. FRASER. I am just limiting myself now to the interpretation. As I read the protocol, it doesn't require that the chemical be lethal. The term "lethal" does not appear in the protocol?

Mr. PICKERING. That is right. "Asphyxiating, poisonous or other gases" appears in the protocol.

Mr. FRASER. Now does the term "incapacitating" appear?

Mr. PICKERING. No; it does not.

IS CS A "LUNG GAS" OR "TEAR GAS"?

Mr. FRASER. I guess in Vietnam—I am told—lung gas has been used. Gas that affects the lungs rather than the eyes.

Mr. PICKERING. I think what we used in Vietnam—subject to correction by the military—is a gas called a riot-control agent and it is something widely used by domestic police forces for law enforcement. I don't really know about the characterization "lung gas." The report of a committee of experts to the Secretary General of the United Nations called them harassing agents and that is another term used.

Mr. FRASER. What was the conclusion of the 14-nation study on this question?

Mr. PICKERING. It did not address itself to the question of whether the harassing agents were included in the prohibition of the Geneva Protocol.

Mr. FRASER. The statement was made by the Secretary General?

Mr. PICKERING. It was the Secretary General's foreword to the statement in which I believe he asked all nations to make a clear affirmation that riot-control agents are included.

Again I think this sort of statement points up the question of ambiguity. At least there are different opinions about this.

Mr. FRASER. We are faced with the fact that the United States has been using these chemicals in Vietnam. I suppose it would be difficult for our Government to now take the position that their use would have been in violation of the protocol?

Mr. PICKERING. I think that this question doesn't arise if you look back as far as the 1930's and examine what our position has been with respect to the Geneva Protocol from that time on. We have maintained fairly consistently throughout the times that this question has arisen that the riot-control agents were not prohibited by the Geneva Protocol.

LAIRD STATEMENT ON STATUS OF TOXINS

Mr. FRASER. With regard to the use of toxins, there is some question as to whether they are bacteriological or chemical.

Mr. PICKERING. I think it would be valuable at this point just to read the statement of both Secretary Laird and the Department of

State on this point. Mr. Laird said on December 16, in relation to a newspaper article which alleged there was a disagreement between the Departments of State and Defense on this subject:

There is no disagreement as far as the Department of State and the Department of Defense are concerned in this area. There is no disagreement between the President's Scientific Advisor and the Department of Defense in this area. We have all taken the position that toxins are in the field of chemical warfare. This is the position taken by the 14-nation commission that advised the Secretary General of the U.N. concerning chemical warfare and the whole field of biological agents.

In the report to the Secretary General which is the position which has been taken before the U.N., toxins are a chemical agent.

It should be pointed out, I think, that this whole program is under review. The chemical warfare and biological research study ordered by the President was ordered at my request and I believe it is one of the most substantial studies that has been undertaken by the National Security Council and one of the most important. I would like to point out no such study has been undertaken since 1958 except by a committee upon which I served in Congress which undertook the study in 1964. The executive branch has not undertaken such a study since 1968, but there is no disagreement.

As far as the matter of the U.K. convention is concerned, we will consider that separately when we get into negotiations and not before negotiations.

The State Department press release responded to the following question:

Can we confirm today's Times story that the State and Defense Departments are at odds over the retention of toxins' production? What is the Department's position?

The statement is that the—

Department of State is in agreement with the Department of Defense that the definition of toxins as chemical agents contained in the report of the Secretary General of the United Nations A–7575 of 1 July 1969 on chemical and biological weapons and in the report of a group of consultants to the World Health Organization dated 21 November 1969 is correct from a technical standpoint.

The President's November 25 announcement involved broad and sweeping changes in the area of our biological research program and our chemical warfare program. The Departments of Defense and State are currently considering together the implementation of the President's announcement including how it relates to toxins.

THE NATURE OF TOXINS AND THEIR PRODUCTION

Mr. FRASER. Toxins are produced by bacteria?

Mr. PICKERING. This is my understanding.

Mr. FRASER. In order to produce toxins for use, you would have to be promoting the development or growth of bacteria.

Mr. PICKERING. Yes. I have limited technical knowledge on this subject, frankly, but it is my understanding that they are produced by bacteria or bacterial organisms of some sort.

Mr. FRASER. According to this New York Times article, toxins can be used to produce botulism, diphtheria, gangrene, staphylococcus food poisoning, tetanus, plague, cholera, and typhoid. Is that a fair characterization?

Mr. PICKERING. That is my understanding.

Mr. FRASER. Perhaps you would like to consult someone on that.

Captain BIRDT. The list is not accurate.

Mr. PICKERING. We will give you a list.

(The following information was provided:)

EFFECTS OF MILITARY TOXINS

TM 3-216 "Military Biology and Biological Agents" lists various incapacitating or fatal conditions effected by toxins. This list, however, contemplates a situation in which the bacteria or virus elaborating the toxin is actually in the host individual and is elaborating the toxin in that individual. However, the military concept for the employment of toxin does not contemplate the spreading of the bacteria or virus proper but rather a product of these, i.e., the toxin itself. Military toxins are not produced to cause diphtheria, gangrene, tetanus, plague, cholera, or typhoid.

Mr. FRASER. Could we get right now what some of them are?

Mr. PICKERING. We cannot give it to you now.

Mr. FRASER. Which ones are not included of those I read, do you know?

STATEMENT OF W. BOWMAN CUTTER, ARMS CONTROL AND DISARMAMENT AGENCY

Mr. CUTTER. I can't give you that.

Mr. FRASER. You just know the list is too broad?

Mr. CUTTER. It is far too broad, I think. Toxins are not a disease. They do not cause infection. Toxins cause a poisoning and they can't be transmitted from man to man. I think this is the difference from saying it is a disease. I see no way that a toxin could cause diseases. You have listed there plague, for example, which is a disease, and diphtheria.

Mr. FRASER. Our problem is that we are relying on a news account of an Army Technical Manual, "Military Biology and Biological Agents." The story purports to identify some of the diseases being produced by toxins.

I suppose it may be referring to the effect of the disease in one individual. Is that possible?

In other words, if the toxin reaches one individual, the results you get will be a disease in that person? In other words, if the toxin produces the pathological reaction in the individual, it would have the same effect on the individual as though he had caught the active disease from another person. Is that possible?

Mr. CUTTER. I don't believe that is correct, to my understanding.

Mr. FRASER. I gather we are not able to talk about the technical side of this point?

Mr. PICKERING. I am afraid we are limited in the scope of our knowledge of the technical side of this particular subject.

PROBLEMS CAUSED BY U.S. POSITION ON TOXINS

Mr. FRASER. Do you agree that even if some of these things can be produced by toxins that to leave these open would raise some very serious questions about the U.S. position?

Mr. PICKERING. The only thing that I can say here is the fact that in the 14-nation report the scientists involved said "toxins are biologically produced chemical substances highly toxic and act by ingestion or inhalation."

I think that is the only technical light I can shed on that and this is from the report Secretary Laird spoke about.

I think my capacity to discuss the infectious qualities and other things is so limited I would not want to get into that.

Mr. FRASER. I don't believe anybody argues that there is an infection from person to person by the use of a toxin. I think the question depends more on these considerations: First, if we are going to retain the rights to manufacture and deploy weapons that will involve the spread of toxins, whether they call them chemical or bacteriological, this involves the production of bacteria to produce the toxin.

Mr. PICKERING. I understand the bacteria produces the toxin. Again I am on weak technical grounds because I am not a biologist.

ACDA VIEW: PRESIDENT'S STATEMENT BANNED TOXINS

Mr. FURNAS. I am not a biologist or qualified to comment on this but it is hard to go far beyond what the President has said. He said:

> The United States will confine biological research to defensive measures such as immunization and safety measures.

He associated the United States with the principles and objectives of the new draft United Kingdom convention which provides that biological agents of types and in quantities which have no independent justification for prophylactic or other peaceful purposes will not be produced or otherwise acquired, nor will a party assist in or permit the production or acquisition of such agents.

Mr. FRASER. If that is the statement, we will give up the production of toxins. Would you agree with that?

Mr. FURNAS. This whole area is broad and far reaching and we are not confident what all the implications of it are and all the applications. These are the things that have to be studied. It seems pretty clear to me what the President meant when he said those two things.

Mr. FRASER. What is clear to you?

Mr. FURNAS. It is clear to me that our biological research will be confined to defensive measures.

Mr. FRASER. And they are not for the production of toxins?

Mr. FURNAS. If that is the way toxins are produced, I would think one wouldn't produce any more toxins for use in offensive purposes.

Mr. ZABLOCKI. Would you include in the President's statement an interpretation that any toxins that were shipped to Vietnam or any other part of the world for military use, would be recalled?

Mr. FURNAS. No. I don't believe I could make that characterization.

TOXIN STATUS NOW "UNDER REVIEW"

Mr. PICKERING. I think we have to go to the President's decision on this and to my statement that this is an area, just as Secretary Laird said, which is under review at this point. I think characterizations of toxins being one thing or another, over and above that statement, is a subject which the administration is taking a very careful look at in the effort to implement what the President had to say about the biological research program and about the chemical warfare program.

Mr. ZABLOCKI. Let us now go into executive session so we can get answers to some of the questions which cannot be addressed in open session. The subcommittee will have to adjourn because of action on the House floor.

The subcommittee will ask all who are guests of the subcommittee, other than witnesses, to vacate the room.

(Whereupon, the subcommittee had a short recess.)

EXECUTIVE SESSION

(The subcommittee resumed, after a short recess, in executive session at 11:30 a.m.)

THE STATUS OF TOXINS

Mr. FRASER. The one point I wanted to make is that the President's decision and his policy statement, as I understand it, came at the end of a fairly extensive and searching review of all the considerations that go into making a decision of this kind.

Now, the President has made a statement which, on the face of it, would seem to outlaw the production and use of toxins. But, now it is said that the question is under review. I assume that all of these questions were under review for the last 6 months or more. Just what are the facts?

Mr. PICKERING. Let me, if I may, go into that. The position on toxins was considered in the course of the review, not in specific terms, and their classification was not considered in specific terms. The scope of the President's decision, as you well know, did not say toxins were biological agents or chemical agents.

There was an administration position supporting Dr. Bennett, who was our representative on the 14-nation committee which classified toxins, I think, along with Lederberg and Meselson in the WHO report, as chemical agents. As a result of that and the President's statement that he is going to ban biological methods of warfare—I don't have the exact quotation before me—I better get it out: He said:

> The United States shall renounce the use of lethal biological agents and weapons and all other methods of biological warfare.

Taken together with the statement which Mr. Furnas referred to which relates to the support for the principles and objectives of the British treaty, we have a problem of implementation and I think at this point the administrative side is doing just what we said. We are taking a look at the implementation of the President's decision. With respect to this, the definition is certainly clear, but the ramifications of the definition and how it fits in with the biological research program or the chemical warfare program is frankly something which is under another look and we would like to go into that further on the executive side.

Mr. FRASER. Would you agree also that we will not produce or use toxin?

Mr. PICKERING. I can't agree because I don't think the President addressed himself to this, in all honesty, and this a question which can relate to either side of what the President had to say, and it is a question which the executive branch wants to study before coming down on one side or the other. I think there are again ambiguities, if I can use that phrase. We want to look at this carefully.

Mr. FRASER. Somebody must have been looking at this for the last 6 months.

Mr. PICKERING. I think the question of toxins was not specifically addressed as to whether they would fall under the biological ban or under the chemical warfare program, as a result of the study. The

President's decision did not comprehend this particular detail of the problem.

As you know, the President's decisions were broad and sweeping. I think, as I said before, the implementation of what he had to say is something which the departments of government now have to take under consideration.

THE MEANING OF THE PRESIDENT'S STATEMENT

Mr. ZABLOCKI. Are you telling us, Mr. Pickering, that we are not to take President Nixon's statement at face value?

Mr. PICKERING. I think we all have to take President Nixon's statement at face value but the question is as to whether something which is biologically produced, as I understand it, and classified as a chemical agent, falls under one group of decisions or another group of decisions and the various aspects of that. While the definition is clearly one of a chemical agent, there are problems about the scope of the President's decision with respect to biological methods of warfare, and the scope of the President's support for the principles and objectives of the British treaty that have to be resolved as a result of the decision he made.

He just didn't tie up, if you like, all the details within the framework of each of his decisions.

Mr. FRASER. Well, normally you have this mass of detail laid out before you and then you arrive at a general policy decision. You have some idea of where the edges of the policy statement fall, but I gather that wasn't true here?

Mr. PICKERING. There is, as all of you know, a very complex, difficult subject involved here where there are large masses of detail. Some of the details relate to the disposal of the the biological stockpile which is under discussion in Defense. This was not specified, if you like, by the President. There are other kinds of things that the President wants to have undertaken that are on the edges of things, the limitation of which has to be discussed and decided upon as a result of what he decided. If there are different points of view, then these have to be worked out.

(Security deletion.)

CB AGENTS IN OTHER COUNTRIES

Mr. ZABLOCKI. In what other areas or nations do we have them?

Mr. PICKERING. Could I make the point that there are no biological weapons in other countries. With respect to Germany we are talking about chemicals.

Mr. ZABLOCKI. Bacteriological?

Mr. PICKERING. There are no bacteriological or biological stockpiles in other countries.

Mr. ZABLOCKI. In how many countries do we have chemical weapons?

Mr. PICKERING. It is my understanding, subject to correction, there is the stockpile in Okinawa which has been announced to be removed and the one in Germany. These are subject to whatever anyone else here behind me may understand the situation to be.

Mr. FURNAS. That is right.

POSITION OF NATO COUNTRIES ON TEAR GAS USE

Mr. ZABLOCKI. Mr. Rhinelander, since we have the stockpile in Germany what is the position of the countries with whom we are allied in NATO regarding the issue of whether tear gas or chemical warfare is covered by the 1925 Geneva Protocol?

Mr. RHINELANDER. I do not think we have an accurate, firm position from many countries on this. Let's turn to the U.N. vote. You can identify from that the 39 who opposed us and their position on the protocol.

The French take the position that tear gas is covered by the protocol. The United Kingdom took that position in 1930. In fact, the United Kingdom memorandum is what led to the question in 1930 whether or not tear gas was included. It was their view that it was. The French agreed.

Mr. PICKERING. Could I give you a list of the NATO members that abstained on the Swedish resolution? This is only an indication, but gives us some indication of the NATO members that took the position at least that the Geneva Protocol was perhaps ambiguous or that the U.N. should not try to make customary international law by majority vote.

Mr. ZABLOCKI. As you said earlier, they may have abstained because of other reasons.

Mr. PICKERING. Yes.

Mr. ZABLOCKI. This would not be a true test of Government positions on the issue.

Mr. PICKERING. There is no true test other than the statements that their representatives have made.

Mr. ZABLOCKI. Provide the list for the record.

Mr. PICKERING. Belgium, Canada, Denmark, France, Greece, Iceland, Italy, Luxembourg, Netherlands, Norway, Turkey, United Kingdom. I think subject to correction that includes the full list of the NATO members that abstained. The NATO members that voted against were Portugal and the United States.

Mr. FRASER. How did Greece vote?

Mr. PICKERING. Greece abstained.

Mr. ZABLOCKI. Did you mention France?

Mr. PICKERING. I am sorry. France abstained; yes, sir.

Mr. RHINELANDER. I believe all NATO members except Portugal and the United States abstained. I think that is the summary.

Mr. PICKERING. Yes.

PROHIBITION AGAINST TOXIN STORAGE ABROAD

Mr. MCCARTHY. The chairman asked about toxins in Germany and you later came back and said there were no biological weapons outside the United States. You just finished saying that toxins are chemicals.

Mr. PICKERING. Are there toxins in Germany? Is that your question?

Mr. MCCARTHY. It seems to me you said there is no biological weapons outside the United States. But if a toxin is a chemical, then it could be outside the United States.

Mr. PICKERING. I frankly do not know what is in the German stockpile.

Mr. FURNAS. To the best of my knowledge, there are not any toxins.

Mr. MCCARTHY. But it could be if you take the definition that a toxin is a chemical.

Mr. PICKERING. That is right.

Mr. MCCARTHY. So there would not be anything to prohibit our storing them outside the United States?

Mr. PICKERING. No. The only thing at the moment is the whole question of the review of how toxins are affected by the Presidential decision. If the review concludes in effect that they are biological methods of warfare, presumably they would follow under that part of the President's decision. If the review concludes they are chemical agents, part of the chemical warfare program, presumably they would be subject to the restraints of that part of the President's program.

Mr. MCCARTHY. So they could be sent abroad if they come under the latter definition?

Mr. PICKERING. If one follows that through to the logical conclusion, yes.

Mr. FURNAS. It has been called to my attention the McIntyre amendment says:

> None of the funds authorized to be appropriated by this or any other Act may be used for the future deployment or storage, or both, at any place outside the United States of any lethal chemical or any biological warfare agents * * * unless prior notice of such deployment or storage has been given to the country exercising jurisdiction over such place.

Mr. PICKERING. That covers both then, and as you know, toxins, it is my understanding, have a limited shelf life.

So that may cover your point.

THE STATUS OF TOXINS

Mr. MCCARTHY. Last year the Joint Chiefs classified toxins as biological agents in a document that still as far as I know has not been superseded.

How does that fit in? You mentioned the U.N. report, the experts' report and the World Health report. What has more relevance for the United States, a U.S. document or a U.N. document?

Mr. PICKERING. Secretary Laird seems to believe the U.N. document has more relevancy.

Mr. MCCARTHY. So he is overruling his Joint Chiefs?

Mr. PICKERING. He may be.

(Security deletion.)

TO WHAT NATIONS DOES UNITED STATES MAKE TEAR GAS AVAILABLE?

Mr. ZABLOCKI. That brings up the question as to how many countries we have given tear gas or otherwise made it available?

Mr. PICKERING. That is something that I can supply to you for the record.

Mr. ZABLOCKI. We have touched upon stockpiling, but have we given small or limited quantities?

Mr. PICKERING. This is available as you know commercially in the United States for sale, and the sale of tear gas is subject to export license.

We could provide you for the record the report we have on overseas sales and I think we can also provide you for the record some indication of what the MAP program quantities have been. Unfortunately, these are both in classified form. We would have to provide you these in classified form.

(The information was later given to the subcommittee.)

USE OF DM IN VIETNAM

Mr. ZABLOCKI. What you are saying is that the United States did not use DM, but DM was used by the South Vietnamese. In view of our military effort being a unified one in Vietnam, we must have given at least tacit approval for the use of DM.

Mr. PICKERING. Again this is something Defense would be more qualified on than I, but it is my belief that the rules of engagement as to what weapons they use in their own country is entirely up to the Vietnamese and their own decisionmaking process. Again, this is my understanding.

Mr. ZABLOCKI. We can pursue that tomorrow, the training in and use of chemical warfare.

Would it be correct for the committee to assume that the French trained the South Vietnamese in the use of DM?

Mr. PICKERING. This I do not not know. I just am not competent to go on this. I understand the use of DM was in the early 1960's, the use we know about of the South Vietnamese forces. I do not know what their state of training was and whether they received specific training or not.

I think it is correct to say in the use of CS there has been assistance training.

Captain BIRDT. That is right.

Mr. PICKERING. By U.S. forces training South Vietnamese forces in the use of CS, which is the standard riot control agent now used in Vietnam.

THE NATURE OF TOXINS

Mr. FRASER. To pursue toxins for a minute, there were apparently repeated references to what toxins produce, and they were described at length in Army manuals. I really wonder if the news reports are that erroneous as suggested earlier.

Does anybody here really know enough about it?

Mr. PICKERING. Mr. Cutter can answer that.

Mr. CUTTER. It is an extremely complicated technical question that I am not qualified to talk on. You need a microbiologist and you need one that is specialized in that part of the business.

Mr. PICKERING. The WHO report discusses it, but again I am not even qualified to judge its accuracy or completeness.

Mr. CUTTER. For example, some toxins, and I think botulinum toxin and staphylococcus enterotoxin are two, are produced by bacteria but are not produced inside the body.

The usual thing that happens in common food poisoning, which is caused generally by staphylococcus enterotoxin, is that the bacteria grows on such things as pastries and mayonnaise and things of that nature. Chicken salad is one. It is the toxin when you ingest the whole

thing. You eat a piece of chicken salad in which the toxin has been produced by bacteria and then you become ill. But you become really literally poisoned and not ill from the point of view of an infectious disease.

There are also other types of toxins that produce—in the case, for example, of diphtheria, one catches diphtheria and diphtheria is a disease, but there is also a toxin attached there that causes a poison.

In the case of—I must say I am speaking from second hand because, as I say, it is an extremely complex problem. I think if you would ask Professor Lederberg, he could give you better answers than I could give you.

I think in the case of viruses, for example, I asked one of our consultants just two days ago, does everything produce a toxin, does every bacteria and virus?

And he said that "No. Viruses cause disease, viruses invade the bloodstream and it is the virus that causes the disease." But I do not think we know, I do not think that the state of the art is such that we can say with certainty that the germs in all cases produce a toxin. I do not know who is writing these articles.

Mr. FRASER. Robert Smith.

Mr. CUTTER. Or where they got their information.

Mr. FRASER. From an Army field manual 27–10.

Mr. CUTTER. And to what depth the field manual went into it.

Mr. FRASER. Another Army manual, technical manual 3–216, discussed the disease botulism in some detail, and the use of botulinum toxin to produce the disease.

Mr. CUTTER. I think the ordinary toxins we think of, and I think they are listed in the Army manual as potential chemical agents, are the botulinum, and the staphylococcus; and there are also of course, which you have not mentioned, toxins such as the venom from snakes. In other words, there are also animal or zoo toxins. There are also plant toxins. Many plants have toxins which are poisonous and which, if you chew the plant or eat it, that will poison you. It is the toxin in a snake, it is not the snake. It is the venom that is toxin. Toxins are produced by microbes of some kind or by animals or by plants. But the ones we hear of mostly and the ones that appear in the open literature as potential chemical warfare agents are botulinum, which produces botulism, and staphylococcus enterotoxin.

People who get botulism or people who eat or otherwise receive botulinum toxin have a 65-percent chance or higher of dying. It is a highly fatal illness. The staphylococcus enterotoxin, which many of us, probably all here in the room, have eaten at some time in their lives: you end up with anywhere from 6 to 24 hours of extreme discomfort and generally recover.

U.S. ARMY MANUAL LISTS TOXINS AS BIOLOGICALS

Mr. FRASER. I think it is worth knowing that the technical manual from which this story is written, and which contains this long list I read, is entitled "Military Biology and Biological Agents." And it then lists some of the diseases produced by toxins.

So apparently the military regarded these as biological agents until the issue came up as the result of the President's policy statement.

Mr. PICKERING. I think before that it was by the biologists who sat in the World Health Organization and at the U.N. for the 14-nation report.

Mr. CUTTER. It was quite a while before that. It is true that in the past, and it is also true that some other military authorities in other countries consider toxins as a part of biological warfare.

The U.S. Army manual that I think you are reading from is the 1964 issue, and I think it lists toxins there as potential chemical warfare agents, if I am not mistaken. I think it was for a fairly practical reason that the toxins are included in that manual on military biology, and that is because this manual has been out for a number of years and it gets revised from time to time, so they left it in there and changed the heading and called it chemical warfare.

Although, as I say, in 1959, for example, when the House Science and Astronautics Committee, and in 1960 when the Senate Subcommittee on Disarmament and Arms Control studied chemical and biological warfare, their definitions, taken from Army manuals, defined biological warfare as the use of living organisms or their toxic by-products. But from a strictly technical point of view, the Secretary General's experts are completely correct—toxins are chemicals.

Mr. FRASER. I was going to say, Mr. Chairman, I think it would be helpful for the committee to have copies of the manual.

Mr. ZABLOCKI. Without objection, I will ask that they be supplied.

Mr. CUTTER. They are not our manuals, but Department of Defense, and we will do our best to get them for you.

Mr. PICKERING. We will ask the Department of Defense.

(Manuals were supplied to the subcommittee.)

U.N. REPORT CHANGED DEFINITION OF TOXINS

Mr. ZABLOCKI. Mr. McCarthy?

Mr. MCCARTHY. You know when Mr. Cutter and Mr. Pickering put a stamp of international authority on this change in definition, I think it is relevant to get into the record here—and I do not see why it should not be in the open but that is up to you—the fact that that chapter was written by Dr. Bennett, a longtime consultant to the Pentagon, and who had access to DOD advice. And when I learned of it I went to see Under Secretary of State Elliot Richardson and pointed this out, that this struck me as a calculated device to effect a change in definition through an international organization to give it a stamp of respectability. It was clear that, should biological warfare be outlawed or unilaterally given up, this definition gave the Army an out so that they could continue using this as a chemical.

So that when you talk about 14 experts and an international forum, I think you have to realize this was hatched right in this town. So I think that it certainly should be part of the record of how this came about.

Mr. CUTTER. Mr. McCarthy, I would like to speak to that because I was at Geneva for 2 weeks as backup with six other people to Dr. Bennett, and also in New York at the U.N. when we finished up the report.

Now, the decision, if you will, to treat toxins as chemicals was made by the committee as a whole during the January session. I was not

at the January session. But I know their discussion. Listening to the discussion and participating in the discussion, in the June session, I know there was absolutely no opposition on the part of anyone to listing toxins as chemical warfare agents. I am sure it was not a plot on the part of Dr. Bennett, who is a very distinguished scientist, and I really do not believe he would be a party to it if it had been.

Mr. McCarthy. Is it not true he has been associated with the Pentagon for many years?

Mr. Cutter. Yes, sir.

Mr. McCarthy. He is listed as an adviser to the Department of Defense in Who's Who?

Mr. Cutter. Yes, sir.

A lot of people have been associated with the Pentagon. The Pentagon tries to get the most outstanding scientists they can as advisers and Dr. Bennett, who, as I am sure you know, served on the President's Science Advisory Committee and served as Deputy Science Adviser to the President, is an outstanding man.

Mr. Pickering. I understand he went to the meeting as a former Deputy Science Adviser to the President or active Deputy Science Adviser.

Mr. Cutter. He was not in office at that time.

Chapter 1 originally was written in draft form by Dr. Bennett. That was assigned to Dr. Bennett. Each of the chapters, and there were five, was assigned to a different expert, and chapter 1 was assigned to Dr. Bennett. He had, as I recall, Academician Reutov and Sir Solly Zuckerman as his coworkers. They served on this little committee with him although he was chairman.

Mr. McCarthy. That is the chapter which included the definitions?

Mr. Cutter. Yes, but the definitions were worked over and worked over many times and the final definitions were written by Sir Solly Zuckerman.

Mr. McCarthy. That is not my understanding of it.

Bennett was the author and, as I understand it, Zuckerman actually did not involve himself to the degree that one might have expected.

Mr. Zablocki. Apparently Mr. Cutter was there. I would have to take his report.

HAS CW PRACTICE ERODED CW POLICIES IN VIETNAM?

Let me come back, Mr. Pickering, to a policy matter we would like to be enlightened on further. It is quite clear that the United States initially justified the use of herbicides, and the use of tear gas in Vietnam on the grounds they involve the same elements used in domestic weed control in the case of herbicides, and riot control in the case of tear gas. While that may have initially been the case, is it not true that the use of herbicides and the use of tear gas have been used for far wider purposes? In the case of herbicides as mentioned by my colleague from Minnesota, have they not been used for killing rice crops?

Has this practice also changed the stated justification for the use? Was the Department advised periodically of expanded uses of chemicals? Was the State Department aware of the amount of tear gas, for example, that was being shipped to Vietnam, a staggering amount?

Were you advised how tear gas and herbicides were going to be used?

Mr. PICKERING. First, with respect to the original justification, clearly there has been an evolution in the use of riot-control agents and herbicides in Vietnam. That is something I think the Defense Department witness will want to talk to you about tomorrow in fairly great detail.

Second, I am not cognizant—I have only been back in the Department for 2 months—I am not cognizant of the fact we were informed of the amounts of CS being shipped to Vietnam. That would not normally be something that would come to us in any event unless we made a specific request for it.

(Security deletion.)

Mr. ZABLOCKI. What was the Department's reaction when you learned the scope of tear gas use and the amount that was being sent to Vietnam? Certainly you were alarmed, I hope, and realized the political impact. What steps did the Department immediately take?

Mr. PICKERING. We participated in the review which was launched by the new administration as soon as it came into control of the Government. I think the administration has carefully looked at this particular question and decided what its policy will be, that the use of riot-control agents and chemical herbicides has a value—military utility.

Mr. ZABLOCKI. Was the Department advised of the use of chemical agents by normal governmental channels, or do you have to depend on reading about it in the press?

Mr. PICKERING. I think it is not part of a regular flow of official information back and forth between the Department of State and Department of Defense except insofar as the Department of State asks the Department of Defense for information on this particular subject. Since the time we got into the National Security Council review, we have considered a great many of these aspects.

Mr. ZABLOCKI. Are you telling the committee that the Ambassador in Vietnam would not know what was coming into Vietnam?

Mr. PICKERING. I am talking about the headquarters of the Department of State here in Washington.

Mr. ZABLOCKI. But the ambassador of every country, it is my understanding, and I prayerfully hope it is policy, reports daily to Washington.

Mr. PICKERING. The quantities of tear gas shipped into Vietnam are not normally the subject of daily reporting by the Department of State.

Mr. ZABLOCKI. Well, a large quantity of gas coming into Vietnam could not slip by the attention of the Ambassador.

Mr. PICKERING. It is my understanding there are great quantities of all kinds of things coming into Vietnam. I don't think this was a subject of particular focus for our Ambassador in Vietnam.

Mr. MCCARTHY. In 1965, Secretary McNamara stated that three gases had been used in Vietnam, CN, CS, and DM, and he didn't say anything about the French sending it in there.

Mr. ZABLOCKI. Or that the South Vietnamese were the only ones using DM.

Mr. MCCARTHY. No; he didn't so specify.

Mr. PICKERING. I said in my testimony here for the record, subject to correction, I would like to go back and check on this particular thing because this has only come to my attention through inquiry. I haven't

had the chance to research this particular thing in detail. We will again be glad to provide you with what we determine on this particular thing. I hope my answers continue to be qualified on that basis.

Mr. ZABLOCKI. You have the privilege of revising.

EFFECTS OF DM

Mr. FRASER. What does DM do?

Mr. PICKERING. DM, as I understand it—again subject to correction by experts—is a nausea-producing agent.

HAGUE CONVENTION OUTLAWS GENERAL POISONING OF FOOD

Mr. FRASER. If the Soviets should attempt to poison the food crops of the United States, would we take the view there was nothing in the Geneva Protocol or anything else speaking against it?

Mr. PICKERING. Here we get to the regulations in connection with the Hague Convention of 1907 which talk about the poisoning of food crops and relate to crops solely for the use of military forces. The general poisoning of crops is a question of international law.

Mr. FRASER. If you are poisoning food crops in Vietnam that might be used by a civilian population supporting the Vietcong, would this violate the Hague Convention?

Mr. PICKERING. Let me, if I can, just read this point: This is an excerpt from the Department of Army Field Manual, Law of Land Warfare, FM 27–10, page 18: "Relevant treaty position is that it is especially forbidden to employ poison or poisoned weapons."

"(b) The foregoing rule does not prohibit measures being taken to dry up springs, divert rivers and aqueducts from their courses, or to destroy through chemical or bacterial agents harmless to man crops intended solely for consumption by the Armed Forces (if that fact can be determined)."

That is the end of the quote. This is the Army's reading on what the relevant rule on land warfare provides in this respect.

Mr. FRASER. The use of herbicides against crops in Vietnam has been more extensive than that, hasn't it?

Mr. PICKERING. It is my understanding from what the military says about this, again, that it has not. That it has been used against crops in isolated areas which are related to the use by Vietcong or North Vietnamese forces. In other words, crops intended for the use of Vietcong or North Vietnamese forces.

Mr. FRASER. In Vietcong-held territory?

Mr. PICKERING. Yes.

Mr. FRASER. How can you distinguish the use?

Mr. PICKERING. That is a question I would hope you would ask the Department of Defense.

Mr. FRASER. I gather if you cannot distinguish the use then the Hague Convention would prohibit it?

Mr. PICKERING. I gather the military has to be satisfied in the use of the anticrop agent that the crop is a crop destined to be used by the forces of the Vietcong or the North Vietnamese Army.

Mr. FRASER. The nature of insurgency war is one that depends very heavily upon——

Mr. PICKERING. It depends on what encompasses the forces of the enemy. I haven't been in a position to have to make these kinds of judgments and I am not aware of the considerations. I note what the rule of land warfare provides and I think it obviously provides fairly strict, stringent rules that have to be maintained and this is something the military should address if you are interested in pursuing it.

SUBCOMMITTEE WISHES TO BE KEPT INFORMED

Mr. ZABLOCKI. Gentlemen, on behalf of the subcommittee, I want to certainly express our deep appreciation for the testimony you have presented and the direct answers you have given to our questions.

Mr. FURNAS. I think we are pleased that in your opening statement you said that the subcommittee hearings held during the past month provide an impressive background for understanding both the need and the possibility for arms control in this field.

If realization is evident in all branches of our Government, the hearings will not have been in vain.

The testimony today also referred to the desire of the subcommittee to look beyond the ratification of the protocol to new international agreements which may be required to control the spread or use of chemical and biological weapons and warfare.

We hope that in the future we will have continuing reports from all Government agencies involved, keeping the subcommittee abreast of what progress is being made.

WORK OF THE INTERDEPARTMENTAL POLITICAL-MILITARY GROUP

As a final question, I would like to ask both Mr. Furnas and Mr. Pickering, since you also in your statement point out that beyond the ratification of the protocol, it is necessary—and I quote Mr. Pickering—"to deal with the development, production, testing, stockpiling, deployment, or proliferation of these weapons: these aspects of the problem present the problem for future work in this field."

Can you advise the subcommittee whether in each of your agencies you have an established "think" group exploring possibilities for arms control? What are your attempts, in other words? What are you doing in order to meet this goal?

Mr. PICKERING. The primary responsibility is the Arms Control and Disarmament Agency. My Bureau in the Department of State is very interested in it and follows disarmament affairs for the Department and we have, as I mentioned in open session, taken the lead in chairing the—maybe I haven't mentioned this—taken the lead in the Interdepartmental Political-Military Group in undertaking the NSC study at the working level and have worked at that through this point, so both through the disarmament agency——

Mr ZABLOCKI. How long has this group been in existence?

Mr. PICKERING. I believe it was set up in the last administration.

Mr. Furnas was involved with it before I was.

Mr. ZABLOCKI. What have they on their agenda?

Mr. PICKERING. This group undertakes studies at the request of the President and the National Security Council Staff and also it attempts to coordinate policy questions of concern between the relevant depart-

ments in the Government relating to the defense and foreign affairs interests of the United States.

Mr. ZABLOCKI. Would the amount of CS, for example, being shipped to one area, or the fact that we are stockpiling chemicals in Germany, be a part of the agenda of this group?

Mr. PICKERING. No, this group relates to the larger policy questions. As of this point, it doesn't get into the operational considerations.

The group will be concerned with continuing reviews of our chemical and biological warfare policy which the President has asked us to undertake and these will be annual, and then also we will participate in semiannual reviews. Is that right?

Captain BIRDT. The semiannual one is the report to the Congress by the Department of Defense.

Mr. ZABLOCKI. You are sure there is a free exchange of information between the Defense and State Departments.

Mr. PICKERING. The Interdepartmental Group has had good cooperation. Many, many people had different views on the pros and cons of various options but these were passed through the National Security Council machinery to the President for his consideration and decision.

I think the group worked effectively and very well. As I noted earlier, there were representatives from many agencies.

Mr. ZABLOCKI. What were some of the accomplishments of this group?

Mr. PICKERING. I think the major accomplishment is the whole scope of the President's decision on chemical and biological warfare, with respect to this particular activity. There is much more involved than the one ambiguity in toxins. The President's decision is a very far-reaching kind of decision. I think that the inclusion of incapacitating chemical agents in our "no first use" position is important. The effort to get the Geneva Protocol back before the Senate for advice and consent is——

POLITICAL ISSUES OF THE GENEVA PROTOCOL RATIFICATION

Mr. ZABLOCKI. Is there any other office within the Department which also enters into the political considerations of the Geneva Protocol? Have you considered whether the Senate will or will not ratify today or tomorrow or next year? Is that perhaps the reason why the President has not as yet resubmitted the Geneva Protocol, because he is not sure that the Senate would ratify?

Mr. PICKERING. Mr. Chairman, I can't put myself in the President's position on this.

My impression of the scope of the work of the Political-Military Group was not the question of the domestic political considerations. Those were, I think, considerations foremost in the President's mind as he went through the process himself. We were charged in the State Department with looking at the international political implications of the various policy choices and alternatives as presented to the President in this particular area.

I have no fears that the domestic political considerations will be ignored in the White House. I think that they are very much attuned to those things, but it is at that level, according to my understanding anyway, that those kinds of considerations are most clearly felt with respect to the policies.

Mr. ZABLOCKI. At the moment, therefore, you do not see any stumbling block which is causing a delay in resubmitting the protocol?

Mr. PICKERING. As I pointed out earlier, I think this is a task which required a great deal of care and a great deal of consultation among government departments to judge just what the reservation might be and those types of things.

I have every hope that within the next day or two the papers will go forward to the White House for Presidential consideration.

Mr. ZABLOCKI. In a day or two?

Mr. PICKERING. Yes. I have every hope this will take place and that things will move on. Certainly it has not been because of lack of interest on the part of the government departments, or of the White House in getting them.

ACDA PARTICIPATION IN CBW CONTROL DECISIONS

Mr. FURNAS. Mr. Chairman, I might say that the Arms Control Agency participates in every stage and level of this national security policymaking process that we have been describing here today from the meetings of the National Security Council itself down to the interdepartmental Political-Military Group which Mr. Pickering has described. We participated fully in this review which has just been completed and which the President's decision marks the beginning of the next step.

We also have bilateral relations and cooperation across the whole level and range of subjects with both the Department of State and the Department of Defense. We in no sense feel left out of this.

I am sure Ambassador Smith regards it his first responsibility to be constantly alert to opportunities to move ahead in the arms control field. We are all aware of the challenges as well as the difficulties. We are grateful when committees like yours and distinguished citizens like Congressman McCarthy take an interest in these subjects. We continue to look at these problems and we will be planning ahead.

I think it is safe to say that every staff meeting that Gerard Smith holds is a session where people try to see what can be done and should be done in this area.

We also have a rather extensive research program, looking ahead, due to the future; since 1964 we have spent on an average of $200,000 a year on chemical and biological verification problems and our programs for the next 2 fiscal years call for similar expenses.

Mr. ZABLOCKI. The civilian element predominates in this particular area and on your committee?

Mr. PICKERING. I think that is true with respect to arms control, but the military has a role and they are not excluded either. It is a cooperative effort, Mr. Chairman.

THE "MILITARY-INDUSTRIAL COMPLEX"

Mr. ZABLOCKI. There is a repeated charge that this Government of ours is being run by an industrial-military complex; that we will soon, if we do not already, have a military totalitarian type of government.

After hearing your testimony, one could conclude that this is not at all true.

Mr. PICKERING. There is a fine balance in the national security con-

siderations between the military and the nonmilitary and that is reflected in the work of the interdepartmental group and I think it is reflected in all of our considerations of disarmament and arms control measures.

Mr. FURNAS. The fact that the State Department chairs the committee Mr. Pickering has described, and we in other agencies are full participants, I think are safeguards against the kind of things you are talking about.

DISTINCTION BETWEEN INCAPACITATING AND RIOT-CONTROL AGENTS

Mr. FRASER. The distinction between incapacitating agents and riot control agents is a perfectly well-understood distinction?

Mr. PICKERING. I think it is a distinction which we understand. I think it is a distinction which is reflected in, again, the international reports on the subject. There are others who understand—I think contrary to our understanding again—that incapacitating agents include riot control agents and I would not want to be on record at this point in saying that there are no differences of opinion on this.

Mr. FRASER. At least for the purposes of our Government——

Mr. PICKERING. For our purpose——

Mr. FRASER. It is well understood.

Mr. PICKERING. We will understand the distinction between the two.

Mr. FRASER. You said a few minutes ago that the President's statement that the United States would follow a "no first use of incapacitating agents" policy was a very important policy statement to make. I thought the United States had always had that position, stated and restated by various Presidents throughout the years.

Mr. PICKERING. It is my impression—again subject to correction—that this was clearing up again something that was not terribly clear at this point; that what was clear was the statement with respect to lethal agents, and the incapacitating agents were on the borderline and that the President's statement clarifies this to the extent that it required clarification and made it completely clear.

INCAPACITATING AGENTS WITHIN PROTOCOL

Mr. FRASER. Let me be certain about this: Incapacitating agents as we understand them would come within the protocol?

Mr. PICKERING. That is right.

Mr. FRASER. Are you saying it was uncertain as to whether or not we would observe the protocol although we had not ratified it?

Mr. PICKERING. Our feeling is that incapacitating agents would come under the prohibitions of the protocol. I think there were discussions prior to the President's statement, perhaps, that indicated there was an area of unclarity here.

Mr. FRASER. The unclarity which other nations would limit at best to riot control agents the United States, or some people in our Government, thought might extend even further to the category of incapacitating agents.

Mr. PICKERING. I think that is a fair statement.

Mr. FRASER. You were apparently prepared to take a rather broad view of the exclusions which some would find in the protocol. At least some people would.

BW PLANNED FOR CUBA INVASION?

Mr. FRASER. It has been said the United States was prepared to use biological agents with regard to the invasion of Cuba. Can you tell us whether or not that is true?

Mr. PICKERING. I just have no knowledge of that.

Mr. FRASER. Has anyone here any information on that question? (No response.)

Mr. PICKERING. I have seen the discussions of this subject in the press.

Mr. MCCARTHY. I would say the Senate Foreign Relations Committe is familiar with the incidents alluded to and there are people in the Government who know what the record is, present and past. I know the information is available in your records.

Mr. FRASER. The reason I ask this is that to a modest degree at least I have the impression that you are called upon, *post facto*, to defend whatever position has been developed in our military planning. That is, I don't feel that the limits are clearly established in the first instance by careful examination of our responsibilities in the international community. There is some looseness here which make it possible to first make military plans which only later are you called upon to defend.

Mr. PICKERING. I think that going back to the President's decision, if there was looseness before, this tends to pin it down. I think this is now national policy reflecting on the military and us alike.

INTRAGOVERNMENTAL DEBATE ON TOXINS

Mr. FRASER. Yes, but the pinning down seems not to be very tight because we have this ambiguity about toxins, for example.

I will have to tell you that having lived through this business of National Government and reading press accounts of it for 7 years, on the whole I find the press considerably more credible. I don't make disparagements of any individual, but I know how the bureaucracy is forced to react and respond. I find responsible newspapers on the whole tell what they honestly think they have discovered.

I believe there is a genuine argument going on about toxins. How this comes out with respect to the President's policy statement is in question.

Mr. PICKERING. At this point the subject has got to be explored in terms of the implementation of the President's statement. I don't think one can say the subject has developed to the point where there is a genuine recommendation.

Mr. FURNAS. I would add to that, if there is an issue here, and no one is clear yet that there is an issue here, it certainly has not been joined, as has been suggested by the news stories we have seen in the last 2 days. That is my honest opinion.

Mr. PICKERING. We have seen cases where they prematurely predict an area of dispute which does not at the time exist. In the course of implementation of what the President has to say, if I can use that word, such a dispute may or may not turn up, depending upon what happens in this process.

Mr. FRASER. I hope that you people assert yourselves. I am very pleased with the decision of the President, and it is my understanding that this position generally was taken against the recommendations of the Joint Chiefs of Staff. I don't believe that that was wrong, and I believe that in this area the President made a very sound judgment.

Mr. PICKERING. Secretary Laird did play an extremely important role in the decisions that were taken and the policy decisions that resulted, and I think any statement disparaging the military in this regard should take full cognizance of the fact that he did take a role of leadership in the study.

Mr. FRASER. The military has a role to play and a responsibility. The civilian leadership enters into it with other larger considerations. I hope that whole operation gets coordinated.

Mr. PICKERING. I certainly concur. I definitely take the same attitude.

Mr. ZABLOCKI. Thank you, gentlemen. Again, we appreciate your coming here and giving so much of your time.

Mr. Pickering, Mr. Furnas, we appreciate you and your associates being here this morning.

The subcommittee stands adjourned until tomorrow morning at 10 a.m., when we hear the DOD.

(Whereupon, at 1 p.m., the subcommittee was adjourned, to reconvene at 10 a.m., Friday, December 19, 1969.)

CHEMICAL-BIOLOGICAL WARFARE: U.S. POLICIES AND INTERNATIONAL EFFECTS

FRIDAY, DECEMBER 19, 1969

HOUSE OF REPRESENTATIVES,
COMMITTEE ON FOREIGN AFFAIRS,
SUBCOMMITTEE ON NATIONAL SECURITY POLICY
AND SCIENTIFIC DEVELOPMENTS,
Washington, D.C.

The subcommittee met, pursuant to adjournment, at 10:17 a.m. in room 2255, Rayburn House Office Building, Hon. Clement J. Zablocki (chairman of the subcommittee) presiding.

Mr. ZABLOCKI. The subcommittee will please come to order.

Today marks the final scheduled session of hearings by the Subcommittee on National Security Policy and Scientific Developments into international aspects of chemical-biological warfare.

Today we are pleased to have as our witness a representative of the Department of Defense. He is Rear Adm. William E. Lemos, the Director of Policy Plans and National Security Council Affairs in the office of the Assistant Secretary of Defense for International Security Affairs.

With Admiral Lemos today as backup witnesses are:

Mr. Benjamin Forman, Assistant General Counsel, International Affairs, Department of Defense; Col. George W. Connell, Jr., Deputy Director, CBR and Nuclear Operations, Assistant Chief of Staff for Force Development, Department of the Army; Albert E. Hayward, Assistant Director, Chemical Technology, Defense Research and Engineering, Department of Defense; and Lt. Col. David W. Einsel, Jr., Office of the Joint Chiefs of Staff.

Our ground rules today are that we will operate at least initially in open session. If questions from the subcommittee touch on classified matters, we will ask the witnesses to withhold their answers. As soon as all unclassified answers have been given, we will clear the room of all visitors and go into executive session.

Admiral Lemos, if you will begin.

STATEMENT OF REAR ADM. WILLIAM E. LEMOS, DIRECTOR OF POLICY PLANS AND NATIONAL SECURITY COUNCIL AFFAIRS, OFFICE, ASSISTANT SECRETARY OF DEFENSE FOR INTERNATIONAL SECURITY AFFAIRS

Admiral LEMOS. Thank you, Mr. Chairman.

Mr. Chairman and the members of the committee, this briefing is in response to your request for information on the use of riot control

agents and herbicides in Vietnam. It is my understanding that testimony on the scope of the Geneva Protocol and the ramifications of arms control measures in the chemical warfare and biological research fields was given on Thursday by representatives of the State Department and the Arms Control and Disarmament Agency.

The United States has consistently maintained that the use of riot-control agents and herbicides is not prohibited by the Geneva Protocol. Further, as a White House official explained following the President's statement on November 25 this year, the term, "incapacitating chemicals," does not include riot-control agents or herbicides. We define—

> Incapacitating agents—as those producing symptoms that persist for hours or days after exposure to the agents has ceased.
>
> Riot-control agents—as those which are widely used by governments for domestic law enforcement purposes, and which produce transient effects that disappear within minutes of removal from exposure.

THE USE OF RIOT-CONTROL AGENTS IN VIETNAM

The first part of my discussion will address the use of riot-control agents in South Vietnam. I will discuss why and how this material is being employed. First, why. Simply stated, riot control agents are used to save lives—American lives, lives of our allies, civilian lives, and enemy lives. Unfortunately, much that we hear discounts the fact that riot-control agents have saved many American and Vietnamese lives. My purpose is to set the record straight by citing specific examples.

The riot-control agent being used in South Vietnam is CS (orthochlorobenzalmalononitrile). This agent, a modern tear gas, causes such fast reaction for those exposed to it that some have complained that it must be somehow more dangerous than the older and better known tear gas, CN. Actually CS is not a gas; it is a solid which is used as a finely divided particulate or dust cloud. The fact is that CS is less likely to cause harm to those exposed to it than the other agent that has been classed as a riot control agent, CN.

Up to 1964, riot control agents were developed and packaged as hand grenades which disseminated CN and CS as a smoke cloud for use in civil disturbances. Riot-control munitions of this type were then and still are used by Federal, State, and local law enforcement agencies in the United States and many other countries for riot control purposes.

In Vietnam, in addition to their riot-control function, these agents were initially conceived as being useful primarily to prevent casualties in the clearing of tunnels, caves, and underground shelters. In such cases their use leads to fewer casualties and lesser loss of life than would the combat alternatives of other weapons. These other alternatives include the use of HE (high explosive) and flame. A key factor in the selection of riot-control agents (RCA) over these other alternatives is the reduction in casualties to civilians, frequently hostages, who often are intermingled with hostile military elements as a result of Viet Cong tactics.

The Department of Defense with the concurrence of the Department of State obtained Presidential approval in November 1965 for

the use of CS and CN in Vietnam. COMUSMACV delegated to his subordinate commanders authority to use these agents in military operations against the enemy. These commanders were authorized to further delegate this authority to the extent deemed suitable for insuring both timely employment and proper control. COMUSMACV stated that "consistent with tactical requirements, hazard to noncombatants will be reduced as much as possible." Further, COMUSMACV directed that these materials not be employed by U.S. elements in situations involving civil demonstrations, riots, or similar disturbances of concern to the civil government until clearance has been obtained from him. This was not because these agents were thought to be ineffective, but because such action was conceived to be the province of the Government of the Republic of Vietnam.

As the effectiveness of these riot-control agents in reducing casualties became increasingly evident in such situations as suppression of hostile firepower and clearance of fortified positions and underground facilities, American commanders at all levels began to see other ways in which the use of the riot-control agents, particularly the new agent CS, could save many American and allied lives. As a result its applicability to other types of operations spread among U.S. units in Vietnam.

Since they save lives, riot-control agents have been treated as normal components of combat power. They add to a commander's flexibility and give him additional means of devising the best method of accomplishing his mission with minimum loss of life. It is difficult to deny a commander the authority to use riot-control agents when it is considered to be one of the most effective means available for saving lives.

EXAMPLES OF EFFECTIVENESS OF CS

I would like now to cite some specific examples which demonstrate the effectiveness of CS and the flexibility it has given our commanders in different combat situations.

I. ATTACK OF OCCUPIED POSITIONS

Commanders have found CS to be highly effective against occupied positions. Such operations fall into several categories: assault against point targets; assault against area targets; clearing of bunkers, caves, and other structures; suppression of small arms fire around helicopter landing zones or downed aircraft; and reduction of enemy resistance to facilitate the taking of prisoners. In all of these situations, CS has proven effective in temporarily reducing the effectiveness of enemy-aimed fire, thereby reducing casualties and facilitating rescues.

A favorite tactic of the Vietcong and the North Vietnamese Army is to enter towns or villages and use the occupants as hostages. The normal employment of fire and maneuver against such an objective could result in numerous civilian casualties and considerable damage to their homes. The VC/NVA turn incidents such as this to propaganda use and tell the South Vietnamese people that the United States is there only to destroy them and their homes. MACV has directed that CS be considered for use in such situations in order to hold to an absolute minimum any danger of civilian casualties and property damage.

For example, CS delivered by mortar has been used specifically to segregate the enemy located in portions of villages without creating unnecessary civilian casualties or damage to property in other parts of a village. One U.S. unit had been receiving heavy fire from a village. The division commander was reluctant to use high explosives in attacking the village as it would have caused unnecessary casualties and the village would have been destroyed. The enemy was located within a small area in the village. The decision was made to use CS while high explosive rounds were authorized only as a last resort and only on small targets. Four mortars delivered 80 rounds of CS on the village within 2½ minutes. Ground troops then swept the area encountering only minor resistance. The village was taken without casualties or major damage.

In another instance, our helicopters were receiving sporadic ground fire from a village in the An Lao Valley. Leaflets were dropped over the village telling the inhabitants to stop firing at aircraft. Fire continued from the village and additional leaflets were dropped telling the people that they should leave the village. CS was then dropped on the village and followed by a sweep with ground forces. Many VC were taken prisoner during the sweep without a shot being fired by either side.

Another notable example occurred during the 1968 Tet offensive when CS was employed by the United States in support of Vietnamese Rangers heavily engaged against a large force of VC in a factory complex in the Cholon area of Saigon. The complex had been successfully defended against several separate assaults. Finally, in the early evening, CS was delivered by helicopter onto the target; the next morning a Ranger company penetrated the complex and found that the enemy had pulled out.

In other cases, as occurred recently near Tay Ninh City, the enemy was so heavily entrenched that artillery and airpower could not dislodge him from his positions and his firing on friendly positions could not be stopped. In such cases, CS is effective in dislodging the enemy from his entrenchments. In one particular case, since the enemy did not cease firing on our forces, it was necessary to use both air and artillery firepower. Under other conditions, where the enemy ceases firing, the use of CS provides an open option to him to accept capture rather than the casualties caused by continued fighting.

II. DEFENSE OF POSITION

CS also has been used to save lives in a defensive role. For example, NVA units had initially overrun an outpost located between two hills on the approach to a U.S. battalion fire support base and then managed to occupy the first three bunkers encountered in the fire support base perimeter. Counterattack by the U.S. forces succeeded in driving the NVA from the bunkers. But the enemy then fell back to positions on the saddle and were protected from friendly fire by stumps and defilade. Attempts to dislodge the enemy with small arms and artillery failed. CS was used and the enemy became disoriented and confused, left their position, and ran. Six were captured immediately. The unit credited the CS with the successful defense of the base and for the capture of the six NVA.

III. TUNNEL CLEARING

Tunnel clearing is how the lifesaving use of CS by our forces in Vietnam began. You have probably read of the well-publicized Marine case, where 17 Vietcong, with some 400 noncombatants being held as hostages, were cleared from a tunnel complex by CS, with no one, I repeat no one, being killed or wounded on either side. All the VC were captured. Such results proved without doubt the role CS could play in both protecting American fighting men, and in reducing civilian casualties. In a similar instance, 43 armed Vietcong were captured with no friendly losses and only one enemy killed when he resisted.

IV. BREAKING CONTACT WITH THE ENEMY

Employment of CS is a very effective means for a small unit to use in reducing casualties while breaking contact with a superior force. A favorite NVA tactic is to ambush or otherwise engage a numerically inferior U.S. element. To counter this tactic small U.S. elements are instructed to deliver a heavy volume of fire and then attempt to break contact as quickly as possible. Often a small unit has difficulty in breaking the contact, and suffers severe casualties. The use of CS can help in breaking contact in such situations. In addition to disorganizing and confusing the enemy, the CS cloud also provides a partial smoke screen which can mask the withdrawal of the U.S. element. Numerous extractions by helicopter have been successfully completed without casualties using such techniques. Similar engagements without CS frequently have resulted in the loss or capture of the entire U.S. patrol.

V. DEFENSE AGAINST AMBUSH

CS may also be used in a counterambush role by vehicular convoys. Some units have fitted escort vehicles with sidemounted CS dispensers. These vehicles are then spaced at intervals throughout the convoy, and these dispensers are set to be activated on command if the convoy is ambushed allowing time for the convoy security elements to dismount and react before they are cut down by enemy fire.

In very heavily jungled areas, reconnaissance by CS on suspected targets proves more effective than HE fires in assisting a friendly force to search a likely area. Trees provide effective shields for the enemy against fragments and whereas the HE frequently does not affect the enemy in dug-in positions, CS causes the enemy to move or at a minimum to cough, thus revealing his position and providing the advancing troops notice that they are approaching a possible ambush location.

VI. RESCUING DOWNED AIRMEN

One of the most dramatic uses of CS is that of assisting in the rescue of airmen who have been downed in enemy-controlled territory. Previously, tactical aircraft have tried to suppress enemy ground fire by strafing while the helicopter rescue operation was underway. This tactic was only partially successful and sometimes endangered our own forces in the area. Air rescue units can use CS to help in these operations. The CS is dropped, usually from helicopters, in the area

of the downed men. This protects the rescue crew and aircraft as well as the downed airmen from aimed enemy fire. The rescue team wearing protective masks then extracts the downed crewmen. There are many documented examples of such successful operations.

SUMMARY

The riot control agent, CS, has become a lifesaving part of military operations in Vietnam. CN, the older agent, because of its relative ineffectiveness, is now seldom used. The use of CS in combat operations clearly reduces casualties among friendly troops, permits extraction of civilians who may be under enemy control often without casualties, and frequently allows the enemy the option of capture rather than casualties. Perhaps the most valid indication of the effectiveness of CS in combat operations is that U.S. personnel continue to carry CS grenades to the field in lieu of some of their normal high explosive ammunition, and ground commanders often call for CS rather than high explosives. Riot control agents are a valuable aid in accomplishing our mission and in protecting our forces.

HERBICIDES

Turning now to the use of herbicides in Vietnam, one of the most difficult problems of military operations in South Vietnam is the inability to observe the enemy in the dense forest and jungle. Defoliating herbicides introduced in 1962 are capable of producing a significant improvement in vertical and horizontal visibility in the type of jungle found in South Vietnam. As viewed by an aerial observer, it is often impossible to see through the canopy to detect VC or NVA operations. In 6 to 8 weeks, after spraying with a herbicide, the observer will have good observation through the canopy. For ground observation, defoliation is highly effective in improving horizontal visibility.

The herbicide program in terms of effects produced has required an unusually small investment of military effort. The entire program has been accomplished with an average of about 17 C–123 spray aircraft and several smaller helicopter sprayers plus some improvised ground-spray equipment.

Herbicide operations are conducted under a program directed by the Government of South Vietnam. Requests for these operations generally originate at the district or provincial level and are submitted through territorial administration command channels. The herbicide spray plan, includes as a minimum the area requested to be treated with herbicide, the public information, civil affairs, and intelligence annexes, along with a statement by the province chief that he will see that just and legal claims are paid for any accidental damage. The ARVN corps commanders and their U.S. corps senior advisers have been delegated authority to approve small scale defoliation by ground-based spray and by helicopters. All requests for crop destruction and larger scale defoliation by C–123 aircraft are forwarded to the Vietnamese Joint General Staff. Upon approval of the request by the Chief of Joint General Staff it is forwarded to the MACV staff for final review.

The MACV staff position is developed as the result of coordination with CORDS (Civil Operations and Revolutionary Development Support), USAID, and political representatives at each level where they exist. An aerial reconnaissance is conducted as the next step to insure that all populated areas and friendly crops have been excluded from the target area. Having determined from this aerial survey and an analysis of the military worth that the project is a valid herbicide target, the project is forwarded to the U.S. Ambassador and COMUSMACV for approval. The Ambassador personally approves all C–123 defoliation projects and all enemy crop destruction projects.

SOME SPECIFIC USES OF HERBICIDES

Some specific uses of herbicides are:

1. Defoliation of base perimeters

A portion of the small-scale ground based or the helicopter spray missions are used in improving the defense of base camps and fire bases. Herbicides are a great help in keeping down the growth of high jungle grass, bushes, and weeds which will grow in cleared areas near these camps. This clearance opens fields of fire and affords observation for outposts to prevent surprise attack and as such is truly a life-saving measure for our forces and our allies. Without the use of herbicides around our fire bases, adequate defense is difficult and in many places impossible.

2. Defoliation of lines of communication

There are many instances of ambush sites being defoliated for better aerial observation and improved visibility along roads and trails. In 1967 there were also many requests for defoliation of VC tax collection points. In otherwise friendly territory there were points along well-traveled routes where the enemy could hide under cover and intercept travelers to demand taxes. Defoliation along these roads was very effective in opening these areas so that they can be seen from observation aircraft, and with few exceptions these roads were opened to free travel. The use of aircraft to spray alongside lines of communication proved valuable in clearing these areas and preventing costly ambush of army convoys with resulting friendly casualties.

3. Defoliation of infiltration routes

Areas used by the enemy for routes of approach, resupply or movement are targets for herbicide spray. Probably the most valuable use of herbicides for defoliation is to permit aerial observation in such areas. This is particularly true in areas near the border so that we can detect movement of enemy units and their resupply.

4. Defoliation of enemy base camps

We know from prisoners of war and from observation that the enemy will move from areas that have been sprayed. Therefore, enemy base camps or unit headquarters are sprayed in order to make him move to avoid exposing himself to aerial observation. If he does move back in while the area is still defoliated, he will be observed and can be engaged.

5. Crop destruction

Crops in areas remote from the friendly population and known to belong to the enemy and which cannot be captured by ground operations are sometimes sprayed. Such targets are carefully selected so as to attack only those crops known to be grown by or from the VC or NVA. The authorization to attack crops in specific areas has been made by the U.S. Embassy, Saigon, MACV and South Vietnamese Government.

Frequent reviews have been conducted of the herbicide program. The most recent one was personally directed and reviewed by COMUSMACV in October 1968 to assure himself that the program was militarily effective. Prior to that, the U.S. Ambassador had directed a review which looked at the political and economic aspects of the program. The Embassy report was released in August 1968. The crop destruction program was also received by the CINCPAC scientific adviser in December 1967. Each of these reports concluded that the program should be continued.

Mr. ZABLOCKI. At this point, will you supply the Embassy report and the CINCPAC scientific adviser report for the fiscal year 1967 if you have it?

Admiral LEMOS. I do not have them with me, but I will supply them.

(The reports, which are classified, were provided to the subcommittee for its records.)

The requests for defoliation and crop destruction have always exceeded our capability to spray. The requirement continues although a tapering off should develop if enemy activity subsides. A recent review by MACV indicated that operations for 1970 will be less than in 1969. In addition, Rome plows are replacing defoliation for clearing along many lines of communication.

THE USE OF 2,4,5-T IN VIETNAM

With regard to the recent publicity of the herbicide agent, 2,4,5-T, which is a component of orange, a herbicide mixture, the bionetics research laboratories conducted a study of the carcinogenic, teratogenic and mutagenic activity of selected pesticides and industrial chemicals for the National Cancer Institute during the period 1965–1968. The study indicated that a large dose of 2,4,5-T administered orally to specific strains of mice during the central portion of the gestation period produced abnormal fetuses.

However, on October 29, 1969, Dr. DuBridge, science advisor to the President, stated, "It seems improbable that any person could receive harmful amounts of this chemical from any of the existing uses of 2,4,5-T."

Nevertheless, Deputy Secretary of Defense David Packard has issued instructions to the Joint Chiefs of Staff to reemphasize the already existing policy that 2,4,5-T be utilized only in areas remote from population.

When the American Embassy conducted the political economic review of the herbicide program, it requested that a disinterested expert be sent from the United States to assess any ecological consequences of the program. Dr. Fred Tschirley, Agricultural Research Service,

Department of Agriculture, was sent over in March 1968 for a 1-month period. Arrangements were made which permitted him to fly over any area of Vietnam he wished to inspect plus on-the-ground visits to any safe area. He concluded that the defoliation program had caused some ecological changes. Although single treatment on semideciduous forest would cause inconsequential changes, repeated treatments could kill enough trees to permit invasion of many sites by bamboo. The presence of bamboo would then retard regeneration of the forest.

The Army supports the need for a more detailed investigation of the ecological effects of herbicides used in Vietnam. Such an investigation should be conducted in coordination with other interested agencies. In order to get such a study started, a research and development project entitled "Ecological Effects of the Military Use of Herbicides in Vietnam" is being initiated. This study would continue into the post-hostilities phase.

EXAMPLES OF DEFOLIATION SUCCESS IN VIETNAM

In the final analysis the sole purpose of the herbicide program is to protect friendly forces and conserve manpower. The following examples should demonstrate the success of the defoliation effort in Vietnam:

1. Major defoliation has been accomplished in war zone C. Prior to defoliation, seven brigades were necessary to maintain U.S./GVN presence. During 1967, after defoliation only three brigades were required.

2. The commander of naval forces in Vietnam in a report to General Abrams stated—

As you know, a major concern is the vegetation along the main shipping channel. Your continuing efforts under difficult and hazardous flying conditions, in keeping this area and the adjacent inland areas devoid of vegetation have contributed considerably in denying the protective cover from which to ambush the slow-moving merchant ships and U.S. Navy craft.

3. In 1968, the commanding general of the 1st Field Force reported—

Defoliation has been effective in enhancing the success of allied combat operations. Herbicide operations using C–123 aircraft, helicopters, truck mounted and hand sprayers have become an integral part of the II CTZ operations against VC/NVA. The operations are normally limited to areas under VC/NVA control remote from population centers. The defoliation program has resulted in the reduction of enemy concealment and permitted increased use of supply routes by friendly units. Aerial surveillance of enemy areas has improved and less security forces are required to control areas of responsibility. An overall result of the herbicide program has been to increase friendly security and to assist in returning civilians to GVN control.

4. The U.S. commander in the III CTZ related:

Herbicide operations have contributed significantly to allied combat operations in the III Corps. Defoliation is an important adjunct to target acquisition. Aerial photographs can often be taken from which interpreters can "see the ground" in areas that previously were obscured. Defoliation also aids visual reconnaissance. U.S. Air Force FAC's (forward air controllers) and U.S. Army aerial observers have discovered entire VC base camps in defoliated areas that had previously been overlooked.

5. In the south in the IV CTZ, C–123 herbicide operations are limited. This is because of the vast areas of valuable crops which are not to be destroyed, even though they may be in enemy hands. There-

fore, the commander of the IV Corps area in presenting his evaluation cited the value of helicopter operations as follows—

A significant helicopter defoliation mission was conducted in the vicinity of SADEC in August 1968. The target area consisted of three main canals which converged and formed a strong VC base. The dense vegetation permitted visibility of only 10–15 meters horizontally and nil vertically. The area was sprayed with approximately 735 gallons of herbicide white and over 90 percent of the area was defoliated. As the result of the defoliation, an ARVN battalion was able to remain overnight in the area for the first time in 5 years. Many enemy bunkers were open to observation. Since the defoliation, the VC presence has decreased to the point that only RF/PF forces are now necessary for local security.

6. As a part of the 1968 evaluation report of herbicide operations, the U.S. senior adviser in the IV Corps tactical zone area reported—

A section of National Highway 4 in Phong Dinh Province was the site for a defoliation operation on June 24, 1968. Since January 1968, a series of ambushes was conducted against SVN convoys and troop movements. Because of the total inability of ground troops to keep the area clear of VC, this area was sprayed using 685 gallons of herbicide white. The target area was primarily coconut palm and banana trees that had been abandoned by their owners for several years. During the period of abandonment the vegetation had become so dense that convoy security elements were not able to see more than 5 meters into the underbrush and had to rely on reconnaissance by fire to discover the hidden enemy. This method of protection had proven ineffective. Three RF/PF companies with U.S. advisers were used to secure the target for the helicopter operation in addition to an armored cavalry troop. Since the defoliation mission was completed, convoys have used the highway two or three times a week without attack or harassment. Only one RF platoon has remained in the area to provide local security to the hamlet and highway.

7. In certain instances, we know the VC have been forced to divert tactical units from combat missions to food-procurement operations and food-transportation tasks, attesting to the effectiveness of the crop destruction program. In local areas where extensive crop destruction missions were conducted, VC/NVA defections to GVN increased as a result of low morale resulting principally from food shortages.

The most highly valued item of equipment to field commanders in Vietnam is the helicopter. There was some question when the helicopter spray equipment was first procured whether field commanders would divert the use of helicopters from combat operations for herbicide spray operations. The very fact that the commanders have used their helicopter spray equipment to the fullest and have asked for more is certainly proof that herbicide operations have been helpful in protecting the American soldier and contributing to successful accomplishment of the ground combat mission.

CONCLUSION

Gentlemen, we have presented to you in as complete and candid a manner as possible the lifesaving usage that we have made of riot control agents and herbicides in South Vietnam and the policies under which this usage has taken place. We believe this usage has been wise and has been accomplished with restraint. The result is that our forces have been better able to accomplish their mission with significantly reduced U.S. and Vietnamese casualties.

ADVERSE EFFECTS OF HERBICIDE USE: DAMAGE CLAIMS

Mr. ZABLOCKI. Thank you for your statement, Admiral Lemos.

You have outlined the uses and the benefits of chemical agents in Vietnam. Certainly there must be adverse political and economic results because of the use of herbicides and tear gases like CS.

Have there not been instances of the misuse of herbicides and tear gas? Could you give a view of those for the record of the subcommittee?

For example, I understand Cambodia has a suit against the United States for damage done because of the use of herbicides. It is also my understanding some South Vietnamese are going to seek damages because of loss of income or loss of property. I understand banana plantations have been destroyed. That would indicate there are uses of chemicals which have been adverse to our interests.

Admiral LEMOS. There have been some such instances.

Mr. ZABLOCKI. Could you tell the committee about how many? You have given all the good side of it. I wouldn't expect you to dwell at length on the reasons why chemicals should not have been used, or where errors were committed, but I think in fairness you ought to tell us a little bit of both sides.

Admiral LEMOS. There have been some few instances and these have been very carefully explored in the reviews that I have mentioned and quite clearly from the results of the reviews it has been determined that in the overall context, the disadvantages and the few abuses were very greatly outweighed by the very real advantages provided to our forces and to the Vietnamese Forces and the very real difficulties they provided the VC and North Vietnamese Forces.

With respect to the Cambodian incident, this was a border incident. As you know, sir, there are stretches of the Vietnamese-Cambodian border that are under dispute. They are not clearly marked in any way. In situations such as this where you know there are enemy base camps, enemy forces operating in the jungle, and from which heavy fire may be coming, spray operations close to the border have been conducted. It would appear that in one of these cases either the spray plane was in an area that was in dispute or was not clearly marked and this situation was reviewed and as I understand it observers were sent to the area and a report has been prepared. Whether that report has been yet released, I do not know. I have not seen it.

HOW CLAIMS ARE PROCESSED AND PAID

Mr. ZABLOCKI. In your testimony, Admiral, you say that the province chiefs supply the basic intelligence as to what areas herbicides should be used in.

Admiral LEMOS. Yes.

Mr. ZABLOCKI. Realizing the political problems between Cambodia and South Vietnam, could this have entered into the selection of the defoliation of areas along the border of Cambodia?

Admiral LEMOS. I am certain it has. As I have indicated, all C–123 spray operations must have the clearance of the Government of Viet-

nam, of COMUSMACV and of the Ambassador. All three must approve C–123 operations.

Mr. ZABLOCKI. You also stated that the province chief must state that he will see that just and legal claims are paid for any accidental damage. Where is he going to get the money?

Admiral LEMOS. To the extent there are damages——

Mr. ZABLOCKI. From my knowledge of the South Vietnamese anything they have is received from us.

Admiral LEMOS. We do provide substantial support to the South Vietnamese. The payments, however, are made by the Government of Vietnam.

Mr. ZABLOCKI. But we pick up the tab?

Admiral LEMOS. Not entirely.

Mr. ZABLOCKI. Could you advise the Congress if we ultimately are going to have war damage claims like we had in the Philippines because of the damage to crops and industry? Do you anticipate there will be such war damage claims?

Admiral LEMOS. I am not able to anticipate that kind of claim.

Mr. ZABLOCKI. In view of the fact that we were the defoliator and, our U.S. Ambassador has been consulted and must give the order for the use of herbicides, wouldn't it be logical that South Vietnamese owners of plantations will be filing claims through the U.S. Embassy the first opportunity they have?

Admiral LEMOS. They have that opportunity now, sir.

Mr. ZABLOCKI. And they are doing so?

Admiral LEMOS. I presume——

Mr. ZABLOCKI. And when hostilities end we will have millions of dollars in claims thrown at us. Has this been taken into consideration by Defense Department when the decision was made to use herbicides?

Admiral LEMOS. I am certain it was taken into consideration.

Part of the reason for the reviews was to consider specifically these points.

INTELLIGENCE ON AREAS DEFOLIATED

Mr. ZABLOCKI. In outlining the elaborate procedures which you have taken in the use of herbicides, in the past, we were impressed—certainly I was—with the lack of accurate and hard intelligence in the Vietcong-held areas.

How sure can the military be that fields that are selected by the Vietnamese province chiefs are in Vietcong-held areas, and how can the province chief know for sure that the crop is going to feed Vietcong soldiers? If we have such excellent intelligence where their Vietcong rice fields are, we should have better intelligence in other areas.

Admiral LEMOS. Intelligence is improving daily, as we move out in the countryside and get more and more hamlets and villages under the control of the Government of Vietnam and more and more people willing to risk their lives to give information that points out where the Vietcong are and where it is difficult to go.

DOD DECISION ON 2,4,5-T

Mr. ZABLOCKI. On page 14, you said that the Deputy Secretary of Defense, David Packard, has issued instructions to the Joint Chiefs

of Staff to reemphasize the already existing policy that 2,4,5-T shall be used in areas remote from population. I thought there was a decision not to employ 2,4,5-T in the future.

Admiral LEMOS. I am told there is no such decision.

Mr. ZABLOCKI. The use of 2,4,5-T is however, under review.

On page 15 you say a review of the ecological effects of the military use of herbicides is now being initiated.

Admiral LEMOS. Yes, sir, that is the whole herbicide program and the ecological effects of all herbicides.

Mr. ZABLOCKI. 2,4,5-T, it is my understanding, is the most potentially dangerous to people, resulting in the greatest political problems. Is that not a fact?

Admiral LEMOS. That is my understanding, yes, sir.

DOD HERBICIDE STUDY

Mr. ZABLOCKI. The herbicide investigation project that you referred to on page 15, could you give the subcommittee more details on this project? It will be conducted by the Department of Defense or contracted out?

Admiral LEMOS. Initially in-house and then go on contract.

Mr. ZABLOCKI. Wouldn't it be preferable to reverse the order and have some uninvolved group study the ecological effects of the military use of herbicides in Vietnam, and then have the military review the report?

Admiral LEMOS. Mr. Hayward you have any comment on that?

Mr. ZABLOCKI. Wouldn't that be advisable?

STATEMENT OF ALBERT E. HAYWARD, ASSISTANT DIRECTOR, CHEMICAL TECHNOLOGY, DEFENSE RESEARCH AND ENGINEERING, DEPARTMENT OF DEFENSE

Mr. HAYWARD. Mr. Chairman, some time ago in our discussions with the American Association for the Advancement of Science, the Department of Defense agreed in principle that this type of survey should be done, and we have every intention of inviting this association, and also of inviting the National Academy of Sciences and other scientific groups, if they would participate in this survey.

The project which Admiral Lemos referred to is being started or initiated now. I believe that our activities during the remainder of this fiscal year will be largely in planning and in reviewing the things that have been done. I can assure you that uninvolved scientific bodies will be invited to participate in this.

Mr. ZABLOCKI. At a later date.

Mr. HAYWARD. Within the next few months.

They should be involved in the planning as well as the discussion, sir. So it will be done within a reasonably short time period.

Mr. ZABLOCKI. Some are hopeful that by then it may be a moot question.

I have a call, will you excuse me? Mr. Fraser . . .

Admiral LEMOS. Surely.

PHYSIOLOGICAL REACTIONS TO CS

Mr. FRASER. Admiral, what are the physiological reactions to CS?

Admiral LEMOS. It is a tear gas. It has an effect on the mucous membranes, which is very temporary, and which causes some temporary irritation, which disappears within just a few moments after exposure. Would you like to add to that?

Mr. HAYWARD. No, sir.

Mr. FRASER. When you say a few moments, do you mean a few minutes or a half hour?

Admiral LEMOS. Less than 20 minutes, normally.

Mr. FRASER. Have you been using the lung gas in Vietnam, or the gas that affects the lungs principally?

Admiral LEMOS. None of these gases are so termed as lung gases.

Mr. FRASER. I am not using the exact term, but in terms of the way it affects the individual.

Admiral LEMOS. If an individual breathes in any of these riot control agents, some of the materials will get into his lungs, yes.

Mr. FRASER. I am talking about an agent where the principal impact is through the inhalation.

Admiral LEMOS. Will you address this?

Mr. HAYWARD. Mr. Congressman, the CS or any tear gas, as Admiral Lemos has said, is irritant to mucous tissues. CS is the only material that we are using in Vietnam. If it is inhaled into the lungs, it will be irritant to those tissues. But these irritations, as Admiral Lemos says, goes away within a few minutes, with the individual going into fresh air.

Mr. FRASER. In its design, what part of the body is it designed to affect?

Mr. HAYWARD. It is designed primarily to affect the eyes and the upper respiratory tract, the nose and throat areas.

Mr. FRASER. What happens? What are the symptoms and what is the reaction?

Mr. HAYWARD. The symptoms are watering of the eyes, sneezing, coughing. Those are the primary symptoms. There is pain—irritating pain—sort of like smelling pepper, that sort of a sharp irritant, in those tissues. The exact physiology is an irritation of the nerve endings which are in the mucousal surface.

Mr. FRASER. This does affect the respiratory tract, you say?

Mr. HAYWARD. Yes, it is irritant to the respiratory tract. CN is similar. It is also an irritant to the respiratory tract.

USES OF GAS TO FLUSH OUT VICTIMS

Mr. FRASER. Admiral, looking at the description you provided of the uses of riot control agents in Vietnam, you have not included a description of the use that we have heard about in this subcommittee. Namely, the use of the riot control agent to flush out the enemy in anticipation of some kind of bombardment, either an area bombardment or some other type of bombardment.

Have there been such uses of riot control agents?

Admiral LEMOS. I am not personally aware of any. The guidance given to the commanders in the field is that CS will be used as one of

their combat arms. The only specific recommendation is in their use against noncombatants, that is, their use in a situation where noncombatants are intermingled with military forces.

They are specifically recommended for use in that situation, so that as the combatant forces and the noncombatant forces make their appearance, you know what the situation is with a great deal more clarity than you possibly know while they are still in fortifications; whereas in the past the tendency has been to use high explosives directly, or in some cases flame weapons, where you had no way of telling whether you would thus indiscriminately involve noncombatants.

With the use of CS, you are at least aware of the situation that you are facing. If the combatants come out and submit themselves to capture, or in other ways indicate that they are not going to continue the fighting, then they are taken prisoner. The civilians who are rounded up in this manner are screened in the usual ways to determine their Viet Cong affiliation, or whether they were forced as hostages, and either released or taken care of in the way that Viet Cong prisoners are taken care of.

Mr. FRASER. I read that in your statement.

Yesterday we had a representative from the State Department, and I asked him if in his conversations about this subject of the use of riot control agents in Vietnam he had come to believe that the riot control agents in some cases had been used to flush the enemy out so as to subject him to bombardment of some kind. His answer was that he did understand that had happened. But you are saying that you have no knowledge of anything of that kind.

Admiral LEMOS. I know of no specific instances.

Mr. FRASER. Admiral, I am sure you may not know of specific instances. Have you any impression whether or not this has happened?

GAS IS A COMBAT WEAPON

Admiral LEMOS. I have impressions that the guidelines for the use of CS are such that they are used in combat situation to save American lives.

Mr. FRASER. American lives?

Admiral LEMOS. American lives, yes, in this situation.

I think one of the situations that I cited for you in the defense of American positions, such a situation might be that an American position that is under heavy fire, CS will be used against the enemy firing base to cause them to prevent that fire. To the extent that firing base is capable of continuing to fire, and enemy artillery shells are continuing to land on United States or Vietnamese positions, then certainly high explosives will be used to prevent that fire from continuing to produce casualties among the Americans and South Vietnamese.

It is a combat weapon and authorized for use in combat.

Mr. FRASER. It is used, then, I gather, in conjunction with our weaponry sometimes to increase casualties on the other side.

Admiral LEMOS. No; it is never used in a deliberate effort to increase casualties. It is used to suppress enemy fire, and if in the process of that effort enemy fire continues, then there have been cases and there are cases where heavy explosives have been used in order to complete the job of suppressing the enemy fire. The point is that

it is used to give the enemy the option of giving up his attack against Americans, in this situation.

If the enemy chooses not to give up that attack, then all other means available to the Commander will be used to prevent the enemy from continuing his attack.

HAS GAS BEEN USED TO INCREASE ENEMY CASUALTIES?

Mr. FRASER. I would like to get the record straight on this. You have read these reports that riot-control agents have been used to flush the enemy out and the B–52's have come along as a follow-on.

Admiral LEMOS. I have not read of follow-on B–52's.

Mr. FRASER. Then maybe my impression or information is wrong. I would like to get the record straight.

The impression has been given to this subcommittee—I do not remember where it came from—that from time to time these riot-control agents are used in effect to increase the casualties on the other side. As you say, they are used as a combat weapon, but they are used in conjunction with whatever kind of firepower we can bring to bear. I am not trying to be a moralist about this. I am trying to find out first what we are doing, because chemical weapons in general have been condemned by the international community.

I am trying to find out what we are using them for in Vietnam. You tried to draw some tight circles of very careful and precise and specific use. Is it your judgment that the kind of uses you describe, to the best of your knowledge, represent the only uses that have been made of riot-control agents in Vietnam?

Admiral LEMOS. I cannot possibly testify that I know of all uses. There are uses delegated to commanders at battalion level.

It just is not possible to answer your question in a definitive way.

I would simply state that I know of no deliberate effort to use CS in a way that would insure increased casualties.

It is used as a protective device for United States and Vietnamese forces, and if the enemy which has been subjected to CS continues to fight, then they are brought under fire by other means.

Mr. FRASER. Perhaps we should get into the record here what ways you have of knowing specific uses of riot control agents. What kind of field reports come to your direct attention?

Admiral LEMOS. In my job as Director of Policy Plans and National Security Council Affairs I do not normally see field reports. I do see cable traffic, which addresses general problems such as this.

I participated in the review of the use of these agents and that is about the extent of my involvement with the vehicle.

Mr. FRASER. Perhaps this question has been asked.

THE TSCHIRLEY REPORT ON HERBICIDES

Mr. ZABLOCKI. May I interrupt at this point to develop your question further. Admiral, you mentioned Dr. Fred Tschirley, who was sent over to Vietnam in March 1968. Did you have an opportunity to read his report?

Admiral LEMOS. I have not personally read his report; no, sir.

Mr. ZABLOCKI. Then you would not be in a position to say whether

he had reported the effects of utilizing 2,4,5-T or any of the other herbicides?

Admiral LEMOS. I have not read his report.

REGULATIONS ON GAS FOR FIELD COMMANDERS

Mr. FRASER. Are there published regulations or guidelines to the commanders in the field with respect to the use of the riot control agents?

Admiral LEMOS. There are.

There are classified rules of engagement which include the use of riot control agents; yes, sir.

Mr. FRASER. Do they spell out in some detail the circumstances under which they can be used?

Admiral LEMOS. The guidance is quite general. It is completely consistent with the U.S. policy that riot-control agents have no prohibition in their use in such situations as we are facing in Vietnam.

Mr. FRASER. In other words, the guidelines are that they may use them in combat situations?

Admiral LEMOS. Yes, sir.

Mr. FRASER. You outlined a number of specific illustrations of the use of the riot controls agents. The guidelines are not framed with that specificity, I gather?

Admiral LEMOS. That is correct.

Mr. FRASER. You do not yourself get back any information as to how in fact it is used?

Does your office?

Admiral LEMOS. No, sir.

Mr. FRASER. I am not that familiar with the Pentagon, but how would you come to know what in fact had been the case; in other words, what had been the actual practice?

Admiral LEMOS. As I have indicated earlier, my office is involved in National Security Council affairs.

As I believe was indicated yesterday, and certainly was indicated by the President on November 25, the NSC review of chemical warfare was extremely thorough and all parts of the Government were involved. The question of the use of riot-control agents was very thoroughly explored, and the decision resulting from that review was that there was no prohibition to that use, and that they would be used as necessary in Vietnam in combat operations.

Mr. FRASER. When you say they would be used as necessary in combat operations, there is no restriction either in the policy or in the guidelines that says they can only be used to lessen the number of casualties on both sides, or something of that kind.

Admiral LEMOS. I am sure it does not say that they would be used only in circumstances where they would reduce the number of casualties, but it does give guidance that they would be used in the effort to reduce casualties.

WHY NO GAS USED IN WORLD WAR II AND KOREAN CONFLICT?

Mr. ZABLOCKI. We heard yesterday from the Department of State witnesses that the United States has since 1930 consistently held the

right to use tear gas in warfare. You have outlined to the committee how useful tear gases can be in combat. If this is the case, why didn't we use tear gas in World War II and the Korean conflict?

Admiral LEMOS. The situation is much different in this war than either of those, as I am sure you know. I cannot swear why we did not. I am not at all sure that we did not. I just do not know.

My knowledge of this war is substantially greater than my knowledge of either of the other two, and I have reviewed enough situations, and have listed here enough situations that established the real use of riot control agents in this kind of a war to satisfy myself that they are extremely useful, that they do in fact save a large number of lives, not only American, and that the use should be continued.

CS AND CN COMPARED

Mr. ZABLOCKI. As far as the use of CN and CS is concerned, you made quite a point at the beginning of your statement that CS is less likely to cause harm to those exposed to it than the other agent that has been classed as a riot-control agent, namely, CN.

Admiral LEMOS. Yes, sir.

Mr. ZABLOCKI. Yet in summary you say that CN, because of its relative ineffectiveness, is now seldom used. Would you explain to the committee where CS is more effective and in what ways? If the difference is not too great and you say there is nothing to be alarmed about the use of CS, then what is the reference to the ineffectiveness of CN?

Admiral LEMOS. It is the relative ineffectiveness. CS is better than CN.

Mr. ZABLOCKI. In what respect?

Admiral LEMOS. It is quicker acting.

Mr. ZABLOCKI. Longer-lasting?

Admiral LEMOS. No, sir. It is not longer lasting. It is quicker acting, and statistically it has proved to be less toxic than the CN.

THE STATUS OF TOXINS

Mr. ZABLOCKI. The issue of toxins has come to the attention of the subcommittee during these hearings, whether toxins are chemicals or biochemicals. Is it not true that we must carry on a bacteriological program in order to obtain the toxins, in your opinion?

Admiral LEMOS. At the present time the technology is such that the production of toxins does require a biological process. The resultant product is a chemical and there is broad agreement on that.

Mr. ZABLOCKI. The President has limited bacteriological programs to research and study of techniques of immunization. Has this not ruled out the production of toxins?

Admiral LEMOS. It has not ruled out, that is correct.

Mr. ZABLOCKI. The President's statement has not ruled out the production of toxins?

Admiral LEMOS. The President's statement has not ruled out the production of toxins.

Mr. ZABLOCKI. Earlier you did say that toxins were, at least, to a degree, a bacteriological type of weapon, or do I misunderstand you?

Admiral LEMOS. No, sir; I did not say that, and I would not, because they are not. They are chemical agents, they are completely stable, and they are incapable of being spread from one person to the next. So they display none of the characteristics that one would generally find in a biological weapon.

Mr. ZABLOCKI. Then you claim that a toxin is a chemical.

Admiral LEMOS. Absolutely.

THE FUTURE OF DM

Mr. ZABLOCKI. DM has been classified as a gas whose first use the United States will renounce. Is that your understanding, Admiral?

Admiral LEMOS. No.

Mr. ZABLOCKI. Has the United States used DM in Vietnam?

Admiral LEMOS. The United States has not.

Mr. ZABLOCKI. DM has not been used in Vietnam? If you wish, you can refer to this matter in executive session to advise as to what extent DM may have been used and by whom.

Admiral LEMOS. I would be perfectly willing to state in open session that the United States does not use DM and does not now consider it a part of its riot control inventory and is taking steps to remove all stocks of DM.

Mr. ZABLOCKI. But the United States did have it in its inventory?

Admiral LEMOS. It did have it in its inventory.

Mr. ZABLOCKI. And did not use it?

Admiral LEMOS. It did not use it.

Mr. ZABLOCKI. What was the purpose of having it in the inventory in the first place?

Admiral LEMOS. In past times before we had the better riot control agents, it was in the inventory for that purpose.

Mr. ZABLOCKI. Mr. Taft.

VOLUME AND EXTENT OF HERBICIDE USE

Mr. TAFT. Thank you, Mr. Chairman.

Admiral, I noticed the herbicide portion of your statement earlier, and I wonder if you could give us any indication of the volume or extent of the use of herbicides in connection with crop destruction. I notice that you say that specific areas have been approved where it was thought that the NVN or VC had crops growing on which they were going to support themselves. This has occurred with the approval of the Embassy.

Specifically, what degree of use is involved here as compared to all of the use of herbicides in Vietnam?

Admiral LEMOS. In these circumstances I cannot provide an answer for that here. We can provide that information for the record.

Mr. TAFT. I would like to have that if you would provide it for the record, please.

Admiral LEMOS. Yes, sir.

(The information follows:)

COMPARISON OF DEFOLIATION AND ANTICROP OPERATIONS IN SOUTH VIETNAM, 1962 TO JULY 1969

	Defoliation (acres)	Crop (acres)	Percent crop versus defoliation
1962	4,940	741	5
1963	24,700	247	1
1964	83,486	10,374	12
1965	155,610	65,949	42
1966	741,247	103,987	14
1967	1,486,446	221,312	15
1968	1,267,110	63,726	5
1969 (January–July)	797,180	38,819	5

PHOSPHOROUS SHELLS NOT CHEMICAL WARFARE

Mr. TAFT. Are we still using phosphorous explosive shells in Vietnam, and do you include those in a definition of chemical warfare?

Admiral LEMOS. I certainly do not include those in the definition of chemical warfare. I cannot answer specifically your question whether they are currently being used, but I can certainly provide that for the record.

Mr. TAFT. What would lead you to say that they are not a method of chemical warfare?

Admiral LEMOS. My backup tells me that they are used but they are not chemicals, and that they are not chemicals was my first reaction.

Mr. TAFT. What consideration would lead to the use of phosphorous shells as compared to other explosive shells?

Admiral LEMOS. They are used principally for target marking, and they produce a white smoke. On occasion they would be used to produce a smokescreen.

Mr. TAFT. They are not used principally as an antipersonnel type weapon.

Admiral LEMOS. No, sir.

Mr. TAFT. Thank you, that is all I have, Mr. Chairman.

Mr. ZABLOCKI. Mr. Fraser.

PRODUCTION OF TOXINS AND PRESIDENTIAL CBW STATEMENT

Mr. FRASER. Admiral, I would like to follow up on the question of toxins. The President in his statement on the U.S. policy in the field of biological and chemical warfare, says that the United States will confine its biological research to defensive measures such as immunization and safety measures. How can we continue under that statement to produce toxins that are generated by bacteria?

Admiral LEMOS. I believe the President is talking about biological research associated with biological weapons.

I do not and others have not read into those words any reference to the preparation of materials which, when produced, are properly classed as chemical agents.

Mr. FRASER. The President went on to say that the United States associates itself with the principles and objectives of the United Kingdom draft convention. Are you familiar with the British draft convention?

Admiral LEMOS. In a rudimentary way, yes, sir.

Mr. FRASER. In your judgment, would that preclude a production of toxins from bacteria?

Admiral LEMOS. I think that Mr. Laird has addressed that specific problem, and I would quote from his statement at his press conference earlier this week.

As far as the interpretation of the U.K. Convention, that is a matter that we will consider separately when we get into negotiations and not before negotiations.

Mr. FRASER. In other words, the President's statement that we associate ourselves with the principles and objectives of that draft has no meaning, that we are reserving to ourselves the complete freedom to take whatever position we choose on that draft convention, whenever we get into negotiations on it. Is that the position of the Department of Defense?

Admiral LEMOS. It certainly is not, sir.

U.S. SUPPORT OF BRITISH CONVENTION

Mr. FRASER. Can you enlarge on this, because Mr. Laird's statement makes no reference to the President's statement here, and it apparently gives no weight to it in limiting the range of choices that we would have in going into the negotiations.

Admiral LEMOS. The President's statement does not mention toxins.

Mr. FRASER. No, but it does talk about the British draft.

Admiral LEMOS. Yes, sir.

Mr. FRASER. Let me ask you this question: Do you think the British draft precludes the production of toxins that have to come from the production of bacteria?

Admiral LEMOS. Some interpret it so, yes, sir.

Mr. FRASER. Who, for instance?

Admiral LEMOS. I for one do not find in the British convention a specific prohibition to the use of toxins.

Mr. FRASER. Don't you find in the British convention statements that would preclude the use of bacteria-produced toxins?

SYNTHETIC TOXIN PRODUCTION

Admiral LEMOS. I do not, because in time to come it is perfectly feasible and probably within our technological capability to produce toxins synthetically by a process other than biological.

Mr. FRASER. Admiral, granted that future advances in technology may give us that new capability, we are talking about how things are today.

Admiral LEMOS. That is right. We would not wish to take a position in advance on a convention which does not specifically prohibit toxins and lock ourselves into a position where when if we attain capability to develop toxins synthetically we would have prejudged the issue by prohibiting their development, simply because they end up as toxins.

Mr. FRASER. You are anticipating a rule that we are not trying to cover now.

We are talking about what the British Treaty says; and second, what the President meant when he said we should endorse and associate ourselves with the principles of that convention. I have a press clipping that quotes a spokesman for the British Government, and I am quoting from an article in the New York Times of December 17:

The British Government did consider the production and possession of bacteria for the development of toxins prohibited.

The President also said that our research in the field of bacteria would be a limited one, as I noted earlier. Out of all of this, it is the position of the Department of Defense that none of this inhibits the continued production of bacteria in order to generate toxins and stockpile them for potential use in warfare.

THE UNITED STATES IS NOT NOW PRODUCING TOXINS

Admiral LEMOS. That is another issue, sir. We have not produced toxins for a year and we are not now producing them and have no plans to produce them.

Mr. FRASER. I am glad to hear that. But that does not get at the question of what our policy is going to be in terms of the President's statement, because I suppose the next year we could start again.

Admiral LEMOS. I would agree that the position of the Department of Defense is that we should not foreclose on the issue of the production of toxins, in the light of positions that have now been taken by this Government.

Mr. FRASER. In other words, as far as you are concerned—as the spokesman for the Department of Defense—that issue is settled. The President did not intend by his statement, as far as the Department of Defense is concerned, to interfere or impair in any way the production of bacteria in order to generate toxins.

Admiral LEMOS. I think I can say that the Department of Defense does not find in the President's directive or the statement by the President, any specific prohibiton to the production of toxins. That does not mean that the matter is closed.

Mr. FRASER. If it is not closed, in what way is it open?

Admiral LEMOS. The very fact that it is being discussed at this hearing means that it is not closed.

Mr. FRASER. As far as we are concerned, but how about the Department?

Admiral LEMOS. The Department is not blind or deaf certainly to the Congress, or to the judgments of other agencies of the Government in these matters. To the extent that other agencies of the Government will be involved in negotiating the United Kingdom convention, and to the extent that other agencies of the Government may possibly have views which are not precisely those of the Defense Department, they will be reviewed again.

It would be presumptuous of me at this time to suggest in advance of that review what the outcome will be. So I say, just as Mr. Laird has said, when we get into the negotiations and determine what the views of all concerned are, the determination will be made.

DIVERGENCE OF VIEWS WITH ACDA ON TOXINS

Mr. FRASER. We had a representative from the Arms Control Agency here yesterday who said that he thought the statements of the President were quite clear, and he arrived at a different conclusion than you expressed today.

Has this divergence of interpretation come to your attention earlier?

Admiral LEMOS. I think it is safe to say that there is a larger area of agreement than there is of divergence between the agencies of the Government. There is agreement among the agencies of the Government that toxins are chemicals, that there is no requirement to remove them from our stockpile, and so forth.

Mr. FRASER. I was talking about the divergence in the interpretation of the President's policy statement.

Admiral LEMOS. I have not read the statement of the Arms Control Agency's representatives, so I cannot answer.

Mr. FRASER. My question was—I will rephrase it—Have you independently become aware there was a difference of interpretation within the Government?

Admiral LEMOS. On that one issue.

Mr. FRASER. Yes, on how it would relate to the possibility of continued production of bacterial toxins.

Admiral LEMOS. I have not read his statement, and except for your telling me so, that I am now aware of it. I was not aware.

Mr. FRASER. You had no knowledge?

Admiral LEMOS. No, sir.

Mr. FRASER. Thank you, Mr. Chairman.

Mr. ZABLOCKI. Mr. Fulton.

USE OF GAS IN RIOT SITUATIONS IN VIETNAM

Mr. FULTON. We are glad to have you here. I have one short point on page 3 of the statement.

At the end of the first paragraph, COMUSMACV stated that consistent with tactical requirements, combatants and noncombatants will be reduced as much as possible. Furthermore, COMUSMACV directed that these materials not be employed by U.S. elements in situations involving civil demonstrations, riots, or similar disturbances of concern to the civil government until clearance has been obtained from him, which refers back, I believe, to COMUSMACV. The next sentence is that this was not because these actions were thought to be ineffective but because such action was conceived to be the province of the Government of the Republic of Vietnam.

To me it would be clear that the use of such materials in civil demonstrations, or riots, or similar disturbances of concern to the civil government, are exclusively in the province of the Government of the Republic of Vietnam. The way this is said on page 3, it looks as if COMUSMACV has made an edict that it is also within his jurisdiction. How does that occur?

Admiral LEMOS. I do not read it that way, sir, and perhaps it may be poorly written.

Mr. FULTON. That is why I am trying to clear it up.

Admiral LEMOS. COMUSMACV is the commander of all U.S. forces in Vietnam. He has directed that these agents will not be used in civil disturbances without his authority. What that means is that if the Government of Vietnam was faced with a riot situation, and U.S. forces were the most available to assist the Government of Vietnam in putting down that riot, they would go to COMUSMACV and request

his assistance. He then would issue the orders to the U.S. forces to do what might be necessary in that instance.

Mr. FULTON. That point I am making, and the statement is, that probably that should be made clear—that there is no jurisdiction of a civil nature in COMUSMACV for the use of these materials in civil demonstrations, riots, or similar disturbances of concern to the civil government of the Republic of Vietnam. And that jurisdiction would have to be given in a specific instance by the civil government of Vietnam.

Admiral LEMOS. I would agree with that, sir.

Mr. FULTON. So that is really what it means, not that COMUSMACV, on his own, as it is written here, could on his authority authorize the use. I do not believe that the way it is stated is a correct explanation of the authority of COMUSMACV.

Admiral LEMOS. Your explanation of it is much more correct.

Mr. FULTON. So in the chain of command, then—if this is the case—who would COMUSMACV go to in order to get this authority on the U.S. side?

Admiral LEMOS. Who would he go to?

Mr. FULTON. Yes. Who is the authority on the U.S. side to give COMUSMACV the authorization to use materials such as these in civil demonstrations, for example?

Admiral LEMOS. He has that authority. If the Government of Vietnam were to come to COMUSMACV in a riot situation and say, "I want your help," COMUSMACV would have the authority to go to him with help and use CS.

ROLE OF THE AMBASSADOR

Mr. FULTON. The point I am making then, more clearly, is, doesn't COMUSMACV have to go to the U.S. Ambassador to the Republic of Vietnam on civil matters in dealing with the Government of the Republic of Vietnam?

I would imagine on a civilian point that it would move over to the civilian representative of the U.S. Government, who would then give the joint authorization for COMUSMACV to authorize.

Admiral LEMOS. That is a good point. The probability is that if time permitted—and this is always a problem—that the Government of Vietnam would go to the Ambassador rather than COMUSMACV. But I would not exclude the situation in which, because of the time element, that the Chief of the Joint General Staff might not go to COMUSMACV for assistance.

Mr. FULTON. It would seem to me that it would be wiser to have it well known that the military does not interfere in civilian demonstrations with any kind of materials, or riots or similar disturbances, that are of concern in the civil government of South Vietnam unless there is proper authorization, other than just the COMUSMACV. And that is the way this is written.

I think your procedures should now be changed, and maybe it is possible to do it at this time.

Admiral LEMOS. I agree, I think your point is particularly well taken. I may have overstated my understanding of what you were saying previously.

Mr. FULTON. No; I do not think you are.

Admiral LEMOS. There is no lack of understanding on the part of COMUSMACV as to his role in Vietnam.

The point that was being made here was simply perhaps an inadequate effort to point that out—that U.S. forces do not get involved in civil demonstrations in Vietnam. We do not.

I would like to make that very clear for the record.

Mr. FULTON. That is all, thank you.

Mr. ZABLOCKI. It is my understanding that if they would perchance become involved, it would have to be with the approval of the Ambassador.

Admiral LEMOS. Absolutely.

Mr. ZABLOCKI. In view of the fact that on page 11 you state that the Ambassador approves all C–123 defoliation projects.

Admiral LEMOS. That is right.

Mr. ZABLOCKI. If the Ambassador must approve military activity, he certainly should approve any involvement of the military in civilian activity.

Admiral LEMOS. There is no doubt about it.

Mr. FULTON. There is no doubt about it.

EFFECT OF PRESIDENTIAL ORDER ON FORT DETRICK

Mr. ZABLOCKI. Admiral, you stated that the Department of Defense is not deaf or blind to the views of Congress and other agencies of Government. The President, as adequately pointed out by my colleague from Minnesota, limited bacteriological programs to research on techniques of immunization. But recent press reports indicate that Fort Detrick officials expect very little change in their program despite the President's statement. How deaf or blind is the DOD in the instance of the operations at Fort Detrick in relation to the President's statement. Are the press reports accurate which indicate that Fort Detrick officials have stated there will be no change there?

Admiral LEMOS. I cannot believe that it was an accurate press report.

Mr. ZABLOCKI. This is in the Post under the byline of Robert Frames, "Detrick Work Continues."

Are you familiar with that report?

Admiral LEMOS. No, sir.

DISPOSAL OF BW STOCKS

Mr. ZABLOCKI. That is the Frederick, Md., Post. Could you specify in detail the steps which the Department of Defense is now taking to comply with directives of the President that existing stocks of bacteriological weapons are to be disposed of?

What will be the effect on the Pine Bluff Arsenal?

Admiral LEMOS. I cannot tell you the specific effect on the Pine Bluff Arsenal. I am not certain that a firm determination has been made yet. I would state simply that the procedure in this case, this being a fairly typical National Security Council action, which results in a National Security Decision memorandum, it results in an implementing directive which assigns responsibility to various agencies and

individuals to do specific things. Such an implementing directive has been issued, and the President's decisions are in the process of being implemented. Some of these take time. It is a very sweeping decision.

TRANSFER OF FACILITIES TO HEW

Mr. ZABLOCKI. Admiral, would you agree with some who advocate that in order that the President's directive be implemented effectively, the operations at Pine Bluff Arsenal and Fort Detrick, should be transferred to NIH, or HEW?

Admiral LEMOS. I am not qualified to answer that, sir.

Mr. ZABLOCKI. Are any of your associates in a position to advise the committee whether this would be an advisable transfer in order to better implement the President's directive?

Mr. HAYWARD. Mr. Chairman, in answer to your question, the President's spokesman at the time of his announcement, as you know, stated that the prospects of having the biological defensive research carried out by the Department of HEW would be explored. We are in the process of doing that now. There are, of course, a great many details that have to be worked out. There would be changes in budgets between the two departments, in personnel authorizations. We are in the process of beginning to explore all of the ramifications of this. The Department certainly has not ruled this out, but a decision has not been reached either by Secretary Laird or Secretary Finch at this time.

Mr. ZABLOCKI. If it is not ruled out, then the Department has no opposition?

Mr. HAYWARD. That is correct.

Mr. ZABLOCKI. As a matter of fact, very likely will fully cooperate in such a transfer?

Mr. HAYWARD. If this eventuality turns out to be that which is obviously in the best interests of the country, the Department of Defense would do everything in its power to carry it out as rapidly as possible.

Mr. ZABLOCKI. In your opinion, then, will the operations, if they are to be in step with the President's directive, be better handled in HEW?

Mr. HAYWARD. I personally do not think this has been analyzed to an extent that a firm answer can be given at this time, Mr. Chairman.

Mr. ZABLOCKI. When would you expect such a decision to be arrived at?

Mr. HAYWARD. I cannot answer that. I do not know if the timetable has been established by the Secretary, Mr. Chairman, and I would not like to guess and find out that Secretary Laird has another timetable in mind.

Mr. ZABLOCKI. It would not necessarily have to await the report of the research and development project that you referred to on page 15, Admiral? That is, on the ecological effects of the military use of herbicides in Vietnam.

Admiral LEMOS. No, sir.

Mr. ZABLOCKI. That study would take some time?

Admiral LEMOS. As I have indicated, that would——

TERATOGENIC EFFECTS OF 2,4,5-T

Mr. ZABLOCKI. One further question, Admiral. You have stated on page 14, quoting Dr. DuBridge, the Science Adviser to the President, "It seems improbable any person could receive harmful amounts of this chemical from any of the existing uses of 2,4,5-T."

Yet reports from Saigon tell of deformed babies and attribute the birth deformations directly to the use of 2,4,5-T. Have you any comments?

Admiral LEMOS. I have seen no substantiation for any of those reports. I have heard a report of a single child, not plural, but without any substantiation and it would seem to me that if in fact this were the case, that if the method of use was harmful to humans, there would be more than an isolated deformity. I am sure if we examine the statistics of this sort of thing happening in Vietnam, both before this war and during it, that this is not a sufficient statistical variation.

Mr. ZABLOCKI. Well, Admiral, substantiated or not, if the reports persist you will agree they present a political problem.

Admiral LEMOS. Yes, sir.

Mr. ZABLOCKI. This was taken into account fully when the decision was made to employ herbicides.

Admiral LEMOS. Yes, sir.

Mr. ZABLOCKI. Nevertheless, you still maintain that the benefits outweigh the problems?

Admiral LEMOS. This report is not substantiated. Until there is a substantiated report that this effect is real, it is not entirely discounted, but it is given a lower weight than a substantiated report.

Mr. ZABLOCKI. If the incidence of birth defects was substantiated, would the Department of Defense then not only curtail the use, but possibly withdraw entirely the policy of using 2,4,5-T and withdraw all quantities in Vietnam so they could not be used in the future?

Admiral LEMOS. I personally have no doubt that this would be the case.

REPORTS OF CLASH BETWEEN STATE AND DOD ON TOXINS

Mr. FRASER. I don't want to beat a dead horse here, but I was looking at the New York Times clipping of December 16. The lead paragraph is that there is a clash between State and the Pentagon on the meaning of the President's statement.

You are saying you are here this morning oblivious of that report?

Admiral LEMOS. No, sir. Which particular article is it?

Mr. FRASER. I will read the first sentence:

> The Pentagon and the State Department are at loggerheads over whether President Nixon's decision last month on chemical-biological warfare included some of the most potent and practical elements in this area of America's arsenal: disease-producing toxins.

Admiral LEMOS. I am very well aware of that article. That article——

Mr. FRASER. I asked you earlier whether you were aware of a disagreement on interpretations of the President's policy statement and you said not until I told you about it.

Admiral LEMOS. Because I read that in the New York Times does not make it so. As soon as I read that article, I called responsible

people in the Department of State and asked what it was all about. I called responsible people in the Arms Control Agency and asked what this is all about and the result of that was Mr. Laird's statement to the press which was quite unequivocal that there is not disagreement between the Department of Defense and we are not at loggerheads on the issue raised in that article.

Mr. FRASER. Mr. Laird announced there was no disagreement.

Admiral LEMOS. That is right.

Mr. FRASER. The way the Government works, therefore, by decree, there was no disagreement?

Admiral LEMOS. That was followed within an hour and a half by a press statement from the State Department which agreed that there was no disagreement. That makes it a little stronger.

Mr. FRASER. At least until it was revived yesterday?

Admiral LEMOS. As I said before, I was unaware of what was revived yesterday.

Mr. FRASER. That is fair enough.

USE OF HERBICIDES ON CROPS

Let me go now to the use of herbicides on crops which might supply food to the VC or the NVA. Your statement on crop destruction on page 13 says that crops in areas remote from friendly populations and known to belong to the enemy that cannot be captured by ground operations are sometimes sprayed.

There are areas in Vietnam which are not friendly to the NVA which are friendly to the VC. Would such an area qualify for crop destruction?

Admiral LEMOS. It would depend on a number of things. I can't find it here immediately, but I think I pointed out that in the Fourth Corps, which is in the delta, it was very much an area of rice production and spraying with C–123 is extremely limited. The second sentence is: "This is because of the vast area of valuable crops which are not to be destroyed, even though they may be in enemy hands." So the specific answer to your questiton is that this is looked at very carefully and we are really talking about very isolated crops in areas of known Vietcong and North Vietnamese army units, and which are clearly a part of that complex and being used, or being grown by them, or by people forced by them to grow for them.

Mr. FRASER. I noted the statement about the area of the delta, but in other parts of Vietnam how can you determine whether or not the crops are being grown by direction of the VC?

Admiral LEMOS. By the proximity of the main force VC and North Vietnamese units and by information derived from the people in the surrounding area.

Mr. FRASER. One of my most vivid impressions when I made a short visit to Vietnam was my being transported to one of the most secure provinces along the eastern seaboard and discovering that this province had in the hills a number of VC who were guerrilla units rather than main forces. My recollection is, although I am not certain, that there was crop destruction in those areas. As I understand it, we are under an injunction under the Hague Convention not to destroy crops which may be in part for the use of the populations, is that right?

Admiral LEMOS. Yes, sir.

VERIFICATION OF CROP USE IN VIETNAM

Mr. FRASER. How are we able to verify adequately whether or not the crops are in fact aimed just for the fighting units or may not in fact be intended for noncombatants—I know this is a difficult problem in this kind of war.

Admiral LEMOS. It is very difficult.

Mr. FRASER. We are still bound by the Hague Convention, are we not?

Admiral LEMOS. Yes, sir.

Mr. FRASER. How do we determine that under these circumstances?

Admiral LEMOS. As I indicated, we take extensive aerial photographs of every area where such a proposal is made and those aerial photographs are very carefully analyzed by a broad spectrum of people and if the crops are close to populated areas, they are not subjected to herbicides.

Mr. FRASER. What do you mean by "populated areas"? Do you mean close to a district town, to a real concentration of people?

Admiral LEMOS. I can't give you the specific cutoff, but the crop destruction program is associated with enemy camp areas and not the villages and hamlets.

Mr. FRASER. The crops that are grown by those friendly to the Vietcong I suppose become a source of food for the Vietcong?

Admiral LEMOS. Yes, sir.

Mr. FRASER. Simply because it is a friendly area?

Admiral LEMOS. That is right. There is no question that the Vietcong does get a substantial amount. They are being shut out of a great number of areas where they used to be able to get rice quite freely from the village and hamlet residents. It is becoming much more difficult and that is one of the reasons why the Chieu Hoi rate is up so much. They are not able to get through.

Mr. FRASER. How can we be sure?

Admiral LEMOS. All you can do is do the best possible.

Mr. FRASER. Let's say there are hamlets around and that the area is generally friendly to the Vietcong. Does that qualify the crops for destruction?

Admiral LEMOS. It does not.

Mr. FRASER. You have to determine it in order to employ the herbicides.

Admiral LEMOS. There has to be substantial evidence that the crops are being grown specifically for the use of Vietcong troops and North Vietnamese troops.

Mr. FRASER. And nobody else?

Admiral LEMOS. And nobody else.

Mr. FRASER. Isn't that a very high standard to impose?

Admiral LEMOS. Yes, sir, and that is why the percentage of crop destruction is—a note just handed to me says: "Every year since we began the program crop destruction has been less than 1 percent of the total South Vietnamese food production." It is not a large program.

POLICY ON BOMBING DAMS AND DIKES

Mr. ZABLOCKI. Mr. Fulton.

Mr. FULTON. When we are talking of crop destruction, of course, that brings up the question of bombing and destroying dams. From what you say as a matter of fact, then, at no time had there been a policy either under consideration or in effect by the United States or South Vietnam's Government, for the bombing of the dams and dikes in North Vietnam because of the Geneva Convention, is that correct?

Admiral LEMOS. I would hesitate to say such things are never even under consideration because of the range of contingency plans——

Mr. FULTON. My point is really that the Geneva Convention has a restraint that, if the Geneva Protocol is lived up to, it completely forbids either the use or the contemplated use or consideration of the bombing of dams and dikes for the raising of food. If we are going to live up to the Geneva Convention, why then you just can't even consider it. If it comes out that you are not going to live up to it under the military, then you do consider another course of action. So my question is, has that been the policy, as what I had said, is that accurate?

STATEMENT OF BENJAMIN FORMAN, ASSISTANT GENERAL COUNSEL FOR INTERNATIONAL AFFAIRS, DEPARTMENT OF DEFENSE

Mr. FORMAN. My name is Benjamin Forman, Assistant General Counsel for International Affairs.

I had assumed from your question, as originally stated, and from the admiral's reply, that you were talking in the broad sense and not limiting yourself to the small dam or dike.

Mr. FULTON. No; I am talking of the broad policy.

Mr. FORMAN. I think the admiral was talking in a larger context that might well, for example, be large power dams, related to the production of armaments, of utilities, electricity, and that might be considered as a possible target.

Mr. FULTON. I specifically limited it. I didn't mean the destruction of a dam edging a rice paddy. I am not talking about that. I am talking of the dams of North Vietnam which, if broken, would really stop food production. Therefore, I had said, what has been the policy of the U.S. Government and South Vietnam under the Hague Convention? How has the military approached the prohibition of the Hague Convention, if it has even thought of it?

Admiral LEMOS. I think the clearest answer to that is that we have never done it in North Vietnam.

REASON FOR RESTRAINT: LAW OR CUSTOM?

Mr. FULTON. Well, I might say I was once being complimented by one of the members of the clergy on my having been good all week and done well. I said: "Well, Your Excellency, I shouldn't get too much credit for not having done certain things because I really was too busy even to think of a good sin."

Is that the case here, that you are too busy doing other things that, while this was possible, you never really had an intention under

all circumstances to live up to the Geneva Convention if it didn't prove convenient, satisfactory, or necessary?

Admiral LEMOS. All I can say is that all of the efforts against North Vietnam, including our planning of it, were subjected to the very highest review in all responsible agencies of the Government. I cannot conceive of the approval of plans in direct violation of that convention.

Mr. FULTON. But you also said, when I brought up the word "consideration," that there may have been alternative plans under consideration although not used for the bombing of North Vietnam dikes that are for the main purpose of food production.

Admiral LEMOS. Mr. Forman correctly analyzed my problem when he said I misinterpreted what you are saying. There are a number of dams in North Vietnam not directly related to the problem you propose.

Mr. FULTON. We are really trying here to get the basis for the policy that is in effect and the limitations on the policy under international law. So my question is based really on finding out whether the policy just "growed" like Topsy or it was an express fitting the policy in, the U.S. military, under the Geneva Convention.

That is all, Mr. Chairman.

Admiral LEMOS. I don't know how to answer that question except to say that the military do not of themselves do things in violation of U.S. policy.

Mr. FULTON. No, I agree with you thoroughly, but that's the other side of the coin. I am saying, how did we in the United States as a military decision, arrive at this particular policy? How was the policy arrived at?

Admiral LEMOS. The policy not to bomb?

Mr. FULTON. The dikes of North Vietnam that have to do with food production?

Admiral LEMOS. I am very certain it was arrived at on the basis of consideration of this convention.

Mr. FULTON. So then there were no plans ever as an alternative, by the U.S. military, even considered for the bombing of dikes of North Vietnam that are used primarily for food production?

Admiral LEMOS. In my capacity I can say clearly that I am unaware of any such plans——

Mr. FULTON. May we have the information supplied for the record, Mr. Chairman?

Mr. ZABLOCKI. Very well.

(The information follows:)

Question. History of plans for bombing of dams in North Vietnam as an anti-crop operation?

Answer. (Statement for record). The Department of Defense policy is not to divulge details of military plans.

HOW MANY DEFOLIATION CLAIMS?

Mr. ZABLOCKI. I would like to clarify something. On page 10, Admiral, you list the procedure under which herbicide spray is used. I refer again to the payment of legal claims. "The province chief will see that claims are paid for unjust and illegal damage."

I am not sure when you answered my question earlier, you understood what I meant to ask. On whose behalf was he making that pledge? His Government? Our Government?

Admiral LEMOS. His Government.

Mr. ZABLOCKI. I believe I did ask whether you would supply for the record, Admiral, how many claims have been made.

Admiral LEMOS. I don't recall.

Mr. ZABLOCKI. And what will be the procedure for paying them? I am personally satisfied that if the claims are made to the province chief he will somehow get it to the Saigon Government and they will get to the U.S. Government and we will be picking up the tab. Please supply for the committee this particular answer. It may be a very controversial issue some day.

Admiral LEMOS. Yes, sir.

(The information follows:)

Question. Number of claims submitted for damage from herbicide and crop damage? Procedures for paying these claims?

Answer (statement for record). The US Foreign Claims Commission in RVN has received 49 claims from residents of the RVN in the amount of $66,816 (US dollars) for herbicide damages. The 43 claims adjudicated so far have been denied either because such damage was combat related or damage observed was not caused by defoliants. Claims against the US Government may be payable for certain accidental defoliation damage resulting from a spray aircraft mishap.

Herbicide claims from Vietnamese and foreign nationals residing in the RVN are normally made against the GVN and are handled in GVN channels. Prior to the initiation of herbicide operations, the respective GVN province chief requests such operations and pledges indemnification for accidental damage to crops and trees of friendly citizens. Procedures require that such claims be initiated at District level and processed to Province headquarters for adjudication up to an amount of 100,000 piasters. (One US dollar equals 118 piasters). Claims of an amount greater than 100,000 piasters are processed to Headquarters, Joint General Staff and the Ministry of Defense for adjudication on a case by case basis. Maximum compensation payment is 500,000 piasters. The GVN programs handle the great bulk of crop damage claims in RVN; however, if a local national insists on filing a claim against the United States because of defoliation damages to his property, his claim is accepted and investigated. The claim and report of investigation are referred to a US Foreign Claims Commission appointed by COMUSMACV for adjudication under the authority of the Foreign Claims Act, 10 USC 2734 and PL 90-521.

Since the defoliation claims program is being kept in GVN channels and an active claims program is being kept in operation by the GVN, an influx of compensable claims against the US Government generated by the potential termination of hostilities is not expected.

Mr. ZABLOCKI. If there are no further questions, on behalf of myself and the entire subcommittee, Admiral, I want to thank you for your excellent presentation and for the direct answers you have given to the questions that were asked of you.

In view of the fact that certain matters are classified which you will supply to the committee for the record, I see no reason to go into executive session.

Therefore, this concludes the hearings of the subcommittee on the international aspects of chemical-biological warfare. The subcommittee will stand adjourned until further notice.

Thank you, Admiral.

(Whereupon, at 12:35 p.m., the subcommittee was adjourned until further notice.)

APPENDIX A

Statement of Hon. Dante B. Fascell to the National Security Policy and Scientific Developments Subcommittee, House Foreign Affairs Committee, November 20, 1969, in Support of House Resolution 490, Urging the President To Resubmit for Ratification the Geneva Protocol Treaty of 1925

Mr. Chairman, I thank you for this opportunity to state my unequivocal support for a Resolution which I have cosponsored with many of our colleagues, which would urge the President to resubmit the Geneva Protocol of 1925, banning the first use of gas and bacteriological warfare, to the United States Senate for ratification.

The issue of chemical and biological warfare has long been a subject of concern. It would be in the best interests of the United States to have a full-scale debate on what this nation's policies should be toward the use of chemical weapons. Resubmission of the Geneva Protocol to the Senate would provide an opportunity for formal discussion on this most important issue.

The United States Senate evidenced their interest in this subject when on August 11, 1969, by a 91–0 vote they agreed to institute guidelines and controls over chemical and biological agents.

It is proper that we urge the President to resubmit the Geneva Protocol to the Senate. Our traditional policy of no first use of gas and bacteriological warfare can then be reaffirmed through ratification of this treaty by the Senate.

The ideals embodied in the Geneva Protocol confirm a position to which the U.S. has long been in accord. Now is the time to act to demonstrate our good faith.

Statement of Hon. Edward R. Roybal of California, in Support of House Resolution 490, Urging the President To Resubmit for Ratification the Geneva Protocol of 1925 Banning the First Use of Gas and Bacteriological Warfare

Mr. Chairman, I am pleased to have this opportunity to present my views in support of H. Res. 490, to express the sense of the House of Representatives that the President should resubmit the Geneva Protocol of 1925, banning the first use of gas and bacteriological warfare, to the United States Senate for ratification.

The past few months have witnessed a steadily growing concern both in Congress and in the public mind over the use of chemical and biological weapons. I find it deplorable that it was only after the unfortunate accidents at Dugway and Okinawa that the public became fully aware of our active program toward the development of these agents as weapons. Now that the veil of secrecy has been somewhat lifted, it is no wonder our increased awareness has given rise to demands for more stringent controls over chemical-biological weapons as well as more readily available information as to our capability.

Nor has the need for control of chemical-biological weapons escaped attention on the international scene.

Under the auspices of the United Nations, the recent conclusions of the Secretary General's report have expressed our suspicions and given a sound basis for concern about these silent killers.

Should full-scale chemical and biological war break out, it is reasonably certain that no one could predict what the effects would be; this fact alone limits their practical application in military usage. In short, we have a potential doomsday machine.

One of the frightening aspects of these types of weapons is the fact that they can be so easily acquired.

Any nation with a modest chemical industry and the rudiments of medical technology can convert these efforts toward production of chemical and biological agents as weapons; small quantities of agents produced in elementary facilities can do a substantial amount of damage.

The detestable nature of chemical-biological weapons is only made more so by the chances of easy and rapid proliferation. The possibility of worldwide acquisition increases the chances of their employment in war.

And it is quite clear that the occurrence of chemical and biological warfare would threaten our very survival. It is imperative that we take action now.

In 1925, men of foresight recognized the potential hazards of chemical and biological war; the product of that vision was the Geneva Protocol, a treaty which bans the first use of chemical and biological weapons in war.

Since then all the major powers of the world except two have joined in that recognition and have ratified the Geneva Protocol; *all* the major powers of the world, except two: the United States and Japan. It is most regrettable that the United States must be counted among the exceptions.

From time to time since 1925 the United States has been called upon to state its policy, since it is not a party to the Protocol. Repeatedly, it has been declared that the United States would observe the principles and objectives of the Geneva Protocol, and our actions on the battlefield have been consistent with that policy and interpretation of the Protocol.

However, our failure to ratify the Geneva Protocol now would, at the least, cast doubt on the validity of these assurances. As the matter has come to the forefront of attention in the public forums of the world, for the United States not to act affirmatively at this particular point in history, would seem to place us substantially in opposition to our past practice.

Congressional concern over chemical-biological weapons has reached a critical juncture with this move for ratification. There has been some progress toward domestic control of our own program, with the Senate approval last August of measures to limit the testing, transport and production of chemical-biological

weapons; a primary goal of this action was to avoid development in any manner which might even suggest efforts toward an offensive capability.

But on the international level, the United States has maintained an awkward silence, or at most has made vague references to our interest in seeking control.

A number of proposals have been advanced in both the Conference of the Committee on Disarmament (formerly the Eighteen Nation Disarmament Committee) and the United Nations; the Soviet Union's draft treaty is among them.

Yet the United States has made no such overtures, although we have supported the two United Nations resolutions which have been aimed toward the prevention of chemical-biological warfare. And in the current United Nations session we have yet to give a clear indication of our present policy, which we are told is undergoing Administration review.

The delay in voicing a firm stand has provided a substantial stumbling block to the United States position in these negotiations. We cannot take initiatives of our own, much less state a definite position, until our policy is unequivocally affirmed; ratification of the Geneva Protocol would serve this purpose well.

Nor can we expect to achieve a respectable or influential position among negotiators seeking control of chemical-biological weapons, as long as the United States is not a party to the Protocol. For the reaffirmation of our objectives as a nation, especially toward an issue which is so vital to the future of mankind, I believe the United States must ratify the Geneva Protocol without delay.

Our mandate is clear. In an attempt to make up for lost time, there has been a series of proposals outlined as part of an effort to devise effective methods of control. The problem is a complicated one, and efforts to solve it promise to be lengthy and difficult.

But in the midst of the complexities there is a way which would mark a significant first step toward successful control of chemical-biological weapons: adherence by all nations to the Geneva Protocol of 1925.

Thank you.

Statement of Hon. Lester L. Wolff Submitted to the Subcommittee on National Security Policy and Scientific Developments of the House Foreign Affairs Committee in Support of a Resolution Calling Upon the President To Resubmit the Geneva Protocol of 1925 to the U.S. Senate for Ratification, November 18, 1969

There is little doubt in most men's minds that the possibility of the use of chemical and biological agents adds a horrifying dimension to the context of waging war. The universal condemnation of the use of such weapons is further justified by the recent assertions from various respected sources as to their limited military effectiveness, and their damaging effect on efforts toward international peace and security. It is unfortunate that until recently Congress has directed so little attention toward these weapons; our awareness of the potential dangers of chemical-biological warfare is made more painfully clear when one reads about the extensive development and stockpiling of chemical-biological agents in the world's already overflowing arsenals. It is not unreasonable to declare that the future of the civilized world could rest on the outcome of endeavors to prevent the use of chemical-biological weapons. It is with this thought in mind, but with no grandiose illusions of offering an easy solution to a complex problem that I have supported and co-sponsored H.R. 504, calling on the President to resubmit the Geneva Protocol of 1925 for prompt Senate approval and subsequent ratification. Such action is essential, if we expect to proceed toward the settlement of so crucial an issue.

But it is not as if we have ignored this question altogether. In 1925, men and nations saw fit to conclude a treaty which prohibited the first use of these insidious weapons in war. The United States was among the leaders who sought such an agreement, and signed it. Yet I regret to say that when the Geneva Protocol of 1925 entered into force in 1928, the United States was not among the nations which had ratified it. And today, the United States and Japan remain the only major industrial powers which have not become parties to the treaty. The fact that the Geneva Protocol is the only major international agreement in force which treats the use of chemical and biological weapons makes this fact all the more disturbing.

The United States has taken the position that it observes the principles and objectives of the Geneva Protocol. Despite the fact that we did not ratify it in 1925, several Presidents and representatives in international negotiations have not hesitated to reaffirm our adherence to the principles of the agreement. In 1943, President Roosevelt issued a strong statement in which he declared:

I have been loath to believe that any nation, even our present enemies, could or would be willing to loose upon mankind such terrible and inhumane weapons . . . Use of such weapons has been outlawed by the general opinion of civilized mankind. This country has not used them, and I hope that we will never be compelled to use them. I state categorically that we shall under no circumstances resort to the use of such weapons unless they are first used by our enemies.

Our actions and restraint in both World War II and the Korean War served to strengthen the force of that statement. In 1960, President Eisenhower upheld this policy when it was believed by some that there had been suggestions made to alter it.

More recently we have consistently maintained a position with regard to our aim to observe the principles of the Protocol. In 1966, the United Nations passed a resolution calling on all nations for a pledge of their "strict observance by all States of the principles and objectives" of the Geneva Protocol; the United States co-sponsored and strongly supported this measure. United States failure to ratify the Geneva Protocol was defended by Ambassador Nabrit at that time. He maintained that "whether or by what procedure, States that have not yet done so

should adhere to the Geneva Protocol is for each of them to decide in the light of constitutional and other considerations that may determine their adherence to any international instrument, and particularly one which dates from 1925." Similar arguments were advanced by United States Ambassador William Foster last December, although the United States again supported another resolution which sought steps toward greater control, the first being the Secretary General's report issued in July of this year. The findings of that report, arrived at by men of science and reason, resulted in an overwhelming indictment of chemical and biological agents as having no place among legitimate weapons of war.

The record of our policy, as well as our actions in keeping with that policy, establishes a meaningful rationale on which to base this move toward ratification. How much longer can we continue to voice strong support for the worthy goals of this treaty, and expect these statements to be credible, if we bypass ratification again? The amount of propaganda which our critics in international forums have been able to reap from our inactivity to date has been substantial. And as long as the United States is not a party to the Protocol, we can be assured of more of the same.

In light of our past policy and the negative effect of our neglect of the Geneva Protocol, I find that there are few, if any "constitutional and other considerations that may deter" our adherence to this agreement. Queries to the Arms Control and Disarmament Agency and to the President himself have been met with promises of a review of national policy, moves which have only served to delay action and thereby weaken the United States position. President Nixon stated in the United Nations on September 16 that we would continue to support arms control measures with regard to chemical and biological warfare. At a time when so much emphasis has been placed on the capacities of nations to destroy each other, and more important, at a time when we might be approaching the most significant negotiations of the nuclear age at Helsinki this week, what better gesture could be made to enhance international trust in our objectives than to meet this challenge, and to take a step toward peace? Ratification of the Geneva Protocol would not only put an end to a needless source of embarrassment and irritation for the United States, but it will greatly serve to strengthen this nation's position in a manner other than, and quite contrary to, a display of military prowess.

Moreover, ratification of the Geneva Protocol by the United States will contribute to those efforts to establish some rein over the terrifying force of these weapons. Some have contended that because of the universal abhorrence of the employment of chemical and biological weapons, there is no need for a formal instrument to enforce an established precept of international law. But the presence of such a feeling has not prevented the steady accumulation of chemical-biological weapons. As this accumulation is allowed to proceed, we can expect to run increasing risks of the occurrence of full-scale chemical and biological war. I would hope that eventually control over chemical-biological weapons will lead to their elimination from the world's arsenals. But arms control measures take time, and need to be undertaken in an atmosphere of trust in one another's desire for and end to futile competition. Thus, as an important step toward control over chemical-biological weapons, and toward curtailing the arms race, adherence to the Geneva Protocol, especially by a great power such as the United States, cannot help but strengthen the foundations of international law and provide an added incentive to seek an end to an unnecessary source of world tension.

Considering that the development of chemical-bilological agents has contributed an extremely sophisticated weapons system to the vast array of man's monstrous weapons, and the fact that an international agreement toward a sane course has been in existence among most of the great powers for nearly 45 years, I cannot stress enough the urgency of the task under consideration here today. The time is long overdue for this nation to take a positive step toward the control of chemical and biological weapons. I consider ratification of the Geneva Protocol the most logical and expedient course of action toward this goal.

Statement of Hon. Patsy T. Mink to the Subcommittee on National Security Policy and Scientific Developments of the Committee on Foreign Affairs, U.S. House of Representatives, for Ratification of the Geneva Protocol, November 20, 1969

Mr. Chairman and distinguished members of the Subcommittee, thank you for this opportunity to urge your approval of legislation toward United States ratification of the Geneva Protocol. As a sponsor of House Resolution 439 which declares it the sense of the House of Representatives that the President should submit the Geneva Protocol of 1925 to the Senate for ratification, I strongly support this goal.

The Geneva Protocol commits nations not to initiate use of gas and bacteriological warfare. Ironically, such an agreement among nations was first urged by the United States. Representative Theodore E. Burton, of Ohio, Chairman of the House Foreign Affairs Committee, led the American delegation to the Geneva Conference for the Control of the International Trade in Arms, Munitions, and Implements of War which met in Switzerland in 1925. Representative Burton proposed an amendment to the convention being considered by the Conference prohibiting the use of gas and bacteriological warfare. An amendment was added and signed by the U.S. Representatives at the Conference. The Senate did not take up ratification of the protocol until a year later, however, and in the interim we are informed that the American chemical industry and the Army Chemical Warfare Service lobbied successfully against it. The protocol was never brought to a vote on the Senate floor, and to this day the Senate has not had an opportunity to vote on it. And now it cannot, until the Geneva Protocol is again submitted by the President. Requesting him to do so is the purpose of the legislation which I support.

While the United States has failed to act on this humane agreement to ban the first use of deadly gas and bacteriological warfare agents, more than 60 other nations—including every other NATO country and every Warsaw Pact nation—have done so.

This year the Congress has acted to control our own testing of these agents. The Senate unanimously approved strict curbs on the testing and transportation of chemical and biological warfare (CBW) agents and the House approved similar limitations. These provisions, included in the military procurement bill, are now before the President for his signature.

Congress has gone on record expressing strong disapproval of these deadly and obnoxious agents. It is now time for the Executive Branch to respond by taking the next step toward a humane national policy in this field. There is no reason why the United States cannot join the rest of the world's industrial nations in ratifying the Geneva Protocol. This agreement does not prevent our use of such weapons in the event they are first used against us by an enemy. Our failure to guarantee only against first use stands as a threat to potential aggressors, who may be encouraged in times of conflict to use CBW agents first because the United States has not agreed not to itself.

In my opinion we may have already violated the Geneva Protocol by our use of repugnant chemicals like napalm and defoliating agents, and I believe that the President should direct an immediate ban on their use. It is shocking to read accounts of innocent people poisoned, and of birth malformations, resulting from these defoliants which now pollute the Vietnam environment.

By adopting this legislation, the House Committee on Foreign Affairs will continue the anti-CBW tradition it has followed for decades. We can do no less for the cause of peace and humanity, and I request with strongest urgency that you approve this resolution.

Letter and Resolution From the National Council of the Churches of Christ in the U.S.A.

December 19, 1969.

Hon. Clement Zablocki,
House of Representatives,
Washington, D.C.

Dear Mr. Zablocki: I have followed with interest the hearings being conducted on the question of chemical and biological weapons by your Subcommittee on National Security Policy and Scientific Developments. The National Council of Churches, on the basis of its policy statement on "Defense and Disarmament: New Requirements for Security", adopted a resolution on December 4 on the subject of chemical and biological weapons.

You will note that it commends the President for the initiative he has taken in this area of concern, and calls for the prompt ratification by the Senate of the 1925 Geneva Protocol, but "without crippling reservations and interpretations such as those which would permit continued use of chemical defoilants and of tear gas as an accessory to lethal weapons." It seems that the use of chemical defoilants which deprive segments of the Vietnamese population of the food necessary for life, and the use of tear gas (CS) to flush opponents from cover and into the range of lethal weapons, should both logically fall under the President's rubric of lethal and incapacitating weapons. At least a majority of the present Protocol signatories appear to agree with this interpretation.

I would hope that word of this action by the National Council of Churches would be brought to the attention of your Subcommittee as they pursue the CBW question in their hearings.

Sincerely,

Allan M. Parrent,
Director of Program.

Resolution on Chemical and Biological Weapons

(Based upon General Board Policy Statement "Defense and Disarmament: New Requirements for Security," September 12, 1968)

ADOPTED BY THE GENERAL ASSEMBLY DECEMBER 4, 1969

Whereas the NCCCUSA has previously called for "the strengthening of international revulsion against the production and use of chemical and bacteriological weapons and the development of effective control and verification measures to reinforce international restraints," and

Whereas the use in warfare of chemical and biological weapons is repugnant to the Christian conscience, particularly because of the indiscriminate nature of such weapons, their horrendous effects, and the threat their use would pose for the whole human race, and

Whereas the President of the United States has recently—

(*a*) Reaffirmed the U.S. renunciation of first use of lethal and incapacitating chemical weapons,

(*b*) Stated his intention to submit to the Senate for ratification the Geneva Protocol of 1925 prohibiting "the use in war of asphyxiating, poisonous or other gases, and—the use of bacteriological methods of warfare,"

(*c*) Renounced the use of all methods of biological warfare, and

(*d*) Begun steps to dispose of existing stocks of biological weapons,

Therefore be it resolved that the Assembly of the NCCCUSA—

1. Commends the president for his initiative in taking a major step toward outlawing chemical and biological warfare and weapons and supports him in his renunciation of the use of such weapons;

2. Recognizes this action as a praiseworthy attempt to find that concurrence between legitimate national interests and the general welfare of the international community for which responsible statesmanship is always seeking;

3. Urges the prompt ratification by the U.S. Senate of the Geneva Protocol of 1925, without crippling reservations or interpretations such as those which would permit continued use of chemical defoliants and of tear gas as an accessory to lethal weapons;

4. Records its opposition to the production, maintenance, or use of all chemical and biological weapons;

5. Encourages the President in his stated intention to dispose of existing stockpiles of biological weapons.

Letter and Report From the Friends Committee on National Legislation

Washington, D.C., December 18, 1969.

Dear Friend: We are one of the organizations which heartily endorsed President Nixon's initiative on November 25 in renouncing all use of biological warfare and submitting the Geneva Protocol of 1925 to the Senate.

Since that time it has appeared that the order may be much more limited than originally thought. Specifically, it now appears that according to the Defense Department interpretation the prohibition does not include biologically produced toxins despite the traditional inclusion of these in the biological warfare field. The enclosed memorandum prepared by the American Friends Service Committee gives further details on this and other aspects of the President's announcement.

We note also that on December 16 the U.N. General Assembly voted 80–3, with 36 abstentions, its interpretation that tear gas and chemical defoliants are included in the prohibition in the Geneva Protocol of 1925. The United States is in a tiny minority in arguing that these chemicals, now widely used in Vietnam, are not prohibited by the Geneva Protocol.

Sincerely yours,

Edward F. Snyder.

Report by the National Action/Research on the Military Industrial Complex—A Special Project of the American Friends Service Committee

Little or No Change Indicated in U.S. CBW Activities

On November 25 President Nixon held a press conference on chemical and biological warfare (CBW). This speech has been publicized as a major change in U.S. policy and a move on the President's part toward a ban on CBW agents. However, a close analysis of the President's speech reveals that it requires virtually no change in either our current use of chemical weapons in Vietnam, or our research, development and production of these and other CBW munitions.

In specific, the President made the following recommendations:

> As to our chemical warfare program, the U.S.:
>
> > Reaffirms its oft-repeated renunciation of the *first use of lethal* chemical weapons (italic added).

This is not a ban on chemical weapons: it is a restriction on first use. However, even this restriction does not cover *all* chemical weapons; it only covers the ones that the U.S. is not currently using. The range of weapons defined by the U.S. as *non-lethal* includes all gases (even mustard gas) except the nerve gases (GB and VX). Gases like adamsite (DM), which is being used in Vietnam, are classified as "riot control agents," even though the Army says that DM is not to be used "in any operation where deaths are not acceptable."(1) Even the tear and lung gases, which do not kill their victim directly, are used to drive him into the open where he can be killed by aircraft or gun fire.(2) Yet they are exempted, as "non-lethal" weapons, from the President's restrictions.

"First use" of chemical herbicides and defoliants will also continue, despite the fact that they are used to destroy food crops to starve "the enemy," and to destroy the jungle cover to improve kill ratios. The substances used for these purposes include two arsenic compounds, 2,4–D and 2,4,5–T—the latter banned in the U.S. following a study which showed malformations and birth defects in all of the litters of the test mice administered the chemical during pregnancy. The study followed reports in Saigon newspapers of high rates of birth defects in the Vietnamese countryside.(3)

The "first use" of such chemical warfare munitions as napalm and white phosphorous, classified as incendiaries, will also continue.(4)

> Extends this renunciation to the first use of incapacitating chemicals.

The only CW munition classified by the Army as "incapacitating" is BZ, a psycho-chemical similar to LSD. The Pentagon has admitted that BZ is terribly expensive (at $20 a pound, it takes 10 tons to knock out a battalion(5)), and it seems, from trial uses in Vietnam, that the gas has been found to be unreliable. The French newspaper L'Express reported a use of BZ by the U.S. Army's 1st Cavalry (Airmobile), March 14, 1966, in the Vietnamese town of Bongson.(6) The problem with BZ is that it affects each person differently. While it makes some people passive, others may act violently irrational. So we are faced with a situation in which the President plans to extend the no-first-use ban to a weapon which we have reportedly used first and found to be ineffective.

Consonant with these decisions, the administration will submit to the Senate, for its advice and consent to ratification, the Geneva protocol of 1925 which prohibits the first use in war of "asphyxiating, poisonous *or other gases*, and of bacteriological methods of warfare" (italic added).

This treaty, which was never ratified by the Senate largely due to pressure from the chemical industry, the American Legion, and the Army Chemical Corps, provides a ban on first-use-in-war, but does not prohibit research, development, production or stockpiling of CBW munitions.

In addition, the Nixon Administration does not consider tear gases and herbicides to be covered by the Protocol, even though two-thirds of the signatory nations (including Britain, France and the USSR) have officially interpreted the ban on "other gases" as inclusive of such weapons.(7) Thus, our ratification of the Protocol, if we impose these limitations, will serve to weaken the ban, while not affecting our current chemical warfare program in Vietnam.

> Biological weapons have massive unpredictable and potentially uncontrollable consequences. They may produce global epidemics and impair the health of future generations. I have therefore decided that:
>
> > The U.S. shall renounce the *use* of lethal biological agents and weapons, and all other methods of biological warfare (italic added).

This statement sounds sweeping indeed, at first reading. However, biological weapons constitute less than 10% of the U.S. arsenal of CBW agents (the rest being chemical). Furthermore, at least part of this BW arsenal will not be covered in the ban because of a re-defining of biological toxins which was one result of U Thant's report to the U.N. General Assembly in July, 1969. That report, compiled by chemical warfare experts from all over the world, reclassified the non-reproductive toxins, which are produced by living organisms, as chemical, rather than biological, warfare agents.(8)

It was discovered that the first chapter of the U.N. report, which included the changed definition, was written by a team headed by Dr. Ivan Bennett, Director of the New York University Medical Center, Research Contract Director of the Army Chemical Corps and an advisor to the Army on epidemiology and pathology.(9) His staff included three Pentagon officials, and the first draft of Bennett's chapter was written by the Army's CBW experts, according to Representative Richard McCarthy, Democrat of New York.(10)

In a telephone conversation with Dr. Bennett, he reported that his staff, even while in Geneva working on negotiations of the final draft, were in telephone contact with the Pentagon "every day." However, he stressed that his participation in the report was that of a private scientist, and thus he could not speak for the Pentagon as to whether they accepted the new definition.(11)

Dr. Benjamin L. Harris, Deputy Assistant Director of Chemical Technology of the Office of Defense Research and Engineering, was then asked about the new definition. He acknowledged that until quite recently the military definition of biological warfare was the "employment of living organisms, *toxic biological products*, and plant growth regulators to produce death or casualties in man, animals or plants; or defense against such actions."(12) However, he said, now that the U.N. committee of "international experts" had decided on this new, clear definition, "*we certainly subscribe to it*" (emphasis added).

He was then asked specifically whether the stockpile of 20,000 Botulinum bullets at Pine Bluff Arsenal (revealed in recent press reports) (13) would be destroyed. Dr. Harris answered: "What we have and where we have it is still classified." (14)

Botulinum is the deadly toxin given off by Botulism bacteria. Such dead toxins, unlike live germs, would not set off epidemics that might spread beyond the "hostile territory," nor would they produce the "massive, unpredictable and potentially uncontrollable consequences" which the President cited as the drawbacks to the employment of germ warfare weapons.

Thus, far from being banned, as the President implied, the use of germs in warfare has merely been refined. We now produce a "chemical" agent extracted from live germs to induce the disease directly. This allows us to apply the disease to selected targets rather than to rely on random infection. Botulinum bullets, then, could be effective assassination of counterinsurgency weapons which would need only to nick their victims to produce death by Botulism, the disease indused by the powerful toxin.

The President has renounced the militarily unreliable part of the U.S. biological arsenal, and has reclassified the useful part as "chemical substances."

> The U.S. will confine its *biological* research to defensive measures *such as* immunization and safety measures (italic added)

This statement provides a wide-open loophole for biological research and development (R&D). It practically negates the President's biological warfare renunciation, at least in respect to its impact on our current activities, since it has been traditional to define biological research and development as "defensive."

For example, the day of the President's speech, Secretary of Defense Melvin Laird told Senator Charles Mathias, Jr. (R-Md.) that "there will be no major impact on the basic research in defense systems and safety" being conducted at Fort Detrick, Md., the nation's biological warfare research and development center. (Among the diseases involved in the work at Detrick are pneumonic plague, tularemia, brucellosis, anthrax, encephalitis, glanders, Rocky Mountain spotted fever, undulant fever, psittacosis, cholera, botulism and coccidioidomycosis.) (15) In fact, the Deputy Commanding Officer at Fort Detrick, Colonel Lucien Winegar, "said it would be 'fair to assume' that Detrick will continue to produce dangerous organisms that could be used offensively, since any defense against biological weapons involves the production of harmful agents that are potentially available to an enemy." (16)

As "defense" involves producing "offensive" diseases, so "offense" involves "defensive" inoculation of one's own troops. Thus the lines between defense and offense are blurred to the degree that the distinction becomes meaningless. It would seem that Rep. Richard McCarthy's statement made at Tufts University on September 15, 1969, would still hold true even after the Presidents' speech, McCarthy said:

* * * there is very little of a defensive nature in our biological warfare program. We do not have any defense for our civilian population against a germ attack. We do not even have an effective warning system against attack with biological agents. . . . Even our armed forces have no effective means of protection against biological warfare. . . . We can conclude from the lack of a defense that our germ warfare policy is one that would defend against biological warfare by the threat of a biological attack in relation. (17)

Finally, we come to a point in the President's speech which suggests a small change in our actual activities, rather than merely a change in our rhetoric.

> The DOD has been asked to make recommendations as to the disposal of existing stocks of bacteriological weapons.

Here the President, while not ordering any specific action has asked the Department of Defense to make recommendations about possible actions. It is hard to tell how this will affect our biological warfare facilities. Fort Detrick (the largest BW center, which had a 1969 budget of $421.5 million (18) claims that it does not stockpile weapons, (19) but maintains only "limited components for biological testing." Pine Bluff Arsenal in Arkansas (which has 273 refrigerated "igloos" for storage, and biological production facilities to mass-produce its

biological agents if they are needed) (20) may have a small portion of its activities cut back, but the Base Commander, Colonel Clyde L. Frair, says: "We have no plans at this time. . . . It will be Laird's job and that of the DOD to come up with the procedures." (21) If this base does give up storage of germs for biological warfare, it would still retain its stocks of chemical and nerve gas weapons, its stocks of bacteria-produced "toxins," its production facilities for incendiaries and its "defensive" biological research and development.

The Army's largest testing area, the Dugway Proving Grounds in Utah, apparently will not be affected. In fact, the President said nothing at all about the halting of open-air testing such as the kind that killed 6000 sheep outside of Dugway last year.

While little change is indicated in these three leading U.S. CBW installations, there have been reports of cuts in CBW staffs in some areas. (22) Such reports, however, should be carefully scrutinized in light of indications by White House spokesmen that "as much as possible, this [defensive] research will be shifted from the Defense Department to the Department of Health, Education, and Welfare." (23) Senator Charles Mathias, in reporting on his interview with Secretary of Defense Laird on the day of the President's speech, also indicated a trend in this direction. (24) A shift of CBW research to such agencies as the National Institutes of Health would be a deceptive victory indeed for CBW critics.

If the purpose of the President's speech was not, then, to indicate a major change in U.S. CBW activities, what was its purpose? It is interesting to note that the President's speech was delivered at a time when the Song My revelations had generated an international atmosphere of anti-American feeling. The speech produced the expected wave of congratulation from European capitals.

The speech also came at a time when the big powers were becoming increasingly fearful of the proliferation of relatively cheap CBW munitions among the smaller nations of the world, as indicated by the final ratification of the nuclear nonproliferation treaty by the U.S. and the USSR the previous day.

Perhaps even more important, the statement came within one day of the publication of Representative McCarthy's book, *The Ultimate Folly: War by Pestilence, Asphyxiation, and Defoliation* (Knopf, 1969), a high point in the anti-CBW movement.

Further, it came the day of the release of still another Congressional investigation which scrutinized U.S. CBW activities. (25)

Thus, while the President's minor restrictions may help the world to breathe a microscopic degree easier, the overall effects of the speech may be the opposite. The President's speech may have served to disarm the President's critics more than to disarm the U.S. CBW capacity.

—Written by Arthur Kanegis, NARMIC Research Assistant.

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1 *Employment of Chemical and Biological Agents*, Army Field Manual FM 3–10, March 31, 1966, p. 7.

2 This use is confirmed by sources as divergent as widespread newspaper accounts, first hand letters from soldiers in Vietnam (reprint in *War/Peace Report*, November, 1969, p. 17), testimony before congressional hearings (U.S., Congress, Senate, Committee on Foreign Relations, *Hearings on CBW*, 91st Cong., April 30, 1969, p. 34) and *Army* magazine itself ("Infantry Support Weapons," *Army*, October 1969), although the Pentagon officially insists that it uses these gases "to save lives" (Pentagon Press Release, September 23, 1969).

3 "Thalidomide Effects from Defoliants," *Scientific Research*, Vol. 4, No. 23, November 10, 1969, p. 12.

4 The Army classifies these chemical substances as incendiaries rather than chemical weapons, arguing that they kill people by burning and asphyxiation rather than by poisoning. However, the Encyclopedia Brittanica defines Napalm as "an aluminum soap of naphthenic and palmitic acids which when mixed with gasolines form sticky syrup used in CHEMICAL WARFARE." The thickening substances used in Napalm were first developed in 1944–1945 under contract to the Chemical Warfare Service, and improved more recently by U.S. chemical companies (Dow's Napalm "B"). White phosphorous is

also a chemical substance, and is manufactured in the chemical weapons production facilities at the Pine Bluff CBW Arsenal. (William Terry, "Huge Germ-War Arsenal Awaiting Orders to Close," *Washington Post*, November 27, 1969, p. A2.)

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13 Robert M. Smith, "20,000 Poison Bullets Made and Stockpiled by Army," *New York Times*, October 31, 1969.
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16 *Ibid.*
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19 Hanrahan, p. A6.
20 Smith, "20,000 Poison Bullets."
21 Terry, p. A2.
22 Seymour Hersh, Dispatch News Analysis, Dispatch News Service, 1969.
23 James M. Naughton, "Nixon Renounces Germ Weapons," *New York Times*, Nov. 26, 1969, p. 16.
24 Hanrahan, p. A6.
25 U.S. Congress, House, Committee on Appropriations, *Hearings, Department of Defense Appropriations for 1970*, 91st Congress, July 1, 1969 (released November 26, 1969).

Report on the President's CBW Speech

President Nixon's November 26th speech on CBW left many critics of chemical and biological warfare surprised and heartened at their apparent victory. Cautious jubilance, however, soon turned to scepticism when an article appeared in the Washington Post the same day as the reports of the President's speech, revealing that the nation's primary biological warfare installation would be continuing business as usual. We decided to research the consequences of the President's speech, and soon came to the conclusion, embodied in a report sent out to the press, that little or no change would actually occur in the activities of the U.S. chemical and biological warfare establishment.

Our primary disclosure, U.S. continuation of the production of toxins, (the poisonous by-products of bacteria), was picked up by numerous papers across the country. This report led to a dispute, aired in Congressional testimony, between the Arms Control and Disarmament agency, which insisted that toxins

were included in the ban on bacteriological warfare, and the Defense Department, which insisted they were not. During this controversy a report was issued, and then denied, that Henry A. Kissinger, the President's advisor on national security affairs, had ordered a temporary halt in the production of toxins until the dispute could be resolved. In addition, NARMIC's disclosures of the redefinition of toxins led to a clarification by the British that their ban would include toxins.

Meanwhile, NARMIC staff member Arthur Kanegis shared his report with Congressman Richard McCarthy (D. NY.), who, as the leading Congressional CBW critic, had provided resource materials essential to NARMIC's investigation. Immediately, McCarthy held a press conference in which he said that this retention of toxins, if upheld, would call into question the credibility of the President's original statement. He repeated this charge in a letter to the President. However, the production of toxins continues.

The NARMIC report's charges regarding the President's exemption of tear gas and defoliants from U.S. ratification of the Geneva ban were evidently shared by most of the nations of the world. For shortly thereafter the General Assembly resoundingly rebuffed the U.S. position on tear gas in an unprecedented vote which isolated the U.S. Although the Administration sent letters to virtually all nations urging them to vote with its position on tear gas and defoliants, the United Nations Political Committee, by a vote of 58 to 3, and then the General Assembly itself, by a vote of 80 to 3 (with 36 abstentions), accepted the resolution.

While the issues raised by the NARMIC report did receive wide coverage in much of the press across the country, NARMIC believes that the public needs even more information on this vital subject. Already the report in full has been printed in a few newspapers and numerous peace publications across the country, and in the Congressional Record. We are now in the process of revising it for publication in a medical journal and several national liberal magazines. NARMIC staff will continue to do research and education in this vital area. The anti-CBW struggle is not over.

APPENDIX B

Protocol Prohibiting the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, Geneva, June 17, 1925

The undersigned plenipotentiaries, in the name of their respective Governments:

Whereas the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world; and

Whereas the prohibition of such use has been declared in Treaties to which the majority of Powers of the world are Parties; and

To the end that this prohibition shall be universally accepted as a part of International Law, binding alike the conscience and the practice of nations;

Declare:

That the High Contracting Parties, so far as they are not already Parties to Treaties prohibiting such use, accept this prohibition, agree to extend this prohibition to the use of bacteriological methods of warfare and agree to be bound as between themselves according to the terms of this declaration.

The High Contracting Parties will exert every effort to induce other States to accede to the present Protocol. Such accession will be notified to the Government of the French Republic, and by the latter to all signatory and acceding Powers, and will take effect on the date of the notification by the Government of the French Republic.

The present Protocol, of which the French and English texts are both authentic, shall be ratified as soon as possible. It shall bear to-day's date.

The ratifications of the present Protocol shall be addressed to the Government of the French Republic, which will at once notify the deposit of such ratification to each of the signatory and acceding Powers.

The instruments of ratification of and accession to the present Protocol will remain deposited in the archives of the Government of the French Republic.

The present Protocol will come into force for each signatory Power as from the date of deposit of its ratification, and, from that moment, each Power will be bound as regards other Powers which have already deposited their ratification.

In witness whereof the Plenipotentiaries have signed the present Protocol.

Done at Geneva in single copy, this seventeenth day of June, One Thousand Nine Hundred and Twenty-Five.

States Parties to the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases and of Bacteriological Methods of Warfare, Done at Geneva June 17, 1925

States which have deposited instruments of ratification, accession, or continue to be bound as the result of succession agreements concluded by them or by reason of notifications given by them to the Secretary-General of the United Nations:

Argentina—May 12, 1969
Australia—January 22, 1930 [1]
Austria—May 9, 1928
Barbados [2]
Belgium—December 4, 1928 [1]
Botswana [2]
Bulgaria—March 7, 1934 [1]
Burma [2]
Canada—May 6, 1930 [1]
Ceylon—January 20, 1954
Chile—July 2, 1935 [1]
China—August 7, 1929
China Democratic People's Rep.—August 9, 1952 [1]
Cuba—June 24, 1966
Cyprus—December 12, 1966
Czechoslovakia—August 16, 1938 [1]
Denmark—May 5, 1930
Estonia—August 28, 1931 [1]
Ethiopia—September 18, 1935
Finland—June 26, 1929
France—May 9, 1926 [1 3]
Gambia, The—November 16, 1966
Germany, Fed. Rep.—April 25, 1929
Ghana—May 3, 1967
Greece—May 30, 1931
Guyana [2]
Holy See—October 18, 1966
Hungary—October 11, 1952
Iceland—November 2, 1967
India—April 9, 1930 [1]
Indonesia [2]
Iran—July 4, 1929
Iraq—September 8, 1931 [1]
Ireland—August 18, 1930 [1]
Israel—February 20, 1969 [1]
Italy—April 3, 1928
Jamaica [2]
Latvia—June 3, 1931
Lebanon—April 17, 1969
Lesotho [2]
Liberia—April 2, 1927
Lithuania—June 15, 1933
Luxembourg—September 1, 1936
Madagascar—August 12, 1967
Malawi [2]
Malaysia [2]
Maldive Islands—January 6, 1967
Malta [2]
Mauritius [2]
Mexico—March 15, 1932
Monaco—January 6, 1967
Mongolia—December 6, 1968 [1]
Nepal—May 9, 1969
Netherlands—October 31, 1930 [1 4]
New Zealand—January 22, 1930 [1]
Niger—April 19, 1967
Nigeria—October 15, 1968 [1]
Norway—July 27, 1932
Pakistan—June 9, 1960
Paraguay—January 14, 1969
Poland—February 4, 1929
Portugal—July 1, 1930 [1]
Romania—August 23, 1929 [1]
Rwanda—June 25, 1964
Sierra Leone—March 20, 1967
Singapore [2]
South Africa—January 30, 1930 [1]
Spain—August 22, 1929 [5]
Swaziland [2]
Sweden—April 25, 1930
Switzerland—July 12, 1932
Syrian Arab Rep.—December 17, 1968 [1]
Tanzania—April 22, 1963
Thailand—June 6, 1931
Trinidad and Tobago [2]
Tunisia—July 12, 1967
Turkey—October 5, 1929
Uganda—May 24, 1965
Union of Soviet Socialist Reps.—April 5, 1928
United Arab Rep.—December 6, 1928
United Kingdom—April 9, 1930 [1 6]
Venezuela—February 8, 1928
Yugoslavia—April 12, 1929 [1]
Zambia [2]

[1] With reservation.
[2] By virtue of agreement with former parent State or notification to the Secretary-General of the United Nations of succession to treaty rights and obligations upon independence.
[3] Applicable to all French territories.
[4] Applicable to Surinam and Curacao.
[5] With declaration.
[6] It does not bind India or any British Dominion which is a separate member of the League of Nations and does not separately sign or adhere to the Protocol. It is applicable to all colonies.

RESERVATIONS TO THE 1925 GENEVA PROTOCOL

AUSTRALIA

Subject to the reservations that His Majesty is bound by the said Protocol only towards those Powers and States which have both signed and ratified the Protocol or have acceded thereto, and that His Majesty shall cease to be bound by the Protocol towards any Power at enmity with Him whose armed forces, or the armed forces of whose allies, do not respect the Protocol.

BELGIUM

(1) The said Protocol is only binding on the Belgium Government as regards States which have signed or ratified it or which may accede to it.

(2) The said Protocol shall *ipso facto* cease to be binding on the Belgian Government in regard to any enemy State whose armed forces or whose Allies fail to respect the prohibitions laid down in the Protocol.

BRITISH EMPIRE

Does not bind India or any British Dominion which is a separate Member of the League of Nations and does not separately sign or adhere to the Protocol.

(1) The said Protocol is only binding on His Britannic Majesty as regards those Powers and States which have both signed and ratified the Protocol, or have finally acceded thereto;

(2) The said Protocol shall cease to be binding on His Britannic Majesty towards any Power at enmity with Him whose armed forces, or the armed forces of whose allies, fail to respect the prohibitions laid down in the Protocol.

BULGARIA

The said Protocol is only binding on the Bulgarian Government as regards States which have signed or ratified it or which may accede to it.

The said Protocol shall *ipso facto* cease to be binding on the Bulgarian Government in regard to an enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.

CANADA

(1) The said Protocol is only binding on His Britannic Majesty as regards those States which have both signed and ratified it, or have finally acceded thereto;

(2) The said Protocol shall cease to be binding on His Britannic Majesty towards any State at enmity with Him whose armed forces, or whose allies *de jure* or in fact fail to respect the prohibitions laid down in the Protocol.

CHILE

(1) The said Protocol is only binding on the Chilian Government as regards States which have signed or ratified it or which may definitely accede to it.

(2) The said Protocol shall *ipso facto* cease to be binding on the Chilian Government in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.

CZECHO-SLOVAKIA

The Czecho-Slovak Republic shall *ipso facto* cease to be bound by this Protocol towards any State whose armed forces, or the armed forces of whose allies, fail to respect the prohbitions laid down in the Protocol.

ESTONIA

(1) The said Protocol is only binding on the Estonian Government as regards States which have signed or ratified it or which may accede to it.

(2) The said Protocol shall *ipso facto* cease to be binding on the Estonian Government in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.

FRANCE

(1) The said Protocol is only binding on the Government of the French Republic as regards States which have signed or ratified it or which may accede to it.

(2) The said Protocol shall *ipso facto* cease to be binding on the Government of the French Republic in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.

INDIA

(1) The said Protocol is only binding on His Britannic Majesty as regards those States which have both signed and ratified it, or have finally acceded thereto;

(2) The said Protocol shall cease to be binding on His Britannic Majesty towards any Power at enmity with Him whose armed forces, or the armed forces of whose allies, fail to respect the prohibitions laid down in the Protocol.

IRAQ

On condition that the Iraq Government shall be bound by the provisions of the Protocol only towards those States which have both signed and ratified it or have acceded thereto; and that they shall not be bound by the Protocol towards any State at enmity with them whose armed forces, or the forces of whose allies, do not respect the dispositions of the Protocol.

IRELAND

The Government of Ireland does not intend to assume, by this accession, any obligation except towards the States having signed and ratified this Protocol or which shall have finally acceded thereto, and

Should the armed forces of an enemy State or of the allies of such State fail to respect the said Protocol, the Government of Ireland would cease to be bound by the said Protocol in regard to such State.

THE NETHERLANDS (including Netherlands, Indies, Surinam and Curacao)

Subject to the reservation that, as regards the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, this Protocol shall *ipso facto* cease to be binding on the Royal Netherlands Government in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.

NEW ZEALAND

Subject to the reservations that His Majesty is bound by the said Protocol only towards those Powers and States which have both signed and ratified the Protocol or have acceded thereto, and that His Majesty shall cease to be bound by the Protocol towards any Power at enmity with Him whose armed forces, or the armed forces of whose allies, do not respect the Protocol.

PORTUGAL

(1) The said Protocal is only binding on the Government of the Portuguese Republic as regards States which have signed or ratified it or which may accede to it.

(2) The said Protocol shall *ipso facto* cease to be binding on the Government of the Portuguese Republic in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.

ROMANIA

Subject to the reservation:

(1) That the said Protocol only binds the Romanian Government in relation to States which have signed and ratified or which have definitely acceded to the Protocol.

(2) That the said Protocol shall cease to be binding on the Romanian Government in regard to all enemy States whose armed forces or whose allies *de jure* or in fact do not respect the restrictions which are the object of this Protocol.

SPAIN

Declares this Protocol as compulsory *ipso facto* and without special

agreement, in relation to any other Member or State accepting and executing the same obligation, that is to say, on condition of reciprocity.

UNION OF SOUTH AFRICA

Subject to the reservations that His Majesty is bound by the said Protocol only towards those Powers and States which have both signed and ratified the Protocol or have acceded thereto, and that His Majesty shall cease to be bound by the Protocol towards any Power at enmity with Him whose armed forces, or the armed forces of whose allies, do not respect the Protocol.

UNION OF SOVIET SOCIALIST REPUBLICS

(1) That the said Protocol only binds the Government of the Union of the Soviet Socialist Republics in relation to the States which have signed and ratified or which have definitely acceded to the Protocol.

(2) That the said protocol shall cease to be binding on the Government of the Union of Soviet Socialist Republics in regard to all enemy states whose armed forces or whose allies *de jure* or in fact do not respect the restrictions which are the object of this Protocol.

French Text of the Geneva Protocol of 1925

PROTOCOLE

LES PLÉNIPOTENTIAIRES SOUSSIGNÈS, au nom de leurs Gouvernements respectifs :

CONSIDÉRANT que l'emploi à la guerre de gaz asphyxiants, toxiques ou similaires, ainsi que de tous liquides, matières ou procédés analogues, a été à juste titre condamné par l'opinion générale du monde civilisé.

CONSIDÉRANT que l'interdiction de cet emploi a été formulée dans des traités auxquels sont Parties plupart des Puissances du monde,

DANS LE DESSEIN de faire universellement reconnaître comme incorporée au droit international cette interdiction, qui s'impose également à la conscience et à la pratique des nations,

DÉCLARENT:

Que les Hautes Parties Contractantes, en tant qu'elles ne sont pas déja Parties à des traités prohibant cet emploi, reconnaissent cette interdiction, acceptent d'étendre cette interdiction d'emploi aux moyens de guerre bactériologiques et conviennent de se considérer comme liées entre elles aux termes de cette déclaration.

Les Hautes Parties Contractantes feront tous leurs efforts pour amener les autres États à adhérer au présent Protocole. Cette adhésion sera notifiée au Gouvernement de la République française et, par celui ci, à toutes les Puissances signataires et adhérentes. Elle prendra effet à dater du jour de la notification faite par le Gouvernement de la République français.

Le présent Protocole, dont les textes français et anglais feront foi, sera ratifié le plus tôt possible. Il portera la date de ce jour.

Les ratifications du présent Protocole seront adressés au Gouvernement de la République française, qui en notifiera le dépôt à chacune des Puissances signataires ou adhérentes.

Les instruments de ratification ou d'adhésion resteront déposés dans les archives du Gouvernement de la République française.

Le présent Protocole entrera en vigueur pour chaque, Puissance signataire à dater du dépot de sa ratification et, dès ce moment, cette Puissance sera liée vis-à-vis des autres Puissance ayant déjà procedé au dépot de leurs ratifications.

United Kingdom Draft Proposal

(Revised draft Convention for the Prohibition of Biological Methods of Warfare and accompanying draft Security Council Resolution)

The states concluding this convention, hereinafter referred to as the "Parties to the Convention".

Recalling that many States have become Parties to 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,

Recognising the contribution that the said Protocol has already made, and continues to make, to mitigating the horrors of war,

Recalling further United Nations General Assembly Resolutions 2162B (XXI) of 5 December, 1966, and 2454 A (XXIII) of 20 December, 1968, which called for strict observance by all States of the principles and objectives of the Geneva Protocol and invited all States to accede to it,

Believing that chemical and biological discoveries should be used only for the betterment of human life,

Recognising nevertheless that the development of scientific knowledge throughout the world will increase the risk of eventual use of biological methods of warfare,

Convince that such use would be repugnant to the conscience of mankind and that no effort should be spared to minimise this risk,

Desiring therefore to reinforce the Geneva Protocol by the conclusion of a Convention making special provision in this field,

Declaring their belief that, in particular, provision should be made for the prohibition of recourse to biological methods of warfare in any circumstances.

Have agreed as follows:

ARTICLE I

Each of the Parties to the Convention undertakes, insofar as it may not already be committed in that respect under Treaties or other instruments in force prohibiting the use of chemical and biological methods of warfare, never in any circumstances, by making use for hostile purposes of microbial or other biological agents causing death, damage or disease by infection or infestation to man, other animals, or crops, to engage in biological methods of warfare.

ARTICLE II

Each of the Parties to the Convention undertakes:

(*a*) not to produce or otherwise acquire, or assist in or permit the production or acquisition of:

(i) microbial or other biological agents of types and in quantities that have no independent justification for prophylactic or other peaceful purposes;

(ii) ancillary equipment or vectors the purpose of which is to facilitate the use of such agents for hostile purposes;

(*b*) not to conduct, assist or permit research aimed at production of the kind prohibited in sub-paragraph (*a*) of this Article; and

(*c*) to destroy, or divert to peaceful purposes, within three months after the Convention comes into force for that Party, any stocks in its possession of such agents or ancillary equipment or vectors as have been produced or otherwise acquired for hostile purposes.

ARTICLE III

1. Any Party to the Convention which believes that biological methods of warfare have been used against it may lodge a complaint with the Secretary-General of the United Nations, submitting all evidence at its disposal in support of the

complaint, and request that the complaint be investigated and that a report on the result of the investigation be submitted to the Security Council.

2. Any Party to the Convention which believes that another Party has acted in breach of its undertaking under Articles I and II of the Convention, but which is not entitled to lodge a complaint under Paragraph I of this Article, may lodge a complaint with the Security Council, submitting all evidence at its disposal, and request that the complaint be investigated.

3. Each of the Parties to the Convention undertakes to co-operate fully with the Secretary-General and his authorised representatives in any investigation he may carry out, as a result of a complaint, in accordance with Security Council Resolution No. _____.

ARTICLE IV

Each of the Parties to the Convention affirms its intention to provide or support appropriate assistance, in accordance with the United Nations Charter, to any Party to the Convention, if the Security Council concludes that biological methods of warfare have been used against that Party.

ARTICLE V

Each of the Parties to the Convention undertakes to pursue negotiations in good faith on effective measures to strengthen the existing constraints on chemical methods of warfare.

ARTICLE VI

Nothing contained in the present Convention shall be construed as in any way limiting or derogating from 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.

ARTICLE VII

[Provisions for amendments.]

ARTICLE VIII

[Provisions for Signature, Ratification, Entry into Force, etc.]

ARTICLE IX

1. This Convention shall be of unlimited duration.

2. Each Party 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 this Convention, have jeopardised the supreme interests of its country. It shall give notice of such withdrawal to all other 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 X

[Provisions on languages of texts, etc.]

Canadian Draft Proposal

(Chemical and Bacteriological (Biological) Warfare: Draft United Nations General Assembly Resolution)

To facilitate consideration at the XXIV United Nations General Assembly of that part of the Report of the ENDC on chemical and bacteriological (biological) warfare, the Canadian Delegation submits the following draft resolution which has been developed from the remarks made by the Canadian Representative at the 424th meeting of the Committee on 31 July 1969. The draft resolution takes into account the Report of the Secretary-General on chemical and bacteriological (biological) weapons and the effects of their possible use (A/7575 of 1 July 1969), the proposals of delegations, especially those of the Delegation of Poland, on this Report, the draft Convention on the Prohibition of Biological Methods of Warfare submitted by the Delegation of the United Kingdom (ENDC/255 of 10 July 1969) as well as other views advanced by various delegations on this subject during the 1969 session of the Committee.

Draft General Assembly Resolution on CBW

The General Assembly,

Recalling its Resolution 2454 (A) (XXIII) of 20 September 1968,

Having considered the Report of the Secretary-General of 1 July on chemical and bacteriological (biological) weapons and the effects of their possible use,

Noting the recommendations of the Secretary-General contained in the foreword to his Report,

Noting further the conclusion of the Report that chemical and bacteriological (biological) weapons stand in a class of their own as armaments which exercise their effects solely on living matter,

Sharing the sense of horror also expressed in the Report at the idea that bacteriological (biological) weapons could deliberately be used to spread disease,

Mindful of the further conclusion of the Report that the prospects for general and complete disarmament under strict and effective international control and hence for peace throughout the world would brighten significantly if the development, production and stockpiling of chemical and biological agents intended for purposes of war were to end and if they were eliminated from all military arsenals.

Having considered the Report of the Eighteen-Nation Committee on Disarmament on its preliminary consideration of the action to be taken in the light of the Report of the Secretary-General,

Recognizing the importance of the Geneva 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,

Conscious of the need to maintain inviolate the Geneva Protocol and to ensure its universal applicability,

1. *Reaffirms* Resolution 2162 (B) of 5 December 1966 and calls anew for strict observance by all States of the principles and objectives of 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;

2. *Invites* all States to accede to the Geneva Protocol;

3. *Welcomes* the Report of the Secretary-General on chemical and bacteriological (biological) weapons and on the effects of their possible use, and expresses its appreciation to the Secretary-General and to the consultant experts who assisted him;

4. *Requests* the Secretary-General to publicize the Report in as many languages as is considered desirable and practicable, making use of the facilities of the United Nations Office of Public Information;

5. *Recommends* to all Governments the publication of the Report, translated as appropriate, so as to acquaint public opinion with its contents, and invites the specialized agencies, regional inter-governmental organizations, and national and international non-governmental organizations to use their facilities to make the Report widely known;

6. *Recommends* the Report of the Secretary-General to the Eighteen-Nation Committee on Disarmament as a basis for its further consideration of the question of the elimination of chemical and bacteriological (biological) weapons;

7. *Commends* the draft Convention on the Prohibition of Biological Methods of Warfare submitted by the United Kingdom and urges the Eighteen-Nation Committee on Disarmament to complete work on this draft Convention at an early date; and

8. *Requests* the Eighteen-Nation Committee on Disarmament to present a report on progress on all aspects of the problem of the elimination of chemical and bacteriological (biological) weapons to the XXV United Nations General Assembly.

"Third World" Draft Proposal—Argentina, Brazil, Burma, Ethiopia, India, Mexico, Morocco, Nigeria, Pakistan, Sweden, United Arab Republic and Yugoslavia

(Working Paper on a proposed declaration by the United Nations General Assembly regarding prohibition of the use of chemical and biological methods of warfare)

The General Assembly,

Considering that chemical and biological methods of warfare have always been viewed with horror and been justly condemned by the international community;

Considering that these methods of warfare are inherently reprehensible, because their effects are often uncontrollable and unpredictable and may be injurious without distinction to combatants and non-combatants and because any use would entail a serious risk of escalation;

Recalling that successive international instruments have prohibited or sought to prevent the use of such methods of warfare;

Noting specifically in this regard

that the majority of States then in existence adhered to the Geneva Protocol of 17 June 1925,

that since then further States have become Parties to that Protocol,

that yet other States have declared that they will abide by is principles and objectives,

that these principles and objectives have commanded broad respect in the practice of States, and

that the General Assembly, without any dissenting vote, has called for the strict observance by all States of the principles and objectives of the Geneva Protocol;

Recognizing therefore, in the light of all the above circumstances, that a customary rule of international law prohibits the use in international armed conflicts of all biological and chemical methods of warfare, regardless of any technical developments;

Mindful of the Report of the Group of Experts, appointed by the Secretary-General of the United Nations under General Assembly Resolution 2454 A (XXIII) of 20 December 1968, on chemical and bacteriological (biological) weapons and the effects of their possible use, published on 1 July 1969 (A/7575);

Considering that this Report and the Foreword to it by the Secretary-General adds further urgency for an affirmation of this rule and for dispelling, for the future, any uncertainty as to its scope and, by such affirmation, to assure the effectiveness of the rule and to enable all States to demonstrate their determination to comply with the rule;

Condemns and declares as contrary to international law the use in international armed conflicts of

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, and

any biological agents of warfare: living organisms, whatever their nature, or infective material derived from them, which are intended to cause disease or death in man, animals or plants, and which depend for their effects on their ability to multiply in the person, animal or plant attacked.

Warsaw Bloc Draft Proposal—Request for the Inclusion of an Additional Item in the Agenda of the Twenty-Fourth Session—Conclusion of a Convention on the Prohibition of the Development, Production and Stockpiling of Chemical and Bacteriological (Biological) Weapons and on the Destruction of Such Weapons

Letter dated 19 September 1969 from the representatives of Bulgaria, the Byelorussian Soviet Socialist Republic, Czechoslovakia, Hungary, Mongolia, Poland, Romania, the Ukrainian Soviet Socialist Republic and the Union of Soviet Socialist Republics addressed to the Secretary-General

On instructions from the Governments of the People's Republic of Bulgaria, the Byelorussian Soviet Socialist Republic, the Czechoslovak Socialist Republic, the Hungarian People's Republic, the Mongolian People's Republic, the Polish People's Republic, the Socialist Republic of Romania, the Ukrainian Soviet Socialist Republic and the Union of Soviet Socialist Republics, we request that an item entitled:

"Conclusion of a convention on the prohibition of the development, production and stockpiling of chemical and bacteriological (biological) weapons and on the destruction of such weapons" should be included in the agenda of the twenty-fourth session of the United Nations General Assembly as an important and urgent matter.

In proposing that this item should be considered by the United Nations General Assembly, the Governments of the People's Republic of Bulgaria, the Byelorussian Soviet Socialist Republic, the Czechoslovak Socialist Republic, the Hungarian People's Republic, the Mongolian People's Republic, the Polish People's Republic, the Socialist Republic of Romania, the Ukrainian Soviet Socialist Republic and the Union of Soviet Socialist Republics are proceeding from the position that the complete elimination from the arsenals of States of such dangerous weapons of mass destruction as chemical and bacteriological (biological) weapons would be in the interests of the preservation and consolidation of peace and the security of peoples. The Governments of the People's Republic of Bulgaria, the Byelorussian Soviet Socialist Republic, the Czechoslovak Socialist Republic, the Hungarian People's Republic, the Mongolian People's Republic, the Polish People's Republic, the Socialist Republic of Romania, the Ukrainian Soviet Socialist Republic and the Union of Soviet Socialist Republics believe that there is a pressing and urgent need to solve this problem, particularly in present-day circumstances when a number of countries are continuing to perfect, produce and stockpile chemical and bacteriological weapons. This creates a potential threat that mankind may become the victim of a chemical and bacteriological war which would have grave consequences on the entire process of the development of civilization and on the future of all mankind.

The efforts which have been made within the framework of the United Nations and the Disarmament Committee in regard to chemical and bacteriological weapons have so far produced certain encouraging results. General Assembly resolutions 2162 B (XXI) and 2454 A (XXIII), which were adopted by an overwhelming majority of States Members of the United Nations, confirmed the great importance 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, an instrument which embodies important and generally recognized rules of international law. These resolutions also reflect the interest of States in the adoption of further measures which would help to remove the danger of a chemical and bacteriological war.

The report of the Secretary-General of the United Nations on "Chemical and bacteriological (biological) weapons and the effects of their possible use," which was prepared on the initiative of the Disarmament Committee, also demonstrates that the use of chemical and bacteriological weapons would have catastrophical consequences for all mankind. This document has help to produce awareness of

the need to take steps which would outlaw not only the use but also the very existence of chemical and bacteriological (biological) weapons.

Guided by the desire to contribute to the achievement of this objective, the Governments of the People's Republic of Bulgaria, the Byelorussian Soviet Socialist Republic, the Czechoslovak Socialist Republic, the Hungarian People's Republic, the Mongolian People's Republic, the Polish People's Republic, the Socialist Republic of Romania, the Ukrainian Soviet Socialist Republic and the Union of Soviet Socialist Republics call upon the Governments of all States to give due attention to the consideration of the question of the "Conclusion of a convention on the prohibition of the development, production and stockpiling of chemical and bacteriological (biological) weapons and on the destruction of such weapons." The People's Republic of Bulgaria, the Byelorussian Soviet Socialist Republic, the Czechoslovak Socialist Republic, the Hungarian People's Republic, the Mongolian People's Republic, the Polish People's Republic, the Socialist Republic of Romania, the Ukrainian Soviet Socialist Republic and the Union of Soviet Socialist Republics are submitting a draft of such a convention for consideration by the General Assembly. The adoption by the General Assembly of a decision supporting the proposal for the conclusion of a convention on the prohibition of the development, production, and stockpiling of chemical and bacteriological (biological) weapons and on the destruction of such weapons would, we are convinced, be an important contribution to the cause of peace and would be in the interests of all mankind.

We should be grateful if you would consider this letter as an explanatory memorandum as provided for in rule 20 of the rules of procedure of the General Assembly, and if you would arrange for it to be circulated, together with the attached draft convention on the prohibition of the development, production and stockpiling of chemical and bacteriological (biological) weapons and on the destruction of such weapons, as an official document of the United Nations General Assembly.

(*signed*) M. TARABANOV,
Deputy Minister for Foreign Affairs
of the People's Republic of Bulgaria.
(*signed*) A. GURINOVICH,
Minister for Foreign Affairs of the
Byelorussian Soviet Socialist Republic.
(*signed*) J. MARKO,
Minister for Foreign Affairs of the
Czechoslovak Socialist Republic.
(*signed*) K. CSATORDAY,
Permanent Representative of the
Hungarian People's Republic to the United Nations.
(*signed*) T. TOIV,
Minister for Foreign Affairs of the
Mongolian People's Republic.
(*signed*) S. JEDRYCHOWSKI,
Minister for Foreign Affairs of the
Polish People's Republic.
(*signed*) C. MANESCU,
Minister for Foreign Affairs of the
Socialist Republic of Romania.
(*signed*) D. BELOKOLOS,
Minister for Foreign Affairs of the
Ukrainian Soviet Socialist Republic.
(*signed*) A. GROMYKO,
Minister for Foreign Affairs of the
Union of Soviet Socialist Republics.

DRAFT CONVENTION ON THE PROHIBITION OF THE DEVELOPMENT, PRODUCTION AND STOCKPILING OF CHEMICAL AND BACTERIOLOGICAL (BIOLOGICAL) WEAPONS AND ON THE DESTRUCTION OF SUCH WEAPONS

The States Parties to this Convention,

Convinced of the immense importance and urgent necessity of eliminating from the arsenals of States such dangerous weapons of mass destruction as chemical and bacteriological (biological) weapons,

Guided by the desire to facilitate progress in the achievement of the objectives of general and complete disarmament,

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

Believing that scientific discoveries in the field of chemistry and bacteriology (biology) must in the interests of all mankind be used solely for peaceful purposes,

Recognizing the important significance of the Geneva Protocol of 17 June 1925 for the Prohibition of the Use of War of Asphyxiating, Poisonous and Other Gases and of Bacteriological Methods of Warfare, an instrument which embodies generally recognized rules of international law,

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

Recalling General Assembly resolutions 2162 (XXI) and 2454 A (XXIII) which condemned all actions contrary to the Geneva Protocol of 17 June 1925,

Noting the conclusions contained in the report submitted to the United Nations General Assembly and the Disarmament Committee on the grave consequences for mankind that might result from the use of chemical and bacteriological (biological) weapons,

Expressing their desire to contribute to the implementation of the Purposes and Principles of the Charter of the United Nations,

Have agreed as follows:

ARTICLE 1

Each State Party to this Convention undertakes not to develop, produce, stockpile or otherwise acquire chemical and bacteriological (biological) weapons.

ARTICLE 2

Each State Party to this Convention undertakes to destroy within a period of _____—observing all the necessary precautions—or to divert to peaceful uses all previously accumulated chemical an bacteriological (biological) weapons in its possession.

ARTICLE 3

Each State Party to the Convention undertakes not to assist, encourage or induce any particular State, group of States or international organizations to develop, produce or otherwise acquire and stockpile chemical and bacteriological (biological) weapons.

ARTICLE 4

Each State Party to the Convention shall be internationally responsible for compliance with its provisions by legal and physical persons exercising their activities in its territory, and also by its legal and physical persons outside its territory.

ARTICLE 5

Each State Party to the Convention undertakes to take as soon as possible, in accordance with its constitutional procedures, the necessary legislative and administrative measures to prohibit the development, production and stockpiling of chemical and bacteriological (biological) weapons and to destroy such weapons.

ARTICLE 6

The States Parties to the Convention undertake to consult one another and to co-operate in solving any problems which may arise in the application of the provisions of this Convention.

ARTICLE 7

1. This Convention shall be open for signature by all States. Any State which does not sign the Convention before it enters 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 States which have signed it. The instruments of ratification and instruments of accession shall be deposited with the Governments of _____ which are hereby designated the depositary Governments.

3. This Convention shall enter into force after the deposit of the _____ instrument of ratification by a Government, including the instruments of ratification of the Governments of States which are permanent members of the United Nations Security Council and of other Governments designated as depositaries of the Convention.

4. For States whose instruments of ratification or accession are deposited after the Convention enters into force, the Convention shall enter into force on the date on which their instruments of ratification or accession are deposited.

5. The depositary Governments shall promptly inform all States which have signed and acceded to this Convention of the date of each signature, the date on which each instrument of ratification or accession is deposited and the date on which the Convention enters into force, and shall transmit other notifications to them.

6. This Convention shall be registered by the depositary Governments in accordance with Article 102 of the Charter of the United Nations.

ARTICLE 8

This Convention, of which the Russian, English, French, Spanish and Chinese texts are equally authentic, shall be deposited in the archives of the depositary Governments. Duly certified copies of the Convention shall be transmitted by the depositary Governments to the Governments of States which have signed the Convention and acceded to it.

In witness whereof, the undersigned, duly authorized thereto, have signed this Convention.

DONE in _____ copies at _____, this _____ day of _____, _____.

APPENDIX C

CBW and National Security—November 3, 1969

This is a study of the strategic and tactical implications of chemical and biological weapons. While an analysis of this length cannot be exhaustive, the sponsors of this study group paper believe that it contains perspectives and recommendations worthy of consideration by this Congress and the Administration.

The sponsors of this study group paper are Congressmen: John Dellenback, of Oregon; Charles A. Mosher, of Ohio; Howard W. Robison, of New York; and Fred Schwengel of Iowa.

Additionally, the following Members of Congress have joined this study group in encouraging, through the release of this paper, a re-examination of the strategic and tactical purposes served by chemical and biological weapons.

Marvin L. Esch of Michigan
Peter H. B. Frelinghuysen of New Jersey
Gilbert Gude of Maryland
Frank Horton of New York
Paul McCloskey of California
Joseph M. McDade of Pennsylvania
F. Bradford Morse of Massachusetts
Ogden R. Reid of New York
Philip E. Ruppe of Michigan
Herman T. Schneebeli of Pennsylvania
Robert T. Stafford of Vermont
Charles W. Whalen, Jr. of Ohio

INTRODUCTION

The recent concern about safety procedures in the handling of chemical and biological weapons has caused us to re-examine the purposes for which we have these weapons. Our effort has necessarily involved analysis of the advantages and disadvantages of CBW in each of the situations our country faces or might face. Accordingly, we have considered chemicals and biologics as deterrents to all-out war and as tactical weapons in limited wars. It stands to reason that the judgment of the Congress concerning the future of these weapons must be based on this kind of analysis.

We need to determine whether these weapons are valuable additions to our already impressive arsenal of conventional and nuclear weapons. It is not justifiable to continue developing, producing and testing chemical and biological weapons simply because we can develop safe testing and storage procedures for them. Also, we cannot logically accept the rationale that we need chemical and biological weapons simply because some other country is engaged in CBW production. Similarly, it is not enough to say that they enhance "flexibility": one must analyze their specific advantages. Only weapons which add a positive measure to our overall national security deserve support.

As a result of our inquiry, we question whether chemical and biological weapons add significantly to our security. The risks we run by using and maintaining secret stockpiles seem to outweigh the dubious advantages offered by these weapons.

On this page and the next page, we will present a few of our concerns, highlighting rationales which are elaborated in the main body of the paper. Here we will also offer some recommendations.

As deterrents to all-out war, chemical weapons are neither more cost-effective nor certain than our nuclear deterrent. Biological weapons are doubly uncertain as mass killers. On the one hand, their effectiveness can be blunted by extreme weather conditions or unpredictable biological reactions. On the other hand, a successful attack by us could initiate an epidemic that might spread to infect our own population. When a weapon is potentially dangerous to both the attacker and the attacked, retaliatory threats lack sufficient credibility.

Although many have accepted the notion that CB weaponry is humane, we are dubious. Many of these weapons are naturally inhumane, while others which

could theoretically be used to reduce war deaths have actually been used to increase them. Contrary to the assumption that weapons which have been secretly developed and tested for years will perform effectively in the field, many of them have not significantly improved our military position and many more cause severe ecological damage which may make them less acceptable than conventional weapons.

We suspect that virtually all CBW is highly escalatory in limited war. When we fight limited conflicts to avoid all-out war, chemical and biological weapons may push us toward total war. When we are willing to escalate, chemicals and biologics are very likely at least as escalatory as tactical nuclear devices.

Finally, we find that in the field of CBW there appear to be unique opportunities to disarm voluntarily or on a negotiated basis. There is genuine international interest in reaching a negotiated settlement on CBW, yet it is doubtful that the elimination of our chemical and biological stockpiles would result in significant military loss.

We are cognizant of the dangers associated either with using these weapons or secretly continuing to produce and stockpile them. There are already indications that our use of chemicals causes serious and permanent damage. Yet, even this damage is small when compared to the unpredictable misery that a full-scale biological attack might initiate or the total war that a chemical attack might provoke during a limited conflict. By possessing these weapons we increase the likelihood of use. In addition, we risk an international incident when an unexplained epidemic provokes charges of a secret biological attack. Finally, these uncertain weapons have a destabilizing effect on relations between adversaries because they make rational calculations difficult.

Because the logic of this paper suggests that the disadvantages of CBW outweigh their marginal advantages and because it takes into account both the evils and the alleged benefits of CB weaponry,

We recommend careful consideration of the following actions:

(1) Eliminating all stockpiles of chemical and biological weapons, including any low-level chemicals designed for military use. This does not include riot control agents used for crowd control in the U.S.

(2) Publicizing the results of future research in the field of CBW.

(3) Encouraging international agreement on the prohibition of chemical and biological production and usage.

(4) Ratification by the U.S. of the 1925 Geneva Protocol.

(5) Declaring that the United States will not use such weapons but will respond to their use by adversaries with appropriate conventional or nuclear force.

I. THE WEAPONS

The term "Chemical and Biological Warfare" is a misleading one. It is not a form of warfare but rather a conglomeration of weapons which must be incorporated into the military strategies and doctrines which have already been developed to maintain our defense posture. The sweep of the phrase masks the diversity of our silent arsenal.

The purpose of this study is to outline the role that chemical and biological agents could play in our overall defense strategy. Where possible, we have attempted to evaluate the merits of the systems as an alternative to those weapons already in use. We also consider briefly the possibility of a negotiated agreement on the production of chemical and biological agents.

It is important that chemical and biological agents be constantly regarded as alternative weapon systems. If objective evaluation indicates that they do not prove better than present armaments, there can be no justification for adding them to our arsenal. Different criteria are unsatisfactory. Maintaining the primacy of flexibility is an imprecise position. If two weapons are of unequal value, certainly only the better one should be deployed. If they are equal, joint deployment is unnecessarily wasteful.

Arguing that the U.S. must develop a weapon because an adversary is doing so is not logically adequate; it is a rationalization of advocates. Keeping up with the Joneses in weapons development is useful only when our own security requires that enemy systems be duplicated. This reasoning was relevant during the recent ABM debate. We did not need an ABM because the Soviets had one. We needed it only if our deterrent force would be vulnerable without it. Likewise, American stockpiles of CBW are not justifiable merely because of Soviet initiatives.

A. The Differences Between Chemicals and Biologics

There are several different categories of possible chemical and biological weapons. Toxins, which are produced by biological organism but cannot themselves reproduce, have been classed with chemical agents in this study as they were in the UN Report on CBW. (See appendix.) While there are significant differences between categories, the basic characteristics of chemical agents are different enough from those of biological weapons that general distinctions between the two classes are both possible and helpful. Biological agents are living organisms which reproduce, chemical weapons are not. It is this basic difference which accounts for the major variations between them.

1. Extent of Effects

Because they are alive, biological agents can pose a danger for a long time and affect a wide area as they reproduce. Chemical agents are effective for only a relatively short time and the area they affect is determined solely by the size of the initial attack and the weather conditions in the strike zone. Thus, when an attack must be controlled geographically, chemical agents are preferable to their biological counterparts. Yet when a general attack is called for, biological weapons are more relevant.

2. Speed

Speed is often absolutely necessary in a military engagement. With the exception of defoliants which require several days to achieve maximum results, chemical weapons can act immediately or within a few hours. In comparison, biological agents are extremely slow. The quickest take at least a day to act and some have incubation periods of three weeks.

3. Duration

The two systems also differ markedly in their duration of effect. The living organisms of a biological weapon may lie dormant for years or centuries before finally infecting humans. Decontamination of infectious areas is difficult at best and impractical for large areas. Chemicals may evaporate relatively soon after an attack, but under certain environmental conditions or after repeated use, areas may remain contaminated for months.

4. Intensity

Some chemical agents are short-term incapacitants, but the most dangerous are those which are designed to kill quickly. Even those previously characterized as temporary have been found to have lingering side-effects such as permanent damage to the eyes or lungs. Conversely, although biological weapons are usually considered lethal, some organisms have been developed which cause illness for a while but make eventual recovery possible.

B. Military Characteristics

To be useful additions to our military arsenal, these weapons should meet a number of criteria. They should be easily delivered, cheaply produced, difficult to defend against, effective under all weather conditions and reasonably controllable. Chemical and biological agents measure up to some of these standards but fall short of others.

1. Delivery

Chemical agents can be delivered in almost any form. They can be dispersed in aerosol sprays, hand grenades or small rockets. In addition, aerial spraying as well as bomb and missile attacks can be used. These systems can also deliver biological weapons, although short-range delivery vehicles are dangerous since the disease could easily return to the attacking troops. A unique delivery method for biological weapons is sabotage. A fifth-column movement is virtually undetectable; and a small amount of infectious biological organisms could quickly spread in the atmosphere or through a water supply to infect population centers. Yet for a large-scale attack the most probable delivery method would be an aerial spraying from a missile or airplane.

2. Production

Both chemicals and biologics can be cheaply and quickly produced in massive quantities with available laboratory and industrial equipment.

3. Defensibility

Defenses against the agents can be directed against the delivery systems or the agents themselves. Luck seems to be an essential part of the defense against sabotage attempts, but defense already developed against bombers and missiles should be equally effective whether CBW or nuclear warfare is being attempted.

Some chemical and biological agents are susceptible to medical treatment. But this treatment must be swift and certain. Because of the necessity for speed, the agent might be incorrectly identified. The wrong antidote for a chemical attack could kill the intended victim; a disease will continue unchecked if the wrong biological antibiotic is prescribed.

Of course, protective measures are possible only after an attack is detected. Nerve gas is odorless, colorless and tasteless. Unless troops correctly identified an incoming rocket as a chemical one before impact, one-third of them could die before they had a chance to don gas masks. Thousands of citizens could be fatally infected by a saboteur's biological attack before officials learned of the deadly contamination. Thus, defense against surprise attacks is extremely difficult and should be largely discounted when setting policy.

4. Weather dependence

An unfortunate change in weather conditions can greatly reduce the effectiveness of both types of weapons when they are dispersed in aerosols or impact explosion devices. Because of this tenuous dependence on the weather, they are not reliable military aids.

5. Controllability

On the other hand, even when weather conditions are favorable an effective attack cannot be easily controlled. In some cases the area affected is indeterminable. In others, the intended victims are not only victims. There is a constant danger that lingering effects will wreak havoc in the area for years after the war ends.

When chemical weapons affect a region they may affect all men and animals in the area. Herbicides can be confined in a specific area. But while they are aimed only at plant life, they may also directly affect the local human and animal populations.

Most biological agents infect only one species, but the infection can spread endlessly, affecting areas far from the initial attack which may not be involved in the war.

Perhaps the most frightening dimension of these weapons is their long-term effects. Even seemingly harmless defoliants now being employed in tactical situations can affect the overall ecological balance of the area and promote extinction of those species which depend on the foliage for nourishment. Plant diseases may make critical inroads into the food supplies of already starving nations. Biological agents could linger in an area and rekindle an epidemic long after treaties were signed and enmity had ceased. They could renew the pangs of war when only historians remember why the war began.

C. Military Missions

Because of the distinctions between the two types of weapons, their military missions are quite different. Chemical agents are considered tactical weapons, to be used in limited engagements. They act quickly and remain in a relatively limited area under favorable weather conditions. They can therefore be incorporated into larger battle plans.

Lethal biological weapons are reserved for all-out conflicts. Once they infect a population, an epidemic of unforeseeable proportions is possible. No battlefield operation calls for such devastation.

II. THE STRATEGY

Knowledge of the military characteristics of these weapons makes possible an examination of their implications for national security.

Our national security depends both on an ability to deter attack and on a capacity of defend against one should deterrence fail. Defense strategy is a purely military science; whereas our deterrence strategy determines our diplomatic posture and public image throughout the world. While the two con-

cepts are related, they are not the same. Many policy discussions suffer because they assume that whatever is good for defense is of equal benefit to deterrence. This is not necessarily so. Weapons which make military victory more probable may also make victory necessary by making war more likely.

National policy makers have relied upon two basic theories of deterrence and defense: counterforce and finite deterrence.

A. Counterforce

Counterforce strategy, as the term suggests, is directed at the military force of the enemy. It hopes to disarm the enemy quickly by destroying his weapons. If it is successful the enemy will be forced to quietly surrender, accept a stalemate or face extinction. The strategy focuses on military targets, not population centers.

CBW does not contribute to our counterforce posture. In an all-out war, these weapons cannot stop incoming missiles or blunt their destructiveness. They cannot ground planes or destroy missiles in their silos. Their primary function would be to attack population centers.

Even if it were assumed that we could become involved in a war which prized strikes against munitions factories during a protracted test of industrial strength, CBW would not be significantly better than conventional tactics. Biological attacks would be difficult to pinpoint and the general population could be afflicted. Chemical agents might be controlled, but they would kill people while leaving the enemy's industrial capacity intact. In both cases, new workers could resume production and repeated strikes would be necessary. Conventional sorties which destroyed the factories themselves would be far preferable in such an unlikely war situation.

B. Finite Deterrence

The strategy of finite deterrence focuses on population attacks and is more suitable for CBW. This strategy attempts to prevent war by making victory so costly or so unlikely that attack is an enemy's least acceptable option. The main focus is on all-out war. We attempt to discourage aggression by threatening retaliation against population centers which would make victory too costly. Presumably any opponent perceives a level of damage which would be unacceptable when set against the gains expected from victory. Since this damage threshold is measurable and thus finite, the retaliation we threaten is finite. Accordingly our posture is termed one of finite deterrence. Once this damage threshold is reached, there is no reason to exceed it. The enemy will be deterred when the minimum threshold damage is assured. Threats of more damage will not produce more deterrence.

An essential element in this strategy is flexibility. The level of damage threatened must be correlated with the attacker's stance. Too little will not deter. Too much in a limited conflict will be disproportionate and thus either irresponsible or unbelievable.

When completely articulated, the theory attempts to respond to aggression at whatever level it is offered with a two-fold purpose in mind. First, enemy victory must be forestalled. Second, conflicts must be decided at the lowest possible level of violence. Consequently, there are three major facets to finite deterrence strategy: minimum deterrence, which makes all-out war politically and morally unacceptable; limited war, which seeks to counter all other forms of force or blackmail; and arms control, which attempts to keep tensions low by keeping force levels low and balanced between adversaries.

Minimum deterrence seeks to maintain an invulnerable strike force capable of inflicting unacceptable losses on the enemy by attacking his population. Of course this threat is only credible if it is used to deter a minor land probe since it would immediately escalate a local conflict into a world-wide conflagration.

The technique of limited war was incorporated to react to localized threats which do not warrant total war. If our limited war capabilities are great, we should be able to deter attacks in any form by threatening an appropriate level of violence.

To deter attacks and keep the attacks that cannot be deterred as small as possible, arms control is a major goal of any strategy of finite deterrence. Arms control also aids deterrence by reducing international tensions which increase the chances of war. While complete disarmament is not feasible, at least for

the present, some arms control is a reasonable and highly desirable goal. Another section of this paper will consider the importance of including CBW in such controls.

1. Minimum Deterrence

a. Civil defense possibilities

Since minimum deterrence threatens to strike a terrible blow to the civilian population of an enemy, civil defense measures might reduce casualties and defeat the purpose of the deterrence measures. However, as a practical matter, civil defense cannot be relied upon to nullify the threat of CBW. Detection of a covert attack is difficult if not impossible. The measures required to protect a population even if an attack is anticipated or identified are highly impractical. Pressurized shelters with air filters would be required to prevent exposure to a continued buildup of harmful agents. In addition, sophisticated laboratory equipment and biological experts would be needed in every shelter to identify and treat diseases before a general epidemic struck underground. Thus, civil defense should not give a victim solace or an attacker pause. The success of a CBW attack will not be significantly diminished by civil defense measures taken against it.

Civil defense against nuclear attacks aimed at population centers cannot avoid millions of deaths in the immediate blast area, even though some civilians might survive deadly fallout if adequate shelters were available. Thus, nuclear weapons will remain a credible deterrent despite attempts to develop civil defense systems.

Because all three weapons can elude or overwhelm civil defense systems, population vulnerability is high regardless of which type of attack is considered. Yet, aside from civil defense considerations, there are significant differences in the application of deterrence strategy to chemical, biological and nuclear weapons.

b. CBW as a deterrent

Lethal chemical weapons such as nerve gas would probably require more delivery vehicles than nuclear weapons to achieve the same unacceptable level of damage. Since their range is determined by the wind direction and velocity, several gas missiles would be necessary to inflict damage equal to that of a single nuclear warhead. If delivery costs were an important factor, nuclear strikes would be more attractive since fewer missiles would be necessary. If assured destruction were the aim, nuclear weapons would again be chosen, since wind and weather conditions could blunt a chemical strike but leave a nuclear blast unaffected.

Yet chemicals might still be retained as a deterrent force. They could be responsible for avoiding a purely chemical attack. A special case has been made for retaining a substantial lethal stockpile in Western Europe to deter a major conventional and chemical onslaught from the East. It is feared that if the U.S. were to abandon its chemical stockpiles, the East would seize upon a tempting opportunity to use lethal chemicals with great success.

Some fear that the West would be faced with an unfortunate triad of options if it did not retain chemicals. NATO might be forced to retreat while suffering heavy casualties from persistent gas attacks. It might equip its troops with protective clothing while ceding a mobility advantage to the East which could be decisive. Finally, it might respond with tactical nuclear weapons to exact a casualty toll from the East similar to the losses its own forces suffered from gas attacks.

It is argued that a substantial arsenal of lethal chemicals could avoid this difficulty, since gas responses to gas attacks would force the East to don protective clothing and make mobility difficult for both sides for the duration of the war. The East might be successfully deterred from using gas if it realized that the West was prepared to respond in kind and neutralize its short-lived tactical advantage.

Yet this scenario is not necessarily a convincing case for a lethal chemical arsenal. It obviously does not weigh the risks of possession which we outline below. In addition, a large-scale conventional war in central Europe may not be possible. Escalation to tactical nuclear weapons or expansion of the war to homelands may be virtually automatic. Certainly it is difficult to imagine a war in Europe which began with lethal chemicals on one or both sides and did not quickly escalate to other weapons and other battlefields.

Yet the most important distinction which must be made in reviewing this scenario is one between deterrence and defense. While some may flinch at the thought of actually using tactical nuclear weapons when another course is open, it is not clear that the threat of nuclear retaliation would not be effective in deterring chemical warfare in Europe. If tactical nuclear devices can deter a chemical attack, the issue of actual retaliation becomes moot.

Finally, actual defense with chemical weapons may not be significantly better than with nuclear devices. There are no meaningful civil defense measures against either weapon. Both sides would have to assume that tactical nuclear weapons might be used against them and disperse their forces accordingly. This would mean that even strikes at clearly identified military targets with either weapon would involve substantial civilian and military losses. Thus, the different intensity between lethal chemical attacks and low-level nuclear blasts might be small and the case for chemical responses to chemical attacks would be marginal.

Biological weapons have also been justified as a deterrent force. There again is no practical civil defense. The delivery systems are as invulnerable as nuclear vehicles, and it seems reasonable to assume that both superpowers will remain vulnerable to a full-scale missile attack for the foreseeable future. A fifth column of saboteurs should remain potent in spite of unforeseen advances in missile and bomber defenses. Nevertheless, biological attacks are not a successful deterrent threat.

Effective deterrence must result from a credible threat of assured destruction judged unacceptable by a potential aggressor. Yet it is reasonable to conclude biological warfare neither assures destruction nor allows for a credible threat.

Even after a biological strike began, the extent of the damage would be unknown. Aerosols would be the most likely delivery method for a large-scale biological attack. Yet reliance on them means that extreme weather conditions might kill the organisms before they had an opportunity to infect the population. Certainly it would be difficult for an attacked nation to wait patiently for perfect weather conditions for retaliation. Consequently, the possibility of a complete failure is a constant danger in biological warfare and the requisite of assured destruction is lacking.

The credibility of a biological threat is undermined by the frightening prospect of a successful attack—one which initiates an epidemic. The disease could be uncheckable. The plague would honor no natural or national boundaries. Once the infection was identified, a terrified population would scurry in all directions to avoid contamination. Yet they themselves would be the carriers who would transform a localized attack into an international tragedy.

Even laboratories with controlled environments and strict safety precautions have been unable to completely avoid infection by these lethal agents. Only strict quarantine procedures and a fair amount of luck have prevented several research accidents from becoming general epidemics.

Uncontrollable biological weapons could endanger their user; they might return to infect his population. The unbridled infection he had unleashed could return to destroy the attacker as well as the attacked. Even a country which was confident that it possessed a secret antibiotic could not launch such an attack. Living organisms often change their characteristics as the result of a mutation. Hardy mutant strains could continue to spread disease after the administration of antibiotics which would have neutralized the original disease strain but which proved ineffective against the new breed of killers.

Of course any threat to exterminate millions of people is incredible. But one is more incredulous when posed with a threat of biological destruction than when a nuclear threat is maintained. By developing "clean" bombs we have attempted to minimize the residual effects our own population might suffer if we retaliated. Consequently, population losses in the U.S. would have to result from a decision by the enemy to launch a second salvo of missiles targeted on our cities. There is a very real possibility that an enemy leader would pause under the stress of a nuclear exchange and accept defeat before issuing a death warrant for another score of megadeaths. Biological weapons do not afford this opportunity to avoid mass destruction in both the attacking and attacked nation; a single disease can spread over both populations without waiting for a second decision from an opposing leader. Thus, while a nuclear retaliation makes national suicide a possibility because a devastated foe might decide to slaughter his enemy, a biological attack makes self-destruction dependent both on the

course of an uncontrollable epidemic, and upon the unpredictable decision of an adversary.

Thus it seems that our overall deterrence posture would not be significantly enhanced by the threat of a biological response. The brinksmanship inherent in modern day aggression would be buoyed by the hope that retaliation would be unsuccessful. In addition, the threat of a biological response loses its credibility as the likelihood of success increases. An effective attack carries with it the fearsome danger of a global epidemic which could sweep all before it, friend and foe alike. Accordingly, the threat of a biological response may be either the threat of no response or of retaliation so costly to both sides that it might not be believed and thus not heeded.

Nuclear weapons are significantly better than biological ones for deterrence purposes. They are just as fearsome and more certain and controllable. Sole reliance on nuclear threats should preserve a credible deterrent for the U.S. Adding a biological menace would not significantly improve that deterrent.

Successful biological attacks are at least as humanly destructive as nuclear strikes. Thus, there is no reason to prefer a biological response in hopes of avoiding all-out nuclear war. Both deal death in massive proportions.

c. The vicious response

Relying on biological weapons as a vicious military response to an all-out attack has little justification. A biological reaction to either a biological or nuclear strike might be extremely damaging and yet less effective than a nuclear response.

We indicated earlier that the incubation period for lethal organisms is from one day to three weeks. This incubation period begins only after a victim has contracted the disease. Thus, an attacker is busily destroying its enemy's wealth and population, the beleaguered victims must wait patiently for their deadly infection to fester. In the meantime, they must accept unmerciful punishment. All the while, the original attacker might feel that he could fight continuously against an enemy that was unable or unwilling to retaliate. Such a confident adversary could be expected to increase the intensity of his attacks as long as he felt he was doing so with impunity.

In contrast, a nuclear response would be quick, calculable and highly damaging. An attacker would be forced to reassess his position against a determined foe willing to fight rather than surrender.

2. Limited War

The term limited war implies that both the weapons used and the area engaged are limited. Such conflicts are entered when the objective is worth all-out war, but when it might be achieved at lower costs in a limited conflict. In other situations, limited wars are fought when the stakes are high enough to justify armed action, but too low to justify total war.

Certainly no country is willing to rattle its nuclear sabres during every international incident. Some areas are just not worth a nuclear war. Yet they may be valuable to a country—valuable enough for a limited war. Other areas may be worth a nuclear war, but victory might be achieved without one if a flexible conventional force were available. To avoid being muscle-bound in most international crisis situations, the nuclear powers have developed a capability and theoretical framework for waging limited war.

When a nation is willing to risk all-out war to achieve its goal, there are no holds barred in the limited phase of the war. Of course, if victory can be won without resorting to nuclear weapons, none will be used. But the enemy is kept constantly aware that its opponent is taunting it up the nuclear ladder. There must be no doubt about the attacker's ultimate resolve.

However, when the stakes are not high enough to justify all-out war, the opponent must be advised that the war will be kept limited. The attacker is willing to accept defeat rather than escalate to nuclear weapons in search of victory. If there is any doubt on the part of the opponent, there exists the danger

that he will escalate the conflict of his own accord in an attempt to show his resolve and perhaps win the war quickly.

Therefore, there must be implicit limits placed on such a war so that both sides clearly understand that they are fighting a truly limited conflict—not one that could reach the unlimited stage. Usually geographic and weapons limitations are self-imposed by both sides as evidence of their good faith. There are no logical reasons for these barriers, since there are no clear logical demarcations between limited and total wars. They are merely different levels of conflict in a continuous scale of violence. The value of the barriers lies in the assurance they provide to an opponent that he need not fear all-out attacks during this particular war. Once these restrictions are decided upon and recognized by both sides, it is clearly of prime importance that they not be abandoned by either side in quest of a small military advantage, lest all barriers fall and all-out war actually result.

There are three main reasons advanced for including chemical and biological weapons in our limited war arsenal. Advocates claim they are: first, more humane than other conventional weapons; second, effective in fulfilling military missions; and third, high intensity responses to enemy action which do not involve a significant danger of nuclear escalation.

a. Humane Weapons

Some proponents of chemical and biological warfare dream of "wars without death." They claim that military objectives can be achieved without the necessity of killing the enemy. They envision sleeping armies, soon to wake captives of a merciful opponent.

For some chemical and biological weapons, this argument is clearly irrelevant. Nerve gas and deadly plagues are no more humane than the conventional weapons they seek to replace or supplement. For other agents, previous military usage indicates that they have been used in conjunction with tactics which seek to kill the enemy.

Biological agents aimed at crops or animal life are used to deprive the enemy of his food supply. Yet any starvation tactics hit the army slowly—after the rest of the population has suffered from malnutrition while the army commands scarce food reserves. The policy of starvation is inhumane as conceived and unconscionable as practiced, since it first hurts those most in need of food and only eventually cuts the rations of the enemy forces.

Biological agents which affect man are also inhumane. Mild forms of disease are not militarily useful because they do not sufficiently guarantee an incapacitated enemy to insure peaceful victory. The lethal agents are just as deadly as conventional weapons and they invariably affect civilians. Certainly, weapons which deal not only death but indiscriminate death cannot be considered humane.

Chemical agents have been developed and used to defoliate large areas identified as enemy strongholds or to destroy crops. Those which seek starvation are indeed inhumane. Those which defoliate enemy hiding places do not result in humane treatment either. Fields of fire and bombing targets are revealed as leaves slowly wither. An enemy caught in these areas cannot expect merciful treatment. Instead, he can fear unobstructed shelling and bombing raids. His death is made more likely because chemical weapons were used by his enemy.

There are both lethal and non-lethal chemical weapons which are used directly against men. Lethal agents, primarily nerve gases, are certainly not humane. In fact, there is less possibility of being merely wounded by nerve gases than by conventional weapons. Even a small dose of these gases can be fatal. Thus, mortality rates are increased when nerve gases are used.

Riot-control gases and harassing agents are not designed to be fatal. If administered in laboratory-prescribed doses they do not kill or permanently damage their victims. But in battlefield conditions, too much gas is usually preferred to too little and there are strong probabilities of permanent damage or even death if an "overdose" strikes an enemy.

Chemical weapons which are theoretically capable of achieving victory without bloodshed have frequently been used to increase enemy casualties. Although the gases themselves are not fatal, they are often employed in tactical situations when the enemy is concealed from conventional weapons. Chemicals are then used to drive the enemy from his hiding place so that he can easily be fired upon.

The inhumane deployment of these weapons during battlefield situations may not be more inhumane than the use of comparable conventional weapons. However, chemical and biological weapons can continue to be inhumane long after the battle is ended. The area may remain contaminated for days, years, perhaps centuries. No conventional weapon is likely to cause this much prolonged suffering. Weapons aimed at plant or animal life may cause serious ecological imbalance, break natural food chains and disrupt environmental stability. Biological agents could cause damage of this magnitude in wide-ranging areas. It is conceivable that entire species, perhaps even man, would move toward extinction after a large attack.

Theoreticians have not realized their visions of wars without death. As now employed, chemical and biological weapons are usually used to kill the enemy directly or indirectly. At times their use kills scores of non-combatants.

b. Effective weapons

The most persuasive argument for military tacticians is that CBW is an effective weapons system. It does things better, quicker, cheaper or safer than alternative weapons. The crucial element in evaluating these claims is the definition of an effective weapon. Most chemical and biological agents can be successful in fulfilling a mission. But the additional damage they cause may make them ineffective weapons in an overall analysis, since an effective weapon should seek to maximize the chances of ultimate victory while minimizing the war's destructiveness.

There is no question that biological agents can be terribly efficient in destroying plant and animal life. Yet starvation may not be an effective addition to military tactics, since the armed forces would be the last to suffer from shortage. In some situations they might never suffer if they maintained supply lines with non-combatant allies.

But the more significant disadvantage to biological agents is their uncontrollability. The disease may return to destroy the attacker's food supplies. They may also spread to neighboring territories. Since military men, like most people, prefer to keep the number of enemies to a minimum, uncontrolled blight could be a severe setback. Neutral nations which helplessly witness their plant or animal life die might feel strong public pressure to avenge the attack as quickly as possible.

When human diseases are meted out to an enemy, the disadvantages are similar but more pronounced. Even a hypothetical army that could secretly inoculate its troops and stockpile a biological agent could not consider the agent an effective weapon. The disease could easily spread beyond the war zone and the pressures for retaliation by neutral nations would again be tremendous. The initial successes achieved by using the agents could be nullified when war was declared by the enraged nation accidently infected by the attacker. In addition, the attacking troops might be afflicted by the same disease when a mutant which proves immune to previous vaccines returns to plague them. Both of these possibilities make ultimate victory less likely. Either one makes a biological agent an ineffective military weapon.

The positive disadvantages of biological strikes must be considered in conjunction with their inherent unpredictability. As demonstrated previously, less than perfect weather conditions can quickly kill bacteria before they infect the enemy. A weapon which works only occasionally is probably worse than no weapon at all, since plans which assume effective results from its use may leave troops helpless if the weapon fails.

Chemical defoliants are effective in killing crops. The question is how effective crop attacks are in defeating an enemy. Defoliants which seek to clear the coun-

tryside of enemy camouflage are eventually successful in denuding the area. Yet there is a real question about the military consequences of these sprayings. It takes several days for the chemicals to take effect. After they have, there is usually renewed growth in the area within a week. During this short period of defoliation, the enemy can avoid barren areas and move only through jungle that has not been affected. Persistent use can prolong the defoliation effects and perhaps even kill trees in the vicinity. Yet a militarily effective program would have to blanket a wide area while continuing to concede relatively concealed movement at night. When the advantages of this program are weighed against the significant disadvantages resulting to the soil, foliage and wildlife of the region, the effectiveness of the weapons is doubtful. Victory is not significantly enhanced while damage to the war zone is certainly intensified.

Defoliants have also been used to deny roadside cover to enemy ambushers. But it should be realized that clear roadbeds often merely widen the fire zone, thereby increasing the exposure of one's own troops as they seek shelter from attack.

Chemical agents aimed at enemy troops have varying degrees of effectiveness. Harassing agents can be effective if the enemy is not equipped with masks. Usually these agents are used to force the enemy out of hiding into clear fields of fire or to prevent enemy pursuit or ambush when friendly troops are moving.

Lethal agents, particularly nerve gases, can be extremely efficient killers. Attempts have been made to develop warning and decontaminating devices to use in conjunction with masks as defenses against nerve gas. Yet present systems are costly, cumbersome and only partially effective. Observers estimate that troops fully equipped with protective devices would still suffer 30% casualties before they could react to a surprise attack.

c. High intensity, nonescalatory weapons

1. *Completely limited war.*—The final and most crucial argument advanced in favor of the use of chemical and biological weapons is that they allow a high intensity response which does not escalate the conflict. Where the U.S. is involved in a limited war and has decided it will not resort to all-out war for victory, this justification is of prime importance. If this argument fails, the other two rationales offered for their use become moot. The danger resulting from escalation far outweighs the benefits which allegedly humane or efficient weapons offer.

When limited war is initiated because all-out war is not justified by the stakes of the conflict, all reasonable precautions must be exercised to insure that the war will remain limited. As we indicated earlier, the normal way of telling an opponent that the war will not be escalated is establishing arbitrary geographical and military boundaries for the conflict. Chemical and biological weapons probably transgress both bounds.

Lethal biological weapons, if successful, can kill as effectively as nuclear warheads. Thus the artificial restraints on the level of violence which are established in a truly limited war would be greatly exceeded. The shift to nuclear war would be a small one. It would be made because nuclear weapons were more reliable, not because they were necessarily more destructive.

In addition, the arbitrary geographical limits set might be unintentionally violated by any biological weapon. Sanctuaries relied upon by one side and honored by the other could well be infected by the attacking biologics. Moreover, the agents could spread to neighboring countries. This is an extremely frightening prospect for conflicts on the Sino-Soviet periphery, such as those in Korea or Vietnam. An uncontrolled epidemic might quickly engage an otherwise uninvolved superpower in all-out war.

Lethal chemical weapons probably also pose an unacceptable risk of escalation by exceeding artificial restrictions on the type of weapon used, since successful nerve gas attacks might kill as many enemy troops as a nuclear blast.

Thus, both biological weapons and lethal chemicals could break delicate barriers which are relied upon to distinguish limited war from all-out war. But even

chemical agents which are not designed to kill the enemy may be dangerously escalatory and thus undesirable. This danger is a consequence of the psychological overtones associated with CBW. As we indicated at the beginning of this study, the term "chemical and biological warfare" masks a wide variety of weapons included in it. Since the entire category is normally eliminated from combat situations, with the exception of low level chemical agents which harrass or defoliate, using one of the more unusual forms of CBW immediately makes the use of all CBW weapons more likely.

The artificial psychological barrier between conventional and chemical-biological-nuclear warfare is an uncanny one. Reliance on it to distinguish limited from all-out war is wise. Breaking it in selected instances may mean breaking it altogether. Once gases and diseases are used on the battlefield, distinctions between types of gasses and diseases may seem academic.

The Vietnam experience has been deceptively fortunate. Escalation might well have occurred had the North possessed the weaponry or the Russians and Chinese the motivation to intensify the conflict. Initial world reactions to American tactics did not distinguish between types of gases. Distinctions were painstakingly clung to by the U.S., even though Hanoi lacked a chemical arsenal to force escalation with. If they had, the war might have lurched precipitously forward toward a full-scale holocaust when the first tear gas canister was introduced on the battlefield. The safest course is to observe the barriers without exception. For once the established barriers are broken, it may be too difficult or too late to erect new ones.

ii. *Initially limited conflicts.*—In those wars where the U.S. decides the stakes are high enough to warrant all-out war, weapons which are escalatory may have a place in our military plans. But inclusion of CBW in those plans depends upon how escalatory these weapons are when compared with others already in our arsenal. If they are at least equally likely to lead to all-out war, there seems to be no justification for using them when other weapons can produce similar military results.

A decision to run the risk of total war by first engaging in a limited war does not necessarily mean that we will follow a course inevitably culminating in total war. There would be little reason to alert the opposition if all-out war were certain to result from a local encounter. We will enter a limited conflict when the stakes justify total war only when there is a significant chance of deciding the issue without resorting to total war.

Put another way, we fight limited wars with an understanding that the objective is worth a risk of total war. That risk may be relatively high or relatively low. Once it is gauged, our strategy must be tailored accordingly. If we are willing to run a 70 percent chance of total war, then all military responses which make total war more than 70 percent likely are to be avoided. All weapons which do not make total war 70 percent likely can be used, even though they might be characterized as "escalatory." Given this theoretical framework, chemical and biological weapons could be justified in a limited war over high stakes if they were less escalatory than other systems with similar military capabilities.

It should be understood that the criteria for assigning an escalation coefficient to weapons is not their military effectiveness, but their psychological impact on the opposition. Because of the long tradition of abstinence from lethal chemicals, biological agents and nuclear devices in limited wars, all three weapons are likely to have a similar psychological impact on the enemy and therefore be equally escalatory.

Since we have been capable of fighting limited wars in the past without relying on anything more than conventional forces, a decision to use lethal chemical, biological or nuclear weaponry is an implicit admission that purely conventional strategy is incapable of achieving victory. It is a signal to the enemy that this realization was accepted and a recourse to new, escalatory weapons was chosen instead of surrender. The use of any of these weapons is a proc-

lamation that defeat will not be accepted without resorting to great military strength. With this warning, an enemy is just as likely to initiate an all-out war regardless of the particular weapon chosen to rupture the tradition of abstinence.

The possibility of escalation results from the breaking of tradition, not from the military mission these weapons are assigned. Their employment indicates that convenional warfare cannot do the job and defeat is unacceptable. Thus it is unlikely that lethal chemical or biological agents could be considered less escalatory than tactical nuclear weapons.

Consequently it seems that, in both the case of limited war which must stay limited and the case of limited war which runs the risk of total escalation, chemical and biological killers cannot be considered valuable for their non-escalatory characteristics.

3. Arms Control

To complete a strategy of finite deterrence, efforts must be constantly made to control the quantity and destructiveness of weapons. War is best deterred when neither side has sufficient hardware to fight one. It is best limited when the types of arms available are limited.

Lethal chemical and biological weapons impede both goals of arms control; thus there are two important reasons for seeking to control the development and proliferation of CBW.

According to publicized reports, both the U.S. and the Soviet Union have large stockpiles of these weapons. Arms control is therefore necessary to limit the quantity of arms available. The initial decision to stockpile has been made. Now the laborious process of disarming faces us.

We have indicated earlier that chemical and biological weapons are extremely destructive. The lethal agents kill large population masses when successfully employed. The non-lethal agents are also highly destructive and may lead to swift escalation when used.

The disarmament issues associated with chemical and biological weapons are in many ways unique. Since chemical and biological weapons have been developed as substitutes for other systems, disarmament can be pursued without significantly decreasing our security in the process.

a. Voluntary

Because it is doubtful that decreasing our CBW stockpiles would yield significant military danger, voluntary disarmament remains a possibility. It might significantly decrease international fears over the weapons even if no other power followed our lead. But there are strong reasons to believe that others would quickly join in a sincere move toward eliminating lethal chemical and biological weapons from the international scene. To some extent we have justified our stockpiles on the grounds that the Soviets have similar arsenals. Certainly neither side can be comfortable when an uncertain balance of terror exists instead of a calculated equilibrium or deterrence.

The Soviets have repeatedly called for accords on CBW, as have Germany and one of the leaders in biological testing—Great Britain. Thus, both sides may be anxious to be rid of their systems if only the other side begins the process. If it is correct to assume that U.S. military security would not be impaired by the elimination of CBW stockpiles, a viable proposal might be that the U.S. take the initiative; if others then followed our lead, world stability could very well be enhanced.

Voluntary disarmamnt in the field of chemical and biological weapons has much to commend it. Military strength could be maintained and similar disarmament might begin in other countries. Regardless of the consequences in the rest of the world, the U.S. could claim unchallenged leadership in the quest for arms control and gain immeasurable world support in her efforts.

b. Negotiated

In a framework of negotiated arms reductions, chemical and biological weapons also offer distinct possibilities. If it assumed that both sides truly fear their actual use in conflict, as public sentiment in both camps indicates, then both sides would be eager to eliminate them from their adversary's arsenal. Because the weapons are not essential to the security of either party, then both can offer major concessions without fearing military insecurity as a result. Thus, suggesting accords on chemical and biological weapons at the beginning of arms talks could test the sincerity of the other parties in achieving significant arms limitations. It could also develop procedures which could be duplicated in other phases of the proposed agreement.

i. *Secrecy and inspection.*—One important area of disagreement which could be resolved in a CBW pact is the joint issue of secrecy and adversary inspection. Chemical agents could easily be developed from compounds used for many industrial purposes. Biological agents could be produced in a converted brewery, far from the view of an adversary denied treaty inspection rights. Secret research could also nullify the effect of the agreement by developing new agents not covered by previous talks. While this may not shift the military balance, it would demean the prestige of the treaty if both parties realized that circumvention was relatively simple. To avoid circumvention of the agreement, on-site inspection procedures and fluid scientific exchanges must be demanded.

Experts have developed inspection patterns which they feel can insure a sufficient probability of detection to make treaty violation attempts unattractive. But because of the general lack of interest in arms control agreements over CBW, there have been no serious efforts to advance these systems in a formal agreement. If inspection systems are agreed to for chemical and biological weapons, their incorporation into nuclear treaties should be much easier.

Eliminating the secrecy which has previously surrounded CBW research and deployment is both necessary for a successful arms limitation agreement and wise as a measure designed to eliminate irrational fears associated with CBW in general. Because no one is quite sure of the extent of our CBW arsenal, whispered tales of a "doomsday bug" cannot be dismissed out of hand. Fear is generated both at home and abroad because of what *might be* stored in secret garrisons, not what is actually stockpiled there.

A second proposal could be the initiation of arms talks to consider CBW. If such advances are spurned, we might then advocate eliminating our stockpiles with wide public knowledge. Also to be considered as possible steps should be the de-classification of future research in the field. We gain nothing by hiding information about a weapons system that seems to be untrustworthy; yet we risk much by encouraging our opponents to believe the worst about such a weapons system.

ii. *Nuclear accords.*—If nuclear agreements are seriously contemplated, as we hope they are, then CBW accords are essential. Otherwise the existence of devastating chemical and biological reserves would subvert any nuclear agreement by continuing an arms race with CBW even though the nuclear surge had been halted. An agreement on nuclear weapons should be a signal that mass death is being made less likely, not that different weapons have been chosen to annihilate humanity.

III. THE RISKS

Incorporation of chemical and biological agents into our overall military strategy, it seems, would involve more than an unnecessary waste of funds for a marginal addition to our military might. Continuing secret research with these agents and augmenting stockpiles of those weapons which have reached the production stage would probably involve enormous risks for our own security and future world stability.

A. Of Use

It is frightening to realize that the dangers of using CBW are perceived most not by the uninformed but by those most knowledgeable in the field. Prize-winning biologists imagine with horror the ultimate consequences of a large biological attack. Chemists who have worked toward weapons development realize that even non-lethal agents can become killers if the wrong dosage is involved.

Our evaluation of the military merits of the various weapons points repeatedly to the following possible disadvantages: Plotting starvation in a world which is already wrestling with the spiraling problems of population and hunger is short-sighted. Tampering with nature's delicate balance is imprudent when the dangers associated with a volatile environment are incalculable. Initiating worldwide epidemics is indeed "medicine in reverse" and adds a dimension of horror and primitivism to modern warfare which is understandably decried by many.

It is important to appreciate the international repercussions of using chemical weapons in Vietnam. By making them respectable after an almost complete international avoidance of them since World War I, the U.S. has made all chemical weapons more attractive in any future war. Once the barrier between conventional and chemical weapons is broken, it is difficult if not impossible to erect new ones which distinguish between categories of chemical weapons.

There are several reasons why chemical warfare would be attractive to many nations once international prohibitions against their use could be easily ignored. They are relatively easy to develop and comparatively inexpensive if a nation feels a need for a mass killer to improve its security. The U.S. has already made scores of countries aware of the potential advantages that chemicals offer by training foreign military officers in the use of these weapons.

The recent Nuclear Non-Proliferation Treaty has made these weapons even more attractive. Denied access to nuclear weapons, countries which still feel a need to exercise independent initiatives with strategic weapons turn quite naturally to CBW. While previous international accords may have deterred them from actually using such weapons, our policies in Vietnam have made CBW a little more respectable and may have made CBW proliferation a real danger.

As with nuclear weapons, the U.S. loses a measure of security when many smaller countries possess a capacity for CBW. Chemical and biological weapons are equalizers in battle which mute the advantage the U.S. maintains in industrial strength and conventional military firepower. It would certainly be better to forego the marginal benefits which CBW provides if such abstinence made proliferation less likely. If weak opponents can respond with CBW, we would not only lose the advantage we had sought by using such weapons, but we would also face the neutralization of our conventional firepower advantage.

B. Of Stockpiles

The dangers of actual use obviously become greater as our stockpiles mount. Moreover, previous experience indicates that an impressive arsenal makes battlefield use quite likely. A long abstinence from all chemical and biological weapons was foresaken in Vietnam after a previous decision to research and develop the weapons had been made. During the conflict, only the decision to employ the gas was necessary. There have been reports that biological weapons were not used during the Cuban missile crisis because they were not available. Other sources indicate that biological strikes have been proposed during the current conflict but pressures to use them were successfully resisted.

It is reasonable to assume that as our capacities in the field of CBW grow, opportunities for using them will seem more numerous. One assent would set a perilous precedent. Reliance on the abstinence of the past does not insure continued avoidance if the weapons are constantly available when military plans are formulated. It is likely that only elimination of the weapons can insure avoidance of them and their inherent dangers.

C. Of Secret Possession

Yet, even before they are actually incorporated into normal combat operations, we run significant risks by testing and producing chemical and biological weapons. Presumably, chemical and biological agents significantly increase international instability and tension because rational calculations are very difficult. As with any weapons system, possession indicates the possibility of use. Thus, although we constantly profess peaceful policies and argue that CBW research is defense-oriented and stockpiling is for deterrent purposes, our adversaries remain unconvinced. They are frightened by our arsenal. Their fears may well lead to unstable relations between our nation and others.

Because of the possibility of covert biological attacks, these fears can conceive a crisis from an accident. If any country were to suffer a sudden epidemic of an unusual or unknown disease it might immediately assume that a traditional enemy had attacked it with biological weapons. Assurances to the contrary might prove futile. A war might begin because of a freak fever or a laboratory mishap. Adequate control of biological weapons could very well reduce the likelihood of such a scenario.

If detection devices were developed and installed, they could increase tensions as well. A false alarm could create diplomatic chaos as accusing fingers were pointed at dozens of potential attackers before the true origins of the alarm were discovered. By maintaining a large, secret arsenal, the U.S. runs the great risk of being a prime suspect if a CBW attack were alleged for any reason. Denying such a charge would be extremely difficult and shifting the blame to another nation may be politically impossible.

Not only are enemy intentions difficult to calculate when chemical and biological agents must be considered, but the capabilities of the enemy are also uncertain. As a possible victim of such an attack, a nation must calculate its position under the assumption that the weapons will be highly effective. Yet as a possible attacker, each nation must play it safe by assuming that these agents will be largely ineffective. The latter set of assumptions will usually persuade a nation not to attack, but the former hypothesis may make a country overly fearful of attack. While one party is developing a peaceful line of diplomacy because it assumes it does not have the capability to use CBW, its opponent is constantly on guard against a CBW attack because it is possible and it must be assumed successful. Neither party benefits from this two-edged sword. Stable relations are subverted because of the unstable calculations which must accompany all adversary situations involving CBW.

It is these risks which must be weighed against the alleged benefits of CBW. Because such questions concerning the disadvantages of CBW exist, there is clear cause to consider the elimination of chemical and biological weapons from our present arsenal.

When considering the desirability of crop destruction or defoliation, the indeterminate damage that may be done to the balance of nature in pursuit of military gain should not be forgotten. The marginal safety which biological weapons add to our deterrent ought to be coupled with the misery which an uncheckable epidemic could promote. Although the suggestion that the weapons be abandoned might seem too extensive. The uneasy diplomatic and political situation which inevitably haunts the nation if it retains them might warrant such thought.

As with any priority decision, serious consideration ought to be given to the alternative resource demands which the nation constantly makes. The scientific talent devoted to perfecting virulent disease strains may be more urgently needed in the quest for medical breakthroughs. The funds required for testing and producing delivery systems might be better spent alleviating the many domestic problems now facing the country. A decision on military affairs must be made within the context of competing peacetime demands. Thus the balance between costs and benefits, advantages and disadvantages must be struck after

weighing both military and non-military factors. In the case of CBW, especially lethal varieties, the balance seems heavily weighted against the weapons.

IV. CONCLUSION

One of the possible results of eliminating our silent arsenal might be the avoidance of the dangers of escalation presently believed associated with CBW. If such a policy were adopted, the risks of stockpiling and the horrors associated with using these weapons could be avoided.

Consideration of applying the brakes in our headlong rush toward developing chemical and biological killers should be a matter of the greatest urgency. These weapons seem ill-suited to today's military strategies. At best, they might be characterized as unacceptable substitutes for weapons already in use. Their abandonment could provide a greater atmosphere of rationality in military calculations and a more secure state of mind for modern day man by removing one horrifying threat to his existence.

TABLE 1.—GENERAL CHARACTERISTICS OF LETHAL CHEMICAL AGENTS

Type	Mechanism	Time for onset of effects	Examples
Nerve agent G	Interferes with transmission of nerve impulses.	Very rapid by inhalation (a few seconds)	Tabun, Sarin, Soman.
Nerve agent V	do	Very rapid by inhalation (a few seconds); relatively rapid through skin (a few minutes to a few hours).	VX.
Blister agent	Cell poison	Blistering delayed hours to days; eye effects more rapid.	Sulfur mustard; nitrogen mustard.
Choking agent	Damages lungs	Immediate to more than 3 hours	Phosgene.
Blood agent	Interferes with all respiration.	Rapid (a few seconds or minutes)	Hydrogen cyanide.
Toxin	Neuromuscular paralysis	Variable (hours or days)	Botulinum toxin.

Source: U.N. report.

ANNEX C.—SOME BIOLOGICAL AGENTS THAT MAY BE USED TO ATTACK MAN

Disease	Infectivity [1]	Transmissibility [2]	Incubation period [3]	Duration of illness [3]	Mortality [3]	Antibiotic therapy	Vaccination [4]
Viral:							
Chikungunya fever	Probably high	None	5 to 6 days	2 weeks—a few months.	Very low (<1 percent).	None	None.
Dengue fever	High	do	5 to 8 days	A few days to weeks.	Very low (<1 percent).	do	Do.
Eastern equine encephalitis	do	do	5 to 15 days	1 to 3 weeks	High (>60 percent)	do	Under development.
Tick-borne encephalitis	do	do	1 to 2 weeks	1 week to a few months.	Variable up to 30 percent.	do	Do.
Venezuelan equine encephalitis	do	do	2 to 5 days	3 to 10 days	Low (<1 percent)	do	Do.
Influenza	do	High	1 to 3 days	do	Usually low, except for complicated cases.	do	Available.
Yellow fever	do	None	3 to 6 days	1 to 2 weeks	High (up to 40 percent).	do	Do.
Smallpox	do	High	7 to 16 days	12 to 24 days	Variable but usually high (up to 30 percent).	do	Do.
Rickettsial:							
Q-fever	do	None or negligible	10 to 21 days (sometimes shorter).	1 to 3 weeks	Low (usually 1 percent).	Effective	Under development.
Psittacosis	do	Moderately high	4 to 15 days	1—several weeks	Moderately high	do	None.
Rocky Mountain spotted fever	do	None	3 to 10 days	2 weeks to several months.	Usually high (up to 80 percent).	do	Under development.
Epidemic typhus	do	do	6 to 15 days	A few weeks to months.	Variable but usually high (up to 70 percent).	do	Available.

Bacterial:							
Anthrax (pulmonary)	Moderately high	Negligible	1 to 5 days	3 to 5 days	Almost invariably fatal.	Effective if given very early.	Do.
Brucellosis	High	None	1 to 3 weeks	Several weeks to months.	Low (<5 percent)	Moderately effective	Under development.
Cholera	Low	High	1 to 5 days	1 to several weeks	Usually high (up to 80 percent).	do	Available.
Glanders	High	None	2 to 14 days	4 to 6 weeks	Almost invariably fatal.	Little effective	None.
Melioidosis	do	do	1 to 5 days	4 to 20 days	Almost 100 percent fatal.	Moderately effective	Do.
Plague (pneumonic)	do	High	2 to 5 days	1 to 2 days	do	Moderately effective if given early.	Available.
Tularemia	do	Negligible	1 to 10 days	2 to several weeks	Usually low sometimes high (up to 60 percent).	Effective	Do.
Typhoid fever	Moderately high	Moderately high	1 to 3 weeks	A few to several weeks.	Moderately high (up to 10 percent).	Moderately effective	Do.
Dysentery	High	High	1 to 3 days	A few days to weeks.	Low to moderately high depending on strain.	Effective	None.
Fungal: Coccidioido mycosis	do	None	1 to 3 weeks	A few weeks to months.	Low	None	Do.

[1] Infectivity: Indicates the potency of the parasite to penetrate and multiply in the host's organisms, regardless of the clinical manifestation of illness. In fact, there are several agents by which the great majority of the exposed population will be infected without developing clinical symptoms.

[2] Transmissibility: This refers to direct transmission from man to man without the intervention of any arthropod vector.

[3] The figures listed under incubation period, duration of disease, and mortality are based on epidemiological data. They vary, according to variations in virulence and dose of the infecting agent, resistance of the host, and many other factors. It also should be noted that, if the agents concerned, would be deliberately spread in massive concentrations as agents of warfare, the incubation periods might be shorter and the resulting symptoms more serious. As to mortality, this refers to the ratio between the number of fatalities to the number of diseased (not to that of infected) individuals, if no treatment is given.

[4] The availability of vaccines is no indication of their degree of effectiveness.

Source: U.N. report.

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BANNING POISON GAS AND GERM WARFARE: SHOULD THE UNITED STATES AGREE?

GEORGE BUNN*

The United States Army Field Manual on the Law of Land Warfare states flatly that

> the United States is not a party to any treaty, now in force, that prohibits or restricts the use in warfare of toxic or nontoxic gases . . . or of bacteriological warfare. . . . The Geneva Protocol for the prohibition in war of asphyxiating, poisonous, or other gases, and of bacteriological means of warfare . . . is . . . not binding on this country.[1]

This article will consider whether the principles of the Geneva Protocol have become so widely accepted that they apply to the United States even though it is not a party. It will analyze the effect of existing reservations to the Protocol, discuss the United States use of tear gases and herbicides in Vietnam in light of its provisions, and recommend that the Protocol be approved by the Senate. This article will first describe the international agreements dealing with poison gas and germ warfare, and the reasons which prevented the United States from becoming a party to them.

I. INTERNATIONAL AGREEMENTS DEALING SPECIFICALLY WITH POISON GAS OR GERM WARFARE

A. The Hague Gas Declaration of 1899

The first treaty dealing specifically with poison gas was the 1899 Hague Gas Declaration which contained an agreement "to abstain from the use of projectiles the sole object of which is the diffusion of asphyxiating or deleterious gases."[2] Twenty-seven states became parties to this declaration, including all participants in the conference except the United States.[3] The American representative, Navy Captain Alfred T. Mahan, refused to agree because gas projectiles were not yet in practical use or fully developed,

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[1] THE LAW OF LAND WARFARE, DEPARTMENT OF THE ARMY FIELD MANUAL FM 27-10, ¶ 38, at 18-19 (1956).

[2] Declaration (IV 2) Concerning Asphyxiating Gases reprinted in J.B. SCOTT, THE HAGUE CONVENTIONS AND DECLARATIONS OF 1899 AND 1907, at 225-26 (3d ed. 1918).

[3] *Id.* at 226.

and because he thought gas warfare was just as humane as other forms of warfare.[4]

The language of this declaration was so limited that it had little if any effect on gas warfare during the First World War. In the first major poison gas attack of the War, at Ypres in 1915, the chlorine gas used by the Germans came from large cylinders, not the "projectiles" described in the declaration.[5] The French used projectiles containing tear gas which they said was not an "asphyxiating or deleterious" gas within the meaning of the declaration.[6] Similarly, a projectile used by Germany did not have "as its sole object" the diffusion of poison gas because, the Germans argued, it was also used for shrapnel.[7] With these and other arguments, the existing limitations on poison gas were brushed aside in the First World War.

B. The 1919 Versailles Treaty

The treaty contained the following provision:

> The use of asphyxiating, poisonous, or other gases and of analogous liquids, materials or devices being prohibited, their manufacture and importation are strictly forbidden in Germany.[8]

While the United States failed to give its consent to the ratification of the Versailles Treaty primarily because of its provisions establishing a League of Nations,[9] the quoted language was incorporated by reference in the 1921 Treaty of Berlin between the United States and Germany.[10] But the United States regarded it as only applicable to Germany.[11] World War I treaties of peace

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4 J.B. Scott, The Hague Peace Conferences: American Instructions and Reports 36 (1916).

5 *See* E. Castren, The Present Law of War and Neutrality 195 (1954); M. Greenspan, The Modern Law of Land Warfare 360 (1959); J. Spaight, Air Power and War Rights 189 (3rd ed. 1947). *See also* V. Lefebure, The Riddle of the Rhine 33-34 (1921).

6 Bernstein, *The Law of Chemical Warfare*, 10 Geo. Wash. L. Rev. 889, 905-06 (1942).

7 E. Castren, *supra* note 5, at 195; Bernstein, *supra* note 6, at 907. This argument was not, however, the basic justification given by Germany for the use of gas. See Kelly, *Gas Warfare in International Law*, 9 Military L. Rev. 1, 39-40 (1960).

8 Treaty of Versailles, June 28, 1919, § 171, reprinted in 3 Treaties, Conventions, International Acts, Protocols and Agreements 3331, 3402 (Redmond ed.); 2 A. Toynbee, Major Peace Treaties of Modern History 1265, 1367 (1968).

9 W.S. Holt, Treaties Defeated by the Senate 249-307 (1933).

10 42 Stat. 1939, 1943 (1921) T.S. No. 658, at 14.

11 The United States' view is necessarily implied by the quotation from the *Army Field Manual* set forth at the beginning of this article. It is based upon the language of article 171 itself, and of the 1921 Treaty of Berlin which incorporated article 171 by reference for the benefit of the United States. *See* Kelly, *supra* note 7, at 24 & n.113.

applicable to Austria, Bulgaria, and Hungary contained similar provisions.[12]

C. *The 1922 Washington Treaty on Submarines and Noxious Gases*

Drawing on the language of the peace treaties, the Washington Treaty stated:

> The use in war of asphyxiating, poisonous or other gases, and all analogous liquids, materials or devices, having been justly condemned by the general opinion of the civilized world and a prohibition of such use having been declared in treaties to which a majority of the civilized Powers are parties,
>
> The Signatory Powers, to the end that this prohibition shall be universally accepted as a part of international law binding alike the conscience and practice of nations, declare their assent to such prohibition, and agree to be bound thereby between themselves and invite all other civilized nations to adhere thereto.[13]

This provision was based upon a United States proposal and was adopted at the urging of Secretary of State Hughes.[14] Perhaps to help achieve later Senate consent, Senator Elihu Root was asked to represent the United States at the conference. In addition Secretary Hughes took pains to have an advisory committee of prominent citizens appointed by President Harding and attempted to mobilize popular opinion behind the treaty.[15] As a result, the Senate gave its consent without a dissenting vote.[16] French ratification was necessary, however, and the treaty failed because of French objections to its provisions on submarines.

D. *The 1925 Geneva Protocol*

This protocol added to the poison gas prohibition of the Washington Treaty a ban on bacteriological warfare. It provided in pertinent part:

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[12] *See* 5 H. TEMPERLY, A HISTORY OF THE PEACE CONFERENCE OF PARIS 209 (1920-24).

[13] Treaty Relative to the Protection of the Lives of Neutrals and Noncombatants at Sea in Time of War and to Prevent the Use in War of Noxious Gases and Chemicals, February 6, 1922, § V, reprinted in 3 TREATIES, CONVENTIONS AND INTERNATIONAL ACTS, *supra* note 8, at 3116, 3118.

[14] *See* text at note 116 *infra*.

[15] *See* R. BUELL, THE WASHINGTON CONFERENCE 206 n.9 (1922); F.J. BROWN, CHEMICAL WARFARE, A STUDY IN RESTRAINTS 64 (1968). Among the members of the advisory committee were Samuel Gompers, Herbert Hoover (then Secretary of Commerce), John L. Lewis, General Pershing, Rear Admiral Rodgers, Franklin Roosevelt (then Assistant Secretary of the Navy), and J. Mayhew Wainright (Assistant Secretary of War).

[16] 62 CONG. REC. 4723-30 (1922).

> Whereas the use of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world; and
>
> Whereas the prohibition of such use has been declared in Treaties to which the majority of Powers of the world are Parties; and
>
> To the end that this prohibition shall be universally accepted as part of International Law, binding alike the conscience and the practice of nations:
>
> Declare:
>
> That the High Contracting Parties, so far as they are not already Parties to Treaties prohibiting such use, accept this prohibition, agree to extend this prohibition to the use of bacteriological methods of warfare and agree to be bound as between themselves according to the terms of this declaration.[17]

The Geneva Protocol was adopted at the insistence of the United States.[18] However, probably because of the ease with which the Washington Treaty had sailed through the Senate, Secretary of State Kellogg did not make the effort to gain support for the Geneva Protocol that Secretary Hughes had made earlier for the Washington Treaty.[19] Although Congressman Burton was the head of the United States delegation, no Senator was included.[20] No advisory committee was enlisted. The Army's Chemical Warfare Service was not prevented from mobilizing opposition to the protocol.[21] It enlisted the American Legion, the Veterans of Foreign Wars, the American Chemical Society, and the chemical industry.[22] Senator Wadsworth, Chairman of the Military Affairs Committee, led the Senate opponents of the protocol.[23] He argued that it would be torn up in time of war, and that poison gas was in any event more humane than many other weapons. Senator Borah, Chairman of the Senate Foreign Relations Committee, finally withdrew the treaty from Senate consideration, presumably because he and the Senate majority leader had concluded that they did not have the votes.[24]

The protocol came into force, however, without the United States.

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17 Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, June 17, 1925; 94 L.N.T.S. No. 2138, at 67 (1929).

18 *See* text at note 121 *infra*.

19 *See* F.J. BROWN, *supra* note 15, at 99.

20 *Id.*

21 For a history of the activities of the opponents and proponents of the protocol, see *id.* at 102-08.

22 *Id.*; *see also* 68 CONG. REC. 152-54 (1926).

23 *See* 68 CONG. REC. 144-46 (1926).

24 *Id.* at 368.

It now has over 60 adherents.[25] All members of NATO except the United States, and all Warsaw Pact members, including the Soviet Union, are parties. Indeed, all European states except Albania have joined the protocol. Of the major industrial countries, only Japan and the United States have failed to become parties.

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[25] The following states have ratified or acceded to the Geneva Protocol on the dates set opposite their names according to the files of the Department of State: Australia, January 22, 1930; Austria, May 9, 1928; Belgium, December 4, 1928; Bulgaria, March 7, 1934; Canada, May 6, 1930; Ceylon, January 20, 1954; Chile, July 2, 1935; China, August 7, 1929; (On July 13, 1952, the People's Republic of China issued a statement recognizing as binding upon it the accession to the Protocol "in the name of China" on August 7, 1929.); Cuba, June 24, 1966; Cyprus, December 12, 1966; Czechoslovakia, August 16, 1938; Denmark, May 5, 1930; Estonia, August 28, 1931; Ethiopia, September 18, 1935; Finland, June 26, 1929; France, May 9, 1926; Gambia, November 16, 1966; Germany, April 25, 1929; (In 1959 Czechoslovakia transmitted to France, the depositary government, an instrument of adherence from the German Democratic Republic.); Ghana, May 3, 1967; Greece, May 30, 1931; Holy See (Vatican), October 18, 1966; Hungary, October 11, 1952; Iceland, November 2, 1967; India, April 9, 1930; Indonesia, October 31, 1930; Iran, July 4, 1929; Iraq, September 8, 1931; Ireland, August 18, 1930; Italy, April 3, 1928; Latvia, June 3, 1931; Liberia, April 2, 1927; Lithuania, June 15, 1933; Luxembourg, September 1, 1936; Madagascar, August 12, 1967; Maldive Islands, January 6, 1967; Mexico, March 15, 1932; Monaco, January 6, 1967; Netherlands, October 31, 1930; (Accession by the Netherlands included Surinam, the Netherlands Antilles, and the Netherlands Indies [Indonesia]. On December 27, 1949, sovereignty over Indonesia was transferred from the Netherlands to the Republic of Indonesia. The Agreement on Transitional Measures adopted by the Round Table Conference at The Hague on November 2, 1949, provides that treaties and other international agreements concluded by the Netherlands are in force for the Republic of Indonesia.); New Zealand, January 22, 1930; Niger, April 19, 1967; Norway, July 27, 1932; Pakistan, 1947; (Pakistan is a party by reason of paragraph 4 of the annex to the Indian Independence Act.); Paraguay, 1933; (In 1933 Paraguay sent to France a note of accession to the Protocol, but there is no record that France notified the other signatories of the accession.); Poland, February 4, 1929; Portugal, July 1, 1930; Rumania, August 23, 1929; Rwanda, June 25, 1964; Sierre Leone, March 20, 1967; Spain, August 22, 1929; Sweden, April 25, 1930; Switzerland, July 12, 1932; Tanzania, April 22, 1963; (Tanganyika acceded to the Protocol on April 22, 1963. In a note dated May 6, 1964, the United Republic of Tanganyika and Zanzibar informed the U.N. Secretary-General that all international agreements formerely in force between either country and other States would continue in force for the United Republic.); Thailand, June 6, 1931; Tunisia, July 12, 1967; Turkey, October 5, 1929; Uganda, May 24, 1965; Union of South Africa, January 22, 1930; United Kingdom, April 9, 1930; U.S.S.R., April 5, 1928; U.A.R., December 6, 1928; (All international agreements concluded with Egypt remain in force for the United Arab Republic.); Venezuela, February 8, 1928; Yugoslavia, April 12, 1929; (Yugoslavia is a party by virtue of the ratification in the name of the Kingdom of Serbs, Croats, and Slovenes on April 12, 1929. The Kingdom changed its official title to "Kingdom of Yugoslavia" in 1929 and in 1954 to the "Federal People's Republic of Yugoslavia."). The following countries have signed the Protocol but have not ratified it to date: United States, Brazil, El Salvador, Japan, Nicaragua, Uruguay.

Of the nuclear weapon powers, only the United States remains outside the protocol.

Many persons credit the protocol with a major role in preventing gas warfare in Europe during World War II.[26] It symbolized

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[26] At the beginning of the war, Britain and France reaffirmed their "intent to abide by the terms of the Geneva Protocol . . . ." assuming Germany did the same. See F.J. BROWN, *supra* note 15, at 210. Britain apparently considered using gas should all other weapons fail to prevent invasion. *Id.* at 227-29. The protocol, and the revulsion against poison gas which it symbolized, constituted a restraint. But, in the opinion of Major Brown who has examined many of the British internal papers, the fear of German retaliation was the primary deterrent. *Id.* at 230.

In response to the British and French declaration of intention to abide by the Geneva Protocol, Germany stated it would "observe during the war the prohibitions which form the subject of the Geneva Protocol . . . ." *Id.* at 230-31. Germany also considered using poison gas. Major Brown concludes that the three factors which prevented German use of gas were fear of retaliation, the initial abhorrence of gas by key military and civilian decision makers, and a lack of readiness resulting in part from this abhorrence and in part from the ban on manufacture and importation of poison gas in the Versailles Treaty. *Id.* at 231, 235-45, 293.

In his summary of the restraints in effect on belligerents during World War II, Major Brown concludes that the legal restraints were "moderately effective, but in an unanticipated sense." *Id.* at 291-94. He believes that the interwar conferences and treaties served to focus renewed public and elite group attention on chemical warfare. This resulted even in military distaste for it, insufficient training and preparation to use it, and strong aversion towards it by high civilian and some military leaders.

> [T]he primary value of the legal restraint rests in its tendency to reinforce other restraints. Treaty prohibition, though imperfect, reinforced both public and military dislike and fear of chemical warfare and provided a ready excuse for lack of substantive preparation.

Id. at 293.

For views giving greater weight to the effect of the protocol in preventing poison gas warfare in World War II, see, *e.g.*, A. ENOCK, THIS WAR BUSINESS 95-96 (1951); O'Brien, *Biological/Chemical Warfare and the International Law of War*, 51 GEO. L.J. 1, 35-36 (1962). *But see, e.g.*, Kelly, *supra* note 7, at 42 (public opinion and the fear of retaliation were the only effective restraints in World War II).

The official Soviet view is that the protocol greatly contributed to the nonuse of poison gas during World War II. See U.N.G.A. Statement of Soviet Representative Tsarapkin, United States Arms Control and Disarmament Agency, 1961 DOCUMENTS ON DISARMAMENT 577 [hereinafter cited as DOCUMENTS ON DISARMAMENT with the appropriate year designated]. Soviet ENDC Representative Roshchin stated in 1968:

> The Geneva Protocol set a legal barrier to the use of such [gas and bacteriological] means of mass destruction, and this was of great importance in the Second World War. The warning given by the Powers of the anti-Hitler coalition that the use of gases and bacteriological means of warfare was inadmissible and that a violator would not go unpunished had its effect on fascist Germany. In giving that warning the Powers of the anti-Hitler coalition based themselves on that important international agreement, The Geneva Protocol of 1925.

ENDC/PV. 389, at 25 (Aug. 13, 1968).

The official U.S. view puts considerable weight on the effect of the declaration threatening retaliation against any use of gas by enemies of the United States, a declaration which was made by President Roosevelt in

the abhorrence for gas which even military men had after World War I. This abhorrence contributed to restraints imposed by both civilian and military leaders.[27] If retaliation was the primary sanction acting to deter the use of poison gas and germs, the protocol established the norm of conduct.[28] Unlike World War I, no gas warfare occurred among the industrial states of Europe.

II. International Limitations Established by Custom

The foregoing brief history has shown that the United States is not a party to any treaty which expressly prohibits it from engaging in gas or bacteriological warfare. To this extent, the *Army Field Manual's* statement is correct. However the principles of the protocol appear to form a rule of customary international law applicable even to the United States.

> Custom is the older and the original source of international law. . . . International jurists speak of a *custom* when a clear and continuous habit of doing certain actions has grown up under the aegis of the conviction that these actions are, according to international law, obligatory and right.[29]

To determine the existence of a customary rule of international law, state practice with respect to the use of poison gas and biological weapons in war should be examined. Where that practice indicates nonuse, the question must still be answered whether this was based on a belief that a rule of international law existed even for those not parties to the protocol. The recent practice and official views of the United States and Japan appear to be most relevant as they are the only major industrial states which have not ratified the protocol.

A. Practice and Belief of States on Gas and Germ Warfare Since the Geneva Protocol of 1925

1. United States

The United States did not engage in gas warfare during World War II although it could have been to our military advantage in the Pacific in 1945. At the beginning of United States participation in World War II, the State Department became concerned that the Japanese, not being parties to the Geneva Protocol, would engage in chemical warfare.[30] The British, French, Italian, and German Governments had exchanged pledges to observe the

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1943. *See* U.N.G.A. Statement of U.S. Representative Nabrit, in 1966 Documents on Disarmament 800-01; U.N.G.A. First Comm. Statement of U.S. Representative Foster, in 1963 Documents on Disarmament 600.

27 *See* note 26 *supra.*

28 *Id.*

29 1 L. Oppenheim, International Law § 17 (8th ed., H. Lauterpacht ed. 1955).

30 F.J. Brown, *supra* note 15, at 198.

protocol; the British had made the same offer to Japan, but it replied evasively.[31] The State Department proposed that a declaration be made to Japan that the United States would comply with the protocol if others did. Secretary of War Stimson, however, opposed any acceptance of the protocol by declaration. In February of 1942 he urged that we "keep our mouths shut," apparently because he was concerned about our preparedness to retaliate if the Japanese used gas.[32]

In June 1942, President Roosevelt was importuned by the Chinese to issue a statement concerning reported Japanese use of noxious gases in China.[33] Without referring to the protocol, Roosevelt threatened "retaliation in kind and in full measure" if Japan persisted "in this inhumane form of warfare" against China or any other American ally.[34]

A year later the United States was better prepared to retaliate, if necessary, and Roosevelt issued a more comprehensive statement. Again, however, he did not refer to the protocol:

> From time to time since the present war began there have been reports that one or more of the Axis powers were seriously contemplating use of poisonous or noxious gases or other inhumane devices of warfare.
>
> . . . .
>
> Use of such weapons has been *outlawed by the general opinion of civilized mankind.* This country has not used them, and I hope that we never will be compelled to use them. I state categorically that we shall under no circumstances resort to the use of such weapons unless they are first used by our enemies.
>
> As President of the United States and as Commander in Chief of the American armed forces, I want to make clear beyond all doubt to any of our enemies contemplating a resort to such desperate and barbarous methods that acts of this nature committed against any one of the United Nations will be regarded as having been committed against the United States itself and will be treated accordingly. We promise to any perpetrators of such *crimes* full and swift retaliation in kind. . . .[35]

After Germany was defeated, consideration was given to using poisonous gas on Japanese forces in the Pacific in order to bring the war swiftly to an end.[36] However, the joint chiefs never recommended its use to the President. Personal and institutional distaste for chemical warfare among military men probably played

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31 *Id.*
32 *Id.* at 199.
33 *Id.* at 200.
34 *Id.* at 201.
35 8 DEP'T STATE BULL. 507 (1943) (emphasis added).
36 F.J. BROWN, *supra* note 15, at 262, *et seq.*

a major role.[37] The military view that gas was an insidious and dishonorable weapon did not necessarily mean that all military decisionmakers agreed with President Roosevelt that the use of gas had been "outlawed by the general opinion of civilized mankind." But some did.[38] President Roosevelt's statement would, in any event, have been a hurdle to overcome even though his death left any final decision to President Truman.

The United States did not use gas warfare in Korea although authority to do so was requested by some of our commanders in the field.[39] Our preparedness was greater than that of the North Koreans or mainland Chinese, and the gas might have been useful in flushing the enemy out of entrenched positions.[40] When the North Koreans accused United States forces in Korea of germ warfare, American representatives denied the charges, maintaining that such warfare was abhorrent.[41] Although not decisive, our failure to use gas in Korea and our defense against the germ warfare charge are evidence that we believed the use of poison gas and germ warfare to be wrong.

During the period between the Korean and Vietnam conflicts, Congressman Kastenmeier (D. Wis.) precipated a debate on the use of chemical and biological warfare by introducing a draft concurrent resolution which would have reaffirmed

> the longstanding policy of the United States that in the event of war the United States shall under no circumstances resort to the use of biological weapons or the use of poisonous or obnoxious gases unless they are first used by our enemies.[42]

Congressman Kastenmeier deduced from public statements and articles that the Defense Department was attempting to relax policy strictures on chemical and biological warfare.[43] When asked whether his administration was contemplating changing United States policy against initial use of chemical and biological weapons, Presdent Eisenhower said that "no official suggestion has been made to me, and so far as my own instinct is concerned, it is not to start such a thing first."[44] Officials of the Eisenhower

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[37] *Id.* at 282.

[38] *See id.* at 284-85, 288; W. LEAHY, I WAS THERE 439-40 (1950).

[39] *See* Kelly, *supra* note 7, at 14; J. ROTHSCHILD, TOMORROW'S WEAPONS 5 (1964).

[40] *See* Kelly, *supra* note 7, at 14; J. ROTHSCHILD, *supra* note 39, at 5.

[41] *See* B. BECHOFER, POSTWAR NEGOTIATIONS FOR ARMS CONTROL 196-201 (1961). The North Korean and Communist Chinese authorities refused to let a U.N. investigating commission enter their territories to determine the truth of their charges against the United States.

[42] H.R. RES. NO. 433, 86th Cong., 1st Sess. (Sept. 3, 1959).

[43] *See* 105 CONG. REC. 18016-18 (1959).

[44] 1960-61 PUBLIC PAPERS OF THE PRESIDENTS OF THE UNITED STATES, DWIGHT D. EISENHOWER 29.

administration later opposed the Kastenmeier resolution, however, and it was never brought to a vote.[45]

Assuming that our use of tear gases and herbicides in Vietnam does not violate the Geneva Protocol, we have observed its principles in that war. Moreover, in replying to Communist charges of violation, United States representatives excepted tear gases and herbicides from the provisions of the protocol, thereby implying a conviction that we had to observe those provisions.[46] Similarly, Secretary Rusk insisted that we were not "embarking upon gas warfare in Vietnam. . . . We are not talking about gas that is prohibited by the Geneva Convention of 1925 or any other understandings about the use of gas."[47]

In 1966, the United States sponsored and voted for a United Nations General Assembly resolution which called for "strict observance by all states of the principles and objectives of the Protocol" and condemned "all actions contrary to those objectives."[48] A United States delegate stated that "while the United States is not a party to the Protocol, we support the worthy objectives which it seeks to achieve."[49] Following this resolution, the State Department took the view that, by voting for the resolution, "the United States reaffirmed its long-standing support for the principles and objectives of the Protocol."[50] In this view, the "basic rule" set forth in the protocol "has been so widely accepted over a

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[45] *See* Chemical-Biological-Radiological (CBR) Warfare and its Disarmament Aspects, A Study Prepared by the Subcommittee on Disarmament of the Senate Committee on Foreign Relations, 86th Cong., 2d Sess. 21 (1960) for reactions to the Kastenmeier proposal.

The Defense Department responded: "Similar declarations might apply with equal pertinency across the entire weapons spectrum, and no reason is perceived why biological and chemical weapons should be singled out for this special attention." The State Department added: "As a member of the United Nations, the United States, as are all other members, is committed to refrain from the use, not only of biological and chemical weapons, but the use of force of any kind in a manner contrary to that organization's charter." *Id.* at 22.

[46] *See* U.N.G.A. Statement of U.S. Representative Nabrit, *supra* note 27, at 801; U.N.G.A. First Comm. Statement of ACDA Director Foster, 1966 DOCUMENTS ON DISARMAMENT 740-42.

[47] 52 DEP'T STATE BULL. 528 (1965).

[48] G.A. RES. 2162(B) (XXI), reprinted in 1966 DOCUMENTS ON DISARMAMENT 798. On December 20, 1968, the General Assembly adopted a resolution reiterating "its call for strict observance by all States of the principles and objectives of the Geneva Protocol of 17 June 1925 . . . ." G.A. RES. 2454A (XXIII). The United States voted for this resolution.

[49] U.N.G.A. Statement by U.S. Representative Nabrit, *supra* note 26, at 801.

[50] Letter from Assistant Secretary of State William B. Macomber to Congressman Rosenthal (D. N.Y.), Dec. 22, 1967. Deputy Secretary of Defense Vance testified in 1967 that the Department of Defense supported the United States' affirmative vote in the United Nations General Assembly last December on a resolution calling on all nations to observe the principles and objectives of the Geneva Protocol of 1925.

long period of time *that it is now considered to form a part of customary international law.*"[51]

2. JAPAN

During World War II the Japanese did use poison gas and replied evasively to a proposal that they observe the Geneva Protocol.[52] In 1944, however, they used neutral diplomatic channels to communicate to the United States a denial of the use of gas "during the present conflict." They further declared that they had "decided not to make use of it in the future on [the] supposition that troops of [the] United Nations also abstain from using it."[53] Japanese internal records state that this decision was based upon a recognition of a legal obligation not to use gas, upon Japan's small stockpile as compared with that of the United States, and upon the vulnerability of Japanese islands to Allied retaliation.[54] After the war, a Japanese court said, by way of dicta, that the use of poison gas and bacteria in war violated international law.[55]

Japan voted for the 1966 United Nations resolution calling for "strict observance by all states of the principles and objectives" of the Geneva Protocol. During the debate, the Japanese representative stated the belief of his delegation "that in any circumstances of war the use of chemical and bacteriological weapons should be most strictly avoided."[56]

Japan's wartime actions up to 1944 revealed a conviction that it was not bound by any rule of international law prohibiting the

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> *We have observed these principles consistently since 1925*, although the United States . . . did not ratify the Geneva Protocol. We have consistently continued our *de facto limitations* on the use of chemical and biological weapons.

Hearings on United States Armament and Disarmament Problems before the Subcomm. on Disarmament of the Senate Comm. on Foreign Relations, 90th Cong., 1st Sess. 55 (1967) (emphasis added). See also Deputy Secretary Vance's letter to Congressman Kastenmeier (D. Wis.) of Mar. 31, 1965 in which he said, among other things, that "national policy does proscribe the first use of lethal gas by American forces . . . ."

[51] Letter of William B. Macomber, *supra* note 50. In a letter to Congressman Wolff (D. N.Y.), July 24, 1967, U.S. Ambassador to the U.N., Arthur J. Goldberg stated:

> The United States position on this matter [poison gas] is quite clear and corresponds to the stated policy of almost all other governments throughout the world as reflected in the voting (91 in favor and 4 abstentions) on U.N.G.A. Resolution 2162B of 1966 which condemned the use of poison gas in warfare. *The use of poison gases is clearly contrary to international law* . . . . (Emphasis added).

[52] F.J. BROWN, *supra* note 15, at 247-48.

[53] *Id.* at 249.

[54] *Id.* at 260.

[55] Shimoda v. State, (Tokyo Dist. Ct., Dec. 7, 1963), reprinted in 8 JAPANESE ANNUAL OF INTERNATIONAL LAW 241-42 (1964).

[56] 21 U.N. GAOR, 1st Comm. 201 (1966). Japan also voted for the 1968 General Assembly resolution referred to in note 48 *supra*.

use of poison gas in war. Its conduct since then, although not free from ambiguity, tends toward recognition of a prohibition on such warfare applicable to Japan.

B. The Effect of Customary Limitations

The practices and convictions of states before the 1966 United Nations resolution have been described by other writers.[57] There

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[57] Professor William O'Brien of Georgetown University made a lengthy survey of state practices and convictions before the 1966 U.N. resolution. He believed the failure of any belligerent, even those not party to the protocol, to use chemical warfare during World War II, was remarkable. The conclusions of his survey are:

> (1) Customary international law and the Geneva Protocol to which most states adhere prohibit the first use of *chemical* weapons but permit retaliation in kind. (2) While there is no customary international law prohibiting *biological* warfare, its first use is denied to adherents to the Geneva Protocol.

Biological/Chemical Warfare and The International Law of War, 51 GEO. L.J. 1, 59 (1962) (emphasis added). A respected British authority reached a similar result; H. Lauterpacht concluded that the cumulative effect of "customary law and of the existing instruments having binding force . . . is probably to render such prohibition [on chemical warfare] legally effective upon practically all States." 2 L. OPPENHEIM, INTERNATIONAL LAW 344 (7th ed. H. Lauterpacht ed. 1952). A French expert reached similar conclusions, see Meyrowitz, note 62 *infra*. Robert Tucker, Johns Hopkins School of Advanced International Studies and a consultant to the Naval War College, concluded that a customary rule existed against "poisonous or asphyxiating gases" but not against other gases or chemical agents. *The Law of War and Neutrality at Sea*, in 1955 INTERNATIONAL LAW STUDIES 52-53 & n.16 (U.S. Naval War College 1957).

Even before the 1966 U.N. resolution, some authorities believed custom prohibited both chemical *and bacteriological* warfare. Georg Schwarzenberger, Director of Studies at the London Institute of World Affairs, wrote in 1958:

> The prohibition of chemical and bacteriological warfare contained in the Protocol must be taken to be merely declaratory of international customary law and equally binding on all states. It then becomes irrelevant whether any particular State is a party to the Geneva Protocol of 1925.

THE LEGALITY OF NUCLEAR WEAPONS 38 (1958). Morris Greenspan concluded that the Geneva Protocol, although by its terms binding only between contracting powers, is now so "universally recognized" that it "must be regarded as binding the community of nations independently of treaty obligation." THE MODERN LAW OF LAND WARFARE 354 (1959).

Other authorities writing before the 1966 U.N. resolution doubted the existence of a broad customary rule prohibiting chemical or bacteriological warfare. Professor Joseph L. Kunz of University of Toledo Law School believed that chemical and bacteriological warfare could only be banned by agreement to which "at least all militarily important states are parties." *The New U.S. Army Field Manual on the Law of Land Warfare*, 51 AM. J. INT'L L. 388, 396 (1957). Professor Myres McDougal of Yale concluded that "it remains controversial whether a general prescription has emerged that is operative not only as against the . . . nations which have ratified the Protocol but also as against those which have not, such as the United States." M. MCDOUGAL & F. FELICIANO, LAW AND MINIMUM WORLD PUBLIC ORDER 637 (1961). Julius Stone, Challis Professor of International Law and Jurisprudence, University of Sidney, concluded in 1954 that whether

is no general agreement among these commentators on a rule of customary international law applicable to those not party to the Geneva Protocol. One major stumbling block for some scholars was that the United States, the strongest military power, had not ratified the protocol.[58] Nor had we, before 1966, issued any general declaration indicating an intent to observe its principles. Even the Roosevelt statement of 1943 failed to refer to the protocol.[59]

In 1966, however, we sponsored and voted for language in a United Nations resolution calling for "strict observance by all States of the principles and objectives of the Protocol" and condemning "all actions contrary to those objectives."[60] Ninety other countries voted for this resolution.[61] Having, in effect, agreed to observe the principles of the protocol, the United States, Japan, and other nonparties which supported the resolution supplied

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toxic gases were then prohibited in war by international law was debatable. In the case of bacteriological warfare, he said that the only prohibition was upon parties to the Geneva Protocol.

> Since, moreover, the United States is not a party to the Geneva Gas Protocol, and it is unlikely that that State will be neutral in any major war, it is apparent that whether the prohibition on bacteriological warfare operates in such a war *will depend upon the willingness of that State to accept voluntarily the self-denying ordinance of the Protocol.*

LEGAL CONTROLS ON INTERNATIONAL CONFLICT 556-57 (1954) (emphasis added).

Three U.S. Army officers surveyed the practices and convictions of states on chemical or bacteriological warfare shortly before the 1966 U.N. resolution: Colonel Bernard Brungs, Major Joseph Kelly, and Major William Neinast. None concluded that there was a customary international rule broadly prohibiting the first use of chemical or biological weapons in war. Kelly, however, concluded that customary law prohibited the United States from using poison gas directly against noncombatants or in situations where the pain and suffering caused by such agents would be disproportionate to the military gain. *Gas Warfare in International Law, supra* note 7, at 64. Brungs found a customary international law rule prohibiting the first use in war of toxins—poisonous products of micro-organisms. *The Status of Biological Warfare in International Law*, 24 MILITARY L. REV. 47, 90 (1964). Neinast found no customary rule whatever in the biological area. *The Status of Biological warfare in International Law*, 24 MILITARY L. REV. 1, 43 (1964).

[58] *See* Kunz, McDougal, and Stone, *supra* note 57.

[59] *See* note 35 *supra* and accompanying text.

[60] G.A. RES. 2162(B), *supra* note 48.

[61] *See* 1966 DOCUMENTS ON DISARMAMENT 798 n.1. Albania, Cuba, France, and Gabon abstained. Of these, only France is a party to the protocol. The French representative stated that a "condemnation of chemical weapons in general" could not be "predicated upon the text of the Geneva Protocol." He added that it was difficult to demand "that states which have not signed and ratified a treaty or convention comply with its principles or norms." In his belief, the proposal of the U.S. and others that the resolution call for observance of the "principles and objectives" of the protocol did not eliminate all objections and might "alter the letter, and certainly, the spirit of the Protocol." 21 U.N. GAOR, 1st Comm., P.V. 201, at 204 (1966).

significant evidence of the existence of a customary rule. Added to the other evidence about which the commentators have argued, these actions strongly indicate a customary rule banning the first use of poison gas and germ weapons in accordance with the principles of the protocol.[62]

This may be an unexpected conclusion for many. To say that the United States must observe the principles of a treaty which was never ratified by the Senate is unusual. There are, however, a few precedents in United States practice.[63] In addition German defendants in the Nuremburg trials were convicted of violating treaty standards under circumstances in which Germany had no treaty obligation.[64] The evidence of a customary rule in the case

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62 It would be difficult to consider this document [the resolution] as meaning less than it says. What it says is the affirmation of the validity of the precept enunciated in the Geneva Protocol as an obligation having force of law over all countries—the prohibition of the use of chemical and/or biological instruments of warfare. We are forced to conclude that the rule of international customary law prohibiting CW [chemical warfare], a rule which existed already aside from the Protocol, must now be considered as extending to BW [bacteriological warfare].

From an unpublished paper prepared for the Swedish Institute of Peace Research and Conflict Resolution by the French authority Henri Meyrowitz, Biological Weapons and International Law, Prohibition of the Use of Biological Weapons and Proposals for Banning the Production of Such Weapons (April 1967).

63 There is no doubt that, when all or most of the Great Powers have deliberately agreed to certain rules of general applicability, the rules approved by them have very great weight in practice among States which have never consented to them. . . . A striking proof of this tendency was given in the war of 1898 between Spain and the United States. Neither belligerent was a party to the article of the Declaration of Paris of 1856 against privateering; the United States had in fact refused to join in it. . . . Nevertheless, when the war of 1898 broke out, the United States proclaimed its intention of adhering to the Declaration of Paris, and the rules laid down were in fact observed by both belligerents . . . .

Pollock, *Sources of International Law*, 18 L.Q. Rev. 418, 419 (1902).

The United States regards a number of almost universal, treaty-originated rules as applicable to other states which are not parties to the treaty in question. In an opinion of March 4, 1966, the legal adviser of the Department of State said that "much of the substantive law of the [U.N.] charter has become part of the general law of nations through wide acceptance by nations the world over." 54 Dep't State Bull. 474, 476 n.3 (1966). The *Army Field Manual* on the law of land warfare states that

even though States may not be parties to, or strictly bound by, the 1907 Hague Conventions and the 1929 Geneva Convention relative to the Treatment of Prisoners of War, the general principles of these conventions have been held declaratory of the customary law of war to which all States are subject. For this reason, the United States has adopted the policy of observing and enforcing the terms of these conventions in so far as they have not been superseded by the 1949 Geneva Conventions . . . .

The Law of Land Warfare, *supra* note 1, at i. *See also* ¶¶ 6-7, at 6-7.

64 *See* United States v. Goering, in Opinion and Judgment of the International Military Tribunal 48-49, 82-83 (1947). A Soviet military tribunal sitting in Khabarovsk in December 1949 convicted a number of Japanese for engaging in bacteriological warfare against the Mongolian

of the Geneva Protocol is at least as strong as that relied upon at Nuremberg.

III. Reservations to the Geneva Protocol

France, the first nation to ratify the protocol, affixed a statement to her ratification, the first paragraph of which reads: "The said Protocol is only binding on the Government of the French Republic as regards States which have signed or ratified it or which may accede to it."[65] This statement appears to have been made out of an abundance of caution because the protocol itself said that parties "agree to be bound as between themselves."[66] Since this "reservation" does not change the treaty's legal effect, it probably does not constitute a true reservation to the protocol requiring acceptance by other parties.[67] In any event, the records disclose no formal objection to it.

A number of later adherents to the treaty followed the French example. However, since the principles of the protocol appear now to have become a rule of general application by custom, the French first paragraph and others like it are probably no longer mean-

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People's Republic in 1939 and against the Chinese in 1940-1942. 2 L. Oppenheim, *supra* note 57, at 343 n.2. A British military manual notes that inasmuch as "Japan was not a party to the Protocol, the Russian Military Tribunal at Khabarovsk . . . would therefore seemed to have assumed that the prohibition of bacteriological warfare derived from the customary law of war prevailing among civilized nations . . . ." Quoted in O'Brien, *supra* note 57, at 34 n.90.

Part of the indictment brought against Japan by the Tokyo War Crimes Tribunal was "[e]mploying poison contrary to the international Declaration respecting Asphyxiating Gases, signed by (*inter alia*) Japan and China at the Hague on the 29th of July 1899 . . . and Article 171 of the Treaty of Versailles. In the wars of Japan against the Republic of China, poison gas was used . . . ." Japan was a party to the Treaty of Versailles but article 171 was directed at Germany. *See* note 11 *supra* and accompanying text. The judgment does not deal with this charge. *See* O'Brien, *supra* note 57, at 34 n.90.

[65] The list of parties to the Protocol together with their dates of adherence appears at note 25 *supra*. The texts of the reservations, as they appear in the files of the Department of State, appear in the Appendix following the article.

[66] The relevant language of the protocol is quoted in the text at note 17 *supra*. The French reservation, however, implies that France intended to be bound "as regards States which have *signed or* ratified" the protocol. In this respect the reservation appears to go beyond the actual obligation of the protocol. France, as the first of the signatories to ratify, probably intended this only as a gesture toward those signatories which had not yet ratified but were expected soon to do so.

[67] A reservation is a formal declaration made by a signatory before it becomes bound by an international agreement that the agreement will not be binding upon it except upon terms that it regards as changing the effect of the agreement under international law.

Restatement (Second) of the Foreign Relations Law of the United States § 124 (1965). See also *id.* comment c and illustrations 2 and 3.

ingful.[68] Thus, if all states must observe the principles of the protocol, France would appear to be obligated not to initiate the use of poison gas or germ warfare against any state even though the reservation said France was bound only to parties.[69]

The French statement has a second paragraph which reads: "The said Protocol shall *ipso facto* cease to be binding on the Government of the French Republic in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol."[70] The main purpose of this paragraph was probably to make clear that France would be free to retaliate against an enemy who violated the protocol to the injury of France. As far as this purpose is concerned, the statement may not be a true reservation since it reflects a general rule of treaty interpretation: material breach by one of the parties to a multilateral treaty permits an aggrieved party to suspend performance of its obligations toward the violator.[71]

Paragraph two is, however, broader than this rule. It would suspend the obligations of the protocol for France when an ally of an enemy of France, whether or not the ally was a party, failed to observe the protocol, even though France was not itself aggrieved. For example, if before the fall of France in World War II, Japan (a nonparty) had used gas against China, France would have been free to use gas against Hitler, Japan's ally.[72] Without the reservation, France would still have had an obligation not to use gas on Germany.

The necessary conclusion is that paragraph two is broader than the interpretation which would have been given to the protocol without the reservation. It is in this respect a true reservation. The question arises whether other parties have accepted it as a limitation on the obligations of France under the protocol. Since the French were the first to ratify, all later parties had notice of their reservation and are bound by it because they did not object when they became parties.[73] The Soviet Union and several of its

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[68] *See* notes 29-64 *supra* and accompanying text. In the Nuremburg trials, the court held that custom had rendered ineffective an article from the Hague Convention of 1907 which was somewhat similar to the French paragraph 1 reservation. The court said that "by 1939 these rules laid down in the convention were recognized by all civilized nations . . . ." United States v. Goering, *supra* note 64, at 83.

[69] "To the extent to which the Protocol should be considered as stating or constituting a rule of customary law . . . the first of the two clauses [i.e., French first paragraph] has lost its significance." Meyrowitz, *supra* note 62, at 5.

[70] *See* Appendix.

[71] RESTATEMENT, *supra* note 67, at § 158; see Opinion of the Legal Adviser of the Department of State, in *Hearings on Executive M before the Senate Foreign Relations Comm.* 88th Cong., 1st Sess. 37-40 (1963).

[72] Meyrowitz, *Les Armes Psychochimiques et le Droit International*, 10 *Annuaire Francais de Droit International* 81, 100 n.51 (1964).

[73] RESTATEMENT, *supra* note 67, at § 128, comments d and f.

East European allies, Great Britain and several of the members of the Commonwealth, Belgium, and the Netherlands, ratified the protocol after France did with reservations like the French paragraph two.[74] But are states which adhered to the protocol *before* one of these later reservations was entered bound by it? For example, is Italy, which ratified without reservation after France but before the Soviet Union, bound by the Soviet paragraph two?

In the presence of objection to a reservation, the traditional rule is that there are no treaty relations between the reserving party and a party which objects because the reservation amounts to a "counter offer" which has not been accepted.[75] As already indicated, Italy is bound by the French reservation because she had notice of it *before* becoming a party. However, she did not receive notice of the Soviet reservation until after she had adhered to the treaty and is not bound by it unless her silence can be construed as acquiescence.[76] Since she did not object to the French paragraph two before becoming a party, she would appear to have had little reason to object to the similar Soviet paragraph two. Common sense and modern practice say she is bound by the Soviet reservation.[77]

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[74] See Appendix for the language of all the reservations. There are variations in these reservations but none appears to be significantly broader than the French reservation. The Soviet reservation, for example, states that the protocol shall cease to be binding on the U.S.S.R. in regard to all enemy states "whose armed forces or those Allies *de jure* or in fact do not respect" the protocol. The phrase "*de jure* or in fact" does not appear in the French reservation. However, the phrase apparently means "Allies *de jure* or in fact" rather than "*de jure* in fact do not respect." A translation from the Russian by experts on Soviet treaty practices confirms this view. *See* J. TRISKA & R. SLUSSER, THE THEORY, LAW AND POLICY OF SOVIET TREATIES 82 (1962) ("the formal or factual allies of which"). If this translation correctly reflects the Soviet intention, its scope does not appear broader than the French reservation.

The Dutch reservation applies only to chemical warfare but is otherwise like the French reservation. There are other minor variations, but none seem to be of great significance.

[75] RESTATEMENT, *supra* note 67 at § 128, comment f, illustration 2. In the case of treaties (such as the protocol) which are intended to have the widest possible application for humanitarian reasons, the International Court of Justice has said that this traditional rule should be modified somewhat. If the reservation, although the subject of an objection, is "compatible with the purpose and object" of the treaty, the reserving party may be regarded as a party despite the objection. *Reservations to Genocide Convention*, [1951] I.C.J. 29-30.

[76] *See* RESTATEMENT, *supra* note 67, at § 128, comment d.

[77] *Id.* at § 128, comments d and h; *Reservations to Genocide Convention*, [1951] I.C.J. 24-26; International Law Comm'n, Report, 21 U.N. GAOR, Supp. 9, art. 17(5) (1966) ("a reservation is considered to have been accepted by a State if it shall have raised no objection to the reservation by the end of a period of twelve months after it was notified of the reservation or by the date on which it expressed its consent to be bound by the treaty, whichever is later.") *But see* 5 G. HACKWORTH, DIGEST OF INTERNATIONAL LAW § 482 (1943); A. MCNAIR, THE LAW OF TREATIES 159 (1961).

Since no objections have been found to any reservations, all adherents to the protocol appear to have treaty relations with all other adherents. Moreover, the differences in obligations between those with reservations and those without appear to be relatively unimportant. As already stated, reservations of the paragraph one variety are no longer meaningful since the principles of the protocol appear to have become applicable to all states through custom. Paragraph two reservations, on the other hand, are probably as important now as they were when drafted because of the alliance arrangements formed during and after World War II. The position of the United States with respect to chemical warfare during this war was clearly influenced by the alliance of the Axis Powers against the Allies. President Roosevelt's famous 1943 declaration said that the use of poison gas by "*any of our enemies . . . against any one of the United Nations* [the Allies] will be regarded as having been committed against the United States itself and will be treated accordingly. We promise *any perpetrators* of such crimes full and swift retaliation in kind . . . ."[78] If the protocol had been binding on the United States subject to such a reservation, its obligations would have been suspended "in regard to *any enemy State* whose armed forces *or whose allies* fail to respect the prohibitions laid down in the Protocol." President Roosevelt promised retribution against the "perpetrator," the state using gas. Paragraph two is not by its terms so limited. More importantly, perhaps, President Roosevelt did not condition United States retaliation upon injury to the United States itself. Neither would paragraph two.

The alliances formed since the war seem quite consistent with the policy behind paragraph two. Article five of the North Atlantic Treaty provides that an armed attack against one or more of the allies in Europe or North America "shall be considered an attack against them all . . . ."[79] Somewhat similar provisions appear in our agreements with our Latin American and Asian allies.[80] The Soviet Union has made comparable promises to its East European allies in the Warsaw Pact.[81] These pro-

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[78] *See* text at note 35 *supra* (emphasis added).

[79] 62 Stat. 2241 (1949), 2244, T.I.A.S. No. 1964.

[80] *See, e.g.*, Inter-American Treaty of Reciprocal Assistance, Sept. 2, 1947, 62 Stat. 1681, T.I.A.S. No. 1838; Security Treaty between Australia, New Zealand, and the United States, Sept. 1, 1951, [1952] 3 U.S.T. 3420, T.I.A.S. No. 2493; Mutual Defense Treaty between the United States and the Philippines, Aug. 30, 1951, [1952] 3 U.S.T. 3947, T.I.A.S. No. 2529; Mutual Defense Treaty between the United States and the Republic of Korea, Oct. 1, 1953, [1954] 3 U.S.T. 2368, T.I.A.S. No. 3097; South East Asia Collective Defense Treaty, Sept. 8, 1954, [1955] 1 U.S.T. 81, T.I.A.S. No. 3170; Mutual Defense Treaty between the United States and the Republic of China, Dec. 2, 1954, [1955] 1 U.S.T. 433, T.I.A.S. No. 3178; Treaty of Mutual Cooperation and Security between the United States and Japan, Jan. 19, 1960, [1960] 2 U.S.T. 1633, T.I.A.S. No. 4509.

[81] Treaty of Friendship, Cooperation and Mutual Assistance, May 14, 1955, in 1955 DOCUMENTS ON INTERNATIONAL AFFAIRS 193-97.

visions anticipate that major war, if it comes, will be fought by military alliances, and that all those within an alliance will cooperate to repulse an attack. States on one side are likely to regard all allies on the other side as enemies—at least those which participate in or support an attack. Once poison gas or germs are used in a war of alliances, both the victim and its allies will be under pressure to retaliate or threaten retaliation in kind, not only against the wrongdoer but also against the wrongdoer's important allies. For example, if East Germany attacked West Germany with gas, the United States might be expected by its allies to retaliate against the Soviet Union unless that country took immediate steps to prevent a recurrence of the attack.[82] President Kennedy's threat of retaliation upon the discovery of Soviet missles in Cuba is illustrative. He declared:

> It shall be the policy of this nation to regard any nuclear missile launched *from Cuba against any nation in the Western Hemisphere* as an attack *by the Soviet Union* on the United States, requiring a full retaliatory response upon the Soviet Union.[83]

Most protocol parties having paragraph two reservations are now members of alliances with military responsibilities. In any future European war involving chemical or biological agents, the allies on one side are likely to regard the use of such weapons by an ally on the other as suspending their protocol obligations toward all members of the other side. Under these circumstances, paragraph two reservations would probably be regarded as being in effect for each of the allies on both sides even though some NATO allies and some Warsaw Pact members had not in fact entered such a reservation. This result would equalize the duties of states under the protocol, thereby producing that mutuality of obligation which states customarily desire. Thus, Italy, which did

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[82] The rules of war limiting the right of reprisal contemplate that certain preliminary steps will be taken before retaliation even if the obligations of the protocol are suspended by the terms of paragraph two. O'Brien lists the following rules on reprisals which he believes should be applicable in the event of use of poison gas or germs in war:

> (1) There must be an antecedent international delinquency by an enemy.
>
> (2) The victim of the delinquency, having made a conclusive determination that the violation has occurred, must use all lawful means at his disposal to induce the delinquent to desist from his illegal behavior.
>
> (3) If there appears to be no reasonable hope for cessation of the illegal behavior of the enemy, the injured belligerent may retaliate with means that would normally be denied it by the law.
>
> (4) The reprisal should be proportionate to the illegal act or acts which engendered the right of reprisal.

O'Brien, *supra* note 57, at 45. *See also* THE LAW OF LAND WARFARE, *supra* note 1, ¶ 497, at 177-78.

[83] 47 DEP'T STATE BULL. 718 (1962).

not object to a Soviet paragraph two but did not enter such a reservation herself, would be on the same footing with regard to the protocol as the Soviet Union.[84] Finally, a significant result of paragraph two is to influence allies toward a common policy of observing the protocol for, if one does not, the others may be subject to retaliation.[85] For all these reasons, the leeway given by paragraph two will probably be regarded as acceptable at least in cases where any of the allies on either side of a future conflict have entered paragraph two reservations. Thus, in any war involving existing alliances, the obligations of all those participating will likely be limited by paragraph two. Differences in the obligations involved in different treaty relationships resulting from the nonuniversality of paragraph two do not therefore seem too important to the United States under all the circumstances.[86]

IV. Interpretation of the Protocol in Light of United States Practices in Vietnam

A. Tear Gases

The United States, South Vietnam, and Australia have used tear gases in the war in Vietnam.[87] The North Vietnamese and Viet Cong have used such gases also,[88] but were not the first to do so. Whether the Geneva Protocol prohibits the use of tear gases in war is an unsettled question. The United States' view is that the protocol

> was framed to meet the horrors of poison gas warfare in the First World War and was intended to reduce suffering

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[84] In the view of the International Law Commission, a reservation which is accepted by silence by a state already a party to the treaty not only modifies the relevant treaty provisions to the extent of the reservation *for the reserving party*, but "[m]odifies those provisions to the same extent for such other party in its relations with the reserving State." International Law Comm'n, Report, *supra* note 77, art. 19(1)(b).

[85] The second clause . . . takes on a deterrent character which is far from negligible in a war involving a coalition. In fact, its effect is to create between belligerents who are members of a coalition, whether or not they signed the Protocol, a common position in regard to the prohibitions laid down on the document. If belligerents who are obligated, but also protected, by the Protocol learn that this protection is jeopardized by a possible course of action on the part of an ally who is not very vulnerable to reprisals himself, it is natural that their destiny and their desire should weigh heavily against a decision of that ally to use weapons prohibited by the Protocol.

Meyrowitz, *supra* note 62, at 5.

[86] *Cf.* Meyrowitz, *supra* note 72, at 100. Meyrowitz here expresses concern about the lack of clarity resulting from the different "regimes" of treaty relationships, the differences depending on whether paragraph two reservations have been entered or not. The reconciliation attempted in the text would help remove the lack of clarity as well as equalize obligations.

[87] S. Hersh, Chemical and Biological Warfare 167-86 (1968).

[88] F.J. Brown, *supra* note 15, at 309.

> by prohibiting the use of poisonous gases such as mustard gas and phosgene. It does not apply to all gases. It would be unreasonable to contend that any rule of international law prohibits the use in combat against an enemy, for humanitarian purposes, of agents that Governments around the world commonly use to control riots by their own people.[89]

The Soviet Union and its allies take the position that the use of tear gases in war is prohibited by the Geneva Protocol.[90] The issue has been in contention for a long time, and no consensus exists on its resolution.

The Geneva Protocol prohibits "the use in war of asphyxiating, poisonous or other gases . . . ." "Other" must include gases not properly described as "asphyxiating" or "poisonous." It certainly includes mustard gas which was not regarded as "asphyxiating" or "poisonous" by experts at the time the protocol was negotiated.[91] Whether it also includes tear gases—which are neither "asphyxiating" nor "poisonous"—is unclear.

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[89] U.N.G.A. Statement of U.S. Representative Nabrit, *supra* note 26, at 800.

[90] *See, e.g.*, U.N.G.A. First Comm. Statement of Soviet Representative Shevchenko, in 1967 DOCUMENTS ON DISARMAMENT 663-66; U.N.G.A. First Comm. Statement of Hungarian Representative Csatorday, in 1966 DOCUMENTS ON DISARMAMENT 734-38.

[91] Mustard gas was designed by Germany to bypass the gas masks used effectively by the Allies. It attacked a man's whole body, creating large but relatively painless blisters on his skin. While it produced eight times as many Allied casualties as all other gases utilized, it caused few deaths. Kelly, *supra* note 7, at 10.

In response to a League of Nations request, experts from a number of countries provided information from which a report on the effects of chemical and bacteriological weapons was compiled in 1924. The experts divided the then known chemical "noxious substances" used in war into three classes apparently corresponding to "poisonous," "asphyxiating," and "all other." These classes were:

> *Toxic agents* which affect the nervous system (*e.g.*, derivatives of prussic acid).
>
> *Suffocating or asphyxiating agents* which cause fatal damage to the lungs (*e.g.*, chlorine and phosgene) or which directly affect the blood (*e.g.*, carbon monoxide).
>
> *Irritant (lachrymatory [tear producing], sneeze-producing and blistering) agents.*

The report based on the experts' advice goes on:

> *Effects of Irritant Agents*
>
> These bodies possess the property of putting a man out of action without killing him.
>
> (a) *Lachrymatory Agents* deprive a man of one of his essential senses—sight. They produce intolerable pain in the neighborhood of the external organs of sight and render a man practically blind as long as he remains in the gas-impregnated atmosphere. But, contrary to public popular opinion, says Professor Zanetti [of Columbia University], the blinding effects of these gases is purely temporary, being caused only by irritation of the membrane of the eyelids and not by any deep-seated effect on the eyeball or optic nerve. The effect usually passes in a few hours, or a few days at the most, and although the victim is as completely put out of action as if his eyes

The principle of *ejusdem generis* suggests that the word "other" should draw some meaning from "asphyxiating" or "poisonous" and that, therefore, the "other gases" prohibited must be similarly deleterious to man.[92] This is consistent with the apparent meaning of the French text of the protocol which is equally authentic.[93] That text proscribes the use in war of "gas asphyxiants, toxiques or similaires." "Similaires" or "similar gases" presumably include those which are not asphyxiating or poisonous but which have similar effect.[94] But whether "other" and "similaires" include only

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were gouged out, there is no record of permanently serious effect being produced thereby.

The efficacy of lachrymatory gas, coupled with its property of not causing permanent disablement, has led to its adoption by police organizations. By its means criminals may be captured without loss of life.

(b) *Sneeze-producing Agents* are arsenical compounds . . . : they cause constant and uncontrolled sneezing attacks of suffocation and intolerable headaches. They drive men to get rid of their protecting masks, thus exposing them to toxic products which may be fired concurrently or immediately after the sneeze-producing gas.

(c) *Blistering Agents.* Certain products such as dichlorethyl sulphide, also called "mustard gas" or "yperite," cause lesions to the skin and mucous membranes which may be of a very serious character. Whenever the skin is exposed even to the vapour exhaled from the slow evaporation of yperite, blisters appear within two to eight hours. . . . In short . . . this action is . . . capable of producing most serious effects on the health of the men who have been subject to it.

Moreover—and this is the principal effect—soil which is saturated with yperite contaminates by contact persons who pass over or are posted on it. The yperite penetrates the fabric of clothing and turns it into an actual blistering plaster. . . . The ground and any articles which have been impregnated with the gas remain dangerous for a number of days.

In discussing the combined effects of irritants, suffocating or asphyxiating, and toxic agents, Professor Mayer of France said:

All the lachrymatory and suffocating gases *are fatal if taken in large quantities.* If the blistering substances, instead of affecting the skin penetrate the lungs, they produce fatal lesions. Thus the effect to which we refer when we speak of a lachrymatory or blistering substance *is only the predominant effect.* . . . It would, therefore, be a mistake to classify chemical compounds according to the gravity of the symptoms to which they give rise. (Emphasis added).

Professor Zanetti remarked that "the dropping of a few aeroplane bombs filled with a high-power lachrymatory gas would as effectively shut down a factory, say, a steel mill, for as long as a month without causing any considerable destruction of life or property such as would ensue by long-range shelling or bombing with high explosive.

LEAGUE OF NATIONS OFF. J., Spec. Supp. 26, at 122-24 (1924). See V. LEFEBURE, *supra* note 5, at 25-28.

92 *Cf.* McBoyle v. United States, 283 U.S. 25 (1931) (phrase "*any other* self-propelled vehicle not designed for running on rails" does *not* include *aircraft* because it is preceded by "automobile, automobile truck, automobile wagon, motor cycle" all of which are *land* vehicles).

93 *See* note 17 *supra* and accompanying text.

94 *See* Meyrowitz, *supra* note 72, at 94. Meyrowitz interprets "toxiques" in the French text to include gases which do no more than injure health. In his view, "similaires" therefore must encompass gases, such as tear gases, which do something less. However, this definition of "toxiques"

gases causing death or serious injury, or whether they include tear gas also, is still not clear.

Some commentators have argued that the English text's use of "other" included tear gases even though the French text used "similaires."[95] Others have reached the contrary view.[96] None has presented a detailed analysis of the negotiating history to buttress his case.

The pertinent language of the protocol is derived from the Washington Treaty on Submarines and Noxious Gas of 1922, which was in turn derived from the Treaty of Versailles of 1919. The history of each, the Geneva Protocol, the Washington Treaty, and the Versailles Treaty, must therefore be examined.

1. THE TREATY OF VERSAILLES

The French were using tear gases for domestic police purposes as early as 1912.[97] Tear gas was used in World War I to a limited extent by both the French and the Germans. After the war the fear of the kinds of gases the Germans had used for major attacks (*e.g.*, chlorine, phosgene, and mustard gas) produced the widespread international concern about all chemical warfare.[98]

During consideration of provisions limiting German rearmament in the Treaty of Versailles, a commission of military experts suggested a provision which read: "Production or use of asphyxiating, poisonous or *similar* gases . . . are forbidden."[99] This draft was approved in principle by the heads of government and foreign ministers and turned over to a drafting committee.[100] That committee produced a draft which read: "The use of asphyxiating, poisonous or other gases . . . . *being prohibited*, their manufacture and importation are strictly forbidden in Germany."[101] The French text contained the same word, "similaires" for "other," as does the Geneva Protocol.

The drafting committee's text shows recognition that there were

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seems inconsistent with the view of the technical experts in 1924. See note 91 *supra*.

95 *See, e.g.*, J. SPAIGHT, *supra* note 5, at 190; A. WALTZOG, RECHT DER LAUDKRIEGSFUHRUNG 37 (1942, Dep't State translation of 1951); Meyrowitz, *supra* note 72, at 94-95. *Cf.* Stone, *supra* note 57, at 555; O'Brien, *supra* note 57, at 57, 60; notes 104, 118, 124 *infra*.

96 *See, e.g.*, Greenspan, supra note 57, at 359 n.186. *Cf.* KUNZ, GASKRIEG UND VOLKERRECHT 36, 51, 70-71 (1927); M. Mc DOUGAL & F. FELICIANO, *supra* note 57, at 636-37; Kelly, *supra* note 7, at 51-52, 60; notes 104, 107 *infra*.

97 A.M. PRENTISS, CHEMICALS IN WAR 688 (1937).

98 *See* notes 89, 91 *supra* and 119 *infra* and accompanying texts.

99 4 FOREIGN RELATIONS OF THE UNITED STATES, THE PARIS PEACE CONFERENCE 1919, at 232 (1943).

100 *Id.* at 362. Balfour for the United Kingdom referred to the prohibition as being on the manufacture of "asphyxiating gases." *Id.*

101 *Id.* at 388.

existing prohibitions ("being prohibited") against the *use* of poison gases in war, but none against their "manufacture or importation" in Germany. There is no record that the draftsmen discussed tear gas or regarded their change of "similar" to "other" as significant. The drafting committee's text was accepted by Wilson, Lloyd George, Clemenceau, and other leaders without any indication that they were aware that the committee had in any way changed the meaning of the text they had approved earlier. Later, just before the text was submitted to the Germans, it was presented to a preliminary conference by a French rapporteur who, in analyzing the provisions of the treaty, said that "poison gas" was what was to be denied to the Germans.[102]

The records of the conference do not disclose what earlier prohibitions the draftsmen relied upon when they produced a draft saying "asphyxiating, poisonous or other gases . . . *being prohibited* . . . ." They may have been referring to the Hague Gas Declaration of 1899 which prohibited "the use of projectiles the sole object of which is the diffusion of *asphyxiating* or *deleterious* gases."[103] However, both the British and the French believed that this language did not include tear gas.[104] The Versailles "being prohibited" language most likely referred to the 1907 Hague Convention rules against "poison or poisoned weapons," against killing or wounding "treacherously," and against employing war material calculated to cause "unnecessary suffering."[105] These rules prob-

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102 *Id.* at 377.

103 *See* text at note 2 *supra.*

104 For the French view, see text at note 6 *supra.* In 1913, the British considered that a "lachrymatory [tear causing] substance without asphyxiating or deleterious effect" was permitted by the wording of the declaration, "although contrary to its spirit." F.J. BROWN, *supra* note 15, at 7-8.

Some German writers have concluded that the declaration prohibited tear gas. This would support the German contention that chlorine was used at Ypres in retaliation to French first use of tear gas. See, *e.g.*, *id.* at 6-7 n.6; E. CASTREN, *supra* note 5, at 195; Bernstein, *supra* note 6, at 905-06. (Such a French first use may have occurred but it finds no proof in available archives of the governments concerned. See F.J. BROWN, *supra* note 15, at 6 n.6; Kelly, *supra* note 7, at 8 n.28.) Other German writers reach the opposite conclusion. Their views are described in Meyrowitz, *supra* note 72, at 92 n.31.

An American technical expert says there are grounds for supposing that by a strict technical interpretation, the French use of tear gas grenades violated the 1899 Declaration. "This opinion, however, proceeds from toxicological knowledge not available at the outset of World War I. No government can be criticized for using against an invading enemy, weapons employed against its own unruly nationals." A.M. PRENTISS, *supra* note 97, at 688. Other writers conclude that the 1899 Declaration did not prohibit tear gas. *See, e.g.*, E. CASTREN, *supra* note 5, at 193; T.J. LAWRENCE, THE PRINCIPLES OF INTERNATIONAL LAW 531 (Winfield ed. 1923).

105 Regulations Respecting the Law and Customs of War on Land, Hague Convention No. IV, Oct. 18, 1907, art. 23(a),(b),(e) (1907), reprinted in 2 TREATIES, CONVENTIONS, INTERNATIONAL ACTS, PROTOCOLS AND AGREE-

ably apply to gases that inflict suffering disproportionate to their military value and, perhaps, to gases which can be assimilated with traditional poisons because they are deadly, painful, and treacherous.[106] However, no authority has been found for the proposition that they prohibit the use of tear gases in war.[107] Quite likely no prohibition on such usè was recognized as in "being" in 1919 when the language of the Treaty of Versailles was drafted. Therefore, that treaty probably did not prohibit tear gases to Germany.

2. THE 1922 WASHINGTON TREATY

This treaty also prohibits the use in war of "asphyxiating, poisonous or other gases." Its French text contains the same word "similaires" for "other."[108] The negotiating history indicates that the Versailles language was offered by the American delegation because many countries had already agreed to it. The language appears to have represented a compromise between conflicting points of view. The technical experts of the negotiating countries were unable to agree on any general prohibition on chemical warfare. The United States experts contended, with their French and British colleagues, that poison gas was similar as a weapon to shrapnel, machine guns, and bombs.[109] The Italians and Japanese disagreed.[110] Finally, the experts concluded that the only limitation "practicable" was to "prohibit the use of gases against cities and other bodies of noncombatants . . . ."[111] This result was not accepted by the Advisory Committee to the United States delegation even though the American expert had agreed to it. "Whatever may be the arguments of the technical experts," said the Advisory Committee, the "conscience" of the American people insists "upon the total abolition of chemical warfare, whether in the Army or Navy, whether against combatant or noncombatant."[112]

MENTS 2269, 2285 (Malloy ed.); J.B. SCOTT, *supra* note 2, at 116. The United States adhered to this convention.

106 *See, e.g.*, E. CASTREN, *supra* note 5, at 194.

107 Lawrence concludes that tear gases did not violate the Hague Regulations. T.J. LAWRENCE, *supra* note 104, at 531. Castren points out that the prohibition on poison and poisoned weapons did not even "extend to asphyxiating gases." E. CASTREN, *supra* note 5, at 194. See also NAVAL WAR COLLEGE, 1935 INTERNATIONAL LAW SITUATIONS 102 (1936).

108 For the language of the treaty, see text at note 13 *supra*.

109 *See* CONFERENCE ON THE LIMITATION OF ARMAMENT 730 (Washington, 1921-1922); *Conference on the Limitation of Armament*, S. Doc. No. 126, 67th Cong., 2d Sess. 384-88 (1922). The chairman of the experts committee was the president of the American Chemical Society and the American expert was the head of the Army's Chemical Warfare Service.

110 CONFERENCE ON THE LIMITATION OF ARMAMENT, *supra* note 109, at 730.

111 *Id.*

112 *Id.* at 732.

The Advisory Committee clearly wished to prohibit the use of tear gases in war, saying that "there can be no actual restraint of the use by combatants of this new agency of warfare, *if it is permitted in any guise.*"[113] Agreeing with this view was a report of the Navy General Board which specifically referred to "tear gases." The board said that "there will be great difficulty in a clear and definite demarcation between the lethal gases and those which produce unnecessary suffering as distinguished from those gases which simply disable temporarily."[114] The American Advisory Committee recommended that the conference bar all of these kinds of gases. It proposed a resolution to be adopted by the conference recommending that "[c]hemical warfare, including uses of gases, whether toxic or nontoxic, should be prohibited by international agreement . . . ."[115]

Secretary of State Hughes did not put this resolution to the conference. Nor did he base his proposal on the views of the technical experts. While he quoted from both reports in his statement to the conference, the resolution offered by the United States delegation and accepted by the conference was based on the language of the Treaty of Versailles.

Hughes did not refer to tear gases. He said that, "in light of the advice of the American Advisory Committee" and "the specific recommendation of the General Board of the Navy," the American delegation "felt that it should present the recommendation that the use of *asphyxiating or poison gas be absolutely prohibited.*"[116] Senator Elihu Root, who submitted the text to the conference, said it was drafted in the language of the Treaty of Versailles and other peace treaties because "between thirty and forty powers" had already agreed to that language, "so that there was not much further to go in securing . . . general consent . . . ."[117] Root understood the Versailles Treaty's "declaration against the use of poison gases to be a statement of the previous rules which had been adopted during the course of the Hague Conferences."[118] As we have seen, these probably were never intended to apply to tear gases.

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[113] *Id.*
[114] *Id.* at 734-36.
[115] *Id.* at 732.
[116] *Id.* at 736.
[117] *Id.* at 738.
[118] *Id.* The memoranda prepared for the American Delegation before the conference summarized earlier League of Nations considerations of this subject. These reported that the League's Council had decided to "condemn the use of poison gas" based upon a report submitted by the French president of a League armaments commission. He said he thought it "impossible in this matter *for the Council to go further than the Hague Conference and the Treaty of Versailles*, which . . . includes provisions forbidding the use of asphyxiating gas." (Emphasis added.) His reference to the Hague Conference was to the 1907 regulations concerning the

3. THE GENEVA PROTOCOL OF 1925

In 1924, a committee of experts under the auspices of the League of Nations considered the effects of chemical and bacteriological warfare. The evil of greatest concern of these experts, and to participants at the later conference, appeared to be the use of poison and mustard gases against large cities.[119] The experts also discussed tear gases, calling them "lachrymatory" agents:

> The efficacy of lachrymatory gas, coupled with its property of not causing permanent disablement, has led to its adoption by police organizations. By its means criminals may be apprehended without loss of life.[120]

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laws and customs of land warfare, including "Article 23 [in which] certain prohibitions have been laid down in particular on the employment of poison and poisoned weapons." Memoranda for the Members of the American Delegation to the Conference on Limitation of Armaments (Including the Private Manufacture of Arms), the Economic Weapon of Article 16, and the Control of Traffic in Arms, at the Paris Peace Conference and Under the League of Nations 8, 10, 98-99 (GPO 1921). Neither the Treaty of Versailles nor the Hague regulations are thought to prohibit tear gas. See notes 97-107 *supra* and accompanying text.

During Senate consideration of the Washington Treaty of 1922, the one Senator who criticized the treaty said, among other things, that the phrase "other gases" was "all inclusive." 62 CONG. REC. 4729 (1922) (remarks of Senator Wadsworth, Chairman of the Senate's Military Affairs Committee). He added that the French text used the word "similaires" but that "other gases" in the English text seemed to have a different meaning. However, he concluded, this was "a point of comparatively small importance." The debate contains no other reference to the point, and no reference at all to tear gases.

[119] The gas to be employed would not necessarily be one which only disables human beings for a time, since the object would be to hamper or destroy some continuous activity aimed at by the attack. Mustard gas, for instance, dropped in large quantities would be likely to hang about the cities and slowly penetrate the houses. . . . [H]eavy poison gases linger, even in the open country, for quite a long time. In a city it is difficult to say how long they might remain, and during all that time the danger would continue.

> [I]t may well be that an unscrupulous belligerent may not see much difference between the use of poison gas against troops in the field and its use against the centres from which those troops draw the sinews of war.

7 LEAGUE OF NATIONS OFF. J., *supra* note 91, at 126; See also PROCEEDINGS *infra* note 121, at 313.

A similar concern was expressed by the American Advisory Committee to the 1922 Washington Conference. They stated:

> The frightful consequences of the use of toxic gases, if dropped from airplanes on cities, stagger the imagination. . . . If lethal gases were used in such bombs [high explosive bombs as those used to attack cities in the First World War], it might well be that such permanent and serious damage would be done, not only of a material character but in the depopulation of large sections of the country, as to threaten, if not destroy, all that has been gained during the painful centuries of the past.

CONFERENCE ON THE LIMITATION OF ARMAMENTS, *supra* note 109, at 732.

[120] 7 LEAGUE OF NATIONS OFF. J., *supra* note 91, at 122.

The 1925 Geneva conference adopted as the scope of the protocol's prohibition the Versailles phrase "asphyxiating, poisonous or other gases" proposed by the United States. In making this proposal, Congressman Burton, the American representative, expressed a strong desire for a provision "relating to the use of asphyxiating, poisonous and *deleterious* gases."[121] The report of the legal committee characterized the American proposal as one dealing with "asphyxiating, poisonous or *other similar gases.*"[122] Another committee described the class as "asphyxiating, poisonous and *other deleterious* gases."[123] There is no recorded discussion of tear gases by the delegates. If they had been determined to prohibit gases the experts had said were in use by police departments to prevent loss of life, they might have been expected to do so more explicitly, or at least to have discussed the point.[124]

4. THE 1930 ATTEMPT TO RESOLVE THE QUESTION

In 1930, the United Kingdom addressed itself to the difference between the French and English texts, a difference which created "a serious ambiguity in the Geneva Gas Protocol of 1925 as well as in all Treaties and Conventions regulating gas warfare signed since the War."[125] The United Kingdom solicited the views of

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121 LEAGUE OF NATIONS, PROCEEDINGS OF THE CONFERENCE FOR THE SUPERVISION OF THE INTERNATIONAL TRADE IN ARMS AND AMMUNITION AND IN THE IMPLEMENTS OF WAR 155 (1925) (emphasis added). An argument can be made that the conference intended a more sweeping ban on *use* of gas than it did on *export* of gas. An American proposal dealing with export had as its scope "asphyxiating, toxic or *deleterious* gases." *Id.* at 161 (emphasis added). The export proposal was rejected as impractical because a distinction between lawful and unlawful exports would present great technical difficulty. A prohibition on the use in war of agents which also had various domestic peacetime uses did not present the same difficulties. But nothing in the debates indicates that the export proposal was designed to exclude tear gases while the use-in-war proposal was not. And as indicated, the scope of the American proposal for a ban on *use* was described by the American delegate as "asphyxiating, poisonous, and deleterious gases."

122 *Id.* at 745 (emphasis added).

123 *Id.* at 596 (emphasis added).

124 As indicated earlier, the Senate failed to give its consent to the Geneva Protocol. During the Senate debate, an opponent of the protocol said that it "undertakes to protect us against all gases. The language of the treaty is not 'fatal gases,' or 'deadly gases.' It is 'asphyxiating, poisonous, or other gases.'" 68 CONG. REC. 148 (1926) (remarks of Senator Reed). Later he added that this language would embrace "tear gas" which is used by police. *Id.* at 150. To this, the floor manager of the treaty replied: "This treaty would not interfere with that." *Id.* (remarks of Senator Borah). The protocol's opponent answered that it would "stop us from using that gas against the next savage race with which we find ourselves in war." *Id.* (remarks of Senator Reed).

125 Preparatory Commission for the Disarmament Conference, LEAGUE OF NATIONS Doc. c.4.M, Series X, Minutes of the 6th Sess., pt. 2, at 311 (1931).

other governments in order to obtain a uniform interpretation on whether or not the use of tear gases was prohibited by the protocol. The British considered that "the use in war of 'other gases,' including lachrymatory gases, was prohibited."[126]

The French shared this view. Their reply stated that the English and French texts were identical in meaning and that tear gases were prohibited in war notwithstanding their use domestically by police departments.[127] The delegates of 10 other states concurred, several saying that they did so because of the difficulty in distinguishing between lethal and nonlethal gases.[128] A majority remained silent.

Only the United States delegate openly disagreed with the British view.[129] The American representative noted the technical difficulties of classifying gases and suggested that the question be considered by the Geneva Disarmament Conference. He added:

> [W]e seek a maximum prohibition of inhumane agencies, but, at the same time, we should not be led to bring into disrepute the employment of agencies which not only are free from the reproach of causing unnecessary suffering, but which achieve definite military or civil purposes by means in themselves more humane than those in use before their adoption. I think there would be considerable hesitation on the part of many governments to bind themselves to refrain from the use in war, against any enemy, of agencies which they have adopted for peacetime use against their own population, agencies adopted on the ground that, while causing temporary inconvenience, they cause no real suffering or permanent disability, and are thereby more clearly humane than the use of weapons to which they were formerly obliged to resort to in time of emergency.[130]

The preparatory commission's report noted that "the Commission felt itself unable to express a definite opinion on this question of interpretation. Very many delegations, however, stated that they were prepared to approve the interpretation suggested in the British Government's memorandum."[131] The committee recognized, however, that the question remained open.[132]

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126 *Id.*

127 *Id.* at 311-14.

128 *Id.* Canada, China, Czechoslovakia, Italy, Japan, Romania, Spain, Turkey, Yugoslovia, and the U.S.S.R. agreed with France and the U.K.

129 Twenty-seven governments participated. DEP'T STATE, REPORT OF THE PREPARATORY COMMISSION FOR THE DISARMAMENT CONFERENCE 8-9 (1931).

130 LEAGUE OF NATIONS Doc. c.4.M, *supra* note 125, at 312.

131 DEP'T STATE, REPORT, *supra* note 129, at 45.

132 *Id.* No resolution of it has ever been achieved. In subsequent League discussions of "qualitative disarmament," tear gases were examined, the American delegate insisting that their use by police was legitimate. In 1932, a special committee on chemical and bacteriological weapons ac-

5. CURRENT INTERPRETATION

While the 1930 discussions were not conclusive of the Geneva Protocol's meaning, the then British view was widely accepted. One basis for that view, however, has since disappeared. The British were concerned that, unless tear gases were prohibited, many countries would build up their arsenals and manufacturing capabilities. But many countries have done this anyway for deleterious gases clearly prohibited by the protocol in order to be prepared to retaliate against use of gas by another country.[133]

Another concern was the difficulty of drawing a line and the danger, if the line were fuzzy, of escalation from tear gases to more harmful substances. This remains a critical problem. The United States has attempted to draw the line by restricting the permitted gases to "agents that Governments around the world commonly use to control riots by their own people."[134] This test is at least reasonably precise. It would probably legitimize only common tear gases such as CN and CS. CN, and to a lesser extent CS, are used by over 50 countries to quell domestic riots, and to capture criminals resisting arrest.[135]

In the 1966, 1967, and 1968 debates in the United Nations General Assembly and the Geneva Disarmament Conference, only the Soviet Union and its allies actively opposed the United States position that tear gases in war did not violate the protocol.[136] Belgium agreed with the American view.[137] The French, without mentioning tear gases, hinted that they no longer believed in giving the protocol the broad interpretation they had given it in the 1930's.[138] The United Kingdom and Kenya referred to the opposing

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cepted this point of view "although it was still of the opinion that lachrymatory gases should not be considered separately from the point of view of their use in warfare, since there were serious practical objections to any discrimination between gases." 1 CONFERENCE FOR THE REDUCTION AND LIMITATION OF ARAMAMENTS 210-12 (1932); *id.*, vol. 2, 452-56 (1932); *id.*, vol. 2, series B, Minutes of the General Commission 569 (1933). The discussions were not directed at the Geneva Protocol but at devising new agreements to ban chemical and bacterial agents, and to regulate their production, importation, and stockpiling.

133 *See* Stone, *supra* note 57, at 566-57. For this reason, in Stone's view, the British reasoning has been "destroyed by the facts." *Id.*

134 *See* note 89 *supra* and accompanying text.

135 *See* U.N.G.A. First Comm. Statement of ACDA Director Foster, *supra* note 46, at 742; Press conference of Secretary of Defense McNamara in Washington, March 23, 1965; Letter from Deputy Secretary of Defense Vance to Congressman Kastenmeier (D. Wis.), March 31, 1965. These gases were used for similar purposes by the British in Cyprus in 1958 and in British dependent territories on a number of occasions. See Press conference of Secretary of Defense McNamara, *supra*; 709 PARL. DEB., H.C. (5th ser.) 1823-26 (1965).

136 *See* note 90 *supra* and accompanying text. *But cf.* ENDC Statement of Swedish Representative Myrdahl, PV. 391, at 9 (1968).

137 *See* U.N.G.A. First Comm. statement of Belgian Representative Fourdin, PV.1608, at 17 (Nov. 14, 1968).

138 *See* note 61 *supra.*

views on tear gas without taking sides.[139] Most countries, however, remained silent.

6. APPLICATION OF STANDARDS TO USE OF GASES IN VIETNAM

The principal gases used by United States forces in Vietnam are the tear gases, CS and CN.[140] However, a vomit-inducing gas, adamsite, has also been used against the enemy.[141] Adamsite appears no longer to be authorized.[142] It is clearly not an agent that "[g]overnments around the world commonly use to control riots by their own people."[143] Its use represents an escalation of the kind feared by the proponents of encompassing all gases, including tear gases, within the protocol.[144]

The use of tear gas was justified by the United States on "humanitarian" grounds—that it would reduce the number of people killed, both combatants and noncombatants, and that its use would be analogous to riot control.[145] In situations where Viet Cong were protected by human shields, or by tunnels or caves, the alternatives were rifles, machine guns, napalm, flame throwers, high explosives, or fragmentation grenades. Tear gas certainly seemed a more humanitarian weapon. But reports from Vietnam reveal that large numbers of tear gas grenades have been dropped on Viet Cong strongholds from helicopters which were followed by B-52's dropping high-explosive or anti-personnel-fragmentation

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139 *See* U.K. Working Paper on Microbiological Warfare, E.N.D.C. Doc. ENDC/231, at 1-2 (1968); U.N. First Committee Statement of Kenyan Representative Odhiambo, 21 U.N. GAOR, First Comm. 2 (1966).

140 Letter from John S. Foster, Director of Denfense, to Senator Brooke (R. Mass.), November 9, 1967.

141 Letter from Deputy Secretary of Defense Vance, *supra* note 135; S. HERSH, *supra* note 87, at 168, 170, 177, 179.

142 Letter from John S. Foster, *supra* note 140.

143 S. HERSH, *supra* note 87, at 168, 183-85, 61-62; 709 PARL. DEB., H.C. (5th ser.) 1823 (1965).

144 *See* notes 113, 114, 128 *supra* and accompanying text.

145 When, for example, civil authorities must enforce law and order in the face of an unruly mob, they must often decide, when other means of persuasion have been exhausted, whether to use brute force and lethal weapons, and thus risk injury and death perhaps even to innocent bystanders, or to disperse the mob by recourse to riot control agents such as tear gas, which have no harmful after-effects. And in Viet Nam, when the Viet Cong takes refuge in a village and uses innocent civilians and prisoners as shields, would it be more humane to use rifle and machinegun fire and explosive grenades to dislodge and destroy the Viet Cong and in so doing risk the lives of the innocent and wounded hostages?
U.N.G.A. First Comm. Statement of ACDA Director Foster, *supra* note 46, at 743.

> *We do not expect that gas will be used in ordinary military operations.* Police-type weapons were used in riot control in South Viet Nam—as in many other countries over the past 20 years—*and in situations analogous to riot control*, where the Viet Cong, for example, were using civilians as screens for their own operations.
> Press Statement of Secretary of State Rusk, 52 DEP'T STATE BULL. 529 (1965) (emphasis added).

bombs.[146] The purpose of such an attack would appear to be to flush out those hiding in tunnels, to incapacitate them with gas, and then to wound or kill them with bombs. This seems wholly inconsistent with the humanitarian justification given by the United States. Moreover, if combatants have been incapacitated by tear gas and are thereby placed out of combat, they are entitled to be "humanely treated" under the 1949 Geneva Conventions.[147] Indiscriminate bombing of an area just saturated with tear gas is hardly humane.

B. Herbicides

Another unsettled issue is whether the use of modern chemical herbicides or defoliants in war is a violation of the protocol. Except for their use by the United States in Vietnam, these chemicals have not been used in war. Indeed they were not discovered until the end of World War II.[148]

The United States has taken a position on these chemicals quite similar to its position on tear gases. This is that "the Protocol does not apply to herbicides, which involve the same chemicals and have the same effects as those used domestically in the United States, the Soviet Union and many other countries to control weeds and other unwanted vegetation."[149] The Soviet view is that the use of "chemical substances in Vietnam to include destruction of the rice crop, which as everyone knows, provides the Vietnamese peo-

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146 S. HERSH, *supra* note 87, at 178-79.

147 Persons who take "no active part in the hostilities, including members of armed forces who have laid down their arms and those placed hors de combat by sickness, wounds, detention *or any other cause* shall in all circumstances be humanely treated . . . ." (Emphasis added.) Geneva Convention for the Amelioration of the Conditions of the Wounded and Sick in the Armed Forces in the Field, Aug. 12, 1949, § 3(i), [1955] 3 U.S.T. 3114, T.I.A.S. 3362. See also *id.* § 12. The same provision appears in the Geneva Convention Relative to the Protection of Civilian Persons in Time of War, Aug. 12, 1949, § 3(1), [1955] 3 U.S.T. 3516, T.I.A.S. 3365. Under the earlier Hague regulations, it is prohibited to kill or wound an enemy who has laid down his arms; or, having no longer any means of defense, has surrendered or offered no resistance to being taken prisoner. Regulations respecting the Law and Customs of Warfare, *supra* note 105, at art. 23(c). See 2 L. OPPENHEIM, *supra* note 57, at 338; Pictet, *Commentary*, 1 GENEVA CONVENTION FOR THE AMELIORATION OF THE CONDITION OF THE WOUNDED AND SICK IN THE ARMED FORCES IN THE FIELD 52-53, 135-36 (1952).

148 The anticrop and antifoliage agents in use in Vietnam are "a mixture of the butyl esters of 2, 4-dichloro-phenoxyacetic acid and 2, 4, 5-trichlorophenoxy-acetic acid, cocodylic acid and a mixture of 2, 4 D and Tordon (4-amino-3, 5, 6-trichoropicolinic acid). All have been widely used for agricultural purposes in this and other countries." Letter from John S. Foster, *supra* note 140.

149 U.N.G.A. Statement of U.S. Representative Nabrit, *supra* note 26, at 801.

ple with their staple diet" is prohibited by the Geneva Protocol.[150] Other countries, except for allies of the Soviet Union,[151] have generally remained silent.[152]

1. THE NEGOTIATING HISTORY

The scope of the ban on chemical warfare in the protocol is broad enough to cover herbicides, but there is real doubt that that was intended. Included within the chemical ban are not only the asphyxiating, poisonous and other gases but "*all analogous* liquids, *materials* or devices . . . ."[153] Taken literally, this is broad enough to include chemical agents which kill plants. It has been argued, however, that the protocol should only be applied to antipersonnel weapons.[154] At least as far as its prohibition on chemicals is concerned, the negotiating history gives same support to this conclusion. As we have seen, the scope clause was derived from the 1922 Treaty of Washington and the 1919 Treaty of Versailles. At neither conference was there any recorded discussion of anticrop weapons. Certainly they were not the principal evil about which negotiators were concerned immediately after the First World War.

Before the 1925 Geneva Conference, however, a League of Nations committee asked a number of experts for a statement on the effect which would be produced on human life, animal life, and "vegetable life" by "chemical warfare"—or "bacteriological warfare."[155] The experts were not aware of any danger to plants

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150 *See, e.g.*, U.N.G.A. First Comm. Statement of Soviet Representative Shevchenko, *supra* note 90, at 664.

151 *See, e.g.*, U.N.G.A. First Comm. Statement of Hungarian Representative Csatorday, in 1967 DOCUMENTS ON DISARMAMENT 659-60.

152 See, however, U.N.G.A. First Comm. Statement of Maltese Representative Pardo, in 1967 DOCUMENTS ON DISARMAMENT 635. Pardo concluded that the protocol did not apply to herbicides.

153 For the language of the protocol see text at note 17 *supra* (emphasis added).

154 Meyrowitz is of the view that the chemical warfare provisions of the protocol should be interpreted as "applying only to methods used directly against human beings." Meyrowitz, *supra* note 62, at 4. Later he says that "it is not clear whether or not the Protocol applies to the use of CW or BW against . . . plant life." *Id.* at 6. The 1924 experts found no chemical agent which was effective except on "human elements." See text at note 157 *infra*. The *Army Field Manual* states that the Hague regulation banning "poison or poisoned weapons" does "not prohibit measures being taken . . . to destroy, through chemical or bacterial agents *harmless to man*, crops intended solely for consumption by the armed forces (if that fact can be determined)." THE LAW OF LAND WARFARE, *supra* note 1, ¶ 37, at 18 (emphasis added). As indicated in the text at note 105, this Hague regulation was probably subsumed in the Versailles Treaty and therefore in the anti-chemical warfare language of the protocol.

Brungs, *supra* note 57, at 79-81, and Mc Dougal, *supra* note 57, at 638 suggest that anticrop agents may be justifiable because food blockades are acceptable under international law.

from chemical warfare. "It would not appear that vegetation is affected by gas," they said.[156] On chemicals, the report concluded that "no agent is at present known which could produce a chemical destruction of sources of wealth except through its action *on the human elements* . . . ."[157] Most of the experts were also of the view that bacteriology was not then able to produce ineffective substances "capable of destroying a country's . . . crops."[158] But Professor Cannon of Harvard's Medical School did "not entirely concur in this latter opinion since he admits the possibility of aeroplanes disseminating over wide areas parasites capable of ravaging the crops."[159]

During the 1925 Geneva Conference, the Versailles-Washington language on chemicals was supplemented by a broad ban on "the use of bacteriological methods of warfare." This resulted from a Polish proposal aimed primarily at antipersonnel weapons.[160] However, the Polish delegate also expressed concern about the possible use of bacteria on crops. He said: "Bacteriological warfare can also be waged against the vegetable world, and not only may corn, fruit and vegetables suffer, but also vineyards, orchards and fields."[161] The acceptance of the Polish delegate's broad language prohibiting *bacteriological* means of warfare would seem to mean that bacteriological anticrop warfare was condemned by the protocol. At the same time, as shown above, the history of the protocol's ban on chemical warfare indicates doubt whether chemical anticrop agents were to be prohibited.

2. HERBICIDE USAGE IN VIETNAM

As we have seen, the United States explained that herbicides did not violate the protocol because they involve the same elements used in domestic weed control.[162] The initial military use of herbicides appears to have been reasonably consistent with this justification. Herbicides were used to destroy jungle trees and plants, particularly along roads, because this vegetation was used as a cover by enemy troops from which to attack American and

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155 7 LEAGUE OF NATIONS OFF. J., *supra* note 91, at 121.

156 *Id.* at 124.

157 *Id.* (emphasis added). The Chinese delegate to the 1925 Geneva Conference read to the other delegates from a brochure prepared by the Womens International League for Peace and Freedom. This described the anticipated horrors of using bombs containing heavy gases to kill people in bombing large cities. The pamplet went on: "Vegetation itself is destroyed . . . . " LEAGUE OF NATIONS, PROCEEDINGS, *supra* note 121, at 313.

158 7 LEAGUE OF NATIONS OFF. J., *supra* note 91, at 126.

159 *Id.*

160 LEAGUE OF NATIONS, PROCEEDINGS, *supra* note 121, at 340.

161 *Id.*

162 *See* note 149 *supra* and accompanying text.

allied soldiers.[163] This use was not unlike the common use of herbicides to kill weeds along highways in this and other countries. Gradually, however, the South Vietnamese and then the Americans began using herbicides to kill rice crops in Viet Cong held areas.[164] Although the chemicals remained the same as those used for certain domestic weed killers, the use was no longer "to control weeds and other unwanted vegetation", the justification given by the United States to the United Nations. As with tear gases, the political rationale given by the United States for making an exception to the protocol has been eroded by the military practice.

V. Should the United States Ratify the Geneva Protocol?

The 1966 General Assembly resolution dealing with poison gas and germ warfare contained an invitation to "all States to accede to the Geneva Protocol . . . ."[165] The United States voted for this resolution. In explaining its position with respect to this invitation, the United States representative stated:

> [W]hether, or by what procedure, States that have not yet done so should adhere to the Geneva Protocol is for each of them to decide in the light of constitutional and other considerations that may determine their adherence to any international instruments, and particularly one which dates from 1925.[166]

The vigorous attacks[167] against American use of tear gas and herbicides in Vietnam have probably not produced a healthy climate for reconsideration of the Geneva Protocol by the United States Senate at the present time. However, if the Paris negotiations make progress toward reducing the level of hostilities in Vietnam, thought should be given to resubmitting the protocol to the Senate.

A. Reasons Supporting Ratification

On the assumption that the use of poison gas or germs in warfare by any country continues to be inconsistent with our national interests, ratification of the protocol is to our advantage for a number of reasons.

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163 S. Hersh, *supra* note 87, at 144-46.

164 *Id.* at 147.

165 *See* G.A. Res. 2162(B), *supra* note 48. This invitation was repeated in the 1968 resolution; G.A. Res. 2454 (Dec. 20, 1968).

166 U.N.G.A. Statement of U.S. Representative Nabrit, *supra* note 26, at 801.

167 *See* note 150-51 *supra* and accompanying text; *See also* the petition of 5,000 U.S. scientists reported in S. Hersh, *supra* note 87, at 147; Mayer & Sidel, *Crop Destruction in South Vietnam*, Christian Century (June 29, 1966); Letter of Dr. Alje Vennema to Dr. E. W. Pleiffer, November 23, 1967, quoted in S. Hersh, *supra* note 87, at 183-84.

1. EFFECT ON REDUCING LIKELIHOOD OF GAS AND GERM WARFARE

The best reason for United States ratification is the increased attention and effectiveness it would give to the protocol as a barrier to the first use of chemical and biological weapons.

Our failure to adhere to the protocol has repeatedly been called to the attention of other nations by the Soviet Union and its allies.[168] All other nuclear powers, including China, and all other major industrial nations, except for Japan, are parties.[169] For these reasons, our accession would be regarded as important by other countries.

The 1966 United Nations resolution dealing with the protocol renewed interest in it as an instrument for maintaining continued restraint on poison gas and germ warfare. Probably as a direct result, some 12 developing countries have become parties since 1966.[170] Our ratification would give further impetus to the effort to secure adherences.

As indicated earlier, the basic prohibition of the protocol appears to apply to nonadhering states. But many of the emerging African and Asian nations do not regard themselves as bound by rules developed as the result of practices of "colonialist" powers.[171] Only adherence to the protocol is likely to be regarded by them as producing a serious inhibition upon their first use of gas or germ warfare. Yet these same states could acquire chemical and biological agents with much less difficulty than they could acquire nuclear weapons. Indeed chemical and biological weapons have sometimes been called the poor man's atomic bomb.[172] The most recent use of poison gas was, after all, in Yemen.[173] Neither that country nor Israel and Jordan are parties to the protocol. Among the emerging countries of Sub-Saharan Africa, only nine have

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168 *See, e.g.*, the statements cited in notes 90, 150, 151 *supra.*

169 The parties and their dates of adherence are listed in note 25 *supra.*

170 *Id.*

171 *See*, O. Lissitzyn, International Law in a Divided World, 1963, International Concilation No. 542, at 37-62; Pal, *International Law in a Changing World*, in INTERNATIONAL LAW IN A CHANGING WORLD 89, 95-96 (Symposium-Oceana ed. 1963).

172 In my view, the development of the biological and chemical warfare materials is in a way far more serious than the development of nuclear weapons. When I say "in a way" I have in mind the fact that the nuclear weapons are a rich man's property or a rich country's property—only the very rich and the super-rich can develop, manufacture and maintain them. As far as biological and chemical warfare materials are concerned . . . they are easily accessible to the poor countries also. That is why it is far more dangerous.

Press statement of U.N. Secretary-General U Thant, July 10, 1968, in U.N. Information Service Note, No. 43, at 10.

173 *See* 113 CONG. REC. A3362-3363; Letter from U.S. Representative to the U. N. Arthur Goldberg to Congressman Wolff (D. N.Y.) July 24, 1967.

joined, all within the last five years.[174] Mainland China and India are parties, but Japan and many less developed Asian countries are not. Latin America currently has the fewest number of parties of any major region of the world. In my view, United States adherence to the protocol would stimulate wider acceptance of it by countries in these areas, and would enhance its credibility as a deterrent to the first use of poison gas and germs in war.

2. AID IN ACHIEVING A UNIFORM INTERPRETATION OF THE PROTOCOL

The problems of interpretation arising from the differences over tear gas and herbicides, as well as from the existing reservations, have been described above. United States ratification with a statement of interpretation to be circulated in the normal course to all parties would offer a useful opportunity to clear up the meaning of the protocol.[175]

While the ambiguity of the protocol in the case of tear gases has been recognized by several other countries, only one has publicly defended our position.[176] Because of the unpopularity of the war in Vietnam and because we are not party to the protocol, our government has had little success in gaining acceptance of our interpretations. However, if we ratified with an interpretative statement after hostilities in Vietnam had subsided, most parties would probably acquiesce in our interpretation and say nothing, assuming there had been an earlier diplomatic effort to achieve this result. Given the ambiguities in the text of the protocol, the statement would most likely be accepted as an interpretation of an ambiguous provision, rather than a reservation which changed the substance of the agreement and therefore really constituted a proposal to enter into a different agreement.[177] Thus we would become a party to the protocol with a clear understanding on tear gas and herbicides as far as most parties were concerned.

Assuming that China and the Soviet Union objected, they would probably aim their objection at our interpretation rather than at our becoming party to the protocol. Unless they treated the interpretation as a reservation going to the heart of the protocol, which it clearly is not, they would, in effect, accept our adherence to the

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174 For the list of parties with dates of adherence, see note 25 *supra*.

175 *See* RESTATEMENT, *supra* note 67, at § 128, comment d. The United States adopted a similar course of action recently to make clear its interpretation of the 1967 Treaty on the Prohibition of Nuclear Weapons in Latin America. For the text of the treaty see 1967 DOCUMENTS ON DISARMAMENT 69. For the interpretive statement, see 58 DEP'T STATE BULL. 555-56 (1968). The interpretive statement which accompanied U.S. signature to a protocol to the treaty was circulated by the depositary government, Mexico, to other interested governments.

176 See *supra* notes 125, 127-28, 137, 139 *supra* and accompanying text.

177 *See* RESTATEMENT, *supra* note 67, at § 124 & comment c.

protocol while continuing their differences of view with us as to its treatment of tear gas and herbicides. [178]

3. IMPROVED UNITED STATES STANDING IN FORTHCOMING DISCUSSIONS OF POISON GAS AND GERM WARFARE

Starting with the 1966 discussion in the General Assembly, there has been renewed international interest in arms control agreements dealing with chemical and biological agents. In the summer of 1968, the British proposed a major addition to the Geneva Protocol which would ban the use, production, and possession of "microbiological" weapons. A British working paper submitted to the Geneva Disarmament Conference criticized the protocol for a number of reasons, including its ambiguity concerning "non-lethal gases," the failure of many states to become parties, the existence of reservations by some parties, and the limited scope of its prohibition on "bacteriological warfare" which the paper contended did not "include the whole range of microbiological agents that might be used in hostilities."[179] On this last point, the British

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[178] The Soviet Union would move much closer to its longstanding goal of achieving widespread adherence to the protocol by accepting the United States as a party. While it would almost certainly continue its objection to our interpretation, it would appear to have little to gain by preventing our adherence to the basic prohibitions of the protocol. Even if the Soviets regarded our interpretation as a reservation, their practice with respect to reservations would permit them to accept treaty relations despite disagreement over the matters covered by our interpretation. According to Triska and Slusser, the Soviet practice is:

> A treaty should be considered "valid between the state that has made the reservation and all other parties with the sole exception of that part to which the reservation pertains, unless the member opposing the reservation states directly that he is opposed to the employment of the entire convention [as] changed by the reservation in the relations between this member and the state that has made the reservation".

J. Triska & R. Slusser, *supra* note 74, at 85.

As to Mainland China, a student of her post-1949 treaty practices has little doubt that she would disagree with our tear gas interpretation. He adds:

> It is far from clear, however, whether the P.R.C. [People's Republic of China] will also claim that such an interpretation or reservation denies the basic objective of the Protocol and therefore entirely invalidates the Protocol's applicability to relations between the U.S. and the P.R.C.

After summarizing the evidence, he states his belief that it is very probable that the P.R.C. will decide to reject our interpretation or reservation but that it is unlikely to declare the entire Protocol inapplicable on this ground.

Letter from Professor Jerome A. Cohen, Harvard Law School, to George Bunn, May 3, 1968.

[179] *See* U.K. Working Paper on Microbiological Warfare, E.N.D.C. Doc. ENDC/231 (1968). *See also* U.N.G.A. First Comm. Statement of Maltese Representative Pardo, *supra* note 152, at 635; U.N.G.A. First Comm. Statement of Italian Representative Carraciolo, PV.1606, at 33-35 (Nov. 12,

working paper appears to be incorrect in light of the negotiating history of the treaty.[180] On the others, the difficulties can be alleviated in large measure in the ways already described without amending the protocol.

The British working paper also pointed out that, even with universal adherence to the protocol, there would still be a risk of large-scale use of gas and germ warfare "as long as states have the right to manufacture them and to use them against violators and their allies." The paper therefore proposed supplementing the protocol with a ban on the possession and production of microbiological agents. The United States representative pointed out that the most important question this proposal raised was how parties could verify the fact that other parties did not possess and were not making biological agents.[181] He recommended that, if

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1968); *but see* U.N.G.A. First Comm. Statement of Soviet Representative Malik, PV.1606, at 18-20 (Nov. 12, 1968); First Comm. Statement of U.S. Representative Foster, PV.1630, at 22-23 (Dec. 5, 1968).

[180] The prohibition on "bacteriological warfare" was proposed in 1925 by Poland. At that time, many micro-organisms which are known to exist today had not been discovered. Since then, for example, viruses have been discovered, and they are not regarded as bacteria today. In 1925, however, the Polish delegate who proposed the ban on "bacteriological warfare" apparently intended to include all germ warfare within it. At the Geneva Conference, he explained that "bacteriological warfare" would include the use as weapons of "cultures of microbes [which] may easily occasion epidemics . . . ." LEAGUE OF NATIONS, PROCEEDINGS, *supra* note 121, at 340. His statement, and the adoption of his proposal, were preceded by an experts' report. In 1924, a Temporary Mixed Commission of the League asked technical experts from several countries what the possible effect would be of an attack by "*bacteriological warfare* by means of *microbes or any other agent* . . . ." 7 LEAGUE OF NATIONS OFF. J., *supra* note 91, at 121 (emphasis added). The examples of bacteriological warfare given by the experts included pollution of drinking water "by cultures of typhus or cholera germs," "propagation of plague by pest infected rats," projectiles containing "streptococci, staphylococci, anthrax spores, glanders bacilli." *Id.* at 125. These various germs include some (*e.g.*, typhus) *which are not regarded as "bacteria" today.* But, it appears that the experts, the mixed commission and the Polish delegate all regarded "bacteriological" as including all germs or other agents for the spread of disease. There is thus no justification for limiting the scope of the ban on "bacteriological warfare" because some new diseases have been discovered since 1925 which we do not classify as bacteriological. It is for this reason that U.S. Representative Foster opposed the British view. He said that "bacteriological warfare" was also "referred to as microbial warfare, bacterial warfare, microbiological warfare, or germ warfare. We should all understand that it means disease-causing living micro-organisms, be they bacteria, or viruses or whatever they might be, used as deliberate weapons of war." U.N.G.A. First Comm. Statement of U.S. Representative Foster, *supra* note 179, at 22-23. Note that the terms of reference for a forthcoming U.N. experts study in this area use the terms "bacteriological" and "biological" interchangeably. See note 187 *infra*.

[181] ENDC Statement of U. S. Representative George Bunn, ENDC/PV. 389, at 34 (1968). The British working paper recognized that "strict processes of verification are not possible." It suggested that "considera-

the British proposal received wide support in principle, a working group be formed to deal particularly with the verification problem.[182] The Soviet Union attacked the British proposal as an attempt to subvert the Geneva Protocol. The Soviet representative said that if the conference were to follow the course suggested by the British, "we might destroy an existing, useful and important international document on the prohibition of chemical and bacteriological weapons without having replaced it by a better or indeed by any other international instrument . . . ."[183]

The United Kingdom proposed an expert study under the auspices of the United Nations Secretary General on the effects of the possible use of chemical weapons.[184] Poland proposed such a study for both chemical and bacteriological weapons.[185] The United States was prepared to accept either proposal but a consensus developed around the Polish plan. The conference recommended a study of the effects of both chemical and bacteriological weapons to the General Assembly[186] which recently passed a resolution accepting the recommendations and directing that such a study be made.[187]

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tion might be given *inter alia* to the possibility that a competent body of experts, established under the auspices of the United Nations, might investigate allegations made by a party to the Convention which appeared to establish a *prima facie* case that another party had acted in breach of the obligations established in the [proposed new] Convention." See U.K. Working Paper, *supra* note 179.

182 ENDC Statement of U.S. Representative George Bunn, *supra* note 181.

183 ENDC Statement of Soviet Representative Roshchin, *supra* note 26, at 26.

184 ENDC Statement of U.K. Representative Mulley, PV.387, at 6 (1968).

185 ENDC Statement of Polish Representative Jaroszek, PV.385, at 23 (1968).

186 Report to the United Nations General Assembly and the United Nations Disarmament Commission, E.N.D.C. Doc. ENDC/236 (1968).

187 G.A. Res. 2454 (Dec. 20, 1968). The terms of reference for this study are as follows:

> The aim of the report is to provide a scientifically sound appraisal of the effects of chemical and bacteriological (biological) weapons. At the same time, the report should serve to inform governments of the consequences of the possible use in war of chemical and bacteriological (biological) weapons, taking into account Resolution 2162B(XXI) of the UNGA of 5 December 1966, and should contribute to the consideration by the ENDC of the problems connected with these weapons. Chemical and bacteriological (biological) weapons should be treated by experts with experience in the respective technical fields.
>
> The report should include the following data:
>
> (1) The basic characteristics of chemical and bacteriological (biological) means of warfare.
>
> (2) The probable effects of chemical and bacteriological (biological) weapons on military and civilian personnel, both protected and unprotected.
>
> (3) Possible long-term effects on human health and ecology.
>
> (4) Environmental and other factors affecting the employment of chemical and bacteriological (biological) means of warfare.
>
> (5) Economic and security implications of the development, acquisition and possible use of chemical and bacteriological (biological) weapons and of systems for their delivery.

This study, and the determination of the Geneva Conference to give chemical and bacteriological weapons further attention,[188] indicate that a considerable amount of international effort probably will be devoted to this problem in the years ahead. The United States will no doubt continue to participate in these discussions. However, we would be more influential with the other important participants, all of whom are parties to the protocol, if we ratified it. This is particularly true since some of the proposals which will be discussed involve amendments to it. United States' interests would be better protected during the discussion of possible future agreements in this field if we became a full-fledged party to the protocol. At a minimum, ratification would limit the effect of Soviet propaganda attacks which tend now to reduce our influence with other delegates.

B. Objections to Ratification

1. IMPERFECTIONS OF THE PROTOCOL

Given the protocol's various problems, it can be argued that it is an imperfect instrument, that it needs revision, and that we should only adhere to it when it is revised.[189] A procedure for alleviating many of the protocol's imperfections has been described above. The international discussions of the last two years make clear that most other countries regard the protocol as the basic instrument in the field, and some, including the Soviet Union, are adamantly opposed to revising it. Moreover, the problems of inspection involved in the United Kingdom's attempt to halt production and reduce or eliminate stockpiles of germ weapons are considerable.[190] Thus the chances of achieving a broad international consensus on amending the protocol, or on a new agreement, are probably not great.

We have already agreed to observe the principles and objectives of the protocol. Since other industrial states almost unanimously have adhered to it and are therefore sometimes unsympathetic to our reasons for not doing so, our insistence on a revision before we ratify is not likely to be very persuasive. We could not, in any event, promise Senate approval for the ultimate product of any efforts toward revision.

2. DANGER OF CLOSING OUR OPTIONS

A second objection to ratifying the protocol is that in time of war other countries would not observe it while we would. We would

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188 *See* Report, *supra* note 186.

189 *Cf.* U.N.G.A. First Comm. Statement of Maltese Representative Pardo, *supra* note 152.

190 *See* note 181 *supra*. Verification problems have haunted international discussions of this subject since at least the experts' consideration in 1924. 7 LEAGUE OF NATIONS OFF. J., *supra* note 91.

thereby give up options to initiate the use of gas or germ warfare.

If other countries should use gas or germ weapons in a future war, we would not give up our option to retaliate in kind by ratifying the protocol.[191] Moreover, we no longer have an effective option to use poison gas or germs *except* in retaliation. Our publicly stated policy is that we will not be the first to use these weapons. We have said we would observe the principles and objectives of the protocol. We are probably bound through custom to its basic prohibitions. Our principal allies would almost certainly restrain any desire we might have to initiate poison gas or germ warfare. The sanctions for violating the protocol, notoriety, retaliation, and war crimes prosecutions, apply even without ratification. Thus, ratification would simply acknowledge the fact that our options are already closed.

VI. Conclusion

The foregoing discussion shows that we have little to lose and considerable to gain by ratifying the protocol. We can increase the strength of the protocol as a barrier to poison gas and germ warfare; help to clear up a few ambiguities and, in doing so, achieve wider support for United States interpretations; and enhance our standing for influential participation in the forthcoming discussions of proposals for additional limitations. On the other hand, if we insist on waiting until the protocol is revised, we will probably have to wait a long time and then have little influence in the revision. Finally, we give up no option which is now open to us by ratifying. In my view, the protocol is the best instrument likely to be achieved in the foreseeable future. The United States would be well advised to join it.

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[191] *See* notes 71, 79-86 *supra* and accompanying text.

Letter to the Editor of The New York Times From Philip Noel-Baker

[From the New York Times, Dec. 9, 1969]

Protocol on C.B.W.

To the Editor:

What does the Geneva Protocol on Chemical and Biological Warfare really mean? Does it allow the use in war of tear gas and herbicides?

When I hear this question, I recall a talk I had in Geneva while the Conference of 1925 was going on. It was with a young French colleague, Henri Bonnet, later a long-term and well-trusted Ambassador to the United States.

"Oh, yes," he said, "the form of words they've got is good. It prohibits every kind of chemical or bacterial weapon that anyone could possibly devise. And it has to. Perhaps someday a criminal lunatic might invent some devilish thing that would destroy animals and crops."

In 1925 everyone in the Conference agreed with Henri Bonnet. It was their purpose to ban *all* C.B. weapons; and they were satisfied that the Protocol would do that.

In 1930, Hugh Gibson, the U.S. delegate to the League of Nations Preparatory Disarmament Commission, questioned whether the Protocol prohibited the use of tear gases.

In Britain we then had a Labor Government. Arthur Henderson was our Foreign Secretary, I was his Parliamentary private secretary; our delegate to the League Commission was the great Lord (Robert) Cecil.

Banned by Protocol

Cecil was anxious that all doubt should be settled without delay. Henderson agreed, and instructed me, in cooperation with the legal section of the Foreign Office, to prepare a memorandum setting out the British view that "tear gases," like all other C.B. weapons, were forbidden by the Protocol, and calling on all other members of the Preparatory Commission to state their view.

Cecil laid the memorandum before the commission on Nov. 18, 1930. Only Gibson voiced his doubt; no one opposed Cecil's arguments; every other member of the commission who spoke—representing France, Italy, Canada, Spain, Japan—confirmed that the tear gases were banned.

This view was accepted without any question throughout the Disarmament Conference of 1932–3, and during its later stages, a new U.S. Delegate, Hugh R. Wilson, declared that the U.S. Government agreed that use of all tear gases was banned by international law.

In the light of these facts, I find it difficult to understand how anyone can argue that the Protocol permits the use of "harrassing" gases and herbicides.

Philip Noel-Baker
London Dec. 4, 1969

The writer served in the League of Nations Secretariat and won the Nobel Peace Prize in 1959.

[From the Congressional Record, Apr. 21, 1969]

Analysis of Differences and Replies on CBW From Departments and Ambassador Yost

(By Hon. Richard D. McCarthy)

Early in February of this year the activities of the United States in chemical and biological warfare were brought to my attention by a disturbing documentary shown on NBC television. I recognized that I knew almost nothing about this aspect of our military capability and decided to inform myself. My main interest was in the public policy questions relating to chemical and biological warfare. Why do we need a capability? What sort of capability do we have? What are our policies governing the use of these weapons? What do these activities cost us each year? What are the safety precautions taken to protect the public against accident? Are our academic and private institutions being improperly involved in chemical and biological research?

In order to inform myself about our CBW program I asked the U.S. Army to brief those Members of Congress who were interested in this field. On March 4, 1969, the Army presented a briefing, most of which they insisted on classifying. I did not find that briefing satisfactory; it did not answer the public policy questions. So I then prepared a comprehensive set of policy questions which I sent to Secretary of Defense Laird, Secretary of State Rogers, Director of the Arms Control and Disarmament Agency Smith, Ambassador to the United Nations Yost, and Dr. Henry Kissinger of the White House staff. While waiting for replies I have made a rather extensive study of the information that is available in public; I have received assistance from several organizations that are involved in a study of chemical and biological warfare, and I have consulted a number of individuals who are very knowledgeable in the field.

I have now received replies from all of the departments and agencies that I contacted with the exception of Dr. Kissinger. His office said that they had hoped to prepare a reply to my March 20, 1969, letter by last Friday but had not had time to do so, which is perhaps as much a comment on the priority placed on CBW policy in relation to other matters as it is on the pressures of the Executive Office. I would like to comment at this time on the nature of the information that I have received.

Chemical and biological warfare activities are shrouded in secrecy, unnecessarily so in my view. The Army's unclassified briefing was perfunctory at best; the classified presentation was not much better. I get the impression that the security curtain is parted only when it serves the interests of the advocates of the program. I found the replies from the departments heartening in some respects, but more deeply disturbing in most others. By far the most revealing information appears in sources available to the public such as occasional statements by public officials, open publications, and press reports, both domestic and foreign.

Perhaps the most immediately disturbing aspect of the replies that I have received from the departments is the contradiction between some of the replies and the information that is available to the public. These contradictions should be resolved; both the Congress and the American public deserves a full explanation if the credibility of our public officials is to be maintained. Some of these contradictions are—

First. Defense states that we maintain a limited offensive capability in chemical weapons; that the carefully controlled inventories are adequate for tactical response.

Yet we have in storage about 100 million lethal doses of nerve gas at Rocky Mountain Arsenal and Tooele Army Depot. Col. S. J. Efnor stated that the gas from a single bomb the size of a quart fruit jar could kill every living thing in a cubic mile. The inventory of nerve gas seems to be more than that required for an adequate tactical response.

38-044—70——23

Second. General Hebbeler in the unclassified briefing stated that biological warfare is generally considered to have strategic implications rather than tactical.

Yet Defense says:

"Although the employment of biological weapons against U.S. population centers cannot be ruled out entirely."

There appears to be a contradiction between the Army's estimate of the threat and that of Defense.

Third. Defense states that the U.S. Armed Forces have the equipment to protect themselves against CB attack with the exception of a biological warning and detection device.

Yet I am informed that the Navy only purchases one-tenth of the quantity of atropine, the nerve gas antidote, needed for their total number of personnel.

Fourth. State and Defense say that review has shown that there is no evidence of substantial permanent or irreparable damage, no significant permanent damage, to the ecology of Vietnam due to defoliation. Both Departments cite the work of Dr. Fred H. Tschirley as an authority; Defense cites a report prepared by Midwest Research Institute.

Yet Dr. Tschirley's report itself says that the mangrove tree, a source of food in Vietnam, is particularly susceptible to damage from herbicides and that he had seen quite a few dead mangroves, a tree taking about 20 years to grow. He goes on to say that a single treatment with the defoliants orange or white would not be expected to have a lasting effect but that a second application during the period of recovery would have a wholly different effect. Press reports state we spray more than once in the same growing system.

Even more damaging, Dr. Tschirley, their authority, reviewed the Midwest Research Institute report for Ecology, a professional magazine, and said:

"Reading the MRI Report before visiting Vietnam left me with the feeling of having read a literature review that resulted in accurate general conclusions, but told me nothing about the ecological consequences of using herbicides in Vietnam. In summary, the MRI Report is a literature review of a subject for which there is a great deal of literature relating to temperate zones, but little relating to tropical vegetation. The FRI Report is disappointing because its direct applicability to Vietnam is so tenuous."

Similarly, Profs. Egbert W. Pfeiffer and Gordon H. Orians, professor of zoology at the University of Montana and professor of zoology at the University of Washington, respectively, made the following report on April 3, 1969, after a 2-week visit to Vietnam.

They described in grim terms the effects of leaf-killing chemicals on Vietnamese plant and animal life. They made a 65-mile trip by armed boat down the waterway linking Saigon with the sea. They scarcely saw a living plant. Bird life, apart from fish-eating birds, has virtually disappeared. The justification for the program, one reminiscent of the colonel's remark at the time of the Tet offensive last year that "we had to destroy the village in order to save the village," was also given by Professors Pfeiffer and Orians. They said that it was completely unrealistic to expect military commanders to forgo such measures. There is no question about it; they save American lives.

Fifth. Defense states that each use of herbicides or defoliants is approved by the U.S. Embassy and the Government of the Republic of Vietnam.

Yet this must be a recent policy change if it is true because in February 1967, Secretary McNamara told congressional committees that the decision on when and where to use chemicals had been turned over to commanders in the fields. Commanders in the area of South Vietnam can defoliate any time they think it will open up avenues of fire that are otherwise unavailable to them. Unless there has been a change in policy, this is a direct contradiction.

Sixth. Defense and State say that the only gas used in Vietnam by U.S. forces is CS, a powerful teargas: Defense says that CN, a milder teargas was also authorized some years ago. Both Departments justify its use by pointing out, that it is often used as a riot control agent, State saying:

"The fact that teargas is used for the control of riots by governments responsible to their people provides an objective standard for differentiating it from other chemical weapons."

Yet in 1965 Deputy Secretary of Defense Vance and Secretary McNamara said that South Vietnamese forces had been equipped with three gases which they had used, CN, CS, and DM. DM, otherwise known as Adamsite gas, was

not classified as an incapacitating gas but rather as an irritant gas until relatively recently by the Army. Both Defense and State point out this gas often allows the Army to accomplish its aims with the minimum violence required, citing the case of civilians mixed with Vietcong that are subdued with gas rather than with explosives. Secretary Rusk spoke of the use of this gas as the attempt to use the minimum level of violence required.

Most disturbing, the New York Times reports that in 1966 helicopters dropped hundreds of teargas grenades on a fortified Vietcong area in preparation for a B–52 bombing raid. Defense spokesmen are then quoted as saying that the purpose of the gas was to drive the Vietcong out of their fortifications so that they could be killed with bomb fragments. Gas has also been dropped prior to artillery attacks according to press reports. This clear use of gas in conjunction with lethal conventional weapons is chemical warfare. The extent of the use of this technique can be speculated upon when we find Defense procuring $81 million worth of riot control munitions—teargas—in 1969.

Seventh. Defense states that strict safety practices are enforced at laboratories which work with CBW agents.

Yet Defense's overall safety record during the past two decades is poor. Fort Detrick, the Army's biological warfare research center has one of the poorest records among major biological institutions for infections. There were 3,300 accidents at Detrick between 1954 and 1962 according to the Phillips report. Half of these occurred in the laboratory, involving broken test tubes, accidental scratches from needles, and so forth. About 400 men were infected as a result of these accidents. And infections among its workers pose some danger to neighboring communities. In 1959 one worker caught pneumonic plague, a highly infectious disease. He also happened to be a lifeguard at a swimming pool and had been in contact with many people. Local residents that might have come in contact with Detrick personnel who could have been infected were not warned of the danger. Nor did the Public Health Service promptly report this to the World Health Organization as required by agreement. In 1951 an Army bacteriologist working at Detrick became ill at his home in Frederick, Md. He was placed in the local hospital where his disease went unrecognized. He was taken to the base hospital shortly thereafter and died of deadly anthrax. The dangers of failing to warn local populations so that the most careful observation can be made is clear to any health authority.

At another installation, the Rocky Mountain Arsenal, where chemical agents are stored and produced, the Army has failed to prevent accidents. In the early 1950's leakage of toxic material from the arsenal began to kill crops and animals on surrounding farms. Vigorous complaints led the Army to drill a deep disposal well to store waste products from their activities. This resulted in the first series of earthquakes that Denver had experienced in 80 years. In the immediate period after the well was drilled and used for storage, there were over 1,500 earth tremors in the Denver area, some reaching up to 6 on the Richter scale. Some tremors destroyed property. As a result, the Army discontinued using the deep well and began pumping material out.

At the Dugway Proving Grounds, used for chemical and biological warfare testing, despite a recent order emphasizing the importance of safety, more than 6,000 sheep in nearby Skull Valley were killed when nerve gas was carried from the testing grounds onto their pastures. I am informed that tests of sheep in a number of areas around Dugway showed low-level exposure to nerve gas. In another disturbing report, I learned that the local sheriff is occasionally asked by Dugway authorities to patrol the roads that pass the proving grounds to insure that motorists don't slow down or stop beside the road. Candor is not the mark of the Army's treatment of these problems; they have refused to confirm that the sheep died of nerve gas although they paid over $300,000 to the farmer for his loss and only last Thursday, awarded him an additional $198,309 in damages.

At the Pine Bluff Arsenal in Arkansas, production center for biological weapons, contamination of a local stream leading into a nearby river with toxic material led the Army to buy up the land along the stream. Presumably the toxic material is diluted when it weeds into the river.

I do not find this safety record very reassuring.

Eighth. Defense states that gases are transported according to rules established by the Interstate Commerce Commission and the U.S. Public Health Service: that an underlying layer of sand is used to reduce vibration and absorb

any leakage; that all shipments are accompanied by a trained escort; that routes are planned to avoid populated areas and to minimize time in populated areas; and that transported agents are not volatile.

Yet in the incident reported in the Denver railyards, these statements appear to be contradicted. I rechecked the facts with Dick Kruse, the reporter for KBT–TV/KBTR in Denver and found that the gondola cars carrying large tanks of nerve gas that he filmed in the Denver railyards on a siding had no sand under them; they were on a siding in the center of Denver for most of the night; that he had spent about 1½ hours filming the tanks both from the ground and upon the gondola cars and had seen no guards. General Hebbeler also stated that GB, presumed to be the agent in the tanks, is relatively volatile.

The movement of these agents by rail is fraught with danger; the Transportation Safety Board of the Department of Transportation has reported on the alarming increase in derailment and other forms of railroad accidents, up 85 percent between 1961 and 1967. As the Dunreith accident illustrated, the accident need not occur to the train carrying the gas; it might be caused by a passing train. If the accident were similar to that which occurred in Laurel, Miss., the explosion of the adjoining train might scatter nerve gas over a 10-block area of a city. Furthermore, the Transportation Safety Board will shortly announce some major revisions in transportation safety regulations because of their inadequacies, I am led to understand.

I also do not find Defense's reply that the statistical probability of a gas transportation accident is very difficult to determine because we have never had one. Certainly the art of safety and reliability analysis, as practiced by NASA and the AEC for example, has proceeded far enough to give some fairly good indications of the dangers involved.

I have also come across information available to the public on the transportation of biological agents that causes me grave concern. In a December 1967 publication issued by Fort Detrick, procedures for the careful packaging of biological agents were described, including a crash of an aircraft with biological agent containers aboard. The packages are designed to protect the biological agents that are being shipped; the report concludes:

"Any number of such packages is now acceptable in one aircraft for shipment by commercial airlines under the Official Air Transport Restricted Articles Tariff No. 6–D. Technical escort is not required. However, current regulations of the Armed Services require technical escort for any shipment in which the total volume of etiologic agent in all packages in one conveyance exceeds 3 gallons."

Although the containers survived a crash of an aircraft going 120 knots from about 40 feet up onto desert soil, it is highly questionable whether they would have survived a midair explosion with metal fragments being blown about or a crash at greater speeds into a mountain cliff. The biological agent might well have been vaporized, wind conditions might carry the vapor to a nearby community with disastrous results. As one expert has said, a fraction of a gram of purified bacteria or virus in aerosol form could be sufficient to infect anyone in a square kilometer.

The publication goes on to indicate that agents may be shipped to Fort Detrick, Md.; Pine Bluff, Ark.; Edgewood Arsenal, Md.; Dover, N.J.; Aberdeen Proving Ground, Md.; Dugway, Utah; Deseret Test Center, Utah; Eglin Air Force Base, Fla.; Oakland, Calif.; China Lake, Calif.; U.S. Naval Base, Brooklyn, N.Y.; Crane, Ind.; Fort McClellan, Ala.; and possibly to Canada, Britain, and Australia.

Ninth. Defense states that we have a CBW budget of $350 million for 1969. That budget includes $139 million for napalm, incendiary weapons, and the like, weapons that I will accept as not normally falling in the definition of CBW. It contains $81 million for tear gas or riot munitions. It contains $5 million for herbicides.

Yet I find it difficult to accept this budget figure. It is generally admitted that the United States spent about $100 million for defoliants and herbicides last year. I cannot believe that we will buy only $5 million this year. A McGraw-Hill investment newsletter states that Edgewood Arsenal would spend about $420 million in 1969 for CBW materials. And this is only one center.

Tenth. Defense states that the Army does use discretion in placing CBW research contracts with academic and private institutions.

Yes it is reported to me that a number of biologists have been approached by an individual asking them to undertake certain specified research projects without identifying the source of the funds that would pay for the work—presumably the Army. Academic biologists have also indicated that they would not undertake research for the Army on CBW projects if it weren't for the great shortage of support funds in this field of science.

I also find use of the Smithsonian, even if not on CBW itself but rather in determining what areas might be suitable for CBW tests, of questionable discretion in view of the Institution's international reputation and need to keep clear of any doubt as to the nature of its work.

Going beyond the immediate contradictions which I have listed some general comments should be made. First, the unnecessary secrecy surrounding our CBW activities from both Members of Congress and the public should be stripped away. A policy of evasiveness in responding to public inquiry only arouses more suspicion that already exists. I found Mr. Foster's reply an improvement over the information provided by the Army but even his reply has contradictions that require clarification. I believe that an inquiry calling on informed and expert opinion is required to resolve these contradictions. I am exploring with my colleagues in the House and Senate the possibility of an ad hoc committee of inquiry or a possible investigation by one of the standing subcommittees of the Senate. I expect to make a recommendation on this shortly.

Second. In comparing the replies of the departments I found a more thorough and comprehensive definition of policy in the reply received from Defense than I did from State. Defense at least says that we have a "no-first use" policy for biological warfare and implies that we have the same policy for lethal gas. The State Department says that it is up to the President to decide national policy and does not mention "no-first use" in reply to these questions. In contrast with Secretary Rusk's rather careful exposition of a no-first use policy in 1965, and a justification of the use of tear gases on humanitarian grounds, State now just says that it is the President's decision, almost an abdication of their responsibility in this aspect of foreign policy.

Third. Although General Hebbeler defended use of incapacitating agents such as tear gas by saying they were not invented at the time of the Geneva Protocol in 1925, it is well documented that tear gas and adamsite were extensively used in World War I. The records of the Preparatory Commission for the Disarmament Conference meeting in 1931 which I placed in the record on April 1, also clearly show that the British, the French, the Spanish, the Yugoslavs, and others stated that they considered tear gas and other noxious gasses, even if nonlethal, to be included in the wording of the Geneva Protocol. Significantly, neither the Defense nor the State reply justified the use of tear gas by saying that it is not included in the Geneva Protocol—a change in policy from General Hebbeler's statement and Defense and State's earlier justification for use of tear gas.

Fourth. I find the use of incapacitating gas in conjunction with B–52 raids and artillery attacks, and the use of defoliants as an antifood weapon not "the minimum use of force required" or a herbicide or defoliant used for agricultural or industrial purposes in the United States and Russia, but rather chemical warfare. This is a change from our policy in World War II when President Roosevelt said:

"Use of such weapons has been outlawed by the general opinion of civilized mankind. This country has not used them, and I hope that we will never be compelled to use them. I state categorically that we shall under no circumstances resort to the use of such weapons unless they are first used by our enemies."

Following World War II Adm. Chester Nimitz was asked about the toughest decisions he had to make. He replied:

"There were a lot of tough ones. I think when the War Department suggested the use of poison gas during the invasion of Iwo Jima that was a trying decision. I decided the United States should not be the first to violate the Geneva Convention. It cost many fine Marines."

Similarly, in the Korean war we went to extraordinary lengths to refute Communist charges that we were using germ warfare. We recognized the grave impact that belief of this charge would have on world opinion.

Yet today, although we state that we adhere to the principles of the Geneva protocol, we are using tear gas to aid in the killing of the enemy and we are using chemicals as an anti-food weapon and in a way that may well have long-

term destructive effect on the Vietnamese countryside. This latter policy seems unlikely to win the battle for the minds of the uncommitted in Vietnam.

I ask, Who is responsible for this change in our chemical and biological warfare policy? Did the President decide? Has Congress agreed to this change? Do the American people accept this new policy as one in keeping with the principles and moral precepts of our Republic? This question demands the most thorough review and debate. I therefore ask President Nixon to resubmit the Geneva protocol of 1925 to the U.S. Senate for ratification so that this review can be made. I, for one, would like to know where the United States stands on this issue today.

Fifth, I find it inconceivable that the United States would knowingly use biological warfare even as a matter of retaliation. Defense admits that we have no warning system to tell when and if such an attack were used against us. Biologists tell us that the purpose of biological warfare research is to develop vaccine-resistant strains of disease. Defense tells us there is no specific therapy available for most BW agents and that vaccination against the more than 100 agents is not practical and would probably harm the health of the individual.

Dr. Joshua Lederberg, Nobel laureate biologist, warns that loosing a biological agent on a nation might well result in a worldwide epidemic raging out of control with new mutant strains of the disease developing that might not respond to a vaccine even if one were initially available.

Dr. James D. Watson, Nobel laureate biologist at Harvard who served on a Presidential Chemical and Biological Warfare Advisory Panel from 1961 until 1964 said in an interview that he thinks CBW programs should be discontinued because they are not a good way of winning wars—militarily they are a waste of time. He went on to say that the top people in the Department of Defense never gave a damn about it—it becomes dangerous with a suspicious, hostile military who are losing a war, so will try it to win.

With these comments in mind, I urge the United States to give full support to the proposal of the British to the 18-Nation Disarmament Conference that biological warfare research and use be fully banned. Research on vaccines against diseases can be conducted, openly, with the results available to everyone. An open inspection system has been suggested, one in which all biologists would report by word of mouth any suspected violations of the ban on biological weapons research or manufacture. We would have little to lose and much to gain.

Sixth, I urge that a top-panel of Department of Transportation, U.S. Public Health Service, Department of Defense, and independent academic experts be convened to review transportation policies for chemical and biological agents and to establish the strictest transportation standards for their transportation, if indeed such transportation is needed.

Finally, I intend to coment further on our chemical and biological warfare policies and practices for I regard them as one of the benchmarks of our moral and ethical principles. There are those who say that it makes no difference how a man dies. I disagree, let me draw from General Hebbeler's briefing; there is a principle of proportionality, which is not only a general principle of international law, but is also fundamental to moral law. It applies, even though the target, the weapon, and the method of attack may be legitimate. It requires that belligerents refrain from employing any kind of violence which is not necessary for military purposes. I believe that chemical and biological warfare are not necessary for military purposes. Let the United States take the lead in seeing that they are banned from use. And let the United States refrain from using those chemicals which begin to break down the thin dividing line between the long-standing principle of no first use and chemical warfare.

The text of the answer from the Department of Defense follows:

"APRIL 15, 1969.

"HON. RICHARD D. MCCARTHY,
"*U.S. House of Representatives,*
"*Washington, D.C.*

"DEAR MR. MCCARTHY: The Secretary of Defense has asked me to reply to your letter of March 7, 1969, concerning chemical and biological warfare.

"Answers to each of your questions are attached. Copies of reports and other materials which are relevant to the questions are included. It is believed this information responds to your inquiries on an unclassified basis. There are areas which could be extended and amplified by classified discussion.

"Sincerely,

"JOHN S. FOSTER, JR.,
"*Director of Defense,*
"*Research and Engineering.*

"QUESTIONS AND ANSWERS

"QUESTION 1

"Is it our national policy to respond in kind to a gas attack against the nation? Do we state that we will use lethal gas against a nation that launches a gas attack against us, rather than a nuclear attack? Wouldn't it be cheaper and just as effective to retaliate with another weapon with which we have had operational experience?

"*Answer*

"It is the policy of the U.S. to develop and maintain a defensive chemical-biological (CB) capability so that our military forces could operate for some period of time in a toxic environment if necessary; to develop and maintain a limited offensive capability in order to deter all use of CB weapons by the threat of retaliation in kind; and to continue a program of research and development in this area to minimize the possibility of technological surprise. This policy on CB weapons is part of a broader strategy designed to provide the U.S. with several options for response against various forms of attack. Should their employment ever be necessary, the President would have to authorize their use. The U.S. does not have a policy that requires a single and invariable response. Deterrence is our primary objective.

Chemical weapons, in many tactical situations, are more effective than conventional (high explosive and projectile) weapons. Accordingly, it is believed wise to deter their use. If two approximately equally effective military forces were engaged in combat, and one side initiated a CB operation, it could gain a significant advantage even if the opposing side has protective equipment. Neutralization of this advantage could not be achieved with conventional arms.

"QUESTION 2

"Is it our national policy to respond in kind to a massive biological weapon attack? Wouldn't it be cheaper and infinitely safer for all of mankind to respond to a biological weapon attack with other weapons with which we have had operational experience?

"*Answer*

"The U.S. policy and its rationale with regard to biological warfare is generally the same as that for chemical. As a matter of policy the U.S. will not be the first to use biological weapons, but we are aware of the capabilities these weapons place in the hands of potential adversaries. For this reason it is important to carry on our R&D program in BW, not only to provide necessary equipment, such as detection and warning devices, but to define and quantify more fully the potential threat to the U.S. from these weapons, and the hazards involved if they are ever used against us.

"QUESTION 3

"If our gas biological warfare efforts are purely defensive in nature, what steps have been taken to defend our public from these threats? Why hasn't the public been instructed as to what to do in the case of a nerve gas attack, a hallucinary gas attack, or an incapacitating gas attack? Do we stockpile antidotes, serums, and vaccines for gas and biological attacks at medical centers and instruct people where they are? We do, after all, instruct people what to do in the case of nuclear attack. We stockpile supplies in fall-out shelters that are marked so that the public will know where they are. Why don't we do the same for the threat from gas and biological weapons?

"Answer

"The threat to the U.S. civil population from CB attack has been studied by the Department of Defense, and these analyses are periodically up-dated. It is clear that the threat of CB attack is less significant than that of nuclear attack. For this reason, more emphasis has been placed in civil defense on the nuclear threat.

"For logistic reasons chemical agents do not appear to pose a major strategic threat against the U.S. For example, it would require many tons of nerve agent munitions to carry out an effective attack against a city of a few million people. This may appear inconsistent with the high toxicity of the nerve agents, but for many technical reasons such as the difficulty in disseminating the agents in vapor or aerosol form, the dilution of the agent in the atmosphere, and their impingement on ground and vegetation, it is correct. For this reason, the U.S. does not maintain stockpiles of therapeutic materials for nerve agents. Although the possibility of the employment of biological weapons against U.S. population centers cannot be ruled out entirely, it does not presently warrant the priority given to defense against the affects of nuclear weapons. Research on methods of detecting and warning, identifying, and defending against biological attack are continuing, as is the review of the magnitude and nature of the threat.

"The Office of Civil Defense has developed an inexpensive but effective protective mask for civilian use, and a limited production run was made to test production quality. No large scale production was undertaken because of the low estimate of the threat as described above. Should the threat to the U.S. population increase, this mask could be produced quite rapidly and, together with other necessary defensive measures, would afford protection against both chemical and biological attack. Filtration systems have been designed and tested, and these could be added to fall-out shelters to afford collective protection for groups of people. In addition, many of the emergency plans developed by the Department of HEW for post-nuclear attack medical support would be applicable. The emergency packaged hospitals, for example, provide for expansion of hospital facilities by the equivalent of 2500 hospitals of 200 bed size.

"The U.S. does not maintain large stockpiles of medical supplies such as antibiotics and vaccines against the possibility of biological attack. There is no specific antibiotic therapy available for most BW agents. As for vaccines, there are more than 100 possible BW agents, and production and administration of 100 vaccines to the U.S. population is not practical. There is medical reason to believe that such a program would be generally injurious to health in addition to requiring prohibitive expenditures.

"QUESTION 4

"We have been told by former Under Secretary of Defense Cyrus Vance, that the 'why' of chemical and biological warfare is defense. Are our soldiers in the field, Vietnam, Korea, Germany, and sailors at sea able to defend themselves against all forms of chemical and biological weapons attack? Since we are using marginal forms of a chemical warfare in Vietnam, are our forces prepared for an escalation in the use of chemical weapons? Are our troops prepared for the possibility of the enemy responding with a stronger weapon than the incapacitating gases we use?

"Answer

"The U.S. Armed Forces have the equipment to protect themselves against CB attack with the exception of a biological warning and detection device which is under development. U.S. soldiers and sailors generally have masks and protective clothing; and collective protection equipment for vans and Communication centers is being developed and supplied; U.S. troops in Vietnam are prepared for possible enemy uses of chemical weapons.

"QUESTION 5

"Why do we choose to call defoliants herbicides of the type we use in our own agriculture rather than chemical warfare? What defoliants or chemicals, if any, are being used in Vietnam to destroy plant life which are not customarily used in the United States? To what extent are they used? What is the distinction between a chemical that is used to destroy crops and a plant disease from the field of biological warfare that could be used against rice or wheat?

"Answer

"There are no herbicidal chemicals used in Vietnam to destroy vegetation which have not been widely used in the United States in connection with clearing areas for agricultural or industrial purposes.

"The term 'defoliants' is used because it properly describes the purpose of its use; that is, to remove leaves from jungle foliage to reduce the threat of ambush and to increase visibility for U.S. Forces. This use of defoliants has saved many American and South Vietnamese lives.

"There are several distinctions between a chemical herbicide and a biological plant disease. The biological agents are living plant pathogens, and may be spread beyond the area of attack by winds, insects or animals. Chemical herbicides do not spread in this manner beyond the area of attack. Further, more is known about the effects of chemical herbicides because of their widespread use throughout the world. Each use of herbicides or defoliants in Vietnam is approved by the U.S. Embassy and the government of the Republic of Vietnam.

"QUESTION 6

"Do we have in practice or in policy an anti-food policy through the use of defoliants in Vietnam? What are our plans to restore the environment of Vietnam which has significantly altered as a result of our defoliant policy? Will we establish a commission similar to the Atomic Bomb Casualty Commission that operated in Nagasaki and Hiroshima after the war to study and correct some of the damage that we caused?

"Answer

"The U.S. has a carefully limited operation in South Vietnam to disrupt the enemy's food supply. It is limited to the attack of small and usually remote jungle plots which we know the VC or NVA are using. Usually these plots are along trails or near their base camp areas. Each such operation is approved by the U.S. Embassy and the government of the Republic of Vietnam. Enemy caches of food, principally rice, are also destroyed when it cannot be used by the South Vietnamese. These limited Allied activities have never, in any single year, affected as much as one percent of the annual food output of South Vietnam.

"To date surveys have shown that there is no evidence of substantial permanent or irreparable damage from the viewpoint of the future development of South Vietnam, attributable to the defoliation effort. The Department of Defense has supported the Department of Agriculture in studies of herbicides in analogous areas, and I am attaching a copy of their report 'Response of Tropical and Sub-Tropical Woody Plants to Chemical Treatments.' The Department of Defense also had a base line study of the forests of Vietnam prepared entitled 'Forests of Southeast Asia, Puerto Rico, and Texas,' a copy of which is attached. More recently a study 'Assessment of Ecological Effects of Extensive or Repeated Use of Herbicides' was done by Midwest Research Institute, a copy of which is attached. This study was reviewed by a special committee of the National Academy of Sciences, and judged by them to be an accurate and competent report. Last fall, the Department of State, with Department of Defense participation, made a survey of the ecology of defoliated areas. One of the scientists who made this survey, Dr. Fred Tschirley from the Department of Agriculture, published his report in *Science*. A copy of his report is attached.

"At the end of active combat, it appears probable that there will be agricultural and forestry activities and other programs which will aid the South Vietnamese people. The Department of Defense would cooperate with the Department of State and the U.S. Agency for International Development as necessary in accomplishing these. The Department of Defense supports the concept of a comprehensive study of the long-term effects of the limited defoliation program, and has endorsed, in principle, proposals by the American Association for the Advancement of Science for such a scientific study.

"QUESTION 7

"Why do we exclude incapacitating gases such as those used in combat operations in Vietnam, from the chemical warfare category? Why are vomiting gases, incapacitating gases, and other irritants regarded as being different from other forms of gas? Apparently, we have a policy of using non-lethal, or at least non-

lethal by intent, gas in combat. Are there occasions under which the gases in use are or have been lethal? Under Secretary Vance has said that these gases are not chemical warfare because they are used by police for riot control and the like. Even if they are, this still appears to be a policy of using incapacitating agents as an offensive weapon. Any distinction made by Secretary Vance is semantic and once again opens the credibility gap.

"Answer

"The only 'incapacitating gas' in use by U.S. Forces in Vietnam is the riot control agent called CS, although CN was also authorized some years ago. Both are tear gases. There is no known verified instance of lethality by CS, either in Vietnam or anywhere else in the world where it has been used to control disturbances by many governments.

"Efforts to find the statement you attribute to the former Deputy Secretary Vance have been unsuccessful. A copy of an excerpt from his testimony two years ago before the Disarmament Subcommittee of the Senate Foreign Relations Committee (February 1967) is attached. The distinction he made is that the U.S. has never used biological weapons, nor have we used lethal chemical weapons since World War I, and that it is against U.S. policy to initiate their use, but that the U.S. has used riot control agents and herbicides. It is believed these distinctions are still valid.

"QUESTION 8

"What precautions are taken to insure that chemical and biological warfare experiments are of no danger to the public? What precautions did not work at the sheep kill at Skull Valley in Utah? What precautions are taken when the Army moves chemical agents from a plant to a storage depot or to a port of embarkation or an airfield? What are the risks if there is a train wreck? Are the agents being transported volatile? Is the statistical probability of an accidental discharge of poisonous chemicals greater than of the probability of a nuclear explosion from, say, an ABM warhead? What can be done to counter the damage that would be done if there were an accidental discharge of a chemical agent while in transit through a city or town?

"Answer

"Strict safety practices are enforced at laboratories which do research on CB agents. Elaborate systems of airtight hoods, air filtration and waste decontamination are employed. These precautions and procedures are reviewed by the U.S. Public Health Service as well as by Department of Defense safety experts. The equipment and building designs developed at the U.S. Army Biological Laboratories, for example, have been generally accepted throughout the world as the ultimate in safety for the investigation of infectious diseases.

"With regard to the extremely unfortunate Skull Valley incident, the exact chain of events is still not completely understood. A freak meteorological situation was probably a major contributing factor. This matter has been carefully reviewed by a special advisory committee appointed by the Secretary of the Army and chaired by the Surgeon General of the U.S. Public Health Service. A copy of this report is included for your information. This committee has made a number of recommendations concerning test limitations, toxicological and environmental investigations, added meteorological facilities, and a permanent safety committee. All of these recommendations are being followed.

"Movement of chemical agents is governed by rules and procedures established by the Interstate Commerce Commission and the U.S. Public Health Service. The material is shipped in special containers; these containers are put on pallets of necessary and fully restrained, and an underlying layer of sand is used to reduce vibration and to absorb agent in the highly unlikely event of leakage. All shipments are accompanied by a trained escort detachment equipped with decontaminating and first aid equipment. Routes are carefully planned to avoid populated areas to the greatest extent possible; and, where they cannot be avoided to move through them carefully and with as little delay as possible.

"The precautions taken—the use of special trains careful routing controlled speeds and other measures—makes a train wreck extremely unlikely. However, even further steps are taken to minimize any hazard that might result from an

accident. Buffer cars are included in the train, the escort detachment is distributed in different cars to provide prompt full-train coverage in emergencies, and transit time through populated areas is minimized. Although the agents are not inert, it is important to note that transported agents are neither volatile nor in the gaseous state. They are liquid, and the most volatile is about eight times less volatile than water. The containers are not under pressure, and nerve agents are rapidly rendered harmless by fire.

"The comparison of statistical probabilities of a railroad accident and subsequent discharge of chemicals or accidental explosion of a nuclear device is very difficult because of the difference between them. Extensive precautions are taken to provide safety in both. There has never been either an accidental nuclear explosion or an accidental discharge of chemical agent during shipment. This absence of data makes it impossible to calculate the respective probabilities of accident.

"In the unlikely event of accidental discharge in a city or town, the first steps would be to secure the area; to decontaminate the liquid material, and to provide first-aid to any individual who came in contact with the liquid. Supplies are carried in the train to accomplish this. Any alkaline material, such as bleach or quicklime, will rapidly decompose nerve agents. Because the agents have low volatility, there is little vapor hazard, however, people should not be allowed in the downwind vicinity as a matter of precaution.

"QUESTION 9

"What is the annual cost of our activities in the fields of chemical and biological warfare? What is the cost of munitions and weapons in these fields? Since comparable figures are available for our procurement and research programs in ICBM's the ABM, Polaris, and similar forces, I assume they can be made available for our CBW program. If they can't, why can't they?

"Answer

"Total U.S. expenditures in the CB field, including smoke, flame, and incendiary weapons, is $350 million for Fiscal Year 1969. There is no procurement of lethal chemical agents or of biological agents. (Details of expenditures are given in the table below.)

"CB expenditures, fiscal year 1969

	Million
"Procurement:	
Smoke, flame, and incendiary	$139
Riot control munitions	81
Herbicides	5
Defensive equipment	15
Total	240
"R.D.T. & E.:	
General and basic R. & D	9
Offensive R. & D	31
Defensive R. & D	30
Test and evaluation	20
Total	90
Operation and maintenance	20

"QUESTION 10

"Do we have the capability to respond to a massive nation-wide gas or biological warfare attack? That is, could we launch a similar and immediate attack against the aggressor? The deterrent effect of our ICBM's is based on the enemy's knowledge that we can and will respond. This has been a policy publically stated by the Secretary of Defense. Is the same true in the field of chemical and biological warfare?

"Answer

"The answer to the question, as stated, is no: the U.S. could not launch an immediate, massive, chemical and biological attack. The U.S. has the technical capability to do this, but it has not been judged necessary or desirable to procure and install the weapon systems for 'immediate massive' attack. The carefully controlled inventories are adequate for tactical response against enemy military forces; not for strategic or 'nationwide' attack.

"QUESTION 11

"Do we have a rapid warning system that will alert the public to a chemical or biological attack?

"Answer

"The U.S. has developed chemical detection and warning instruments which could provide the components for a national alarm system. They have not been deployed to build such a system. However, as noted above, it is believed that the threat of strategic chemical attack is not great. Warning against biological attack is much more difficult technologically. Recently, there has been success with a prototype instrument which would provide some biological warning capability. R&D efforts in this area will be continued.

"QUESTION 12

"Does the Army use any discretion as to what types of institutions should be encouraged or pressed into accepting funds for work in chemical and biological warfare? Does the Army see any conflict in asking a purely civilian institution, such as the Smithsonian, to do work that might conflict with the institution's activities abroad?

"Answer

"The Army certainly uses discretion in selection of all of its contractors. The advice of the Smithsonian Institution was sought in identifying a suitable institute to do this work. As a result, they submitted a proposal, which was accepted. As a direct consequence of this work, there have been 45 papers written by Smithsonian scientists and published in the scientific literature. This has been a remarkably productive scientific investigation brought about by a coincidence of interests in the fauna of the area.

"The Smithsonian Institution was never asked to do nor did they do, any "military" chemical and biological warfare research. It carried out scientific investigations appropriate to its character and objectives, and published the significant findings in the scientific literature. These results are available for use by the Army, by any other government agency, or by any nation or scientist wishing to do so.

"QUESTION 13

"Would the United States or any other major nation be risking its national security by dispensing with chemical and biological weapons altogether, especially in view of their many skills with weapons that have already been used?

"Answer

"It was pointed out in the discussion of Question 1 that CB weapons are, in many military situations more effective than conventional weapons. Thus, a nation which lacked CB weapons and could not deter or counter their use would have to consider more extreme measures. Unilateral CB disarmament would adversely affect a nation's deterrent capability, it would decrease its response options, and it would ultimately seriously degrade its CB defensive capability. The U.S. is committed, as President Nixon wrote recently, to "exploring any proposals or ideas that could contribute to sound weapons." The Defense Department is fully in accord with mutual arms control efforts and supports them in every way possible. For example, members of the Department of Defense will join representatives of the State Department and Arms Control and Disarmament Agency in meeting in late April to assist the United Nations Secretary General's group of 14 consultant experts prepare a report to the Secretary General of the UN on the characteristics of CB weapons.

"QUESTION 14

"Isn't it correct, as Dr. Joshua Lederberg has said, that biological weapons are regarded as a tool of dubious value at best?

"Answer

"It is difficult to answer this question without knowing the context in which Dr. Lederberg stated his conclusion, nor the rationale he used in arriving at it. There are a number of technical uncertainties about the effects of biological weapons, but this does not reduce the vulnerability of the U.S. to them, nor does it negate the potential hazard they pose. Until such time as it can be proved that they are of little value to any nation, if that is indeed the case, or until reliable mutual arms control agreements are reached, it would be imprudent to dismiss them lightly."

The text of the answer received from the Department of State follows:

"APRIL 7, 1969.

"Hon. RICHARD D. MCCARTHY,
"House of Representatives,
"Washington, D.C.

"DEAR CONGRESSMAN MCCARTHY: The Secretary and the Director, Arms Control and Disarmament Agency have asked me to reply to your letters of March 10 and March 20, respectively, in which you inquired as to our national policy with respect to chemical and biological warfare.

"The answers that follow reflects those aspects of your questions that come within the responsibilities of the Department of State and the Arms Control and Disarmament Agency. For ease of reference, I have repeated the questions. Questions 3 and 7 can best be answered by the Department of Defense.

"QUESTION 1

"Is it our national policy to respond in kind to a gas attack against the nation? Do we state that we will use lethal gas against a nation that launches a gas attack against us, rather than retaliate with another weapon with which we have had operational experience?

"Answer

"Should the nation be attacked with either gas or biological weapons, the President would decide upon an appropriate response. As you indicate, there are a number of responses available to the nation.

"QUESTION 2

"Is it our national policy to respond in kind to a massive biological weapon attack? Wouldn't it be cheaper and infinitely safer for all of mankind to respond to a biological weapon attack with other weapons with which we have had operational experience?

"Answer

"My comment on Question 1 is equally applicable to this question.

"QUESTION 4

"Why do we choose to call defoliants herbicides of the type we use in our own agriculture rather than chemical warfare? It is not sufficient to say as Ambassador Nabrit did, that so-called herbicides are not a form of chemical warfare. It only extends the credibility gap between our statements and our practices. What is the distinction between a chemical that is used to destroy crops and a plant disease from the field of biological warfare that could be used against rice or wheat?

"Answer

"In 1966, at the United Nations, Ambassador Nabrit defended United States use in Vietnam of herbicides which involve the same chemicals and have the same

effects as those domestically used in the United States, the Soviet Union, and many other countries, on the basis that such use was not prohibited by the Geneva Protocol of 1925 ('Protocol for the Prohibition of the Use in War of Asphyxiating Poisonous or Other Gases, and of Bacteriological Methods of Warfare'). Although not a party to the agreement, the U.S. is pledged to observe strictly the principles and objectives of the Protocol. The Protocol is not without ambiguity as to the range of prohibited chemical weapons. For example, few nations, if any, consider the use of smoke, flame and incendiary agents, all of which involve chemicals and are asphyxiating at times to constitute chemical warfare or to be prohibited by the Geneva Protocol. Similarly, League of Nations records indicate that, in prohibiting poison gas warfare, the Protocol's drafters did not intend to prohibit the use of chemical anti-plant agents. While some nations believe that the use of chemical herbicides in war is prohibited, we have been candid about our use of these materials, and I see no credibility gap between our statements and our current practices.

"In regard to your question on the use of chemicals to destroy enemy crops as compared with the use of plant diseases for the same purpose, the distinction is one of scale and control

"Herbicides can be employed with some precision and since they do not spread, in the sense that plant diseases spread, they can be controlled. On the other hand, plant diseases are living organisms capable of causing epiphtotics (plant disease epidemics). Moreover, naturally occurring plant disease organisms have been known to be carried by winds and cause destruction of food crops many hundreds of miles from the original source of infection. This is not possible with chemical herbicides.

"The U.S. has never used plant disease or any other form of biological weapon, as a weapon of war.

"QUESTION 5

"Do we have in practice or in policy an anti-food policy through the use of defoliants in Vietnam? What are our plans to restore the environment of Vietnam which has been significantly altered as a result of our defoliant policy? Will we establish a commission similar to the Atomic Bomb Casualty Commission that operated in Nagasaki and Hiroshima after the war to study and correct some of the damage that we caused?

"*Answer*

"There are two purposes served by the use of chemical herbicides in South Vietnam: one is to clear jungle foliage in order to increase visibility on the ground and from the air; the other purpose is to destroy only those specific food crops being grown by Viet Cong forces, thereby increasing the logistics burden on the enemy by causing him to divert human and other resources to noncombat activities. The same chemicals are used for both purposes.

"With regard to the effect of the use of herbicides on the Vietnamese environment, Ambassador Ellsworth Bunker established a special inter-agency committee in 1968 to make a comprehensive review of the program. The committee's task was to assess the military benefits of the program in relation to its costs, and to study its effects upon the ecology of the country. The review indicated that, in general, herbicide operations in Vietnam have been accomplished without significant permanent damage to the ecology of the country. In this regard, I am enclosing an article from the 21 February 1969 issue of 'Science' which was written by Fred H. Tschirley, of the Department of Agriculture. Dr. Tschirley served on the review committee.

"There is certainly much merit in a long range study of the ecological effects of herbicides in Vietnam. Such studies in combat are obviously difficult at present but should be initiated as soon as practicable.

"QUESTION 6

"Why do we exclude incapacitating gases such as those used in combat operations in Vietnam from the chemical warfare category? Why are vomiting gases, incapacitating gases, and other irritants regarded as being different from other forms of gas? Apparently we have a policy of using non-lethal, or at least non-lethal by intent gas in combat. Are there occasions under which the gases in use are or have been lethal? Under Secretary Vance has said that these gases

are not chemical warfare because they are used by police for riot control and the like. Even if they are this still appears to be a policy of using incapacitating gas as an offensive weapon. Any distinction made by Secretary Vance is semantic and once again opens the credibility gap.

"Answer

"The only anti-personnel agent used by the U.S. forces in Vietnam is the riot control agent CS, better known as tear gas. This chemical riot-control agent has been widely used by governments around the world for the control of domestic disturbances. We have no verified reports from Vietnam of any occasion in which this gas has been lethal. To the contrary, we have many reports of lives being spared by the use of tear gas. The fact that tear gas is used for the control of riots by governments responsible to their people provides an objective standard for differentiating it from other chemical weapons.

"QUESTION 8

Would the United States or any other major nation be risking its national security by dispensing with chemical and biological weapons altogether, especially in view of their many skills with weapons that have already been used?

"Answer

The potential risk, if any, posed to the security of the U.S. and other states by dispensing with these weapons altogether continues to be a matter for our consideration. It will require particular study in our consideration of the proposed ban on all biological weapons introduced by Great Britain at the Eighteen Nation Disarmament Committee (ENDC) last summer. It is expected that the results of the current study being undertaken by the United Nations Secretary-General, especially with regard to the security implications of these weapons, will provide additional insights into this problem.

"QUESTION 9

Why isn't the United States initiative in chemical and biological warfare control and disarmament as active or apparent as it is in the field of nuclear weapons?

"Answer

"The very nature of the threat posed by nuclear weapons required that the U.S. join with other nations in achieving agreement in this area on a priority basis.

"The U.S. Arms Control and Disarmament Agency has long been concerned with the problem of controlling lethal chemical and biological weapons. To this end ACDA has undertaken a comprehensive program of research on the verification aspects of possible arms control measures relating to these weapons. While the results of these studies have been encouraging, the research is not yet at the point where specific measures for international consideration could be recommended.

"QUESTION 10

"Lethal chemicals have not been used at all in warfare by the major powers for the past fifty years and biological weapons have never been used. Why shouldn't we initiate steps at the international level to dispense with those weapons altogether, beginning with biological weapons?

"Answer

"We would agree with you that it may be advantageous to focus new arms control arrangements on these weapons, beginning with biological weapons. Accordingly, the U.S. has expressed its willingness to give serious study to the British proposal banning microbiological methods of warfare which would supplement the 1925 Geneva Protocol. Submitted to the ENDC in 1968, the U.K. proposal called for a prohibition on the production, possession and use in any and all circumstances of microbiological agents.

"QUESTION 11

"What are the United States' plans for bringing up limitations on the use of chemical and biological weapons at the United Nations, and other international forums?

"Answer

"The U.S. has on numerous occasions expressed its interest in participating in discussions which may promote progress in achieving effective arms control measures in the field of chemical and biological weapons. Most recently, on March 18, 1969, President Richard M. Nixon instructed the U.S. Delegations to the ENDC to 'join with other delegations in exploring any proposal or ideas that could contribute to sound and effective arms control relating to these weapons.' President Nixon's message hopefully will lead each delegation to undertake new and productive approaches to the problem of controlling chemical and biological weapons. It should be recalled that the U.S. in 1966 co-sponsored the operative part of a UN General Assembly resolution which called upon all States to observe strictly the principles and objectives of the 1925 Geneva Protocol. Moreover, just last year the U.S. played a leading role in the creation by the UN Secretary-General of a consultant experts group to study the effects of CB weapons. (The U.S. is one of fourteen countries represented in that group.) The results of that study, expected by July 1969, should contribute to the ENDC's consideration of the problems associated with the control of chemical and biological weapons.

"I hope that the above answers will help to clarify some of the policy issues about which you have expressed concern. Please do not hesitate to let me know if I can be of further assistance to you.

"Sincerely,

"H. G. TORBERT, Jr.,
"Acting Assistant Secretary for Congressional Relations."

The text of the reply received from the U.S. Representative to the United Nations Charles W. Yost follows:

"MARCH 28, 1969.

"Hon. RICHARD D. MCCARTHY,
"House of Representatives,
"Washington, D.C.

"DEAR CONGRESSMAN MCCARTHY: I have read your recent letter on the subject of chemical and biological warfare with great interest. Frankly I must say that many, indeed almost all of the questions you raise relate to national policy matters which do not come within the purview of my office. I have therefore taken the liberty of forwarding your letter to the Department of State so that an appropriate response can be prepared in the near future.

"You ask about the degree to which the U.S. has shown initiative in this aspect of disarmament and you ask what our plans are at the UN for bringing up limitations on the use of these weapons. I am attaching to this letter a copy of Resolution 2454 which was adopted by the General Assembly on 20 December 1968 with our support. Although the U.S. was not itself an original co-sponsor of this Resolution we worked actively behind the scenes in its drafting and along with 106 other members of the General Assembly voted for it (none voted against it, only Guinea and Malawi abstained). You will note that by this Resolution the General Assembly condemns all actions contrary to the objectives of the 1925 Geneva Protocol and calls for strict observance by all States of the Principles and objectives contained therein. It also asks the Secretary-General to appoint experts to prepare a report on the consequences of the use of chemical and bacteriological weapons, and to transmit this report to the Eighteen-Nation Disarmament Committee in Geneva by July 1, 1969, and to the members of the UN in time for consideration of the report itself at the next session of the General Assembly in September.

"The Resolution further recommends that governments give the report wide distribution through all media in order to acquaint public opinion with its contents. Since the adoption of this Resolution the Secretary-General has designated the following consultant experts to assist in the preparation of this report:

"Dr. Tibor Bakacs, Chief Director of the National Institute of Public Health, Budapest.

"Dr. Hotse C. Bartlema, Head of the Microbiological Division of the Medical-Biological Laboratory, National Defense Research Organization, Rijswijk, Netherlands.

"Dr. Ivan L. Bennett, Former Deputy Director of the Office of Science and Technology, Executive Office of the President of the United States, Washington, D.C. Currently Deputy Director, New York University Medical Center.

"Dr. S. Bhagavantam, Scientific Adviser to the Ministry of Defense, New Delhi.

"Dr. Jiri Franek, Head of the Military Institute for Hygienic Epidemiology and Microbiology, Prague.

"Dr. Yosio Kawakita, President of University of Chiba, Professor of Bacteriology, Chiba City, Japan.

"M. Victor Moulin, Ingenieur en chef de l'Armement, Paris.

"Dr. M. K. McPhail, Director of Chemical and Biological Defense, Defense Chemical, Biological and Radiation Laboratories, Defense Research Board, Ottawa.

"Academician O. A. Reutov, Professor at the Moscow State University, Moscow.

"Dr. Guillermo Soberon, Chief of the Department of Biochemistry, National Autonomous, University of Mexico, Mexico City.

"Dr. Lars-Frik Tammelin, Chief of Department of Medicine and Chemistry, Research Institute for National Defense, Stockholm.

"Dr. Berhane Tiumelisan, Bacteriologist of the Imperial Laboratory and Research Institute, Addis Ababa.

"Colonel Zbigniew Zoltowski, Professor of Medicine, Director of the Institute of Epidemiology, Warsaw.

"Sir Solly Zuckerman, Scientific Adviser to the Government of the United Kingdom, London.

"These experts held their first organizational session in Geneva in late January 1969 and adopted their terms of reference as well as an outline for their study. It was further decided by the group that they would reconvene in Geneva on 16 April for a period of approximately two weeks.

"I am sure you will agree with me that the background and expertise assembled in this group give grounds to expect that their report will contribute significantly to the further consideration of this subject at both the ENDC and the General Assembly.

"I hope you will find this letter not only responsive to your request but encouraging.

"Sincerely yours,

"CHARLES W. YOST."

Following is the answer received from the U.S. Air Force:

MAY 15, 1969.

Hon. RICHARD D. MCCARTHY,
House of Representatives.

DEAR MR. MCCARTHY: We refer to your recent letter to Secretary Seamans relative to the use of defoliants in Vietnam.

It is not possible to state with any degree of accuracy how many acres have been defoliated. Published figures indicate that from 1962 through 1967, approximately 2.5 million acres in South Vietnam may have been sprayed. It must be emphasized however:

(a) that acres coverage for each year is an estimate based on the number of sorties flown, calibrated spray rates, and the average width of spray swath covered;

(b) that in compiling annual figures and adding them to obtain a total for the period, no adjustment has been made for repeated coverage of the same area;

(c) that a figure for area sprayed is not the same for an area defoliated. Effectiveness of missions varies according to climatic conditions, the type of vegetation, the type and concentration of the agent used, method of application, and other factors.

Hence there can be no accurate determination of how many acres have been defoliated merely on the basis of mission reports or quantities of chemicals used. This could be determined only by a field survey, which has not been conducted. No defoliants or herbicides have been used in North Vietnam. Further details concerning this matter are available on a classified basis.

There has been a steadily increasing pace in defoliation flights since the first operational employment of herbicides. Chemical consumption shows that over 90% of the herbicides sprayed are systemics (Orange, White or Purple), while considerably less than 10% has been cacodylic acid for desiccation and destroying rice.

The following table shows the approximate extent and distribution of herbicide application from 1962 to date.

ESTIMATED [1] AREA HERBICIDALLY TREATED [2] IN SOUTH VIETNAM

	Defoliation (acres)	Crop destruction (acres)
Year:		
1962	4,940	741
1963	24,700	247
1964	83,486	10,374
1965	155,610	65,949
1966	741,247	101,517
1967 [3]	1,486,446	221,312
1968	1,267,110	63,726
1969 (Jan.–Mar.)	356,421	4,693

[1] Not actual land area measurement. Areas were estimated from the number of sorties flown, calibrated spray rates and average width of spray swath covered.

[2] Treated area includes all respraying. Some areas are retreated if necessary; no estimate is available on the extent of reapplication. The actual area is believed to be substantially lower than the figures here show.

[3] For full year 1967. Reference to 965,000 acres on p. 1 of attached Midwest Institute report only for January–September 1967.

Source: MACV Reports.

The procurement cost of defoliation and anti-crop agents is as follows:

Fiscal year:	*Millions of dollars*
1964	1.7
1965	1.9
1966	20.4
1967	39.5
1968	31.4
1969	[1] 1.6

[1] This was previously programmed to be $5,000,000, but was reduced because of sufficient quantity of herbicides is available through prior procurements.

We are also attaching a summary report prepared by the Midwest Research Institute, Kansas City, Missouri, which provides additional information on this subject.

We hope this information will be useful to you.

Sincerely,

JOHN J. SHAUGHNESSY,
Colonel, U.S. Air Force.

SUMMARY DIGEST OF MIDWEST RESEARCH INSTITUTE REPORT

"Assessment of Ecological Effects of Extensive or Repeated Use of Herbicides" by W. B. House, L. H. Goodson, H. M. Gadberry, and K. W. Doktor. Midwest Research Institute, Kansas City, Missouri. Final Report, 15 August–1 December 1967. Contract No. DAHC 15–68–C–0119. Advanced Research Projects Agency, 369 pp.

In this report prepared by the Midwest Research Institute assessment is made of the ecological effects of extensive or repeated use of herbicides or vegetation control chemicals. Military usage of large amounts of herbicides in defoliation and crop destruction in South Vietnam has led to concern as to the ecological consequences of herbicide use. The report furnishes a review of herbicide application on noncropland areas; military use of herbicides; toxicological effects of herbicides; residues and their persistence in vegetation, soil, water and fauna; and the ecological effects of herbicides, defoliants and desiccants on vegetation, animal life and the physical environment.

The basic intent of the investigation was to examine the status of knowledge about the ecological consequences to be expected from the extensive use of

these vegetation control chemicals. Emphasis was given to ecology, the study of the interrelationships of organisms in and to their complete environment, in providing the basis for an objective evaluation of the problem. However, relevant scientific studies in this area were found to be very scanty.

This preliminary assessment has assembled information from more than 1,500 articles in scientific literature supplemented by information contacts with over 140 knowledgeable people in government, universities and chemical industry.

Man's use of fire, the ax and the plow as tools to create greater agricultural productivity and to clear land have caused major ecological disturbances. The ecological changes caused by herbicides at the current rate of use have in no measure reached the proportion of ecological disturbance as those caused by the plow, ax and fire. Herbicides differ from other types of vegetation control agents in that they enter into biological systems, are selective in their effects, and have some degree of persistence.

Within the past 20 years herbicides have become a major tool used to selectively control or destroy vegetation—rapidly, economically and over large areas. In 1965 about 120 million acres of U.S. cropland were treated with herbicides at a cost of $493 million. In the past few years herbicides usage has more than doubled to a current annual production of nearly 250 million pounds, nearly half of which is used on noncropland.

Applications in Vietnam in 1967 used enough herbicide to treat 965,000 acres. However, because many areas were re-treated, the total defoliated area was significantly less.

Three basic herbicides have been used in Vietnam.

Orange, a 50:50 mixture of *n* butyl esters of 2,4-D and 2,4,5-T; used in jungle defoliation.

White, a combination of picloran and 2,4-D in a low-volatile amine formulation for woody plant control and areas in which accurate spray placement is essential.

Blue, cacodylic acid, a contact herbicide for grass control and destruction of rice crops used by the Viet Cong.

Major targets include: Nipa palm and mangrove woodland in coastal areas and along traffic routes in rivers and canals of South Vietnam; moist evergreen or rainforests surrounding Viet Cong strongholds; dense shrubbery and second growth forest along highways, supply roads and railroads to reduce ambush; perimeter of villages and military bases; infiltration routes and supply trails in upland forests; and the Demilitarized Zone.

The response of vegetation to defoliant applications in Vietnam, as would be expected, varies widely due to: diversity in plant species and vegetation types, seasonal variations and monsoons; and differences in herbicides. Only a few scientific reports are available from the areas of operational use in Vietnam as to vegetational response to the defoliation chemicals, although there are many operation reports as well as observations by qualified personnel. However, detailed findings from controlled research tests of defoliation in Thailand and Puerto Rico have shown that: (1) complete defoliation has not been obtained of all species in mixed forest types; (2) maximum defoliation from orange occurs 2 to 3 months after application, and regrowth of some species begins in about 6 months; (3) blue causes rapid desiccation and leaf fall, reaching a maximum at 3 weeks but regrowth occurring within 3 months; (4) woody species vary greatly in duration and degree of defoliation; and (5) herbicide applications made during the rainy season are more effective than during the dry season.

CONCLUSIONS

A. Conclusions from the assessment in relation to the ecological consequences of use of herbicides are as follows:

1. *Destruction of vegetation is the greatest direct ecological consequence of using herbicides*

The impact of herbicides varies in the amount and type of residual vegetation in the areas. Secondary growth or replacement vegetation invades rapidly under the tropical conditions of Vietnam, and partially killed or defoliated trees exhibit rapid recovery.

Three primary temporary changes occur as a result of an ecological disturbance; (1) simplification of the plant community; (2) reorienting the community to a subclimax or unstable condition in which some ecological niches

are vacant; and (3) altering competition within the treated area. The general pattern of plant succession in Southeast Asia following defoliation or other similar disturbance includes first stage dominated by grasses and weeds, followed within a year by a shrub stage, this in turn rapidly replaced by fast growing trees, eventually reaching the previous condition.

2. Long-term effects on wildlife may be beneficial or detrimental

In many temperate zone areas, herbicidal treatment of forest has improved the wildlife habitat and favored animal production through increases in wildlife food plants.

Destruction or modification of the habitat may greatly influence fauna that are rare or in danger of extinction. The increase in grasses and shrubs following defoliation may cause shifts in animal populations depending upon their food requirements. Animals such as the rare kouprey, an ancestral bovine, may be favored by the increase in bamboo and grasses following defoliation.

The many unknown factors, including feeding, habits of many indigenous animals, makes specific effects on wildlife difficult to predict.

3. Herbicides now in use in Vietnam will not persist at a phytotoxic level in the soil for long periods

Under the average temperatures and rainfall in Vietnam, it is reasonable to expect that orange will be dissipated quickly. In temperate regions, 2,4-D persists for about one month regardless of the rate of application, 2,4,5-T may remain in the soil for three months. Picloram, a component of the herbicide white, is persistent in soils but will tend to leach to depths of two to four feet under average rainfall and soil conditions. Cacodylic acid or blue presents no phytotoxicity problem from soil residues. Crops can be planted within a few days after spraying at heavy rates without risk of injury. More rapid disappearance could be expected in the tropics because of the high rainfall and soil temperature.

4. The possibility of lethal toxicity to humans, domestic animals or wildlife by use of herbicides is highly unlikely

Direct toxicity hazard to people and animals on the ground is nearly nonexistent. All three herbicides used present no hazard from skin absorption. If wildlife are affected, it would be from removal of habitat or food rather than direct toxicity.

Extensive studies of toxicity of 2,4-D and 2,4,5-T have shown that the risk of human and animal toxicity from these herbicidal components of orange is very, very low. Applications of orange and white along rivers and canals or even the spraying of the water area itself at rates used in Vietnam for defoliation is not likely to kill the fish in the water.

Data on toxicities of picloram and white show that at recommended rates there is little direct toxicity hazard associated with their use. Cacodylic acid, unlike trivalent arsenic compounds, has a very low oral toxicity.

The report indicates that food produced from the land treated with herbicides will not be poisonous or significantly altered in nutritional quality.

Residues of orange, white and blue will not accumulate in fish or meat products to the point where they will be harmful to man.

5. Unlike many insecticides, herbicides seldom persist in animal or insect tissues

Transfer of herbicides to the next animal in the food chain on defoliant-treated areas is negligible. Most herbicides, including all of those used in Vietnam, are readily excreted and do not accumulate in the animal body.

6. Indirect effects of herbicides resulting from destruction of aquatic vegetation may produce changes in the biota of the aquatic environment

Direct toxic effects on fish and aquatic organisms are negligible. Destruction of specific plants used for fish foods will lead to changes in the food chain of the aquatic ecosystem. Application of herbicides to remove floating aquatic weeds will provide important benefits because their presence depletes the oxygen content of the water.

B. Areas of inquiry in which reliable judgments could not be made in this study were as follows:

1. Effects of spraying 2,4-D and 2,4,5-T esters on water quality

One of the important problems from the standpoint of effect of herbicide residues and the persistence of these residues in the ecosystem involves water sup-

plies. With increasing use of herbicides on noncropland, it is important to evaluate their persistence in surface water. For example, the herbicide, 2,4-D, is degraded rapidly in surface water when applied at amounts up to 5 pounds per acre. Oregon studies showed that detectable quantities of herbicides were found in virtually all streams sampled after helicopter applications of 2,4-D and 2,4,5-T at 2 pounds per acre on forested areas, but persistence was measured by days.

No firm conclusions could be drawn with respect to effect on water quality in Vietnam. Direct toxic effects would be quite unlikely.

2. Effects of defoliation on mammals and birds in danger of extinction

Whether the application of herbicides will be a critical point in survival of rare species is not known.

3. Effects of defoliation on climate and the hydrologic cycle

The climate, microclimate, weather and hydrologic factors of an ecosystem must be considered in any attempt to assess the ecological consequences resulting from indirect effects of herbicide treatments. The relative effects on these factors under tropical conditions would probably not be significant.

4. Effects of defoliation on soil erosion

The use of herbicides on the forests and rangelands of the United States for vegetation control and management has generally been effective in reducing soil erosion by comparison with mechanical methods of vegetation control and other techniques. On sagebrush lands of the West the proper application of herbicides decreases both wind and water erosion hazards. In the Great Plains area, the use of herbicides to achieve chemical fallow has also reduced soil erosion.

In tropical areas removal of forests on lateritic soils may result in modification of the soil to an impervious laterite rock. No evidence has been obtained that such irreversable changes have resulted in areas in Vietnam subject to defoliation. Observers in Vietnam have indicated that the vegetation succession following defoliation in tropical forest is one in which grasses rapidly cover the ground in dense stands followed by rank growth of weeds and vines which are effective in minimizing soil change.

Columns Relating to Chemical and Biological Warfare by Joshua Lederberg

[From the Washington Post, Sept. 24, 1966]

A Treaty Proposal on Germ Warfare

(By Joshua Lederberg)

(The author is Professor of Genetics at the Stanford University School of Medicine, and a recipient of the Nobel Prize for Medicine in 1958.)

On Sept. 19 a distinguished group of my scientific colleagues released the text of a petition to President Johnson concerning U.S. policy on biological and chemical warfare. They point to the encouragement for the wider commitment to these weapons that our own actions in Vietnam might generate.

According to news reports, we are making extensive use of defoliating chemicals not only against forest cover but also against crops purportedly available to the Vietcong. At some times, tear gas has also been used in military and occupation missions.

The United States has vehemently denied the military use of any biological weapons or of any lethal chemical weapons. However, research on these weapons has continued through and from World War II The Army has a well-known research facility at Fort Detrick, Md., and a testing station at Dugway, Utah. The aggressiveness with which these activities have been publicized may be laid to intra-service competition for funds to expand a line of work whose actual military utility is highly controversial.

CBR (Chemical, Biological, Radiological Warfare) can easily evoke a highly emotional response, attracting the most vehement emotions on the inhumanity of war. The focus on boycott demonstrations against napalm production shows this; aircraft manufacture or steel production would be far more consequential to the roots of military homicide. The petitioners do not allude to the specific inhumanity of CBR, but it is undoubtedly involved in the stringency of their reactions.

Can we be "rational" about the inhumanity of one class of weapons as against another? It is hard to imagine more inhuman methods of homicide than explosion or suffocation in a collapsed building or starvation, the most widely practiced techniques of contemporary warfare. Humanitarian opposition to CBR is altogether irrational, except as it is directed to war itself. It can be argued, however, that man's proclivity to warfare must be contained through his social institutions, and any breakdown of traditional limitations in the way war is practiced is one more step of degradation of the species.

The petition suggests that minor uses of CBR will lead to escalation. However, since tear gas is already rationalized for other social purposes, the lumping of Chemical, Biological and Radiological warfare may be especially confusing, and could exacerbate the chances of escalation. Biological warfare should be carefully set apart, particularly for the initiative in international negotiations, for several reasons:

Its development is closest to medical research, therefore conveys the most intense perversions of the human aims of science.

It is the most dubious of military weapons.

Its effects in field use are most unpredictable, with respect to civilian casualties, and even retroactive on the user.

The large scale deployment of infectious agents is a potential threat against the whole species: mutant forms of viruses could well develop that would spread over the earth's population for a new Black Death. Chemical weapons, however potent, at least do not produce equally or more virulent offspring.

One approach to the control of biological warfare should be a nonproliferation treaty. Biological warfare development is within the potential resources of the smallest nations, and the weapons liable to the most irresponsible use. On the other hand, no vital interests of one nation are now committed to biological warfare: the powers can afford to limit their sovereignty in this area.

A nonproliferation treaty in this area could be a constructive precedent for other areas of arms control; the more narrowly it is defined the greater the likelihood of its adoption.

The treaty could dedicate all biological and medical research to human welfare. In this light, no research on living organisms could be classified. M.D.'s and Ph.D.'s in life sciences would be registered and expected to report periodically on their current research activity to an international organization. Ideally, these registrants should have the right of free travel, if necessary, for the purpose of reporting violations of the treaty. Special provisions are needed for proprietary interests, e.g., the drug industry, but with stringent time limits set for confidentiality of its information. A world data center for life sciences would have many human benefits, in addition to centralizing the surveillance of treaty obligations.

The future of the species is very much bound up with the control of these weapons. Their use must be regulated by the most thoughtful reconsideration of U.S. and world policy.

[From the Washington Post, Mar. 30, 1968]

Congress Should Examine Biological Warfare Tests

(By Joshua Lederberg)

The ethics of biological experimentation has become a subject of legislative interest in the last few months. This concern started from the publicity given to important advances like heart transplantation. It may now have a much more pointed application to experiments laden with global hazards, conducted in great secrecy, and outside the reach of any tradition of medical ethics. The news that provokes this observation comes from Skull Valley, Utah, near the Dugway Proving Grounds of the Army Materiel Command.

A few thousand sheep have died, suddenly and mysteriously. At this writing, the Army is still investigating the incident; earlier news reports quoted some military spokesmen as quick to deny the possibility that some experiments at Dugway had misfired.

An independent investigation is clearly out of the question in such a security-sensitive area. Under these circumstances, it is difficult to see how a credible account can be obtained, whatever the facts.

If the incident had no ramifications beyond the accidental release of a potent chemical weapon; if the hazard were limited under any circumstances to a few thousand people, it might be put down to the fortunes of war. The incidental risks would not be fundamentally different from those of high-explosive munitions, casually transported on a large scale.

Sadly, one of the insanities of the chase after military security is a world-wide competition in research and development on biological warfare. Because the Russians or the Chinese might be investigating exotic bacteria and viruses, the argument goes, we must do the same in self-defense. And of course the Russians and the Chinese have exactly the same reaction to our own secret programs.

These activities are aimed at practicing the large-scale deployment of the most contagious enemies of man that he can discover or invent. Our personal security must then depend on the depth of the technical competence of the men responsible for the research. This is impossible to judge from outside the secrecy barrier. However, it is almost certain that the technicians willing to work in this area are self-selected for peculiar nonchalance about it. Who else would? Without other objective surveillance, we have to be unforgivingly harsh in our judgment of mistakes and leaks that do come to public notice.

Is anyone competent enough to play with these matches, which are designed to ignite "controlled pestilence"? According to a paper in the December 8, 1967, issue of Science magazine, the American Public Health Association has a file of 2700 cases of virus infections contracted by workers in medical laboratories. These included 107 fatalities. This file is probably not complete; we have no way of

knowing the completeness with which such cases are reported from military research laboratories. I do know that one of my late colleagues in microbial genetics died of a plague infection contracted in the British laboratories at Porton. And he dies in town.

In the midst of the global arms race, it would be futile to demand a unilateral abnegation of research on biological weapons. A Congress interested in biological ethics should, however make insistent demands for efforts, which do not now exist, to find formulas for international control of species-suicidal research. For his own personal security, every Congressman should also seek his own assurance—less readily available to the common citizen—that the internal surveillance of experiments with contagious weapons is prudent enough to suit him and his family.

[From the Washington Post, Aug. 17, 1968]

SWIFT BIOLOGICAL ADVANCE CAN BE BENT TO GENOCIDE

(By Joshua Lederberg)

The phrase "germ warfare" evokes a moral revulsion which is not strictly justified. War is already awful; how nice it would be to bypass its blood and guts and evoke some clean, almost symptomless disease instead.

From a military standpoint, the ideal agent for BW (biological warfare) would be a completely nonlethal but highly contagious virus that merely stupefied its victims for a few hours or days and for which the good guys had a reliable antidote or preventive antibody. This hypnovirus is a logically plausible ideal, just as is the thought of using mind-altering drugs as chemical warfare agents. (LSD was in fact studied by the U.S. Army long before the hippies discovered it.)

Having the hypnovirus would, however, make very little difference to the maneuverings of the great powers, with their highly automated nuclear missile systems. Could we persuade the Kremlin to exclude biological attack from the threats it intends to retaliate against? The impact of hypnovirus on small-country politics, and on the "policing" of the world by the major powers, would be another matter, one that deserves a more leisurely discussion.

For the moment, hypnovirus is a pipedream. Most BW research is claimed to be defensive. That is, it seeks to anticipate the worst horrors an enemy might develop, then beat him to it so as to know how to defend the population. Needless to say, there is no more ingenious device to ensure the rapid escalation of offensive capabilities.

Whether work is actively proceeding in BW laboratories on producing a hypnovirus, I do not know. They have, however, published abundant reports showing their preoccupation with plague, anthrax, rickettsia, tularemia, encephalitis virus and other equally unpleasant and highly lethal disease agents.

The most chilling thought is that GW research has only just begin to tap the potential offered by chemical genetics for the systematic construction of new disease agents. The announcement of the artificial replication of a virus DNA last December was followed by some rather premature talk about the moral problems of replicating, and altering human DNA. We have a much more immediate concern for the moral problems of the engineering of virus DNA for military purposes.

These anxieties have provoked considerable bitterness in the scientific community and even demonstrations pointlessly misdirected at the Army's biological research laboratories at Ft. Detrick, Md. In recent years, this installation has concentrated on the technology of handling dangerous, infectious materials for research purposes. Its experience is quite valuable for public health work and has been openly published.

Nevertheless, even these positive contributions have a seamier side. The hazards of dealing with dangerous viruses is one of the few discouragements to keep a smaller country from starting its own BW program. As we develop and publicize this technology, we make easier the proliferation of the darkest arts throughout the world.

The makers of policy in Washington, not the technicians at Ft. Detrick, are the just targets of criticism. And they should be chastised less for any malevolent motives in this field than for mere inertia, for technical unfamiliarity, for blind-

ness to the pace of biological advance and its accessibility to the most perilous genocidal experimentation.

The U.N. has had a long history of abortive attempts to start discussions on the control of BW.

Now, the British delegation has introduced new initiatives for BW controls and, evidently with some reluctance, the U.S. State Department for the first time agreed to substantial technical studies. Time is running out, and too little is left to let BW remain merely another minor pawn whose disposition is incidental to other settlements.

[From the Washington Post, Aug. 31, 1968]

The Infamous Black Death May Return To Haunt Us

(By Joshua Lederberg)

In mid-14th century, the Crimean seaport of Caffa (now called Feodosia) was an important fortified outpost of Genoese traders. For the previous 50 years, Genoa had been in intermittent conflict with Venice, and with factions of the Mongel Golden Horde. The famous Travels of Marco Polo were written while this Venetian adventurer was a prisoner-of-war in the hands of the Genoese.

In the year 1346, Caffa was again besieged by the Mongols. During this same time, a vast epidemic of bubonic plague had rapidly spread through the Mongol empire. In the words of Gabriel de Mussis, a contemporary chronicler, "The Tartars, fatigued by such a plague and pestifrous disease, stupefied and amazed, observing themselves dying without hope of health, ordered cadavers placed on their catapults and thrown into the city of Caffa, so that by means of these intolerable passengers the defenders died widely."

After this bacteriological attack, the survivors abandoned the city and returned to Genoa as best they could. By 1348, the Black Death had devastated Europe.

Dr. V. J. Derbes of Tulane Medical School, writing in the Journal of the American Medical Association (April 4, 1966), pointed out that the plague would undoubtedly have reached Europe by trade routes, regardless of this incident. Nevertheless, what is known of the spread of the Black Death, starting from the Italian seaports, is consistent with attaching it to the return of the Genoese ships from Caffa with a heavy cargo of infected rats and fleas.

Plague is still with us. It is usually associated with tropical, rat-infested environments, and indeed it was again killing a million people a year, mostly in India, at the time of World War I. Since World War II, vigorous rat-eradication programs have succeeded in holding plague deaths down to a few hundred.

The disease has, however, gradually spread to native, wild rodents throughout the world, where it smolders, only to break out in an isolated case or small epidemic of "sylvatic" or forest-living plague. The deprivations of war, as in Vietnam, also foster new outbreaks of plagues.

As far as we know, these outbreaks are caused by the same bacillus that spread the Black Death. However, the organism does show considerable variation under laboratory conditions. An epidemic of the Black Death may have reflected the evolution of some especially virulent and contagious form of the bacillus. Fortunately, streptomycin and a few other antibiotics are remarkably effective.

Nevertheless, human ingenuity is quite capable of wasting the good fortune of the human species. Mutant strains of the bacillus that are indifferent to antibiotic therapy are easily cultured.

The potential of plague for biological warfare (BW) is obvious in the light of the historic precedents. Any intelligent program of BW research, especially if its main mission were "defensive," would have to develop aggressive, drug-resistant bacilli in order to evaluate them as a military threat. BW research must also be concerned with the factors that encourage the airborne spread of pneumonic plague.

The Black Death of 1346 probably could have been contained with the resources of modern medicine. When hostile bacilli have been augmented by human intelligence, however, any confidence that they can be contained is a delusion.

The disastrous course of present-day Soviet militarism makes it vastly harder to attempt a world settlement for the surveillance and control of BW agents. But BW can add nothing to the strategic power of nuclear-armed states. If in

nothing else, we should be able to find a common cause in protecting ourselves from a recurrence of pestilence. Or must we console ourselves with the recollection that the Black Death helped pave the way to the Rennaissance?

[From the Washington Post, Sept. 7, 1968]

MANKIND HAD A NEAR MISS FROM A MYSTERY PANDEMIC

(By Joshua Lederberg)

In the aftermath of the six-day war in the Middle East last summer, direct air transport from Uganda to Germany and Yugoslavia was disrupted. Shipments of "green monkeys" for use in preparing vaccines were diverted to London airport before transshipment.

In the process, a group of at least eight monkeys acquired a disease heretofore unknown to medical science. The disease remains unnamed but might be called Marburgvirus, for it infected at least 32 people and killed five of them in Marburg, Germany, and infected two in Frankfurt.

Twenty-seven of the infected cases were among laboratory workers who handled the monkeys or their organs. Five were secondary cases, nurses or doctors who attended the primary ones and were in direct contact with the patients' tissues or secretions. In a brief review in Nature magazine, Dr. C. E. Gordon-Smith, director of the British biological warfare research laboratory at Porton, also alludes to the transmission of Marburgvirus as a venereal disease, but this is perhaps conjectural.

There is, however, no doubt that Marburgvirus is extraordinarily contagious and rapidly lethal in a distressingly high proportion of cases. It is found in the blood, throat secretions and urine of infected animals and men and direct contact is the only known medium of transmission. What might have been an epidemic of world-shaking dimensions was contained by the sheer good luck that it did not spread to man at London airport but first appeared in the medically knowledgeable environment of the laboratory destinations.

The Porton laboratory was involved when the unusually contagious character of the new disease was first realized by the German physicians. As its director remarks, "The facilities for the study of infectious diseases are of a kind probably unmatched in Western Europe; there is a strict code of safety and specially designed apparatus to cope with hazardous operations. Elaborate precautions are taken to prevent the escape of infective material and a research section is devoted solely to the study of laboratory hazards."

Its scientists were then especially prepared for the further experimental study of the new disease. They soon showed that the Marburgvirus was quite distinct from any previously known disease agent and quite unresponsive to every antibiotic tried.

The virus is also under study in Johannesburg and in the United States Public Health Service researchers at the Communicable Disease Center at Chamblee, Ga., have confirmed that it is a new virus though possibly related to the vesicular stomatitis of cattle.

The origin of Marburgvirus is unknown. It may be indigenous to green monkeys in Africa; it may have been acquired by contact with other animals in whose company the monkeys were held during transshipment through London.

The threat of a major virus epidemic—a global pandemic—hangs over the head of the species at any time. We were lucky on this occasion, but it was a near miss. It could easily have established a very large focus of infection in countries like India or China or South Vietnam, and in our present knowledge of virology we would have been ill-equipped to stop it from dominating the earth, with a half-billion casualties.

We have also seen the irony of the constructive role played by a BW laboratory in containing the virus. But we cannot blind ourselves to the knowledge that biological warfare now has one more potential weapon in its repertoire. Furthermore, a great deal of scientific ingenuity is dedicated to "improving" such agents, the most suicidal of human enterprises today.

Marburgvirus is but one example of the evils of nature that are our real enemies in the living world. It is very unlikely to discriminate between Democrat or Communist or Maoist. And as human society is now organized, our encounters with such threats will not for long be just near misses.

[From the Oak Ridger, Oak Ridge, Tenn., Sept. 9, 1968]

Science and Man—

HAILING ORNL EXAMPLE OF "GENETIC ENGINEERING"

(By Joshua Lederberg)

Recent advances in fundamental biochemistry have generated much speculation about genetic engineering, the calculated modification or design of an organism based on new knowledge of the genetic code. Now the first factual example to illustrate such an effort has been reported.

(The report in Nature magazine, by Drs. Stanfield Rogers and Peter Pfuderer, of Oak Ridge National Laboratory, also indicates the broadening functions of these laboratories, for the research was sponsored jointly by the Atomic Energy Commission and by the National Cancer Institute.)

In higher organisms, the genetic code is embodied in the DNA of the chromosomes of each cell. This is then translated into multiple copies of RNA "messenger" molecules and these in turn regulate the formation of the various proteins that make up the cell.

Some simple viruses, like the tobacco mosaic virus, have a simplier life cycle that bypasses the DNA. Instead, their RNA functions both as the hereditary material, being able to replicate as such, and as its own messenger. The tobacco mosaic virus, a disease of tobacco plants, has been much used for basic studies of virus biochemistry.

Previous studies pioneered by Dr. Marshall Nirenberg had established that the triplet in messenger RNA that reads "A-A-A-" (A standing for adenine) is translated into the amino acid protein chain. Rogers and Pfuderer used a specific enzyme to add a chain of about 18 A's to the end of the natural tobacco mosaic virus molecule. After purifying the product, they then used the modified complex to infect tobacco plants. If the dangling chain of AAA-triplets was translated according to modern theory, they reasoned, they should find new substances in the infected leaves, namely strings of up to six lysines.

This is precisely what they report.

The most important point that remains to be investigated is how the modified complex functions as a virus—that is, whether it replicates itself according to expectation. This information should be available very soon.

The result has mainly theoretical interest, by corroborating contemporary speculations about ways in which modified viruses—and, by implication, genes of higher organisms—can be artificially designed. We can expect to hear soon of methods of grafting two preexisting sequences together, so that tobacco mosaic virus could be extended with a more meaningful message than one for monotonous lysine strings. This could then lead, for example, to the production of virus-infected plants of precious and rare products like human growth hormone.

Even monotonous sequences may have great economic significance. The AAA . . . modification theoretically should exaggerate the amount of lysine manufactured by the infected plant. Lysine is one of the essential amino acids and many cases of malnutrition stem from a deficiency of lysine in the locally available food crops. We can readily visualize the engineering of tempered plant viruses that would augment the value of the protein produced by conventional crops.

The extension of this approach to animal viruses, furthermore, is one of the most promising approaches to a fundamental attack on genetic defects in man: the missing genes might be reintroduced into afflicted children by vaccinating them with specially engineered viruses.

There is, as always, another side to the coin. The lead editorial in the same issue of Nature remarks: "It is hard to decide why discussion of chemical and biological warfare has become so fashionable." But the obvious application of this new science to military progress in anti-human, viral weapons certainly adds new substance to our anxieties about biological warfare.

[From Book World, June 15, 1969]

One-Third of Europe Dead of the Plague

(By Joshua Lederberg)

The plague has always slumbered here and there around the world. About the year 1340, it flared up in Central Asia near Lake Issyk Kul, to the east of Tashkent. Its ravages in Asia and India are uncounted. By 1346 it had reached the Crimea, a scene of brush-fire conflicts between the Genoese and Tartar empires. With an intuitive sophistication in bacteriological warfare, the Tartars infected the Genoese fort by catapulting their own corpses over its walls. The stricken Genoese fled back to Italy, carrying the plague with them and igniting an epidemic, known to history as the Black Death, that spread rapidly across Europe. During the next two-and-a-half years it is estimated that about one-third of Europe's population was killed by it. But we do not have accurate statistics, and other guesses vary from 20 to 60 per cent, which seems a reasonable range for the plague's impact on different communities. The survivors were beset by repeated but much milder outbreaks for the next sixty years.

In this excellent book, Philip Ziegler suggests that Europe had been weakened by several decades of economic and agricultural decline, but we have very little scientific information to explain the ferocity of the epidemic. Most specialists believe that the present-day plague bacillus would be quite capable of a similar recrudescence except for the availability of antibiotics and pesticides to control rat fleas, if not the rats themselves, both of which maintain the potential contagion.

Fourteenth-century Europe only dimly understood the role of contagion, and was told by its leaders that the plague was above all a visitation of a vengeful God for vaguely specified sins. In Central Europe the Jews were persecuted as scapegoats, according to long-established custom, but the persecutors discovered no immunity to plague by that route.

One historical side effect of the Black Death in Scandinavia may have been a weakening of support for the dying colonies of Norsemen in Greenland. This foothold collapsed before the rediscovery of the New World by a Genoese in 1492—and the fact that we celebrate Columbus Day is at least one historical consequence.

Ziegler tells the story with ample but not stifling documentation and with an engaging balance of detached statement and illustration. The statistical arguments about the mortality percentages are a necessary building stone and, happily, are assembled in one chapter. With equal discretion, Ziegler has written another chapter devoted to a fictional synthesis of the experience of a composite village in England. Though the primary data are sparse and Ziegler takes proper pains to point this out, he builds a most credible, restrained account.

His larger view brings out few conclusions that will surprise anyone who has read shorter accounts of the Black Death (like William L. Langer's in *Scientific American*, February, 1964) or chapters in history texts and encyclopedias.

The surprising thing about the Black Death is that it was assimilated into the historical life of the period without working any extraordinary change in its larger institutions. Despite the misery of individuals and families, most communities survived; government rarely broke down; inheritance taxes were dutifully collected on the suddenly increased numbers of estates; there were few direct challenges to authority or shifts in centers of power. One can speculate about the role of the Black Death in accelerating the breakdown of feudalism, but it is hard to substantiate an influence commensurate with the mortality figures. The Black Death was an unprecedented source of private bereavement, but it had minimal social impact, perhaps because it visited rich and poor alike, with little discrimination. Ziegler points out that the loss of teachers and clergy may have sped up the vernacularization of education and of the liturgy. We might also guess that it inspired some skepticism about faith in the power and truth of the Church, but this assumes a degree of rational intellectual commitment that is rarely evoked by real distress.

APPENDIX D

Statistical Analysis of Teratogenic Effects of Pesticides

(By D. W. Gaylor, M. D. Hogan)

BIOMETRY BRANCH, NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES, SEPTEMBER 5, 1969

Introduction

This report contains a statistical analysis of the teratogen data collected by the Bionetics Research Laboratories of Litton Industries during the period 1965–1968 for the National Cancer Institute. The teratogen screening study contained 53 compounds chosen as representative of several chemical classes of pesticides and industrial compounds.

Four strains of mice were used: C57BL/6, AKR, C3H, and A/Ha. Most of the studies were performed with the C57BL/6 strain. A hybrid fetus resulting from mating a C57BL/6 female with an AKR male was used to study a few compounds.

Most compounds were administered subcutaneously in solutions of dimethylsulfoxide (DMSO). Water soluble compounds were administered in saline solutions. In some cases, the water soluble compounds were studied using both DMSO and saline. Compounds administered orally were suspended in a 50% solution of honey. A group of untreated controls were included as well as controls receiving only DMSO, saline, or honey. Females entered the study at the onset of their first pregnancy as indicated by a vaginal plug. Subcutaneous injections of 100 μl per mouse were made at the nape of the neck. Oral administration was by gastric intubation using a volume of 100 μl per mouse. Compounds were administered daily beginning on the 6th day of pregnancy and continuing through the 14th day (15th day for AKR mice). The mice were sacrificed on the 18th day (19th day for AKR mice) of gestation. Upon sacrifice, fetuses were examined for anomalies. Approximately two-thirds of the fetuses were then stored in Bouin's solution until they were necropsied. The remaining fetuses were treated with alizarin red stain. The numbers of resorption sites and dead fetuses were also noted.

Because of the marked complexity of teratologic investigations in general and, in particular, because of the nature of the experimental design underlying the Bionetics study, several assumptions had to be made in order to statistically analyze the data from this study.

All statistical analyses were performed on a per litter basis rather than a per fetus basis, since initial investigations indicated that the occurrences of anomalies among fetuses within litters were correlated. The large litter-to-litter variation may be a reflection of some maternal effect, an indication of the effective dose level of the compound actually reaching the fetuses, experimental variation, or, as is most likely, some combination of the three factors.

Another important consideration that should be noted is that while controls were run periodically throughout the duration of the study, no effort was made to match compounds and controls with respect to either route or dates of administration since no time trends were anticipated. While there were no statistically significant time trends within the various control groups in terms of the onset of fetal anomalies in the C57BL/6 mice, the incidence of fetal mortality was certainly time-dependent in this strain, with 1965 being characterized by a low incidence of pre-natal deaths. Furthermore, there was a period of approximately six months, extending from the latter part of 1965 into early 1966, during which no control animals were run. During this period a change in the substrain of C57BL/6 mice used in the study took place. Finally, among abnormal litters, i.e., litters containing at least one abnormal fetus, there was some suggestion that the distribution of abnormal fetuses per litter was stochastically larger in the DMSO controls than it was in the untreated controls. Thus, one cannot

ignore the possibility of the existence of a time x strain x solvent interaction that is undetectable in the controls because of the level of background teratologic activity is relatively low. This potential interaction effect could either enhance or dissipate the effect of any given compound, depending on the conditions under which it was administered. Thus, the data were separated by both time period and solvent for the purposes of analysis.

Similarly, an increase in fetal anomalies in the DMSO controls of the AKR mice was noted after November, 1966. Thus, the AKR data were analyzed separately in two time periods.

One should also bear in mind that not all compounds were administered at more than one point in time or in more than one solvent or strain. Thus, in general the compounds in the study cannot be compared for teratogenic potential, since those that were tested extensively were more likely to show some adverse effect and, perhaps, less likely to appear consistent over time, solvent, and/or strain.

As has already been noted, approximately two-thirds of the fetuses were stored in Bouin's solution until they were necropsied, with the remainder being treated with alizarin red stain. However, in many instances the proportion of necropsied fetuses was slightly higher for the compound under investigation than for the corresponding controls. It is doubtful if this discrepancy could have any appreciable effect on the conclusions since the incidence of anomalies detectable only by necropsy among control animals was relatively low. Furthermore, if all of the control and pesticide-treated mice had been necropsied, the significance of the differences observed in this study would be intensified. Thus, no effort was made to correct for inequalities in the necropsy/stain ratio in the present analysis.

Next one should note that no attempt was made to correct for differences in litter sizes or sex-ratios within litters, since both of these factors may be, at least in part, a reflection of the effect of the compound under investigation.

In conclusion it must be re-emphasized that the Bionetics Study was a screening study for detecting teratogenic potential in a group of pesticides and commercial compounds, and that the results apply only to the strains of mice used with specific routes of administration of relatively high doses.

Results

Those test conditions with pesticides and industrial compounds which resulted in statistically increased levels of anomalies in C57BL/6 mice are listed in Table 1 and for AKR mice in Table 2. The proportion of abnormal litters gives the proportion of litters containing one or more abnormal fetuses. This gives a measure of the prevalence of anomalies across litters. The proportion of abnormal fetuses per litter gives a measure of the prevalence of anomalies within litters. The proportion of abnormal fetuses per litter for litters containing abnormal fetuses gives a measure of the prevalence of anomalies within affected litters. A significant increase of dead fetuses and resorptions is listed. Some tests were conducted on only one day or adjacent days as listed. Eye anomalies (mainly microphthalmia and anophthalmia) accounted for approximately 50% of the individual anomalies in C57BL/6 mice. To a large extent the results in Table 1 reflect changes in the incidence of eye anomalies. Thus, statistically significant increases in anomalies other than eye anomalies are listed in the last column of Table 1.

The negative controls consisted of untreated animals and mice administered 100 μl of DMSO, saline, or honey.

The known teretogens, Trypan Blue and Ethylene Imine, Table 1, and 6-aminonicotinamide, Table 2, showed elevated levels of anomalies, although the latter control wasn't consistent over all dose levels.

Only those test conditions which resulted in statistically elevated incidences of anomalies are listed in Tables 1 and 2. Some of these pesticides and industrial compounds gave no increase in anomalies when tested in other solvents, species, or dose levels. These conditions are listed in Table 3. It must be emphasized that failure to detect a statistically significant increase in anomalies may only be a reflection of experimental insensitivity due to experimental and biological variation and insufficient number of litters. Thus, compounds showing no increases cannot be considered non-teratogenic. For example, Trypan Blue in DMSO at the highest dose level tested, 37.5 mg/kg, did not show an increase in anomalies possibly due to higher fetal mortality.

Standard corrected 2 x 2 chi-square tests [ref. 1] were used to compare the proportion of abnormal litters for the compound with the controls in the same solvent. In the cases where tests were conducted in two time periods, the results from the two chi-squares were combined by the method described in ref. [1]. The levels of statistical significance for the combined tests are listed under the total column for proportion of abnormal litters.

The distribution of the proportion of abnormal fetuses per litter for compounds were compared with the appropriate control distribution by use of the non-parametric Mann-Whitney U-test, ref. [2]. This test requires that the proportion of abnormal fetuses per litter is independent from litter to litter, but requires no assumption about the frequency distribution of these proportions. Again, where litters were run in both time periods, the significance level for the combined tests is given under the total column.

The brackets include groups which were combined before statistical tests were conducted.

References

1. Snedecor, G. W. and Cochran, W. G., *Statistical Methods*, 6th ed. Iowa State Univ. Press, Ames, Iowa (1967).
2. Steel, R. G. D. and Torrie, J. H., *Principles and Procedures of Statistics*. McGraw-Hill Book Co., Inc., New York (1960).

Summary

One compound, 2,4,5-T was tested more extensively than the others. It showed statistically increased proportions of litters affected and increased proportions of abnormal fetuses within litters in both DMSO and Honey for both C57BL/6 and AKR mice. In particular, cleft palate and cystic kidneys were significantly more prevalent. In addition a hybrid strain resulting from a C57BL/6 female and AKR male showed significant increases in anomalies, in particular cystic kidney, when administered at 113 mg/kg of body weight in DMSO.

PCNB produced an increase in renal agenesis across litters and within litters when administered from days 6–14 or days 6–10 of pregnancy. However, renal agenesis was not produced when PCNB was administered only from days 10–14 of pregnancy.

In addition to 2,4,5-T and PCNB, compounds which resulted in statistically significant increases in the proportion of litters containing abnormal fetuses and in the increased incidence of abnormal fetuses within litters were: Captan, Folpet, 2,4-D Isooctyl Ester, 2,4-D Butyl Ester, 2,4-D Isopropyl Ester, Sevin, IPC, 2,4-Dichlorophenol, and 2,4-D. With the exception of 2,4,5-T, the compounds cited above produced elevated incidence of anomalies in one strain and one solvent only.

Phenylisothiocyanate and Captax showed only an increase in the proportion of litters affected. Compounds showing only an increase in the proportion of abnormal fetuses within litters were: α-naphthol, and 2,4-D Methyl Ester.

Sevin plus Piperonyl Butoxide did not show an increase in non-specific anomalies, but resulted in significantly more cystic kidneys for doses above 10 mg/kg Sevin and 100 μl/kg Piperronyl Butoxide in DMSO.

As noted previously, failure to detect statistically significant increases of anomalies may be due to insensitivity resulting from experimental variation and small numbers of litters tested. In addition, higher fetal mortality among some of the negative compounds may be selectively eliminating abnormal fetuses.

Report of the Secretary General of the United Nations on Chemical and Bacteriological (Biological) Weapons and the Effects of Their Possible Use

Pursuant to General Assembly resolution 2454 A (XXIII) of 20 December 1968, the Secretary-General has the honour to transmit herewith to the General Assembly the report on chemical and bacteriological (biological) weapons and the effects of their possible use, prepared with the assistance of qualified consultant experts.

In accordance with paragraph 4 of the resolution, the report is also being transmitted to the Security Council (S/9292) and the Conference of the Eighteen-Nation Committee on Disarmament[1] as well as to the Governments of Member States.

Foreword by the Secretary General

During the past few years, I have become increasingly concerned by developments in the field of chemical and bacteriological (biological) weapons and have given expression to this concern on several occasions. A year ago, I stated publicly that "the international community was not sufficiently conscious of the dangers inherent in this new type of weapon of mass murder", and that "due attention had not been focused on this very serious problem". In the introduction to my annual report on the work of the Organization, in September 1968, I stated:

"While progress is being made in the field of nuclear disarmament, there is another aspect of the disarmament problem to which I feel too little attention has been devoted in recent years. The question of chemical and biological weapons has been overshadowed by the question of nuclear weapons, which have a destructive power several orders of magnitude greater than that of chemical and biological weapons. Nevertheless, these too are weapons of mass destruction regarded with universal horror. In some respects, they may be even more dangerous than nuclear weapons because they do not require the enormous expenditure of financial and scientific resources that are required for nuclear weapons. Almost all countries including small ones and developing ones may have access to these weapons, which can be manufactured quite cheaply, quickly and secretly in small laboratories or factories. This fact in itself makes the problem of control and inspection much more difficult. Moreover, since the adoption, on 17 June 1925, of the Geneva Protocol for the prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases and of Bacteriological Methods of Warfare, there have been many scientific and technical developments and numerous improvements if that is the right word, in chemical and biological weapons, which have created new situations and new problems. On the one hand, there has been a great increase in the capability of these weapons to inflict unimaginable suffering, disease and death to ever larger numbers of human beings; on the other hand, there has been a growing tendency to use some chemical agents for civilian riot control and a dangerous trend to accept their use in some form in conventional warfare.

"Two years ago, by resolution 2162 B (XXI), the General Assembly called for the strict observance by all States of the principles and objectives of the Geneva Protocol of 1925, condemned all actions contrary to those objectives and invited all States to accede to the Protocol. Once again, I would like to add my voice to those of others in urging the early and complete implementation of this resolution. However, in my opinion, much more is needed . . ."

At its twenty-third session, by resolution 2454 A (XXIII), the General Assembly requested me to prepare, with the assistance of qualified consultant experts, a report on chemical and bacteriological (biological) weapons in accordance with the proposal contained in the introduction to my annual report

[1] By a letter dated 1 July 1969 from the Secretary-General to the Co-Chairmen of the Conference.

on the work of the organization (A/7201/Add.1), and in accordance with the recommendation contained in the report of the Conference of the Eighteen-Nation Committee on Disarmament of 4 September 1968 (A/7189).

In pursuance of this resolution, I appointed the following group of fourteen consultant experts to assist me in the preparation of the report: Dr. Tibor Bakacs, Professor of Hygiene, Director-General of the National Institute of Public Health, Budapest; Dr. Hotse C. Bartlema, Head of the Microbiological Department of the Medical-Biological Laboratory, National Defense Research Organization TNO, Rijswijk, Netherlands; Dr. Ivan L. Bennett, Director of the New York University Medical Center and Vice-President of Medical Affairs, New York University, New York; Dr. S. Bhagavantam, Scientific Adviser to the Minister of Defence, New Delhi; Dr. Jiri Franek, Director of the Military Institute for Hygiene, Epidemiology and Microbiology, Prague; Dr. Yosio Kawakita, President of University of Chiba, Professor of Bacteriology, Chiba City, Japan; M. Victor Moulin, *Ingénieur en chef de l'armement, Chef du Bureau Défense chimique et biologique, Direction technique des armaments terrestres*, Saint Cloud, France; Dr. M. K. McPhail, Director of Chemical and Biological Defence, Defence Chemical, Biological and Radiation Laboratories, Defence Research Board, Ottawa; Academician O. A. Reutov, Professor of Chemistry at the Moscow State University, Moscow; Dr. Guillermo Soberon, Director, *Instituto de Investigaciones Biomedicas, Universidad Nacional Autonma de Mexico*, Mexico City; Dr. Lars-Erik Tammelin, Chief of Department for Medicine and Chemistry, Research Institute for National Defence, Stockholm; Dr. Berhane Teoume-Lessane, Medical Co-Director and Head of Department of Viruses and Rickettsiae, Imperial Central Laboratory and Research Institute, Addis Abba; Colonel Zbigniew Zoltowski, Professor of Medicine, Epidemiologist and Scientific Adviser to the Ministry of National Defence, Warsaw; Sir Solly Zuckerman, Chief Scientific Adviser to the Government of the United Kingdom, Professor Emeritus, University of Birmingham.

Mr. William Epstein, Director of the Disarmament Affairs Division, Department of Political and Security Council Affairs, served as Chairman of the Group of Consultant Experts, Mr. Alessandra Corradini, Chief of the Committee and Conference Services Section, acted as Secretary of the Group. He was assisted by members of this Disarmament Affairs Division.

After giving due consideration to the terms of the resolution and to the views expressed and the suggestions made during the discussion of the question at the twenty-third session of the General Assembly, I reached the conclusion that the aim of the report should be to provide a scientifically sound appraisal of the effects of the chemical and bacteriological (biological) weapons and should serve to inform Governments of the consequences of their possible use. Within this over-all framework, the report would furnish accurate information in a concise and readily understandable form on the following matters: the basic characteristics of chemical and bacteriological (biological) means of warfare; the probable effects of chemical and bacteriological (biological) weapons on military and civil personnel, both protected and unprotected; the environmental factors affecting the employment of chemical and bacteriological (biological) means of warfare; the possible long-term effects on human health and ecology; and the economic and security implications of the development, acquisition and possible use of chemical and bacteriological (biological) weapons and of systems for their delivery.

The consultant experts to whom I conveyed these terms of reference accepted them as the basis for their study.

It was my intention that the group of Consultant Experts should survey the entire subject from the technical and scientific points of view, so that the report could place these weapons in proper perspective. It was also my hope that an authoritative report could become the basis for political and legal action by the Members of the United Nations.

As the report was to be made available by 1 July 1969, very concentrated efforts by the consultant experts were required in order to cover this extensive field. The members of the Group, acting in their personal capacities, carried out this demanding task at three sessions between January and June 1969.

The Group had the benefit of valuable submissions from the World Health Organization, the Food and Agriculture Organization, the International Committee of the Red Cross, the Pugwash Conference on Science and World Affairs (Pugwash) and the International Institute for Peace and Conflict Research

(SIPRI). I wish to express my grateful appreciation to all the consultant experts for their dedicated work and to the organizations and bodies who co-operated in the preparation of the study.

The Group has submitted to me a unanimous report embodying its findings and conclusions. I wish to avail myself of this opportunity to express my gratification for the very high level of competence with which the consultant experts have discharged their mandate. In a very short period of time, they have produced a study, which, in spite of the many complex aspects of the subject matter, is both concise and authoritative. It is a document which, I believe, provides valuable insights into the grave dangers that are posed by the production and possible use of these dreaded weapons.

I am particularly impressed by the conclusion of the consultant experts wherein they state:

"The general conclusion of the report can thus be summed up in a few lines. Were these weapons ever to be used on a large scale in war, no one could predict how enduring the effects would be, and how they would affect the structure of society and the environment in which we live. This overriding danger would apply as much to the country which initiated the use of these weapons as to the one which had been attacked, regardless of what protective measures it might have taken in parallel with its development of an offensive capability. A particular danger also derives from the fact that any country could develop or acquire, in one way or another, a capability in this type of warfare, despite the fact that this could prove costly. The danger of the proliferation of this class of weapons applies as much to the developing as it does to developed countries.

"The momentum of the arms race would clearly decrease if the production of these weapons were effectively and unconditionally banned. Their use, which could cause an enormous loss of human life, has already been condemned and prohibited by international agreements, in particular the Geneva Protocol of 1925, and, more recently, in resolutions of the General Assembly of the United Nations. The prospects for general and complete disarmament under effective international control, and hence for peace throughout the world, would brighten significantly if the development, production and stockpiling of chemical and bacteriological (biological) agents intended for purposes of war were to end and if they were eliminated from all military arsenals.

"If this were to happen, there would be a general lessening of international fear and tension. It is the hope of the authors that this report will contribute to public awareness of the profoundly dangerous results if these weapons were ever used, and that an aroused public will demand and receive assurances that Governments are working for the earliest effective elimination of chemical and bacteriological (biological) weapons."

I have given the study prepared by the consultant experts my earnest consideration and I have decided to accept their unanimous report in its entirety, and to transmit it to the General Assembly, the Security Council, the Eighteen-Nation Committee on Disarmament and to the Governments of Member States, as the report called for by resolution 2454 A (XXIII).

I also feel it incumbent upon me, in the hope that further action will be taken to deal with the threat posed by the existence of these weapons, to urge that the Members of the United Nations undertake the following measures in the interests of enhancing the security of the peoples of the world:

1. To renew the appeal to all States to accede to the Geneva Protocol of 1925;

2. To make a clear affirmation that the prohibition contained in the Geneva Protocol applies to the use in war of all chemical, bacteriological and biological agents (including tear gas and other harassing agents), which now exist or which may be developed in the future;

3. To call upon all countries to reach agreement to halt the development, production and stockpiling of all chemical and bacteriological (biological) agents for purposes of war and to achieve their effective elimination from the arsenal of weapons.

LETTER OF TRANSMITTAL

JUNE 30, 1969.

DEAR MR. SECRETARY-GENERAL: I have the honour to submit herewith a unanimous report on chemical and bacteriological (biological) weapons which was prepared in pursuance of General Assembly resolution 2454 A (XXIII).

The Consultant Experts appointed in accordance with the General Assembly resolution were the following:

Dr. Tibor Bakacs, Professor of Hygiene, Director-General of the National Institute of Public Health, Budapest.

Dr. Hotse C. Bartlema, Head of the Microbiological Department of the Medical-Biological Laboratory, National Defence Research Organization TNO, Rijswijk, Netherlands.

Dr. Ivan L. Bennett, Director of the New York University Medical Center and Vice-President for Medical Affairs, New York University, New York.

Dr. S. Bhagavantam, Scientific Adviser to the Minister of Defence, New Dehli.

Dr. Jiri Franek, Director of the Military Institute for Hygiene, Epidemiology and Microbiology, Prague.

Dr. Yosio Kawakita, President of the University of Chiba, Professor of Bacteriology, Chiba City, Japan.

M. Victor Moulin, *Ingénieur en chef de l'armement, Chef du Bureau Défénse chimique et biologique, Direction technique des armements terrestres,* Saint Cloud, France.

Dr. M. K. McPhail, Director of Chemical and Biological Defence, Defence Chemical, Biological and Radiation Laboratories, Defence Research Board, Ottawa.

Academician O. R. Reutov, Professor of Chemistry at the Moscow State University, Moscow.

Dr. Guillermo Soberon, Director, *Instituto de Investigaciones Biomedicas, Universidad Nacional Autonoma de Mexico, Mexico City.*

Dr. Lars-Erik Tammelin, Chief of Department for Medicine and Chemistry, Research Institute for National Defence, Stockholm.

Dr. Berhane Teoume-Lessane, Medical Co-Director and Head of Department of Viruses and Rickettsiae, Imperial Central Laboratory and Research Institute, Addis Ababa.

Colonel Zbigniew Zoltowski, Professor of Medicine, Epidemiologist and Scientific Adviser to the Ministry of National Defence, Warsaw.

Sir Solly Zuckerman, Chief Scientific Adviser to the Government of the United Kingdom, Professor Emeritus, University of Birmingham.

The report was drafted during sessions held in Geneva between 20 and 24 January and between 16 and 29 April, and finalized at meetings held in New York between 2 and 14 June 1969.

The Group of Consultant Experts wish to acknowledge the assistance they received from the World Health Organization, the Food and Agriculture Organization, the International Committee of the Red Cross, the Pugwash Conference on Science and World Affairs (Pugwash) and the International Institute for Peace and Conflict Research (SIPRI), all of which submitted valuable information and material for the purposes of the study.

The Group of Consultant Experts also wish to express their gratitude for the valuable assistance they received from members of the United Nations Secretariat.

I have been requested by the Group of Consultant Experts, as their Chairman, to submit their unanimous report to you on their behalf.

Yours sincerely,

WILLIAM EPSTEIN,
Chairman, Group of Consultant Experts on Chemical and Bacteriological (Biological) Weapons.

INTRODUCTION

1. In accordance with the resolution of the General Assembly 2454 A (XXIII) the Secretary-General was asked to prepare, with the assistance of qualified consultant experts, a report on chemical and bacteriological (biological) weapons and on the effects of their possible use. Specifically the experts were asked to provide a scientific appraisal of the characteristics of the chemical and bacteriological (biological) weapons which could be used in warfare; of the effects they could have on military personnel and civilians; as well as of their long-term effects on health and our physical environment. They were also asked to provide a statement about the economic and security implications of the development, acquisition and possible use of such weapons and associated weapon systems. The report which follows is confined to these objectives.

2. No form of warfare has been more condemned than has the use of this category of weapons. The poisoning of wells has been regarded from the time immemorial as a crime incompatible with the rules of war. "War is waged with weapons, not with poison" (*"Armis bella non venenis geri"*), declared the Roman jurists. As the destructive power of arms increased over the years, and with it the potential for the widespread use of chemicals, efforts were made to prohibit through international understandings and by legal means the use of chemical weapons. The Brussels Declaration of 1874 and the Hague Conventions of 1899 and 1907 prohibited the use of poisons and poisoned bullets and a separate declaration of the Hague Convention of 1899 condemned "the use of projectiles the sole object of which is the diffusion of asphyxiating or deleterious gases".

3. The fear today is that the scientific and technological advances of the past few decades have increased the potential of chemical and bacteriological (biological) weapons to such an extent that one can conceive of their use causing casulties on a scale greater than one would associate with conventional warfare. At the moment most of our knowledge concerning the use of chemical weapons is based upon the experience of World War I. Gas was first used in 1914 and the first big attack in 1915 claimed 5,000 human lives. It is estimated that from then until the end of the war in 1918, at least 125,000 tons of toxic chemicals were used, and according to official reports gas casualties numbered about 1,300,000, of which about 100,000 were fatal. The agents which were used in this war were much less toxic than those, in particular nerve agents, which could be used today, and they were dispersed by means of relatively primitive equipment as compared with what is now available, and in accordance with battlefield concepts of a relatively unsophisticated kind.

4. It is true that a considerable effort has also been made to develop chemical agents which have as their purpose not to kill but to reduce a man's capacity to fight. Such agents are used by civil authorities of a number of countries in order to suppress disorders and to control riots, but when used in warfare they would inevitably be employed as an adjunct to other forms of attack, and their overall effect might be lethal.

5. Since World War II, bacteriological (biological) weapons have also become an increasing possibility. But because there is no clear evidence that these agents have ever been used as modern military weapons, discussions of their characteristics and potential threat have to draw heavily upon experimental field and laboratory data, and on studies of naturally occurring outbreaks and epidemics of infectious disease, rather than on direct battlefield experience. Their potential importance in warfare can be sensed when one remembers that infectious disease even as late as World War II caused numerous casualties.

6. The greater threat posed by chemical weapons today derives from the discovery and manufacture of new, more toxic compounds. On the other hand, bacteriological (biological) agents already exist in nature and can be selected for use in warfare. Some of these agents, notably bacteria, have been known for several decades, but there is a vast number of other possible agents, especially viruses, which have been discovered only recently, and some of these also possess characteristics which make their use possible in war. Increases in potency of these various types of agent have been made possible by scientific and technological advances in microbial genetics, experimental pathology and aerobiology.

7. As is well known, the use of toxic gases in World War I generated so powerful a sense of outrage that countries were encouraged to adopt measures prohibiting both chemical and bacteriological (biological) weapons. The result was the Geneva Protocol of 17 June 1925, which prohibits the use in war of asphyxiating, poisonous or other gases and of all analogous liquids, materials or devices, as well as bacteriological methods of warfare. This established a custom and hence a standard of international law, and in practice most States have adhered to the principle that no one should resort to the use of such weapons. But despite the abhorrence in which they have always been held by civilized peoples, chemical weapons have none the less on occasion been used. For example, mustard gas was used in Ethiopia in 1935–36, causing numerous casualties amongst troops and a civilian population which was not only completely unprotected, but which lacked even the most elementary medical services. It should also be noted that the existence of the Geneva Protocol of 1925 may have helped as a deterrent to the use of chemical or bacteriological (biological) weapons in

World War II, even though the belligerents in that conflict had developed, produced and stockpiled chemical agents for possible use. The International Tribunal at Nuremberg brought into the open the fact that amongst the new agents which had been produced and stockpiled during the course of the war were such highly lethal agents as Tabun and Sarin. Since then the validity and effectiveness of the Geneva Protocol have been reinforced by the approval, by the General Assembly of the United Nations, without a single dissenting voice, of resolutions 2162 B (XXI) of 5 December 1966 and 2454 A (XXIII) of 20 December 1968, calling for "strict observance by all States of the principles and objectives" of the Geneva Protocol, and inviting all States to accede to it.

8. It is simple to appreciate the resurgence of interest in the problems of chemical and bacteriological (biological) warfare. Advances in chemical and biological science, while contributing to the good of mankind, have also opened up the possibility of exploiting the idea of chemical and bacteriological (biological) warfare weapons, some of which could endanger man's future, and the situation will remain threatening so long as a number of States proceed with their development, perfection, production and stockpiling.

9. The report, as is noted in the General Assembly resolution, is designed to submit to peoples and governments, in a form easily understood by them, information on the effects of the possible use of chemical and bacteriological (biological) weapons, as well as to promote a further consideration of problems connected with chemical and bacteriological (biological) weapons. Information about the nature of chemical and bacteriological (biological) weapons, about their increase and diversification as technology has advanced, about their long-term effects on human beings, animals and vegetation, and about environmental factors which condition these effects, is provided in Chapters I to IV of the Report. In Chapter V, which deals with the economic and security implications of chemical and bacteriological (biological) warfare, the experts have interpreted the word "security" to mean both security in the narrow military sense, and security in terms of the adverse and long-term effects which these weapons, given they were ever used, could have on the framework of civilized existence.

10. As the present report shows, the outstanding characteristics of this class of weapons, and particularly of bacteriological (biological) weapons, is the variability, amounting under some circumstances to unpredictability, of their effects. Depending on environmental and meteorological conditions, and depending on the particular agent used, the effects might be devastating or negligible. They could be localized or widespread. They might bear not only on those attacked but also on the side which initiated their use, whether or not the attacked military forces retaliated in kind. Civilians would be even more vulnerable than the military. The development, acquisition and deployment of chemical and bacteriological (biological) weapons—quite apart from questions of protection—constitutes a real economic burden which varies in extent for different countries. Above all their acquisition could not possibly obviate the need for other weapons.

11. As chapters I and V of the report indicate, it would be enormously costly in resources, and administratively all but impossible, to organize adequate protection for a civilian population against the range of possible chemical agents. Even military personnel, if locally engaged in a particular operation in which chemical and/or bacteriological (biological) weapons were used and where they had the advantage of protective measures, would be unlikely to escape the widespread and longer-term effects on their country at large. These might arise, for example, from the impracticability of protecting soil, plants, animals and essential food crops against short and long-term effects.

12. To appreciate the risks, which bacteriological (biological) warfare could entail, one has only to remember how a natural epidemic may persist unpredictably, and spread far beyond the initial area of incidence, even when the most up-to-date medical resources are used to suppress the outbreak. The difficulties would be considerably increased were deliberate efforts made, for military reasons, to propagate pathogenic organisms. Mass disease, following an attack, especially of civilian populations, could be expected not only because of the lack of timely warning of the danger, but also because effective measures of protection or treatment simply do not exist or cannot be provided on an adequate scale.

13. Once the door was opened to this kind of warfare, escalation would in all likelihood occur and no one could say where the process would end. Thus the report concludes that the existence of chemical and bacteriological (biological)

weapons not only contributes to international tension, but that their further development spurs the arms race without contributing to the security of any nation.

14. The present report will, in accordance with resolution 2454 A (XXIII), be submitted to the Eighteen-Nation Committee on Disarmament to the Security Council and to the General Assembly at its twenty-fourth session. We hope that it will contribute to the implementation of measures which, in the final analysis, will eliminate chemical and bacteriological (biological) weapons from all military arsenals.

CHAPTER I. THE BASIC CHARACTERISTICS OF CHEMICAL AND BACTERIOLOGICAL (BIOLOGICAL) MEANS OF WARFARE

15. Since World War I, when chemical warfare was first resorted to on a large scale, the variety and potency of chemical and bacteriological (biological) weapons has grown steadily, and there has been a corresponding increase in the capacity to deliver them to a target area. The particular threat posed by chemical weapons today derives from the existence of new, and far more toxic, chemical compounds than were known fifty years ago. Since bacteriological (biological) agents exist naturally, their increased potency as weapons has resulted from a process of selection rather than from the production of entirely new agents. As is explained in later sections of this report, selection has been made possible by advances in our knowledge of the genetics of microbes, and through advances in experimental aerobiology.

16. The most significant result of these technical developments is the great variety of injurious effects which these agents can induce, and the consequent increase in the number and types of situation in which there might be a temptation to use them for military purposes.

A. Characteristics of chemical and bacteriological (biological) weapons

17. For the purposes of this report, chemical agents of warfare are taken to be chemical substances, whether gaseous, liquid, or solid, which might be employed because of their direct toxic effects on man, animals and plants. Bacteriological (biological) agents of warfare are living organisms, whatever their nature, or infective material derived from them, which are intended to cause disease or death in man, animals or plants, and which depend for their effects on their ability to multiply in the person, animal or plant attacked.

18. Various living organism (e.g., rickettsiae, viruses and fungi), as well as bacteria, can be used as weapons. In the context of warfare all these are generally recognized as "bacteriological weapons". But in order to eliminate any possible ambiguity, the phrase "bacteriological (biological) weapons" has been used throughout to comprehend all forms of biological warfare.

19. All biological processes depend upon chemical or physico-chemical reactions, and what may be regarded today as a biological agent could, tomorrow, as knowledge advances, be treated as chemical. Because they themselves do not multiply, toxins, which are produced by living organisms, are treated in this report as chemical substances. We also recognize there is a dividing line between chemical agents of warfare in the sense we use the terms, and incendiary substances such as napalm and smoke, which exercise their effects through fire, temporary deprivation of air or reduced visibility. We regard the latter as weapons which are better classified with high explosives than with the substances with which we are concerned. They are therefore not dealt with further in this report.

20. Finally, we recognize that both chemical and bacteriological (biological) agents are designated either as lethal agents, that is to say, agents which are intended to kill, or as incapacitating agents, that is to say, agents which are intended to cause disability. These terms are not absolute, but imply statistical probabilities of response which are more uncertain with bacteriological (biological) than with chemical agents. Not all individuals will die from an attack with a given lethal agent, whereas some, for example infants and people weakened by malnutrition, disease or old age, as well as a high proportion of individuals in special circumstances, for example following irradiation, might succumb to an attack with incapacitating chemical or bacteriological (biological) agents. With a few chemical agents, notably some tear gases (lachrymators), there is a negligible probability of any fatal outcome, and these have been used by many

Governments to quell riots and civil disorders. When used in this way they are called riot control agents. Lachrymators have also been widely used in warfare as harassing agents, in order to enhance the effectiveness of conventional weapons, or to facilitate the capture of enemy personnel.

1. Differences between chemical and bacteriological (biological) warfare

21. Although there are some similarities between chemical and bacteriological (biological) agents regarded as weapons of war, they differ in certain important respects. These differences are related to (1) potential toxicity; (2) speed of action; (3) duration of effect; (4) specificity; (5) controllability; and (6) residual effects.

Potential toxicity

22. Although more toxic than most well-known industrial chemicals, chemical warfare agents are far less potent on a weight-for-weight basis than are bacteriological (biological) agents. The dose of a chemical agent required to produce untoward effects in man is measured in milligrams (1/1,000 of a gram), except for toxins which may be in the microgram (1/1,000 of a milligram) range. The corresponding dose for bacteriological (biological) agents is in the picogram (1/1,000,000 of a microgram) range.

23. This difference reflects the fact that bacteriological (biological) agents, being alive, can multiply, and its significance is that, weight-for-weight, bacteriological (biological) weapons could be expected to inflict casualties over very much more extensive areas than could chemical weapons.

24. Being living organisms, bacteriological (biological) agents are also very much more susceptible to sunlight, temperature, and other environmental factors than are chemical agents. A bacteriological (biological) agent disseminated into a given environment may retain its viability (ability to live and multiply) while losing its virulence (ability to produce disease and injury).

Speed of action

25. As a class, chemical agents produce their injurious effects in man, animals or plants more rapidly than do bacteriological (biological) agents. The time between exposure and significant effect may be minutes, or even seconds, for highly toxic gases or irritating vapours. Blister agents take a few hours to produce injury. Most chemicals used against crops elicit no noticeable effect until a few days have elapsed. On the other hand, a bacteriological (biological) agent must multiply in the body of the victim before disease (or injury) supervenes; this is the familiar "incubation period" of a disease, the time which elapses between exposure to infection and the appearance of symptoms of illness. This period is rarely as short as one or two days, and may be as long as a few weeks or even longer. For both chemical and bacteriological (biological) agents the speed of action is affected by the dose (i.e., the quantity absorbed) but this secondary factor does not obscure the basic difference between the two classes of agents in the time they take to manifest their effects.

Duration of effect

26. The effects of most chemical agents which do not kill quickly do not last long, except in the case of some agents such as phosgene and mustard, where they might continue for some weeks, months or longer. On the other hand, bacteriological (biological) agents which are not quickly lethal cause illness lasting days or even weeks and on occasion involve periods of prolonged convalescence. The effects of agents which act against plants and trees would last for weeks or months and, depending on the agent and the species of vegetation attacked, could result in death.

Specificity

27. While both classes of agents can be used to attack man, animals or plants, individual biological agents have in general a much greater degree of host specificity. Influenza, for example, is essentially a disease of man; foot-and-mouth disease mainly affects cloven-hoofed animals; and rice blast is a disease confined to rice only. On the other hand some diseases (for example, brucellosis

and anthrax) occur both in man and animals. However, chemical agents are much less specific; nerve agents can affect mammals, birds and invertebrates (e.g., insects).

Controllability

28. By controllability is meant the ability to predict the extent and nature of the damage which chemical and bacteriological (biological) agents can cause. This is a most important consideration in their use as weapons. The most likely means of delivering chemical and bacteriological (biological) agents is by discharge into the atmosphere, relying on turbulent diffusion and wind currents to dilute and spread the agent over the area being attacked. Control is thus possible only to the extent that the meteorological situation can be predicted.

29. Because they infect living organisms, some bacteriological (biological) agents can be carried by travellers, migratory birds, or animals, to localities far from the area originally attacked.

30. The possibility of this kind of spread does not apply to chemical agents. But control of contamination by persistent chemical agents could be very difficult. Should large quantities of chemical agents penetrate the soil and reach underground waters, or should they contaminate reservoirs, they might spread hundreds of kilometres from the area of attack, affecting people remote from the zone of military operations. Although we know of no comparable substance likely to be used as a chemical warfare agent, the spread of DDT over the globe illustrates, in an extreme form, how man-made chemicals can spread. This chemical insecticide is now found in the tissues of creatures in all parts of the world, even in places in which it has never been used. For example, as a result of its transfer through food chains, it is even found in the tissues of the penguins which live in Antarctica.

Residual effects

31. In circumstances which favour their persistence, herbicides, defoliants and perhaps some other chemical agents, might linger for months, stunting the growth of surviving or subsequent plant life, and even changing the floral pattern through selection. Following repeated use, certain chemical agents could even influence soil structure. The risk of residual effects with some bacteriological (biological) agents is potentially greater, mainly because they could lead to disease, which might become epidemic if man-to-man transmission occurred readily. Bacteriological (biological) agents might also find unintended hosts in the animals and plants of an area, or be transported by infected individuals over great distances to new environments.

2. Technology of chemical and bacteriological (biological) warfare

32. The technological problems associated with chemical and bacteriological (biological) warfare are of two kinds: (1) those associated with the production of the agents and the weapons needed for their dissemination and (2) those which concern the provision of the protective equipment and defences necessary to protect military forces and civilian populations. Any nation whose chemical, pharmaceutical and fermentation industries are well advanced could produce chemical and bacteriological (biological) agents on a scale commensurate with its other military capabilities. The assurance of safety in the production of bacteriological (biological) agents, problems associated with the synthesis of complex chemical agents, and deciding on the best weapons to disseminate them, are examples of some of the relevant technological difficulties. A special problem associated with the development and maintenance of an offensive capability in bacteriological (biological) warfare relates to the fact that some agents are viable for only a short time (a few days) after manufacture. This period can be extended by refrigeration of the agent or by freeze-drying it before storage. The drying processes, however, are very complex and difficult where large quantities of highly pathogenic agents are involved. The problems which relate to defence are far more difficult, for as with most weapons, effective defence calls for much more stringent training, and demands far more manpower and monetary resources than does the offence. For example, alarm systems against chemical attack are very complex electro-mechanical devices whose production demands a highly technologically based industry. They cannot be maintained except by expert and highly trained personnel.

3. Chemical and bacteriological (biological) weapons systems

33. The use in warfare, and the possible military effectiveness, of chemical and bacteriological (biological) agents cannot be appreciated if they are thought of simply as poisons and plagues. They need to be considered in the context of the weapon systems of which they would be part.

34. A weapon system comprises all the equipment and personnel, as well as the organizational structure, required to maintain and operate a military device. By itself, for example, a cannon is not a weapon system. Only when it is integrated into an artillery battery, together with trained crew, ammunition, vehicles, supplies, spare parts, firing table, forward observer, communications and command organization does it constitute a weapon system. Correspondingly, artillery shells filled with mustard gas or nerve agents and guns to fire them, or an aircraft with a spray tank filled with a bacteriological (biological) agent, are not by themselves weapon systems.

35. Many complex technological problems have to be overcome in transforming a chemical or bacteriological (biological) "agent" into a "weapon system". A "weapon" is of little military value if it is not dependable and if it cannot be delivered to a target with certainty. This means that in the development of a chemical and bacteriological (biological) weapon system it is not only necessary to consider matters such as mass means of delivery, but also the limitations on use set by terrain and weather prediction.

36. In addition, considerations affecting defence need to be taken into account. Masks, protective clothing, detection alarms, special medical supplies, augmented logistic facilities and, above all, thoroughly trained military and civilian personnel, are necessary parts of chemical and bacteriological (biological) weapons systems. The concept of a fully developed chemical or bacteriological (biological) weapon system is thus exceedingly complex, and implies as much technical capability and as high a degree of training as does the operation of any other advanced weapon systems. While chemical and bacteriological (biological) weapon systems are cheaper and more readily attained than nuclear weapons, and while they may in some circumstances be more effective militarily than conventional weapons, they are highly complex systems which for their development and operation call for sizeable resources and considerable expertise. But the possibility always exists that by choosing a single agent and a simple means of delivery, a nation could equip itself relatively cheaply to attack a limited area with a reasonable chance of success.

B. Concepts of the use of chemical and bacteriological (biological) weapons in war

1. Chemical Weapons

37. Chemical weapons could be used either within the zone of contact of opposing forces; or against military targets such as airfields, barracks, supply depots, and rail centres well behind the battle-area itself; or against targets which have no immediate connexion with military operations; for example, centres of population, farm land, and water supplies. The circumstances in which they could be used within a zone of contact are many and varied—for example, to achieve a rapid and surprise advantage against a poorly trained, ill-equipped military force which lacked chemical protective equipment; to overcome troops in dug-outs, foxholes, or fortifications where they would be otherwise protected against fragmenting weapons and high-explosive; to remove foliage, by means of chemical herbicides so as to improve visibility and to open up lines of fire, and to prevent ambush; to create barriers of contaminated land on or in the rear of the battlefield to impede or channel movement; or to slow an enemy advance by forcing them to use protective clothing and equipment. Such equipment undoubtedly restricts mobility and impedes normal activities. It is thus highly probable that once one of two well-equipped sides had been attacked with chemical weapons, it would retaliate in kind, in order to force its opponent to suffer the same penalties of restriction. In all such operations civilians who had not fled from the battle-area might become casualties, as they also would if, while not in the battle-zone, vapours of aerosols drifted toward them with the wind, or if they strayed at a latter date into areas contaminated with a persistent agent. The risk of civilian casualties would obviously be greater if chemical attacks were made on military targets well in the rear of the zone of contact, and would be very serious in the case of attacks on centres of population.

2. Bacteriological (Biological) Weapons

38. There is no military experience of the use of bacteriological (biological) agents as weapons of war and the feasibility of using them as such has often been questioned. One issue which has frequently been raised concerns the validity of extrapolations made from laboratory experience to military situations in the field. Some recent investigations under field conditions throw light on this point.

39. In one field trial, zinc cadmium (one micron is 1/1,000,000 of a metre) in diameter, from a ship travelling 16 kilometres offshore. About 200 kilograms were disseminated while the ship travelled a distance of 260 kilometres parallel to the coastline. The resulting aerosol travelled at least 750 kilometres, and covered an area of over 75,000 square kilometres.

40. This observation provides an indication of the size of area which might be covered by a windborne aerosol, but it does not tell whether the bacteriological (biological) agents which might be spread in an aerosol would still retain the ability to produce disease. All bacteriological (biological) agents lose their virulence or die progressively while travelling in an aerosol and the distance of effective travel of the cloud would depend on the rate of decay of the particular agent in the particular atmospheric conditions prevailing.

41. Some idea of the relative size of areas which can be covered by bacteriological (biological) and chemical aerosols can be gained from this same experiment. Had the particles that were carried been a bacterial or viral agent, they would not have caused casualties over as large an area as the one covered, because of decay of the agent while in the aerosol state. However, depending on the organism and its degree of hardiness, areas of 5,000 to 20,000 km^2 could have been effectively attacked, infecting a high proportion of unprotected people in the area. If the same means are applied to a hypothetical chemical attack using the most toxic chemical nerve agent, then about 0.8 kg of agent would have been released per km. The downwind hazard from this, in which some casualties might be expected, would not have extended more than one kilometre, and probably less, unless meteorological conditions were extremely favourable (see chapter III). The area covered by such a chemical attack might thus have between 50 to 150 $km.^2$ as compared with the 5,000 to 20,000 km^2 for the bacteriological (biological) attack.

42. For purposes of sabotage or covert (secret, as in sabotage actions behind enemy lines) operations, small aerosol generators for bacteriological (biological) agents could be built, for example, into fountain pens or cigarette lighters. It is also possible to conceive of the distribution of bacteriological (biological) agents by hand to poison either water supplies or ventilation systems, especially in a situation of breakdown of sanitary facilities due, say, to military mobilization, or to a nuclear attack. In addition to producing casualties, such an attack could produce severe panic. If half a kilo of a culture of Salmonella (a group of bacteria, many species of which produce severe intestinal infections, including gastro-enteritis, food ("ptomaine") poisoning, paratyphoid fever and typhoid fever) had been added to a reservoir containing 5 million litres of water, and complete mixing had occurred, severe illness or disability would be suffered by anyone drinking 1 decilitre (about 3 ounces) of untreated water.

43. The same degree of poisoning as would be produced by half a kilo of Salmonella culture could be achieved with 5 kilos of botulinum toxin, (see chapter II), 7 kilos of staphylococcal enterotoxin, or 50 kilos of V-nerve agent, or in the case of common industrial chemicals, with five tons of sodium fluoroacetate (used as a rodenticide) or ten tons of potassium cyanide.

C. Chemical and bacteriological (biological) agents

1. Chemical Agents

44. Chemical agents are usually described in terms of their physiological effects and are characterized as follows:

Agents affecting man and animals

Nerve agents are colourless, odourless, tasteless chemicals, of the same family as organophosphorus insecticides. They poison the nervous system and disrupt vital body functions. They constitute the most modern war chemicals known;

they kill quickly and are more potent than are any other chemical agents (except toxins).

Blister agents (*vesicants*) are oily liquids, which, in the main, burn and blister the skin within hours after exposure. But they also have general toxic effects. Mustard gas is a good example. Blister agents caused more casualties than any other chemical agent used in World War I.

Choking agents are highly volatile liquids which, when breathed as gases, irritate and severely injure the lungs, causing death from choking. They were introduced in World War I and are of much lower potency than the nerve agents.

Blood agents are also intended to enter the body through the respiratory tract. They produce death by interfering with the utilization of oxygen by the tissues. They, too, are much less toxic than nerve agents.

Toxins are biologically produced chemical substances which are very highly toxic and may act by ingestion or inhalation.

Tear and harassing gases are sensory irritants which cause a temporary flow of tears, irritation of the skin and respiratory tract, and occasionally nausea and vomiting. They have been widely used as riot control agents, and also in war.

Psycho-chemicals are drug-like chemicals intended to cause temporary mental disturbances.

Agents affecting plants

Herbicides (*defoliants*) are agricultural chemicals which poison or desiccate the leaves of plants, causing them to lose their leaves or die. The effectiveness of different chemical warfare agents against man, animals and plants is shown in table 1. The various specific chemical agents are listed and described in chapter 2.

Methods of delivery

45. Chemical munitions are designed to fulfill three objectives: (1) to provide a container for the agent so that the agent/munition combination can be delivered to its target; (2) to attain an effective distribution of agent over the target area; and (3) to release the agent in active form. In the case of incapacitating and riot control agents, it is necessary that the munition itself should not cause injury or death, and that it should not start fires. This is particularly important for devices used in the control of riots.

46. The munitions to be used would depend on the method of delivery, the shape and size of the target area, and other variables. Ground-to-ground munitions include grenades, shells, rockets, and missile warheads; air-to-ground munitions include large bombs, dispensers, spray tanks, and rockets; emplaced munitions include generators and mines.

47. *Ground-to-ground munitions.* Small ground-to-ground munitions (grenades, shells and small rockets) function much like their conventional counterparts. Upon impact in the target area, they would either explode or burn, and so expel the agent to form a cloud which would diffuse and drift downwind, resulting in an elongated alliptical area within which casualties would occur. This represents a point source of dissemination (chapter II).

48. Small rockets would frequently be fired in "ripples", and artillery shells in salvos, resulting in a group of impacts over the target area. This would constitute an area source of dissemination (chapter II).

49. Large ground-to-ground (as well as aerial munitions and missile warheads) might carry a number of small submunitions as well as agent in bulk. The parent munition, upon functioning, would disperse the submunitions over the target area. These would then disseminate the agent over a wide area rather than a single point of impact, as in the case of bulk munitions.

50. Another military concept is to use large warheads filled with several hundred kilos of an agent of low vapour pressure. Such a warhead, burst at a suitable altitude would produce a shower of droplets, effectively contaminating everything on which it fell. A number of such weapons could be used to assure that the target was covered.

51. *Air-to-ground munitions.* Bombs dropped from aircraft are larger than most shells, and consequently would result in a higher concentration of the chemical near the point of ground impact. Bombs bursting close to the ground could be used to achieve a wider dissemination of the agent, especially with chemical agents.

52. A dispenser is a container for submunitions, which, after opening, could remain attached to the aircraft. The submunitions could be released simultaneously or in succession.

53. Small rockets or missiles could also be used to deliver chemical agents from aircraft. The pattern of dispersal would be much the same as that produced by ground-to-ground rockets or missiles.

54. *Ground-emplaced munitions.* Ground-emplaced munitions comprise generators and mines. The generator is a tank containing a chemical agent, a source of pressure, and a nozzle through which the agent is forced. Generators would be placed upwind of the target, and then activated by a suitable device.

TABLE 1.—CATEGORIES OF CHEMICAL WARFARE AGENTS AND THEIR CHARACTERISTICS

	Physical state at 20° C.	Persistency	Main state of aggregation in target	Effective route of entry	Effective against—
Nerve agents	Liquid	Low to high	Vapor, aerosol, liquid.	Lungs, eyes, skin	Man, animals.
Blister agents	Liquid, solid	High	do	do	Do.
Choking agents	Liquid	Low	Vapor	do	Do.
Blood agents	Liquid, vapors	do	do	Lungs	Do.
Toxins	Solid	do	Aerosol, liquid	Lungs, intestinal tract.	Do.
Tear and harassing gases	Liquid, solid	do	Vapor, aerosol	Lungs, eyes	Do.
Incapacitants	do	do	Aerosol, liquid	Lungs, skin	Do.
Herbicides (defoliants)	do	Low to high	do	Foliage and roots	Plants.[1]

[1] Some herbicides, particularly those containing organic arsenic are also toxic for man and animals.

55. Chemical mines would be placed in areas of anticipated enemy activity, and would be activated by pressure or trip wires.

2. Bacteriological (Biological) Agents

56. Like chemical agents, bacteriological (biological) agents may also be classified in terms of their intended use, whether designed to incapacitate or to kill human beings, to incapacitate or kill food and draft animals, or to destroy food plants and industrial crops.

57. Bacteria, viruses, fungi, and a group of microbes known as rickeetsiae are by far the most potent agents which could be incorporated into weapon systems. There is no assurance, however, that other living organisms may not in the future become more important as potential agents for warfare.

The selection of agents for use in warfare

58. The number of bacteriological (biological) agents which could potentially be used in warfare is far fewer than those which cause naturally-occurring disease. To be effective for this purpose they should:

(a) be able to be produced in quantity;

(b) be capable of ready dissemination in the face of adverse environmental factors;

(c) be effective regardless of medical counter-measures;

(d) be able to cause a large number of casualties (this would imply that any agent chosen would be highly infectious, but whether the agent chosen would also be easily transmissible from man-to-man, would depend upon an intent to initiate an epidemic spread).

Agents affecting man

59. All the diseases under consideration occur naturally, and the causative organisms with few exceptions, are known to scientists throughout the world. Incapacitating agents are those which, in natural outbreaks, cause illness but rarely death. If the natural disease has an applicable mortality, the agent is regarded as a lethal one. However, these agents when used as aerosol weapons might cause more severe disease than occurs naturally.

60. Different populations have varying degrees of resistance to the diseases produced by bacteriological (biological) agents. An infectious disease which might be only mildly incapacitating in one population might prove disastrous to another. For example, when measles was first introduced into the Hawaiian

Islands, it caused far more deaths than in the relatively resistant populations of Europe. A bacteriological (biological) weapon which might be intended only to incapacitate could be highly lethal against a population where resistance had been lowered as a result of malnutrition. Conversely, a weapon which was intended to spread a lethal disease might only cause occasional mild illness in people who had been given a protective vaccine or who had become immune as a result of natural infection. The history of epidemiology is rich with surprises.

61. *Viruses* are the smallest forms of life. Most of them can be seen only with the electron microscope, and must be grown on living tissue (tissue cultures, fertile eggs, etc.). Genetic manipulation of the whole virus or chemical manipulation of its nucleic acid, might be used to acquire strains of higher virulence or greater stability to environmental stresses.

62. *Rickettsiae* are intermediate between the viruses and bacteria. Like the viruses, they grow only in living tissue. Judging by the scientific literature, research into the genetics of rickettsiae has been less intense than into that of viruses and bacteria.

63. *Bacteria* are larger than viruses, ranging in size from 0.3 micron to several microns. They can be easily grown on a large scale employing equipment and processes similar to those used in the fermentation industry, but special skills and experience would be needed to grow them in quantity in the particular state in which they readily cause disease. Although many pathogenic (disease-producing) bacteria are susceptible to antibiotic drugs, antibiotic-resistant strains occur naturally, and can be selected or obtained through the use of suitable methods of genetic manipulation. Similarly, it is possible to select strains with increased resistance to inactivation by sunlight and drying.

64. *Fungi* also produce a number of diseases in many, but very few species appear to have any potential in bacteriological (biological) warfare.

65. *Protozoa* are one-celled microscopic organisms which cause several important human diseases, including malaria. Because of their complex life cycles, they too appear to have little significance in the present context.

66. Parasitic *worms* such as hook-worm, and the filarial worms have very complicated life cycles. They cause illness and disability only after long exposure and repeated infection, and would be extremely difficult to produce in quantity, to store, to transport, or disseminate in a weapon. Insects are also difficult to conceive of as weapons. Some, such as the mosquito and the tick are transmitters of disease, and as "vectors," have to be looked upon as having potential military significance. Higher forms of life, such as rodents and reptiles can be dismissed in the context of the present discussion.

Agents affecting animals

67. Bacteriological (biological) anti-animal agents, such as foot-and-mouth disease and anthrax would be used primarily to destroy domestic animals, thereby indirectly affecting man by reducing his food supply.

68. Outbreaks of contagious disease in animal populations, known as epizootics, may spread much more readily than do epidemics among human beings. Viral infections are probably more serious for animals than those caused by other classes of micro-organisms.

69. Most of the bacterial diseases of animal which could probably be used in warfare are also transmissible to man. Human beings would be expected to get the disease if they were affected by the attacking aerosol cloud, and occasional individuals might contract the disease from infected animals.

Agents affecting plants

70. The natural occurrence of devastating plant diseases such as the blight of potatoes in Ireland in 1845, the coffee rust of the 1870s in Ceylon, the chestnut blight of 1904 in the United States of America, and the widespread outbreaks today of cereal (especially wheat) rusts has suggested that plant pathogens might be used for military purposes. There are four major requirements for the deliberate development of a plant disease into epidemic (epiphytotic) proportions: large amounts of the host plant must be present in the region; the agent should be capable of attacking the particular varieties of host plant that are grown; adequate quantities of the agent must be present; and the environmental conditions within the region should be favourable for the spread of the disease. An epiphytotic cannot develop if any one of the above requirements is not satisfied.

Methods of delivery

71. Bacteriological (biological) agents can, in principle, be loaded into the same type of munitions as can chemical agents. Other than for covert or "special-purpose missions", bacteriological (biological) weapons, if developed for military purposes, would in all probability be delivered by aircraft or by large ballistic missiles. Aircraft (including cruise missiles and drones) could drop a large number of bomblets from high altitude, or spray from a low altitude. Because a small amount of agent will cover relatively large areas, bombs would probably be small (1 kilo or less) and dispersed over as wide an area as possible. They could be released from clusters or from dispensers in the manner of chemical weapons, but probably from a higher altitude.

72. An aircraft could establish a line of agent which, as it travelled downwind, would reach the ground as a vast elongated infective cloud (see chapter II). The effectiveness of such a procedure would be highly dependent on weather conditions, but the larger the area, the larger the weather front involved, the greater the chances that the predicted results would be achieved. A small relative error might, however, involve a country not in the conflict.

73. It is conceivable that bacteriological (biological) weapons, probably bomblets, could be packaged in a ballistic missile. The bomblets could be released at a predetermined altitude to burst at ground level. The effect would be the same as bomblet delivery by aircraft except that it would be more costly.

74. Unless transmitted by insects, bacteriological (biological) agents have little power to penetrate the intact skin. Infections through the respiratory tract by means of aerosols is by far the most likely route which could be used in warfare.

75. Many naturally-occurring diseases (e.g. influenza, tuberculosis) are spread by the aerosol route, and some of them, notably influenza, can generate into large epidemics. When an infected person sneezes, coughs, or even speaks, an aerosol is formed which contains particles ranging widely in size. The larger particles are usually of little importance because they fall to the ground. But small particles (3 microns or less in diameter) dry out rapidly in the air, and are the most infectious. They may remain suspended in the atmosphere for a long time. Animal experiments have shown that a great many infectious agents (including many which are transmitted otherwise in nature) can be transmitted to animals by aerosols of small particle size. Laboratory accidents and experiments on volunteers have confirmed the effectiveness of the aerosol route of infection for man.

76. If bacteriological (biological) warfare ever occurred, the aerosol technique would thus be the one most likely to be used, simply because the respiratory tract is normally susceptible to infection by many micro-organisms; because of the wide target area which could be covered in a single attack; and because ordinary hygenic measures are ineffective in preventing the airborne route of attack. Since the particle size of an aerosol is crucial to its ability to penetrate into the lung (see chapter III for detailed discussion), the method for aerosolizing a bacteriological (biological) agent would have to be controllable so as to assure the dissemination of a large proportion of particles less than 5 microns in diameter.

77. Aerosols of bacteriological (biological) agents could be formed by three general methods. Agents could be disseminated by explosive means in much the same way as chemical agents. However, the size of the resulting particle is hard to control by this method, and much of the agent may be destroyed by the heat and shock of the exploding munition. Particles could also be formed by using pressure to force a suspension of the organisms through a nozzle. Particle size is determined by the amount of pressure, the size of the discharge orifices, the physical characteristics of the agent, and atmospheric conditions. Size control of solid particles (dry form of agent) can be achieved by "pre-sizing" before dissemination. Aerosol particles could also be produced as a spray by releasing the agent in liquid suspension into a high velocity air stream. This principle can be applied to spray devices for use on high performance aircraft.

D. Defense of man against chemical and bacteriological (biological) agents

78. A comprehensive defensive system against attacks by chemical or bacteriological (biological) agents would have to provide for detection and warning, rapid identification of agents, protection of the respiratory tract and skin, decontamination, and medical prophylaxis and treatment. Some aspects of such a

system could be dealt with by fairly simple equipment. Others would necessitate highly sophisticated apparatus. But the whole complex would necessitate a very effective organization manned by well-trained personnel. While military units and small groups of people could be equipped and trained to protect themselves to a significant extent, it would be impracticable for most (if not all) countries to provide comprehensive protection for their entire civil population.

1. Medical Protection

Chemical attacks

79. No general prophylactic treatment exists which could protect against chemical attacks. Antidotes (atropine and oximes) to nerve agents of value if administered within half an hour before or within a very short time after exposure. Atropine is itself toxic, however, and might incapacitate unexposed individuals given large doses. Skin can be protected from the vapours of blister agents by various ointments, but they are not effective against liquid contamination.

Bacteriological (biological) attacks

80. Vaccination is one of the most useful means of protecting people from natural infective disease, and the only useful means available for prophylaxis against bacteriological (biological) attacks. The protective value of vaccines against small-pox, yellow fever, diphtheria, and other diseases is fully established, although the protection they afford can be overcome if an immunized individual is exposed to a large dose of the infectious agent concerned. It is probable, however, that even those existing vaccines which are effective in preventing natural infectious diseases might afford only limited protection against respiratory infection by an agent disseminated into the air in large amounts by a bacteriological (biological) weapon. Moreover, whole populations could not be vaccinated against all possible diseases. The development, production, and administration of so many vaccines would be enormously expensive, and some vaccines might produce undesirable or dangerous reactions in the recipients.

81. This picture is not significantly altered by certain new developments in the field of vaccination: e.g. the use of living bacterial vaccines against tularemia, brucellosis and plague; or aerosol vaccination, which is particularly relevant to vaccination of large numbers of people. There have been recent advances in the control of virus diseases, but at present none of these is practicable for the protection of large populations against bacteriological (biological) warfare.

82. Prophylaxis against some diseases can also be provided by the administration of specific anti-sera from the blood of people or animals previously inoculated with micro-organisms, or products derived from them, to increase the anti-body levels (immunity) in their blood. Tetanus anti-toxin is used in this manner, and until more effective methods replaced them, such anti-sera were used for many diseases. It would, however, be impossible to prepare specific anti-sera against all possible bacteriological (biological) agents and to make them available for large populations.

83. Other possibilities, for example the use of therapeutic materials before symptoms appear, are equally remote from practical realization. The include immune serum, gammaglobulin, or drugs such as antibiotics or sulfonamide drugs. The use of gammaglobulin to prevent, or mitigate the severity of, disease may be useful for individuals known to have been exposed. But since gammaglobulin is made by separation from human blood, stocks could never be available except for isolated cases. In theory, chemoprophylaxis (the use of drugs and antibiotics to prevent infection) might also be useful in the short term for small groups operating at especially high risk. But it would only be prudent to assume that the bacteriological (biological) agents which an enemy might use would be those which were resistant to such drugs.

2. Detection and Warning

84. The requirement is to detect a cloud of a chemical or a bacteriological (biological) agent in the air sufficiently quickly for masks and protective clothing to be donned before the attack can be effective. Usually the objective would

be to try and detect the cloud upward of the target so that all those downwind could be warned. There are also requirements for the detection of ground contamination with chemical agents and for detection equipment to enable those under attack to decide when it would be safe to remove their protective equipment.

Chemical attacks

85. In World War I it was possible to rely upon odour and colour as the primary means of alerting personnel that a chemical attack had been launched. The newer, more toxic chemical agents cannot be detected in this way. On the other hand, presumptive evidence that such weapons had been used would nonetheless still be of value as warning. Once an enemy had used chemical weapons, each subsequent attack would necessarily have to be presumed to be a possible chemical attack, and protective measures would have to be instituted immediately. Individuals would have to mask not only in the air attack in which spray was used, or when there was smoke or mist from an unknown source, or a suspicious smell, or when they suffered unexpected symptoms such as a runny nose, choking and tightness in the chest, or disturbed vision, but whenever any bombardment occurred. But because of the uncertainty, it would be clearly desirable to devise and provide a system of instruments which can detect the presence of toxic chemicals at concentrations below those having physiological effects, and which would give timely and accurate warning of a chemical attack. It would also be advantageous to have test devices, collectors and analytical laboratory facilities in order to determine whether the environment was safe, as well as to identify accurately the specific chemical agent used in an attack.

86. The first and essential component of a defensive system would be an instrument which could detect low concentrations of a chemical agent. However low the concentration, a person could inhale a toxic amount in a short time because he breathes 10–20 litres of air per minute. Since the human body can eliminate or detoxify very small amounts of many toxic materials, there is no need to consider very long periods of exposure—the concern is with the exposures of only a few hours. This is often referred to technically as the Ct (concentration time) factor. Essential requirements of a method of detection suitable for use by military or civil defense personnel are that it be simple, specific, sensitive and reliable. Typical detector kits contain sampling tubes and/or reagent buttons, papers, etc. After being exposed to particular chemical agents, these detectors change colour or exhibit some other change easily observable without special instruments. Chemical detection kits could also be used to decide when it is safe to remove protective masks or other items of protective clothing. Obviously, laboratories, whether mobile or fixed, can perform more elaborate chemical analyses than can detection kits.

87. Warning devices which have been devised incorporate sensitive detectors that actuate an automatic alarm which alerts individuals to take protective action before a harmful dose of agent is received. They are of two trends: point sampling devices, which sample the air at one location by means of an air pump, and area scanning devices, which probe a specific area for chemical agents. The disadvantage of point source alarms is that they must be placed upwind of the area that has to be protected, and a rather large number may be needed. If the wind shifts, they have to be repositioned. Successful area scanning alarms have not yet been developed.

88. It must be recognized that in spite of instrumental warning systems, personnel near the point of dissemination of a chemical agent might still not have sufficient time to take protective action.

Bacteriological (biological) attacks

89. Unlike chemical weapons, bacteriological (biological) weapons cannot readily be distinguished from the biological "background" of the environment by specific chemical or physical reactions, and much lower aerosol concentrations of bacteriological (biological) agents are dangerous than of chemical agents. The problem of early detection and warning is thus even more difficult than for chemical weapons. A partial solution to the problem has been achieved with certain non-specific but very sensitive physical devices such as particle-counters and protein detectors (protein is a typical constituent of micro-organisms). Pre-

sumptive evidence of a bacteriological (biological) attack might be obtained if there is an unusual deviation from the normal pattern of material in the air recorded by the instruments. The elevation of such a deviation, however, would necessitate intensive and prolonged study of the normal pattern in a given location. This subject is discussed further in annex A.

3. Physical Protection

90. The primary objective is to establish a physical barrier between the body and the chemical and bacteriological (biological) agents, and especially to protect the skin and the respiratory tract. Without this no warning system, however effective, has the slightest value. Protection could be achieved by using various types of individual protective equipment or by means of communal shelters.

Individual protection

91. Protective masks are the first line of defense against all chemical and bacteriological (biological) agents. Although protective masks differ in appearance and design, they have certain features in common: a fitted facepiece, made of an impermeable material soft enough to achieve an effective seal against the face, and some means of holding it in place, such as a head strap, and a filter and absorption system, in canister or other form, which will remove particulate (aerosol) agents by mechanical filtration. The canister also contains activated charcoal, sometimes impregnated to react with agents in the vapour state, but which in any case will absorb toxic vapours. Some masks are made so as to permit the drinking of water while the individual is masked, or attempts at resuscitation measures on casualties without unmasking them. Civil defense masks are often less elaborate versions of the military mask. Gas proof protectors can be provided for infants.

92. A protective mask, properly fitted and in good working condition, will provide complete respiratory protection against all known chemical and bacteriological (biological) agents. However, a certain percentage of masked personnel can be expected to become casualties because of lack of training, failure to keep the mask in good condition, growth of beard, or because facial injuries prevent a good fit, etc. The amount of leakage that can be tolerated with bacteriological (biologic) agents is much less because of their greater potency.

93. Since mustard gases and the nerve agents of low or intermediate volatility can penetrate the unbroken skin, even through normal clothing, the whole body surface must be protected by some form of special clothing, of which there are two kinds, one which is impermeable to liquid agents, and the other which, though permeable to air and moisture, has been treated so as to prevent chemical agents from getting through. Rubber coated fabrics, made into protective suits, constitute the first, while normal clothing, treated with chlorimides or absorbents, is an example of the second. In addition, some form of impermeable cover, ground sheet or cape, can be used to protect against gross liquid contamination. Feet and hands are usually protected by special gloves, and either by boot covers or treated boots.

94. Together with a mask, protective clothing, properly worn and in good condition, will afford excellent protection against known chemical and bacteriological (biological) agents. The greatest degree of protection is provided by the impermeable type but when worn continuously it becomes very burdensome because of heat stress, particularly in warm environments. Permeable clothing allows somewhat greater activity, but even so, physical activity is impaired.

Collective or communal protection

95. Collective protection takes the form of fixed or mobile shelters capable of accommodating groups of people, and has been devised not only for civilians but also for special groups of military personnel (e.g. command posts, field hospitals). Collective protection is the most effective physical means of protection against all forms of attack. Sealing or insulating the shelter will provide protection only for a limited time, because of lack of ventilation. Sealing plus a supply of oxygen and a means of eliminating carbon dioxide is better, but once again the time of occupancy is limited. The shelter could be none the less safe even

though surrounded by fire or high concentrations of carbon monoxide. The best kind of shelter provides ventilation with filtered air to maintain a positive pressure relative to that outside. This positive internal pressure prevents the penetration of airborne agents, and permits entry or exit of personnel and equipment without contamination of the interior of the shelter. Extended periods of occupancy are possible.

96. These principles of collective protection are applicable to all enclosures arranged for human or animal occupancy. They have been used to provide protection by: hastily constructed or improvised field shelters, mobile vans and armoured vehicles, and permanent or fixed shelters designated for housing civilian or military personnel.

97. Once a bacteriological (biological) attack had been suspected or detected it would be necessary to identify the specific agents involved so that proper protective measures could be taken and chemo-prophylaxis and treatment planned. Indentification would also help to predict the incubation period and hence the time available for remedial measures to be taken. At present the only means of identifying specific micro-organisms is by normal laboratory procedures. Many routine laboratory methods of identification require as long as two to five days, but some recent developments have reduced this time appreciably. It is possible to collect the particles from large volumes of air and concentrate them in a small amount of fluid. Bacteria can then be trapped on special filters and transferred to nutrient media, where sufficient growth may take place to permit identification of some kinds of bacteria within fifteen hours. Another method, the fluorescent antibody technique, can be highly specific, and is applicable to bacteria and some viruses. In some cases, it allows of specific identification within a few hours. But despite all these recent developments, laboratory identification of biological agents is still a complicated and unsatisfactory process.

4. Decontamination

Chemical agents

98. Prolonged exposure to weather and sunlight reduces or eliminates the danger of most chemical agents, which are slowly decomposed by humidity and rain. But one could not rely on natural degradation to eliminate the risk and, in general, it would be essential to resort to decontamination. This would reduce the hazard but it is a time-consuming process and would greatly hamper military operations.

99. A wide range of chemicals could be used as decontaminants, the choice depending on 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 time available. Decontaminants range from soap and detergent in water, to caustic soda, hypochlorite and various organic solvents, and their successful use calls for large numbers of people, a copious supply of water, and appropriate equipment.

100. Decontaminating solutions, powders, applicators and techniques have been developed for decontaminating skin, clothing, personal equipment and water. These would need to be used immediately after an attack.

101. Unless food had been stored in metal cans or other containers which were impermeable to chemical agents, it would have to be destroyed. Decontamination of complex equipment and vehicles is a difficult and time-consuming procedure. Special pressurized sprayers to disseminate powdered and liquid decontaminants have been developed for this purpose, as have paints or coatings to provide a smooth impermeable surface to preclude the penetration of chemical agents.

102. Decontamination might even need to be extended to roads and selected areas. This would involve the removal of contaminated soil by bulldozing, or covering it with earth, using explosives to spread a powdered decontaminant over a wide area.

Bacteriological (biological) agents

103. Decontamination procedures for biological agents are similar to those used for toxic chemical agents. Aeration and exposure to strong sunlight will destroy most micro-organisms, as will also exposure to high temperatures. Thoroughly cooking exposed food, and boiling water for at least fifteen minutes will kill almost all relevant micro-organisms. Calcium hypochlorite and chlorine

can also be used to purify water. Certain chemical compounds, such as formaldehyde, ethylene oxide, calcium and sodium hypochlorites, sodium hydroxide and betapropiolactone, can be used to decontaminate materials and work areas. A hot, soapy shower is the best way to decontaminate human beings.

E. Protection of domestic animals and plants against chemical and bacteriological (biological) attacks

1. Chemical Attacks

104. The widespread protection of domestic animals and plants from chemical attack would be impracticable. Once a crop had been attacked with herbicides there is no effective remedial action. The damage could be made good only by a second planting of either the same or another crop, depending on the season.

2. Bacteriological (Biological) Attacks

Animals

105. Animals or flocks could be protected by collective shelters, although the cost would be great and, in the absence of automatic warning devices, it would be impossible to assure that the creatures would be sheltered at the time of attack.

106. The ideal means of protection for animals would be vaccination. Vaccines have been developed, and many are routinely produced, for foot-and-mouth disease, rinderpest, anthrax, Rift Valley fever, hog cholera, Newcastle disease and others. Vaccination of animal herds by aerosols is a promising area of investigation.

Plants

107. The only hopeful approach would be to breed disease resistant plants. This is a regular part of most national agricultural programmes, and has as its object the increase of crop yields. But unless the exact identity of the bacteriological (biological) agent which might be used were known well in advance (possibly years), it would not be feasible to apply this principle to provide protection to crops against this kind of attack.

108. Efforts devoted to spraying fungicides and similar preparations to reduce loss after attack do not appear to be economically effective. In most cases the best procedure is to utilize available manpower and machines in planting second crops.

Annex A. Early warning systems for air-borne bacteriological (biological) agents

An ideal automatic system for early warning against an attack with bacteriological (biological) agents would comprise the following components:

(1) a device to collect large volumes of air and concentrate the particulate matter obtained, in a small volume of fluid or on a small surface;

(2) a device to quantify and identify the collected material;

(3) a mechanism to assess the results and to initiate an alarm if necessary.

To collect and identify bacteriological (biological) agents and to initiate an alarm so that protective measures can be taken in sufficient time to be useful is extremely difficult. This is so because, firstly, identification of agents is generally time-consuming and, secondly, large and fluctuating quantities of bacteria and other organic materials exist in the atmosphere at all times. Thus if pathogens from a cloud released by an aggressor were collected, the device would need, not only to determine whether the quantity collected was significantly above the normal amounts that might occur, but also what the agent was, or at least that, in the amount collected, it was highly dangerous to man.

At present, warning devices are available which are sensitive but non-specific and these, unfortunately, would give an unacceptably high proportion of false alarms. Others are being developed which attempt to incorporate both rapid response with high specificity, but none to date is in the production stage. Research on this important problem is being continued and some of the approaches and techniques that are being used in this study are listed below.

Classification of automated biodetection approaches [2]

General category and suggested approach

Physical particle detection: Magnification; light scattering; volume displacement.

Key biochemical components: Antigen detection by fluorescent labelling; dyes and staining; bioluminescence and fluorescence; optical activity, pyrolysis products detection; ATP detection; proteins, nucleic acids, or others.

Biological activity: Growth (increase in cell mass or numbers); CO_2 evolution; phosphatase activity; substrate change (pH, Eh, O_2 interchange); pathogenic effects.

CHAPTER II. THE PROBABLE EFFECTS OF CHEMICAL AND BACTERIOLOGICAL WEAPONS ON MILITARY AND CIVILIAN PERSONNEL, BOTH PROTECTED AND UNPROTECTED

A. The effects of chemical agents on individuals and populations

109. The effects of chemical warfare agents on humans, animals and plants depend on the toxic properties of the agent, and dose absorbed, the rate of absorption and the route by which the agent enters the organism. Toxic agents may enter the body through the skin, the eyes, the lungs, or through the gastro-intestinal tract (as a result of eating contaminated food or drinking contaminated liquids).

110. For a given agent absorbed under the same conditions, the effect will be proportional to the dose absorbed. This is why it is possible to define for each agent certain characteristic doses, such as the dose which, under given conditions, will on average cause death in 50 per cent of the individuals exposed (the 50 per cent lethal dose, or "LD 50"), or the dose which will cause 50 per cent non-fatal casualties, or the dose which will have no appreciable military effect. These are expressed in milligrams of agent, with reference to a healthy adult of average weight. They may also be given in terms of milligrams per kilogram of body weight.

111. For purposes of evaluation it is convenient to express the same idea somewhat differently in the case of gases, vapours and aerosols absorbed through the respiratory passages. Here the absorbed dose depends on the concentration of the agent in the air, on the respiration rate of the subject, and on the duration of the exposure. If, for the sake of illustration, it is assumed that the average respiration rate for groups of individuals engaged in various activities remains relatively constant, it follows that the dose, and therefore the effect produced, will be directly proportional to the product of the concentration of the agent in the air (C in milligrams/cubic metre) and the exposure time (t in minutes). This is called the dosage (or Ct factor), certain characteristic values of which (for example the LD 50) are used in particular situations for quantitative estimates of the effects produced.

112. For toxic agents acting on or through the skin, the dose absorbed by contact will often be related to the "contamination rate", expressed in grams/square metre, which indicates to what extent surfaces are contaminated by the liquid.

113. The consequences of an attack on a population are a combination of the effects on the individuals in it, with both the concentration of agent and the susceptibility of individuals varying over the whole area exposed to risk. Different individuals would respond differently to an attack, and might have different degrees of protection. Possible long-term contamination of personnel from chemical warfare agents persisting on the ground and vegetation may add to the immediate, direct effects.

114. Protective masks, protective clothing and shelters and, to a certain extent, decontamination when applicable, give substantial protection against all chemical warfare agents. But, as already emphasized, the mere possession of a means of protection by no means constitutes an absolute safeguard against contamination by poisons. Alarm and detection equipment is important, sometimes vital,

[2] Adapted from Greene, V. W. "Biodetecting and Monitoring Instruments Open New Doors for Environmental Understanding," *Environmental Science Technology*, February 1968, pp. 104–112.

because without it timely warning, which is essential to the proper use of protective equipment, would be lacking. Since protective measures are most effective when performed by trained personnel working effectively in units, military personnel are more likely to be provided with adequate protection than a civilian population. In any event, the civilian population in most countries is simply not provided with protection against chemical warfare.

115. Several chemical warfare agents which were known during World War I, and others developed since, have been reported on in the scientific literature. However, the effects of the more lethal modern chemical weapons have not been studied under conditions of actual warfare. Furthermore, no complete and systematic field studies of the use of defoliants, herbicides and riot control agents are available. The following descriptions of the probable effects of chemical weapons, based both upon evidence and on technical judgment, must therefore be regarded as somewhat conjectural.

1. Effects of Lethal Chemical Agents on Individuals

116. Table 1 provides a classification of the most important lethal chemical agents, and notes some of their characteristics in terms of the effects they produce. More details are given in annex A.

TABLE 1.—GENERAL CHARACTERISTICS OF LETHAL CHEMICAL AGENTS

Type	Mechanism	Time for onset of effects	Examples
Nerve agent G	Interferes with transmission of nerve impulses.	Very rapid by inhalation (a few seconds)	Tabun, Sarin, Soman.
Nerve agent V	do	Very rapid by inhalation (a few seconds); relatively rapid through skin (a few minutes to a few hours).	VX.
Blister agent	Cell poison	Blistering delayed hours to days; eye effects more rapid.	Sulfur mustard; nitrogen mustard.
Choking agent	Damages lungs	Immediate to more than 3 hours	Phosgene.
Blood agent	Interferes with all respiration.	Rapid (a few seconds or minutes)	Hydrogen cyanide.
Toxin	Neuromuscular paralysis	Variable (hours or days)	Botulinum toxin.

117. Lethal chemical agents kill in relatively small doses, and as a rule the amount that causes death is only slightly greater than that which causes incapacitation. Death may occasionally be caused by high doses of presumed incapacitating agents and, conversely, minor effects could be caused by low doses of lethal agents. Blister agents are considered with the lethal agents since a small but significant fraction of the personnel attacked with such agents may die or suffer serious injury.

Nerve agents

118. These lethal compounds are readily absorbed through the lungs, eyes, skin and intestinal tract without producing local irritation, and they interfere with the action of an enzyme (cholinesterase) essential to the functioning of the nervous system. The nerve-agent casualty who has been exposed to a lethal dose will die of asphyxiation within a few minutes if he is not treated swiftly by means of artificial respiration and drugs such as atropine or oximes. Otherwise recovery is generally rapid and complete. Occasionally, it may take several weeks, but will be complete unless anoxia or convulsions at the time of exposure were so prolonged as to cause irreversible brain damage.

119. The route of entry of the agent into the body has some influence on the appearance of symptoms. These develop more slowly when the agent is absorbed through the skin than when it is inhaled. Low dosages cause a running nose, contraction of the pupil of the eye and difficulty in visual accommodation. Constriction of the bronchi causes a feeling of pressure in the chest. At higher dosages, the skeletal muscles are affected—weakness, fibrillation, and eventually paralysis of the respiratory muscles occurring. Death is usually caused by respiratory failure, but heart failure may occur. It is estimated that the most toxic nerve gases may cause death at a dosage of about ten mg min/m^3. (A dosage of one mg min/m^3 consists of an exposure of one minute to gas at a concentration of one milligram per cubic metre.) Less toxic ones are lethal at dosages of up to 400 mg min/m^3.

Blister agents or vesicants

120. Mustard is a typical blister agent which, like other members of this class, also has general toxic effects. Exposure to concentrations of a few mg/m^3 in the air for several hours results at least in irritation and reddening of the skin, and especially irritation of the eyes, but may even lead to temporary blindness. Exposure to higher concentrations in the air causes blisters and swollen eyes. Severe effects of this kind also occur when liquid falls on the skin or into the eyes. Blistering with mustard is comparable to second degree burns. More severe lesions, comparable to third degree burns, may last for a couple of months. Blindness may be caused, especially if liquid agent has entered the eyes. Inhalation of vapour or aerosol causes irritation and pain in the upper respiratory tract, and pneumonia may supervene. High doses of blister agents cause a general intoxication, similar to radiation sickness, which may prove lethal.

121. The first step in treating a person who has been exposed to a vesicant or blister agent, is to wash out the eyes and decontaminate the skin. Mild lesions of the eyes require little treatment. The blisters are treated in the same way as any kind of second-degree burns.

Other lethal agents

122. *Phosgene* and compounds with similar physiological effects were used in World War I. Death results from damage to the lungs. The only treatment is inhalation of oxygen and rest. Sedation is used sparingly.

123. *Hydrogen cyanide* in lethal doses causes almost immediate death by inhibiting cell respirations. Lower doses have little or no effect.

124. Most of the so-called blood agents contain cyanide, and all act rapidly. The casualty would either die before therapy could begin, or recover soon after breathing fresh air.

125. *Botulinum toxin* is one of the most powerful natural poisons known, and could be used as a chemical warfare agent. There are at least six distinct types, of which four are known to be toxic to man. Formed by the bacterium *Clostridium botulinum*, the toxin is on occasion accidentally transmitted by contaminated food. The bacteria do not grow or reproduce in the body, and poisoning is due entirely to the toxin ingested. It is possible that it could be introduced into the body by inhalation.

126. Botulism is a highly fatal poisoning characterized by general weakness, headache, dizziness, double vision, dilation of the pupils, paralysis of the muscles concerned in swallowing, and difficulty of speech. Respiratory paralysis is the usual cause of death. After consumption of contaminated food, symptoms usually appear within twelve to seventy-two hours. All persons are susceptible to botulinum poisoning. The few who recover from the disease develop an active immunity of uncertain duration and degree. Active immunization with botulinum toxoid has been shown to have some protective value, but antitoxin therapy is of limited value, particularly where large doses of the toxin have been consumed. Treatment is mainly supportive.

2. Effects of Lethal Agents on Populations

127. As already indicated, the possible effects of an attack on populations with lethal chemical warfare agents would depend upon the agent used, upon the intensity of the attack, whether the population was mainly under cover or in the open, on the availability of protective facilities, on the physiological state of the individuals affected, and upon the meteorological conditions, which might differ from what had been predicted, and alter during the course of an attack.

128. The importance of meteorological conditions on the spread of agent from its point or area of release is illustrated by Figures 1(a), 1(b) and 1(c) which show in an idealized diagramatic form the type of dosage contours to be expected from a point source, from multiple sources and from a linear aerial source respectively when exposed to the effects of wind.

129. Figure 1(a) (not printed in RECORD) shows the shape of the zone travelled by the chemical cloud produced by a point source (for example, one isolated munition), at the far left of the innermost cigar-shaped figure under conditions of a strong wind (say 5–20 km/h) in the direction indicated.

130. The number on each line indicates the dosage (Ct=concentration times time) on the line. The dosage at any point inside the area delimited by the curve

is greater than the number indicated. On the basis of these data, it is possible to estimate the casualties when the characteristic dosages of the agent used are known. For example, if the LD 50 value of the agent were 30 milligram-minutes/cubic metre, there would be more than 50 per cent fatalities in the area inside the contour marked 30.

131. This figure applies to a volatile agent such as Sarin, which is usually released in the form of a vapour or an aerosol cloud. In the case of a non-volatile liquid released in the form of droplets which fall onto the ground and contaminate it, a corresponding map could be drawn for the level of contamination of the soil (expressed in milligrams/square metre).

132. Figure 1(b) (not printed in RECORD) shows the same phenomenon in relation to an area source such as would result, for example, from attack by a missile warhead filled with small bombs or by an artillery salvo.

133. In the case of a volatile agent released in the form of a vapour or aerosol, the resulting cloud, carried downwind, covers a zone whose general shape is the same as in the case of a point source (Figure 1(a)), but its dimensions are obviously much larger and the dosage values are also larger.

134. If a non-volatile agent were released in the form of droplets, the hazard would be very great in the impact area because all surfaces (skin, clothing, vehicles, equipment, vegetation, etc.) would be contaminated. The downwind hazard caused by the drift of the most minute particles would extend over a much smaller area than in the previous case because only a relatively small number of minute particles would be carried by the wind.

135. Figure 1(c) (not printed in RECORD) shows the zone covered by a linear aerial source as in the case of dissemination of a non-volatile agent from an aircraft.

136. The emitted cloud is carried by the wind and does not touch the ground until it has travelled some distance away from the line of flight of the disseminating aircraft; this depends on the altitude of the aircraft and on the wind velocity. Since the cloud has already been subjected to the influence of turbulent diffusion before reaching the ground, the dosage values or contamination rates will be highest some distance away from the zone boundary nearer the source.

137. Because of meterological and other variables, it is impossible to make general statements about the quantitative effects of chemical weapons on populations. The following hypothetical examples, therefore are intended merely to illustrate what might happen and the degree to which protective measures could reduce casualties. To provide representative illustrations, the examples chosen include the different hazards created by nerve agents used in a battle zone, on military targets in the rear and on civilians in a town.

Effects of nerve gas on protected troops in combat

138. A heavy attack with air-burst munitions dispersing non-volatile liquid nerve agent would create concentrations on the ground that could range from one-tenth of a gram to ten grams of liquid per square metre, giving a mean value of about five grams. This would be extremely hazardous. At the same time, aerosol concentrations would be created over almost the entire impact area (dosages about twenty mg. min/m^3). This would produce casualties even if there were no liquid hazard.

139. To counter this type of attack, protective measures of a very high order of efficiency, including protective masks, light protective clothing, means for decontamination, detection systems, antidotes and medical care, would have to be available. Protective clothing and rapid utilization of gas masks would give a certain measure of protection. But in this case, subsequent decontamination and medical care would be necessary to avoid heavy lethal losses.

Effects of nerve gas on a military target in the rear

140. An attack from the air with a volatile nerve agent against a military installation in a rear area would cause an intense liquid and vapour hazard in the installation itself, and a vapour hazard downwind in the surrounding area. As suggested in figure 1(b), the impact area would be very heavily contaminated; gas dosages inside and close to the impact area would be very high. Further downwind the gas concentration would decrease gradually, and finally become innocuous. A general picture of the way casualties would occur in a downwind area is indicated in figure 1(a).

141. After an attack in which tons of Sarin were used against an area of one square kilometre, the impact area and the area immediately downwind from it would be highly lethal to all unprotected personnel. Lethal casualties would occur at dosages above eighty mg. min/m^3. Some very light casualties would result at dosages around five mg. min/m^3. The distance between the impact area and the area of lowest effective dosage would depend on the local topography and on weather conditions, but would rarely exceed a few tens of kilometres.

142. Personnel provided only with gas masks, but not wearing them at the moment of the attack, would suffer substantial losses in and close to the impact area, both because of the effects of the liquid and because of the high gas concentration inhaled before they could don their masks. Further downwind, masks would give essentially complete protection if warning were provided reasonably quickly.

Effects of a nerve gas attack on a town

143. The population density in a modern city may be 5,000 people per square kilometre. A heavy surprise attack with non-volatile nerve gas by bombs exploding on impact in a wholly unprepared town would, especially at rush hours, cause heavy losses. Half of the population might become casualties, half of them fatal, if about one ton of agent were disseminated per square kilometre.

144. If such a city were prepared for attack, and if the preparations included a civil defence organization with adequately equipped shelters and protective masks for the population, the losses might be reduced to one-half of those which would be anticipated in conditions of total surprise.

145. Although it would be very difficult to achieve, if there were a high level of preparedness, comprising adequate warning and effective civil defence procedures, it is conceivable that most of the population would be sheltered at the time of the attack, and that very few would be in the streets.

146. Given a town with a total population of 80,000, a surprise attack with nerve gas could thus cause 40,000 casualties, half of them fatal, whereas under ideal circumstances for the defence, fatalities might number no more than 2,000. It is inconceivable, however, that the ideal would ever be attained.

3. Effects of Incapacitating Chemical Agents

147. Incapacitating chemicals, like tear gases and certain psychochemicals, produce in normal health people a temporary, reversible disability with a few if any permanent effects. In young children, old people and those with impaired health, the effects may sometimes be aggravated. They are called incapacitating because the ratio between the lethal and incapacitating doses is very high. The types which could have a possible military use are limited by requirements of safety, controlled military effectiveness and economic availability.

148. Many chemical compounds fall into this category, of which ω-chloracetophenone (CN), ortho-chlorobenzylidenemalononitrile (CS), and adamsite (DM) are probably the most important. They are solids when pure, and are disseminated as aerosols.

149. Either as vapour or in aerosol, tear and harassing gases rapidly produce irritation, smarting and tears. These symptoms disappear quickly after exposure ceases. The entire respiratory tract may also be irritated, resulting in a running nose and pain in the nose and throat. More severe exposures can produce a burning sensation in the trachea. As a result, exposed persons experience difficulty in breathing, attacks of coughing and occasionally, nausea and headaches.

150. Extremely high dosages of tear and harassing gases can give rise to pulmonary edema (fluid in the lungs). Deaths have been reported in three cases after extraordinary exposure, to ω-chloracetophenone (CN) in a confined space.

151. The effects of adamsite (DM) are more persistent. Nausea is more severe and vomiting may occur.

152. Results of experiments on various species of animals (see annex B) and some observations of human responses lead to the following tentative conclusions. First, CS is the most irritating of these gases, followed by adamsite (DM) and ω-chloracetophenone (CN). Second, the tolerance limits (highest concentration which a test subject can tolerate for one minute) of DM and CS are about the same. Third, the least toxic of the tear gases is CS, followed by DM and then CN. Fourth, human beings vary in their sensitivity to, and tolerance of, tear and harassing gases. And finally, the toxicity of these gases varies in different animal species and in different environmental conditions.

153. The symptoms caused by tear gases disappear, as tears wash the agent from the eyes, and if the victim gets out of the tear gas atmosphere. Some, however, cause reddening or rarely even blistering of the skin when the weather is hot and wet.

Toxins

154. Staphylococcus toxin occurs naturally in outbreaks of food poisoning—which is the only medical experience with this toxin. The symptoms have a sudden, sometimes violent, onset, with severe nausea, vomiting and diarrhea. The time from ingestion of the toxin to the onset of symptoms is usually two to four hours, although it may be as short as a half hour. Most people recover in 24–48 hours and death is rare. Treatment is supportive and immunity, following an attack, is short-lived. The toxin is resistant to freezing, to boiling for thirty minutes, and to concentrations of chlorine used in the treatment of water. Staphylococcus toxin could be considered as an incapacitating chemical warfare agent. Symptoms can be produced in animals by intravenous injection, and the toxin may also be active by the respiratory route.

Psychochemicals

155. These substances have been suggested for use in war as agents which could cause temporary disability by disrupting normal patterns of behaviour. The idea cannot be accepted in its simple form, since these substances may lead to more permanent changes, particularly in individuals who are mentally unbalanced or who are in the early stages of a nervous and mental disease. Moreover, very high doses, which would be difficult to exclude during use in war, can cause irreversible damage to the central nervous system or even death. Psychochemicals could also have particularly severe effects on children.

156. Compounds such as LSD, mescaline, psilocybin, and a series of benzilates which cause mental disturbance—either stimulation, depression or hallucination—could be used as incapacitating agents. Mental disturbance is, of course, a very complex phenomenon, and the psychological state of the person exposed to a psychochemical, as well as the properties of the agent, would profoundly influence its manifestations. But, despite the variation in responses between individuals, all those affected could neither be expected to act rationally, nor to take the initiative, nor make logical decisions.

157. Psychochemicals do more than cause mental disturbance. For example, the general symptoms from the benzilates are interference with ordinary activity; dry, flushed skin; irregular heartbeat; urinary retention; constipation; slowing of mental and physical activity; headache, giddiness; disorientation; hallucinations; drowsiness; occasional maniacal behaviour; and increase in body temperature. While these effects have not been fully studied, there would be a significant risk to affected individuals particularly military personnel, becoming secondary casualties due to uncoordinated behaviour. A single dose of 0.1 to 0.2 mg LSD25 will produce profound mental disturbance within half an hour, the condition persisting for about ten hours. This dose is about a thousandth of the lethal dose.

158. Treatment of the symptoms of psychochemicals is mainly supportive. Permanent psychotic effects may occur in a very small proportion of individuals exposed to LSD.

159. It is extremely difficult to predict the effects which an attack with psychochemical agents would produce in a large population. Apart from the complication of the varying reaction of exposed individuals, there could be strange interactions within groups. A few affected individuals might stimulate their fellows to behave irrationally, in the same way as unaffected persons might to some extent offset the reactions of those affected. Since the probability of fatal casualties resulting directly from exposure is low, some normal group activity might be sustained. Protective makes would probably provide complete protection, since practically all potential psychochemical agents, if used as offensive weapons, would be disseminated as aerosols.

4. Other Effects of Chemical Agents

Effects on animals

160. The effects of lethal chemical agents on higher animals are, in general, similar to those on man. The nerve agents also kill insects.

Effects on plants

161. A variety of chemicals kill plants, but as already indicated, little is known about their long-term effects. The effective dose ranges of defoliants vary according to the particular species of plant attacked, its age, the meteorological conditions and the desired effect: e.g., plant death or defoliation. The duration of effect usually lasts weeks or months. Some chemicals kill all plants indiscriminately, while others are selective. Most defoliants produce their effects within a few weeks, although a few species of plant are so sensitive that defoliation would occur in a period of days.

162. An application of defoliating herbicide (for example, the commonly used "2,4-D" and "2,4,5-T" which are the butyl esters of (2,4-dichlorophenoxy) acetic acid and (2,4,5-trichlorophenoxy) acetic acid) per acre (roughly 36 kg per hectare) can produce 65 per cent defoliation for six to nine months in very densely forested areas, but in some circumstances some species of trees will die. Significantly lower doses suffice for most agricultural and industrial uses throughout the world. Defoliation is, of course, a natural process—more common in trees in temperate zones than in the tropics. Essentially what defoliants do is trigger defoliation prematurely.

163. Desiccation (the drying out) of leaves results in some defoliation, although usually the leaf-drop is delayed, and the plant would not be killed without repeated application of the chemical. Chemical desiccants cause a rapid change in colour, usually within a few hours.

B. The effects of bacteriological (biological) agents on individuals and populations

164. Mankind has been spared any experience of modern bacteriological (biological) warfare, so that any discussion of its possible nature has to be based on extrapolation from epidemiological knowledge and laboratory experiment. The number of agents which potentially could be used in warfare is limited by the constraints detailed in chapter I. On the other hand, the variability which characterizes all living matter makes it conceivable that the application of modern knowledge of genetic processes and of selection could remove some of these limitations. Some species of micro-organisms, consist of a number of strains characterized by different degrees of virulence, antigenic constitution, susceptibility to chemotherapeutic agents and so on. For example, strains of tularaemia bacilli isolated in the United States are generally much more virulent in human beings than those found in Europe or Japan. Foot-and-mouth disease virus is another well-known example of an organism with various degrees of virulence. The situation with bacteriological (biological) weapons is thus quite different from that of chemical weapons, where the characteristics of a given compound are more specific.

1. Effects on Individuals

165. Bacteriological (biological) agents could be used with the intention of killing people or of incapacitating them either for a short or a long period. The agents, however, cannot be rigidly defined as either lethal or incapacitating, since their effects are dependent upon many factors relating not only to themselves but also to the individuals they attack. Any disease-producing agent intended to incapacitate may, under certain conditions, bring about a fatal disease. Similarly, attacks which might be intended to provoke lethal effects might fail to do so. Examples of naturally occurring lethal disease are shown in table 2 and representative incapacitating diseases in table 3. A detailed list of possible agents, with a brief description of their salient characteristics is given in annex C.

166. A number of natural diseases of man and domestic animals are caused by mixed infections (e.g., swine influenza, hog cholera). The possible use of two or more different organisms in combination in bacteriological (biological) warfare needs to be treated seriously because the resulting diseases might be aggravated or prolonged. In some instances, however, two agents might interfere with one another and reduce the severity of the illness they might cause separately.

167. The effects of some forms of bacteriological (biological) warfare can be mitigated by chemotherapeutic, chemoprophylactic and immunization measures (for protection see Chapter I and annex C of this chapter). Specific chemotherapeutic measures are effective against certain diseases, but not against those caused by viruses. But it may not always be possible to apply such measures, and they might not always be successful. For example, with some diseases early therapy with antibiotics is usually successful, but relapses may occur. Moreover, resistance against antibiotics may develop in almost all groups of micro-organisms, and resistant strains may retain full virulence for man as well as for animals.

TABLE 2.—EXAMPLES OF AGENTS THAT MIGHT BE USED TO CAUSE DEATH

Agents and diseases	Incubation period (days)	Effect of specific therapy	Likelihood of spread from man to man
Viruses:			
Eastern equine encephalitis	5–15	Nil	Nil.[1]
Tick-borne encephalitis	7–14	do	Do.
Yellow fever	3– 6	do	Do.
Rickettsiae:			
Rocky Mountain spotted fever	3–10	Good	Do.
Epidemic typhus	6–15	do	Do.
Bacteria:			
Anthrax	1– 5	Moderate	Low.
Cholera	1– 5	Good	High.
Plague, pneumonic	2– 5	Moderate	Do.
Tularemia	1–10	Good	Low.
Typhoid	7–21	do	High.

[1] Unless vector present.

TABLE 3.—EXAMPLES OF AGENTS THAT MIGHT BE USED TO CAUSE INCAPACITATION

Agents and diseases	Incubation period (days)	Effect of specific therapy	Likelihood of spread from man to man
Viruses:			
Chikungunya fever	2– 6	Nil	Nil.[1]
Dengue fever	5– 8	do	Do.
Venezuelan equine encephalitis	2– 5	do	Do.
Rickettsiae: Q-fever	10–21	Good	Low.
Bacteria: Brucellosis	7–21	Moderate	Nil.
Fungi: Coccidioidomycosis	7–21	Poor	Do.

[1] Unless mosquito vector present.

Possible bacteriological (biological) agents

168. Victims of an attack by bacteriological (biological) weapons would, in effect, have contracted an infectious disease. The diseases would probably be known, but their symptoms might be clinically modified. For example, apart from the deliberate genetic modification of the organism, the portals of infection might be different from the natural routes, and the disease might be foreign to the geographical area in which it was deliberately spread. Possible bacteriological (biological) agents representing disease caused by the main groups of relevant microorganism are:

169. *Anthrax:* Under natural conditions, anthrax is a disease of animals, the main source of infection for man being cattle and sheep. Its vernacular synonym "wool sorter's disease" indicates one way men used to contract the disease. De-

pending on the mechanism of transmission, a cutaneous (skin) form (contact infection), an intestinal form (alimentary infection), or pulmonary form (airborne infection) may develop. The lung or respiratory form is most severe, and unless early treatment with antibiotics is resorted to, death ensues within two-three days in nearly every case.

170. Antibiotic prophylaxis is possible, but would have to be prolonged for weeks, since it has been shown that monkeys exposed to anthrax aerosol die if antibiotic treatment is discontinued after ten days. In certain countries, several types of vaccines are employed, but their value has not been fully evaluated.

171. The anthrax bacillus forms very resistant spores, which live for many years in contaminated areas, and which constitute the most dangerous risk the disease presents. From epidemiological observations, the inhalation infectious dose for man is estimated at 20,000 spores. Experiments on animals show that anthrax can be combined with influenza infection or with some noxious chemical agent, and that the susceptibility of the animal to airborne anthrax infection is then markedly enhanced.

172. With suitable expertise and equipment large masses of anthrax bacilli can be easily grown, and heavy concentrations of resistant anthrax spore aerosols could result in a high proportion of deaths in a heavily exposed population. Immunization could not be expected to protect against a heavy aerosol attack. The soil would remain contaminated for a very long time, and so threaten live-stock farming.

173. *Coccidioidomycosis:* This disease, which is also called desert fever, is caused by a fungus in the soil of deserts in the United States, South America and the USSR. The spores of the fungus are very stable, and can easily be disseminated as an aerosol. If they are inhaled, pneumonia with fever, cough, ague and night-sweating, and muscle pains follow after an incubation period of one-three weeks. In most cases, recovery from the disease occurs after some weeks of illness. An alergic rash sometimes breaks out during the first or second week of the illness, and can be significant for proper diagnosis. Treatment presents great difficulties.

174. *Plague:* Under natural conditions, small rodents, from which the disease is transmitted by fleas, are the main source of human infection with plague. This is how "bubonic" plague develops. If the plague microbes are inhaled, pneumonic plague develops after a three-to-five-day incubation period. The patient suffers from severe general symptoms and if untreated, normally dies within two to three days. A patient with pneumonic plague is extremely contagious to contacts.

175. Prevention vaccination is moderately effective against bubonic, but not pneumonic plague. If administered early, streptomycin treatment may be successful.

176. In a study of experimental pulmonary plague in monkeys, it was found that an average dose of only 100 bacterio caused fatal disease in half the animals tested. Animal experiments have also shown that particles of 1 micrometre diameter (1.25,000 of an inch), containing single microbial cells, can cause primary pneumonia, with a rapid and fatal outcome. If the aerosol is formed by larger particles (5–10 micrometres diameter), microbial cells are deposited in the nose and other regions of the upper respiratory tract, and primary foci of the disease develop in the corresponding lymphatic nodes. A fatal generalized infection may then follow.

177. A large mass of plague bacteria could be grown, and probably lyophilized (freeze-dried) and kept in storage. The agent is highly infectious by the aerosol route and most populations are completely susceptible. An effective vaccine against this type of disease is not known. Infection might also be transmitted to urban and/or field rodents and natural foci of plague may be created.

178. *Q-fever:* Under natural conditions, Q-fever is a disease of animals, the main sources of infection to man being sheep, goats and cattle. The infection is transmitted most frequently by the air route.

179. An incubation period of two to three weeks follows the inhalation of the infectious material. A severe attack of an influenza-like illness follows, with high fever, malaise, joint and muscle pains, which may be followed in five to six days

by pneumonia. In untreated cases, the illness lasts two to three weeks; the patient feels exhausted and is unable to do normal work for several weeks. But the disease can be successfully treated with broad spectrum antibiotics (tetracyclines). Prophylactic vaccines have been prepared in some countries, but have not yet been proved suitable for large-scale use.

180. The agent causing the disease is a rickettsia, and is extremely infectious for man. An epidemic of Q-fever once occurred due to contaminated dust which was carried by the wind from a rendering plant some ten kilometres away. Q-fever is also a common and significant laboratory hazard, even though it is only rarely transmitted from man to man. The high susceptibility of humans to this agent has been demonstrated in volunteers.

181. Q-fever rickettsiae are extraordinarily resistant to environmental factors such as temperature and humidity. Very large amounts can be produced in embryonated chicken eggs (20,000 million micro-organisms per millilitre) and can be stored for a long period of time. A Q-fever aerosol could produce an incapacitating effect in a large proportion of the population of an attacked area. The infective agent could persist in the environment for months and infect animals, possibly creating natural foci of infection.

182. *Tularaemia:* Under natural conditions, tularaemia is a disease of wild animals, the source of human infection being rodents, especially rabbits and hares. When it occurs naturally in human beings, who are very susceptible to the disease, skin lesions with swelling of the lymph nodes are its usual manifestation (infection by contact with sick or dead animals, or by way of ticks and other vectors). Infection can also occur through the eye and the gastro-intestinal tract. The pulmonary form (airborne infection) is the more serious. Pulmonary tularaemia is associated with general pain, irritant cough, general malaise, etc., but in Europe and Japan mortality due to this form of the disease was never higher than 1 per cent even before antibiotics became available. American tularaemia strains, on the other hand, are much more dangerous: some epidemics have been associated with a mortality rate as high as 20 per cent, despite antibiotic treatment. Usually treatment with streptomycin or tetracyclines is highly effective. A tularaemia vaccine developed in the Soviet Union is also highly effective.

183. The agent causing the disease is a microbe which is very sensitive to common disinfectants, but which is able to survive for a long as a few weeks in contaminated dust, water, etc.

184. Aerosols of tularaemia have been tested on volunteers. The inhalation infectious dose for man is about ten to twenty-five microbes, and the incubation period five days. By increasing the inhaled dose a hundred times, the incubation periods shortens to two to three days. Owing to its easy aerosol transmission, tularaemia has often infected laboratory workers.

185. The microbiological characteristics are similar to those of the plague bacillis (although antibiotic treatment and vaccination prophylaxis are effective). Both lethal and incapacitating effects are to be expected. The disease is not transferred from man to man, but long-lasting natural foci might be created.

186. *Venezuelan equine encephalitis virus (VEE)*: In nature, VEE is an infection of animals (equines, rodents, birds) transmitted to man through mosquitos which have fed on infected animals.

187. The disease has sudden onset, with headache, chills and fever, nausea and vomiting, muscle and bone pains, with encephalitis occurring in a very small proportion of cases. The mortality rate is very low and recovery is usually rapid after a week, with residual weakness often persisting for three weeks. No specific therapy is available. The vaccine is still in the experimental stage.

188. Numerous laboratory infectious in humans have been reported, most of them airborne. In laboratory experiments, monkeys were infected with aerosolized virus at relatively low concentrations (about 1,000 guinea pig infectious doses).

189. Since the virus can be produced in large amounts in tissue culture or embryonated eggs, and since airborne infection readily occurs in laboratory

workers, concentrated aerosols could be expected to incapacitate a very high percentage of the population exposed. In some areas; persistent endemic infection in wild animals would be established.

190. *Yellow fever:* In nature, yellow fever is primarily a virus disease of monkeys, transmitted to man by a variety of mosquitos (*Aedes aegypti, Aedes simpsoni, Hemagogus* species, etc.) After an incubation period of three-six days, influenza-like symptoms appear with high fever, restlessness and nausea. Later the liver and the kidneys may be seriously affected, with jaundice and diminished urinary excretion supervening. The very severe forms end in black vomitus and death. In a non-immune population, mortality rates for yellow fever may be as high as 30–40 per cent. There is no specific treatment, but prophylactic vaccination, being highly effective, is widely used in yellow fever endemic areas.

2. Effects on Populations

191. Other than for sabotage, the use of aerosol clouds of an agent is the most likely form of attack in bacteriological (biological) warfare. For example, material can be produced containing infective micro-organisms at a concentration of 10,000 million per grain. Let us suppose that an aircraft were to spray such material so as to produce an aerosol line source 100 kilometres in length across a 10 kilometre per hour wind. Then, assuming that 10 per cent of organisms survived aerosolization, and that subsequent environmental stresses caused them to die at a rate of 5 per cent per minute, about 5,000 square kilometres would be covered at a concentration such that 50 per cent of the unprotected people in the area would have inhaled a dose sufficient to infect them, assuming that the infective dose is about 100 micro-organisms per person. This particular calculation is valid for agents such as those which cause tularaemia, plague, as well as for some viruses. The decay rate of the causative agents of Q-fever, anthrax and some other infections is much lower and the expected effect would be still greater.

192. The effects of bacteriological (biological) attacks would obviously vary according to circumstances. Military personnel equipped with adequate protective measures, well trained in their use and provided with good medical services could, if warned of an attack, be able to protect themselves to a considerable degree. But effective early warning and detection systems do not yet exist. On the other hand, attacks, on civil populations are likely to be covert and by surprise and, at present no civilian populations are protected. Unprotected military or civilian personnel would be at complete risk, and panic and irrational behaviour would complicate the effects of the attack. The heavy burden which would be imposed on the medical services of the attacked region would compound disorganization, and there would be a major risk of the total disruption of all administrative services.

193. In view of the extensive anti-personnel effects associated with agents of the kind with which this report is concerned, it is useful to view them against the area of effect of a one-megaton nuclear explosion, which as is well recognized, would be sufficient to destroy utterly a town with a population of a million. It should of course be emphasized that direct comparisons of the effects of different classes of weapons are at best, hypothetical exercises. From the military point of view, effectiveness of a weapon cannot be measured just in terms of areas of devastation or numbers of casualties. The final criterion will always be whether a specific military objective can be achieved with one than another set of weapons. The basic hypotheses chosen for the comparison are rather artificial; and in particular, environmental factors are ignored. But despite this limitation, table 4 gives data that help to place chemical, bacteriological (biological) and nuclear weapons in some perspective as to size of target area, numbers of casualties inflicted, and cost estimates for development and production of each type of weapon. The figures speak for themselves.

TABLE 4.—COMPARATIVE ESTIMATES OF DISABLING EFFECTS OF HYPOTHETICAL ATTACKS ON TOTALLY UNPROTECTED POPULATIONS USING A NUCLEAR, CHEMICAL, OR BACTERIOLOGICAL (BIOLOGICAL) WEAPON THAT COULD BE CARRIED BY A SINGLE STRATEGIC BOMBER

Criterion for estimate	Type of weapon		
	Nuclear (1 megaton)	Chemical (15 tons of nerve agent)	Bacteriological (biological) (10 tons[1])
Area affected	Up to 300 km²	Up to 60 km²	Up to 100,000 km.²
Time delay before onset of effect.	Seconds	Minutes	Days.
Damage to structures	Destruction over an area of 100 km.²	None	None.
Other effects	Radioactive contamination in an area of 2,500 km² for 3 to 6 months.	Contamination by persistence of agent from a few days to weeks.	Possible epidemic or establishment of new endemic foci of disease.
Possibility of later normal use affected area after attack.	3 to 6 months after attack	Limited during period of contamination.	After end of incubation period or subsidence of epidemic.
Maximum effect on man	90 percent deaths	50 percent deaths	50 percent morbidity; 25 percent deaths if no medical intervention.
Multiyear investment in substantial research and development production capability.[2]	$5,000 to $10,000 million	$1,000 to $5,000 million	$1,000 to $5,000 million.

[1] It is assumed that mortality from the disease caused by the agent would be 50 percent if no medical treatment were available.

[2] It is assumed that indicated cumulative investments in research and development and production plants have been made to achieve a substantial independent capability. Individual weapons could be fabricated without making this total investment.

3. Effects on Animals

194. The way bacteriological (biological) weapons might be used against stocks of domestic animals would probably be the same as that used in attacks against man. Representatives diseases and their characteristics are shown in table 5.

195. Viral infections probably cause the most important diseases of domestic animals and could have more devastating effects than diseases produced by other types of pathogens. Since many of the organisms which cause infectious disease in domestic animals are also pathogenic for man, and since some of them may also be readily transmitted from animals to man, either directly or by vectors, such attacks might also affect the human population directly. Attacks upon livestock would not only result in the immediate death of animals, but also might call for compulsory slaughter as a means of preventing the spread of infection.

196. Covert bacteriological (biological) attack during peacetime directed against domestic animals could give rise to serious political and economic repercussions if large numbers of stock were affected. For example, African swine fever occurs endemically on the African continent as a subclinical disease of warthogs. In 1957 it was accidentally brought from Angola to Portugal, and then in 1960 to Spain. Despite strict and extensive veterinary measures that were enforced, losses in pig breeds were estimated to amount within a single year to more than $9,000,000.

197. Isolated attacks against stocks of domestic animals during wartime would have only a nuisance value. However, if a highly infectious agent (e.g., foot-and-mouth disease) were used, even a local attack could have very widespread effects because of spread by the normal commercial movement of animals, particularly in highly developed countries. Extensive attacks with traveling clouds could, however, lead to a disastrous state of affairs. The history of myxamatosis (a rabbit disease) in Europe provides a parallel. Not only did it drastically reduce the rabbit population in France, into which it was first introduced; it immediately spread to other countries of Europe, including the United Kingdom. The risk of the uncontrolled spread of infection to a number of countries is an important consideration in the use of some bacteriological (biological) weapons.

198. The possibilities of protecting domestic animal stocks against bacteriological (biological) attacks are so remote that they are not worth discussing.

TABLE 5.—EXAMPLES OF DISEASES THAT MIGHT BE USED TO ATTACK DOMESTIC ANIMALS

Disease	Animals attacked
Viruses:	
African swine fever	Hogs.
Equine encephalitis	Horses.
Foot-and-mouth disease	Cattle, sheep, hogs.
Fowl plague	Chickens, turkeys.
Hog cholera	Hogs.
Newcastle disease	Chickens, turkeys.
Rift Valley fever	Cattle, goats, sheep.
Rinderpest	Cattle, sheep oxen, goats, water buffaloes.
Vesicular stomatitis	Cattle, horses, mules, hogs.
Rickettsiae:	
Veldt disease	Cattle, sheep, goats.
Q-fever	Cattle, sheep, goats.
Bacteria:	
Anthrax	Cattle, sheep, horses, mules.
Brucellosis	Cattle, sheep, goats, hogs, horses.
Glanders	Horses, mules.
Fungi:	
Lumpy jaw	Cattle, horses, hogs.
Aspergillosis	Poultry, cattle.

4. Effects on Plants

199. Living micro-organisms could also be used to generate diseases in crops which are economically important either as food or as raw material (e.g., cotton and rubber). Significant food crops in this respect include potatoes, sugar-beet, garden vegetables, soya beans, sorghum, rice, corn, wheat and other cereals and fruits. Obviously the selection of the target for a biological attack would be determined by the relative importance of the crop in the national diet and economy. Deliberately induced epiphytotics (plant disease epidemics) could in theory have serious national and international consequences.

200. The fungal, bacterial, or viral agents which could be used against plants are shown in table 6.

TABLE 6.—EXAMPLES OF DISEASES THAT MIGHT BE USED TO ATTACK PLANTS

	Diseases	Likelihood of spread
Viruses	Corn stunt	High.
	Hoja blanca (rice)	Do.
	Fiji disease (sugarcane)	Do.
	Sugar beet curly top	Do.
	Potato yellow dwarf	Do.
Bacteria	Leaf blight (rice)	Do.
	Blight of corn	Do.
	Gummosis of sugarcane	Low.
Fungi	Late blight (potato)	Very high.
	Cereal rusts	Do.
	Rice blast	Do.
	Corn rust	High.
	Coffee rust	Very high.

201. With a few minor exceptions, the plant viruses could be cultured only in living plant systems, the casual agent being found only in the plant tissues and juices. Virus diseases are transmitted principally by insect vectors and to some extent by mechanical means.

202. Bacterial agents which attack plants can persist for months on or in the plants. All of them can be cultured on artificial media. Normally, plant bacteria are not disseminated to any great extent by winds; the principal methods for spread in nature are insects, animals (including man), and water. Rain can spread bacteria locally, while insects and animals are responsible for their more extensive spread. It is conceivable that bacterial plant pathogens could be adapted for deliberate aerial dissemination.

203. Plant funga, which causes some of the most devastating diseases of important agricultural crops, are disseminated mainly by winds, but also by insects, animals, water and man. Many fungal pathogens produce and liberate into the air countless numbers of small, hardy spores which are able to withstand adverse climatic conditions. The epidemic potential of a number of fungal pathogens is considerable.

204. In theory there are measures which could protect crops against bacteriological (biological) attacks; but at present their potential cost rules them out in practice. There is no essential difference between the counter-measures which would have to be introduced to counter bacteriological (biological) weapons and those employed normally to control plant diseases in peacetime. But the use of bacteriological (biological) weapons to destroy crops on a large scale would imply that the attacker would choose agents capable of overcoming any known, economical method of protection. Advanced countries might, as a precautionary measure exchange susceptible plants by more resistant strains. This would be difficult for countries whose agricultural standards were not high, and which would be the most vulnerable to bacteriological (biological) attacks on their crops.

5. Factors Influencing the Effects of Bacteriological (Biological) Attacks

Exotic diseases

205. Any country which resorted to bacteriological (biological) warfare would presumably try to infect, with a single blow, a large proportion of an enemy population with an exotic agent to which they had not become immune through previous exposure. Such exotic agents would lead to the appearance of diseases which normally had not occurred before in a given geographical area, either because of the absence of the organism involved (e.g., foot-and-mouth disease in North America or Japan), and/or of natural vectors (e.g., Japanese or Venezuelan encephalitis in Europe, Rocky Mountain spotted fever in many countries). In addition, a disease which had been controlled or eradicated from any area (e.g., urban or classical yellow fever from many tropical and sub-tropical countries, epidemic typhus from developed countries) might be reintroduced as a result of bacteriological (biological) warfare.

Altered or new diseases

206. Deliberate genetic steps might also be taken to change the properties of infectious agents, especially in antigenic composition and drug resistance. Apart from genetic changes that could be induced in known organisms, it is to be expected that new infectious diseases will appear naturally from time to time and that their causative agents might be used in war. However, it could not therefore be assumed that every outbreak of an exotic or new disease would necessarily be a consequence of a bacteriological (biological) attack. The Marburg disease, which broke out suddenly in 1967 in Marburg, Frankfurt and Belgrade, was a good example. It was acquired by laboratory workers who had handled blood or other tissues of vervet monkeys which had been recently caught in the wild, and by others who came into contact with them. Because the outbreak occurred in medical laboratories it was very skillfully handled. In other circumstances, it might have spread widely before it was controlled.

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Epidemic spread

207. As already emphasized, a wide variety of agents can infect by the inhalation route, so that in a bacteriological (biological) attack a large number of persons could be infected within a short time. From the epidemiological point of view, the consequences would differ depending on whether the resultant disease was or was not transmissible from man to man. In the latter case the result would be a once-for-all disaster, varying in scale and lethality according to the nature of the organism used and the numbers of people affected. The attack would undoubtedly have a strong demoralizing effect on the unaffected as well as the affected population, and it would be in the nature of things that there would be a breakdown of medical services.

208. If the induced disease were easily transmissible from man to man, and if it was one against which the population had not been effectively immunized, it is possible to imagine what could happen by recalling, say, the periodical appearance of new varieties of influenza virus, e.g. the 1957 influenza pandemic. In Czechoslovakia (population about 14 million), 1,500,000 influenza patients were actually reported; the probable total number was 2,500,000. About 50 percent of the sick were people in employment and their average period away from work was six days. Complications necessitating further treatment developed in 5–6 per thousand of the cases, and about 0.2 per thousand died. Those who are old enough to remember the 1918 influenza pandemic, which swept over most of the world, will judge the 1957 outbreak as a mild affair.

Susceptibility of population

209. A very important factor in the effectiveness of an aerosol attack is the state of immunity of the target population. Where the population is completely lacking in specific immunity to the agent which is disseminated, the incidence and severity of disease are likely to be exceptionally high. Naturally occurring examples of very severe epidemics in virgin populations are well known (e.g. measles in Fiji, poliomyelitis and influenza in the Arctic). A similar result follows the introduction of a susceptible population (often a military force) into an already infected area. Thus there was a high prevalence of dengue fever in military forces operating in the Pacific in World War II—sometimes affecting as many as 25 percent of the operational strength of a unit. The local population suffered relatively little from the disease because they had usually been infected early in life, and were subsequently immune.

Populations of increased vulnerability

210. Malnutrition: Recent statistical studies reveal a clear association between malnutrition and the incidence of infectious diseases. FAO, WHO and UNICEF have pointed out that in developing countries, a shortage of nutritious food is a major factor in the high mortality rate due to infectious diseases, particularly in children.

211. *Housing and clothing:* Primitive housing and inadequate clothing would lead to an increased vulnerability to bacteriological (biological) and more particularly chemical weapons. Millions of people live in houses which are permeable to any sort of airborne infection or poison, and millions are inadequately clothed and walk barefooted.

212. Other conditions which characterize poor populations have a definite influence on the spread of infections. Large families increase the opportunities for contagious contact. Inadequate housing, lack of potable water and, in general, bad sanitation, a low educational level, numerous vectors of infectious disease (e.g. insects), and of course, a lack of medical services are factors which also favour the spread of disease. The agents used might also persist in the soil, on crops, grasses, etc., so that delayed action might need to be taken into account.

Social effects and public health measures

213. A basic factor which influences the risk of epidemic situation during every war is a rapid impairment of standards of hygiene. Widespread destruction of housing and of sanitary facilities (water works, water piping, waste disposal, etc.), the inevitable decline in personal hygiene, and other difficulties, create exceptionally favourable conditions for the spread of intestinal infections, or louse-transmitted disease, etc.

214. The importance of adequate public health services is well illustrated by an explosive water-borne epidemic of infectious hepatitis in Delhi in 1955–56, which affected some 30,000 persons, and which occurred because routine water treatment was ineffective. The epidemic was caused by the penetration into the water supply of waste waters heavily contaminated with hepatitis virus. However, there was no concurrent increase in the incidence of bacillary dysentery and typhoid fever, showing that the routine treatment of the water had been adequate to prevent bacterial but not viral infections.

215. Air streams, migrating animals and running water may transport agents from one country to the other. Refugees with contagious diseases pose legal and epidemiological problems. In areas with multinational economies, losses in livestock and crops may occur in neighbouring countries by the spread of the disease through regional commerce.

216. The experiences from fairly recent smallpox epidemics can also be used to illustrate the social effects of an accidentally introduced, highly dangerous airborne infection. In New York (1947) one patient started an epidemic, in which twelve persons became ill and two died. Within a month more than 5 million persons were revaccinated. Similarly in Moscow, in January 1960, a smallpox epidemic of forty-six cases (of whom three died) developed, caused by a single patient. At that time 5,500 vaccination teams were set up and vaccinated 6,372,376 persons within a week. Several hundreds of other health workers searched a large area of the country for contacts (9,000 persons were kept under medical supervision, of these 662 had to be hospitalized as smallpox suspects).

ANNEX A.—CHEMICAL PROPERTIES, FORMULATIONS, AND TOXICITIES OF LETHAL CHEMICAL AGENTS (EXCERPT FROM MATERIAL SUPPLIED BY WORLD HEALTH ORGANIZATION)

[Key to table: 1—trivial name; 2—military classification; 3—approximate solubility in water at 20° C.; 4—volatility at 20° C.; 5—physical states: (a) at —10° C., (b) at 20° C.; 6—approximate duration of hazard (contact, or airborne following evaporation) to be expected from ground contamination: (a) 10° C., rainy, moderate wind, (b) 15° C., sunny, light breeze, (c) —10° C., sunny, no wind, settled snow; 7—casualty-producing dosages (lethal or significant incapacitating effects); 8—estimated human respiratory LCt_{50} (mild activity: breathing rate ca. 15 litres/min); 9—estimated human percutaneous toxicity]

1	Sarin	VX	Hydrogen cyanide	Cyanogen chloride	Phosgene	Mustard gas	Botulinal toxin A
2	Lethal agent (nerve gas)	Lethal agent (nerve gas)	Lethal agent (blood gas)	Lethal agent (blood gas)	Lethal agent (lung irritant).	Lethal agent (vesicant)	Lethal agent
3	100 percent	1 to 5 percent	100 percent	6 to 7 percent	Hydrolysed	0.05 percent	Soluble*
4	12,100 mg/m³	3 to 18 mg/m³	873,000 mg/m³	3,300,000 mg/m³	6,370,000 mg/m³	630 mg/m³	Negligible.
5(a)	Liquid	Liquid	Liquid	Solid	Liquid	Solid	Solid.
5(b)	Liquid	Liquid	Liquid	Vapour	Vapour	Liquid	Solid.
6(a)	¼ to 1 hour	1 to 12 hours	Few minutes	Few minutes	Few minutes	12 to 48 hours	
6(b)	¼ to 4 hours	3 to 21 days	Few minutes	Few minutes	Few minutes	2 to 7 days	
6(c)	1 to 2 days	1 to 16 weeks	1 to 4 hours	¼ to 4 hours	¼ to 1 hour	2 to 8 weeks	
7	>5mg-min/m³	>0.5mg-min/m³	>2,000 mg-min/m³	>7,000 mg-min/m³	>1,600 mg-min/m³	>100 mg-min/m³	0.001 mg(oral).
8	100 mg-min/m³	10 mg-min/m³	5,000 mg-min/m³	11,000 mg-min/m³	3,200 mg-min/m³	1,500 mg-min/m³	0.02 mg-min/m³.
9	1,500 mg/man	6 mg/man				4,500 mg/man [1]	

[1] A drop of mustard weighing a few mgs can produce a serious blister which will be incapacitating if it interferes with the normal activities of an individual.

Annex B. Tear and harassing gases

Three parameters will be used to qualify the effects of tear gases. These are defined as follows:

Threshold of irritation is the atmospheric concentration of the substance (in mg per m^3), which, in one minute of exposure, causes irritation.

Tolerance limit is the highest atmospheric concentration (in mg per m^3) which a test subject can tolerate during one minute of exposure.

Lethal index is a dosage, and thus the product of the concentration in the air (in mg per m^3) and the time of exposure (in minutes), which causes mortality. Data for various tear gasses are given in the following table.

The data given under "Lethal index" are from animal experiments with various species.

Tear gas	Threshold of irritation (mg./m.³)	Tolerance limit (mg./m.³)	Lethal index (mg. min./m.³)
Adamside (DM)	0.1	2–5	15,000–30,000
Ethyl Bromacetate	5.0	5–50	25,000
Bromacetone	1.5	10	30,000
Omega-Chloracetophenone (CN)	.30–1.5	5–15	8,500–25,000
O-Chlorbenzylidene malononitrile (CS)	.05–.1	1–5	40,000–75,000

ANNEX C.—SOME BIOLOGICAL AGENTS THAT MAY BE USED TO ATTACK MAN

Disease	Infectivity [1]	Transmissibility [2]	Incubation period [3]	Duration of illness [3]	Mortality [3]	Antibiotic therapy	Vaccination [4]
Viral:							
Chikungunya fever	Probably high	None	5 to 6 days	2 weeks—a few months.	Very low (<1 percent).	None	None.
Dengue fever	High	do	5 to 8 days	A few days to weeks	do	do	Do.
Eastern equine encephalitis	do	do	5 to 15 days	1 to 3 weeks	High (>60 percent)	do	Under development.
Tick-borne encephalitis	do	do	1 to 2 weeks	1 week to a few months.	Variable up to 30 percent.	do	Do.
Venezuelan equine encephalitis	do	do	2 to 5 days	3 to 10 days	Low (<1 percent)	do	Do.
Influenza	do	High	1 to 3 days	do	Usually low, except for complicated cases.	do	Available.
Yellow fever	do	None	3 to 6 days	1 to 2 weeks	High (up to 40 percent).	do	Do.
Smallpox	do	High	7 to 16 days	12 to 24 days	Variable but usually high (up to 30 percent).	do	Do.
Rickettsial:							
Q-fever	do	None or negligible	10 to 21 days (sometimes shorter).	1 to 3 weeks	Low (usually 1 percent).	Effective	Under development.
Psittacosis	do	Moderately high	4 to 15 days	1 to several weeks	Moderately high	do	None.
Rocky Mountain spotted fever	do	None	3 to 10 days	2 weeks to several months.	Usually high (up to 80 percent).	do	Under development.
Epidemic typhus	do	do	6 to 15 days	A few weeks to months.	Variable but usually high (up to 70 percent).	do	Available.

Bacterial:							
Anthrax (pulmonary)	Moderately high	Negligible	1 to 5 days	3 to 5 days	Almost invariably fatal.	Effective if given very early.	Do.
Brucellosis	High	None	1 to 3 weeks	Several weeks to months.	Low (<5 percent)	Moderately effective.	Under development.
Cholera	Low	High	1 to 5 days	1 to several weeks	Usually high (up to 80 percent).	do	Available.
Glanders	High	None	2 to 14 days	4 to 6 weeks	Almost invariably fatal.	Little effective	None.
Melioidosis	do	do	1 to 5 days	4 to 20 days	Almost 100 percent fatal.	Moderately effective	Do.
Plague (pneumonic)	do	High	2 to 5 days	1 to 2 days	do	Moderately effective if given early.	Available.
Tularemia	do	Negligible	1 to 10 days	2 to several weeks	Usually low sometimes high (up to 60 percent).	Effective	Do.
Typhoid fever	Moderately high	Moderately high	1 to 3 weeks	A few to several weeks.	Moderately high (up to 10 percent).	Moderately effective	Do.
Dysentery	High	High	1 to 3 days	A few days to weeks.	Low to moderately high depending on strain.	Effective	None.
Fungal: Coccidioido mycosis	do	None	1 to 3 weeks	A few weeks to months.	Low	None	Do.

[1] Infectivity: Indicates the potency of the parasite to penetrate and multiply in the host's organism, regardless of the clinical manifestation of illness. In fact, there are several agents by which the great majority of the exposed population will be infected without developing clinical symptoms.

[2] Transmissibility: This refers to direct transmission from man to man without the intervention of any arthropod vector.

[3] The figures listed under incubation period, duration of disease, and mortality are based on epidemiological data. They vary, according to variations in virulence and dose of the infecting agent, resistance of the host, and many other factors. It also should be noted that, if the agents concerned would be deliberately spread in massive concentrations as agents of warfare, the incubation periods might be shorter and the resulting symptoms more serious. As to mortality, this refers to the ratio between the number of fatalities to the number of diseased (not to that of infected) individuals, if no treatment is given.

[4] The availability of vaccines is no indication of their degree of effectiveness.

CHAPTER III. ENVIRONMENTAL FACTORS AFFECTING THE USE OF CHEMICAL AND BACTERIOLOGICAL (BIOLOGICAL) WEAPONS

A. General considerations

217. Extraneous factors influence the behaviour of chemical and bacteriological (biological) weapons to a far greater extent than they do any other kind of armament. Some, such as wind and rain, relate to the state of the physical environment, and to a certain extent can be evaluated quantitatively. Others, which reflect the general ecological situation, and the living conditions and physiological state of the populations exposed to the effects of the weapons, are more difficult to define; their influence—though they could be considerable—cannot be quantified.

218. This limitation applies particularly to bacteriological (biological) weapons. The natural course of infectious diseases—for example in influenza epidemics—shows that they are governed by so many uncontrollable factors that the way they develop cannot as a rule be foreseen. This would also be probably true of pathogenic agents which were deliberately dispersed. On the other hand, the knowledge gained through the study of epidemiology, and in the study of artificial dispersions of bacteriological (biological) agents, both in the laboratory and the field, has shed some light on some of the factors concerned.

219. The ecological problem is the main theme of chapter IV. The factors which concern the variability of the human target, e.g. physiological and living conditions, and levels of protection, have already been described in chapters I and II. This chapter is concerned with the physical environment (climate, terrain).

1. Phenomena Associated With the Dispersal of Chemical and Bacteriological (Biological) Agents

220. It has already been pointed out that chemical substances and living organisms capable of being used as weapons are extremely varied in their nature and in their effects. On the other hand, regarded solely from the standpoint of their physical state after dispersion in the atmosphere, they can clearly be placed in one or other of the following categories:

Liquid drops and droplets of varying size; (diameters greater than about 10 microns)

More or less finely divided liquid and solid aerosols; (diameters less than about 10 microns)

Vapours.

221. Almost always, moreover, especially in the case of liquid chemical agents, the result of dispersion is a mixture of these different phases; thus, a liquid dispersed by an explosive charge give rise to a mixture of aerosol and vapour, while aerial spraying may produce a mixture of droplets and aerosols. Solid chemical substances will be in aerosol form, and this will also be true, as has already been pointed out, of bacteriological (biological) agents.

222. Thus, chemical attacks would usually take effect simultaneously in two forms (fig. 1)—not printed in RECORD.

Contamination of the ground at, and in the immediate vicinity of, the target by direct deposition of the agent at the time of dispersion, and by subsequent settling of large particles;

Formation of a toxic cloud consisting of fine particles or droplets, of aerosol, and possibly of vapour.

223. Most bacteriological (biological) attacks would be designed primarily to create an infectious aerosol as an inhalation hazard. Some ground contamination might, however, also result when infectious particles settled on the ground.

224. Both ground contamination and toxic or infectious clouds would be immediately subject to the physical action of the atmosphere.

225. If the soil contaminants were liquid chemical agents, they would either evaporate, producing a sustained secondary cloud, or be absorbed by the ground, or diluted or destroyed by atmospheric precipitation. If they were solid agents, whether chemical or biological, they might be returned to a state of suspension by air currents, and perhaps carried out of the initially contaminated zone.

226. As it becomes formed, the toxic or infectious cloud is immediately exposed to atmospheric factors, and is straightaway carried along by air currents. At

the same time, the particles within it are deposited at different rates according to their mass, and reach the ground at varying distances from the point of emission, depending on wind velocity (up to several kilometres in the case of particles less than a few tens of microns in diameter). The mechanically stable fraction of the aeorsol (particles under 5 microns in diameter) remains in suspension, and may be carried along for considerable distances.

B. The influence of atmospheric factors on clouds of aerosols or vapours

227. The movement of a toxic or infectious cloud after its formation depends chiefly on the combined effects of wind and atmospheric conditions. The cloud is carried a longer or shorter distance by the wind; at the same time it is dispersed and diluted at a faster or slower rate by turbulence of the atmosphere and by local disturbances of mechanical origin resulting from the roughness of the ground.

228. The cloud may rise rapidly in the atmosphere or remain in the immediate vicinity of the ground, thus retaining its destructive power for a greater or lesser time depending on whether the air layer in which it is released is in a stable or unstable state.

1. State of the Atmosphere

229. The state of the atmosphere plays such an important role in the behavior of aerosol clouds that one might almost say that it is the predominant factor in determining the outcome of an attack, the effect of which could be considerably reduced, or almost nullified, were the atmosphere very unstable, or very serious if it was in a state of pronounced or prolonged stability. For this reason the mechanisms governing the turbulent movements of air, caused by differences in temperature between superimposed air layers require some explanation.

230. Disregarding the frictional layer of air close to the ground, where mechanical turbulence resulting from friction between the air and the rough ground over which it moves creates special conditions, air temperature in the troposphere decreases on average at the rate of 0.64°C for every 100 metres of altitude. Very frequently, however, as a result of thermal exchange between the air and the ground, a cooler air layer may be formed beneath a mass of hot light air; in such conditions, the lower air layer, with its greater density, does not tend to rise and the atmosphere is said to be in "stable equilibrium".

231. The situation, in which the vertical temperature gradient becomes inverted, is known as "temperature inversion", while the air layer affected by the phenomenon is termed as "inversion layer". When present it is eminently favourable to the persistence of toxic clouds.

232. After a day of sunshine, the surface of the ground cools rapidly, with the result that the layer of air close to the ground cools more rapidly than those above it. Both the intensity of the inversion and the thickness of the air layer involved increase to a maximum toward 4 a.m., and then decreases again, finally disappearing shortly after sunrise. This variation is very marked when the sky is clear, and in favorable conditions the inversion may last from fourteen to eighteen hours a day, depending on the season.

233. Very often, however, especially in winter or in overcast weather, when the rays of the sun are not sufficiently intense to heat the surface of the ground, the temperature inversion may last for several days. This condition has characterized all the disasters caused by industrial pollution; for example, the smog which claimed 4,000 victims in London in 1952 took its toll during a period of atmospheric stability which lasted for seven days.

234. Figure 2 shows the evolution of a toxic cloud depending on the state of the atmosphere.

235. Apart from this kind of low-altitude inversion, which is most important in the context of this report since it governs the behaviour of toxic clouds released close to the ground, a similar process may take place on a large scale at higher altitudes (hundreds or thousands of metres) whenever a cool air layer is formed beneath a hot air mass. This may take place over large, cold expanses (i.e. large expanses of land or sea, cloud or fog masses, etc.). Because of the high altitude at which they form, these inversion layers have little effect on toxic clouds released at ground level; but in the case of the long-distance transfer of spores they may act as a screen or reflector.

236. The configuration of the surface of the earth in a particular area, which alters the thermal exchange pattern, may also be conducive to the formation of an inversion. For example, inversions are a customary phenomenon in winter in deep valleys surrounded by high peaks, and occur more frequently in the neighborhood of slopes facing the north than on southern slopes. This also occurs wherever hills of any size enclose a plain or basin, interrupting the general flow of air and preventing mixing from taking place. It is interesting to note that apart from the periodic appearance of smog in London, all the other major accidents resulting from air pollution have occurred in regions where the land configuration fits this description. For example, the small town of Donora, in the United States, lies in a relatively narrow plain bordered by high hills. In 1948 air pollution in the course of an inversion lasting five days led to twenty deaths and 6,000 cases of illness among the town's 14,000 inhabitants.

2. Urban Areas

237. The case of urban built-up areas is more complex, and it may even be said that each one possesses its own micro-climate, depending on its geographical situation, its topography and the layout and nature of its buildings.

238. Because the materials from which they are constructed are better conductors, and because their surfaces face in very varied directions, buildings usually capture and reflect solar radiation better than does the natural ground. Urban complexes therefore heat up more quickly than does the surrounding countryside, and the higher temperature is still further augmented by domestic and industrial heating plants. The result is a flow of cool air from the neighbouring countryside towards the hot centre of the town, beginning shortly after sunrise, decreasing at the beginning of the afternoon and then rising again to a maximum shortly before sunset. This general flow, which is of low velocity, is disturbed and fragmented at ground level by the buildings, forming local currents flowing in all directions.

239. This constant mechanical turbulence, to which is added the thermal turbulence caused by heat-generating sources, should prevent the establishment in towns of a temperature inversion at low altitude. In fact, however, inversions do occur, when conditions are otherwise favourable, but the inversion layer is situated at a higher altitude than over the surrounding countryside (30 to 150 metres).

240. At night, local inversions may be generated at low altitude as a result of rapid radiation from the roofs of houses; thus in a narrow street lined with buildings of equal height, an inversion layer may be created at roof-top level which will persist until dawn.

241. Fog is more frequent over towns than over open country (+30 per cent in summer and +100 per cent in winter). The process of fog formation is accelerated by the particles, dust and smoke which form a dome over the town. At night these particles act as nuclei around which the fog condenses, the fog contributing in its turn to the retention of the particles in the dome. Fog will obviously have the same concentrating effect on particles originating in toxic clouds.

242. One final point which should be noted is that toxic aerosols and vapours may take some time to penetrate enclosed spaces. Once they have done so, they may continue as a hazard for very long unless adequate ventilation is provided.

3. Effect of Wind and Topography

243. The wind carries and spreads the toxic or infectious cloud, which is simultaneously diluted by turbulence. The distance which the cloud travels before its concentration has fallen to a level below which it is no longer harmful depends on the velocity of the wind and the state of the atmosphere. Since topography also produces changes in the normal wind pattern, it too plays an important part in determining the direction of travel of toxic clouds, sometimes focusing their effects in individual areas. Local winds may also be established as a result of differences in the heat absorbed by and radiated from, different ground surfaces.

244. These local surface winds, which affect the air layer nearest the ground up to 300 metres, are frequent and widespread in mountain ranges and near sea coasts. There are slope breezes, valley breezes, sea breezes and land breezes;

and they could shift a toxic cloud in directions which cannot be predicted from a study of the general meteorology of the area. The breezes develop according to a regular cycle. During the day, under the influence of solar radiation, the air moves up the valleys and slopes, and moves from the sea towards the land; at night these currents are reversed. In temperature climates land and sea breezes are predominant during the summer; but they are masked by the general wind pattern during the other seasons of the year. They are predominant in subtropical and tropical regions throughout the year.

4. Example of Combined Effects of Wind and the State of the Atmosphere on a Cloud

245. There is some similarity between the evolution of toxic clouds which could be produced by chemical and bacteriological (biological) attacks and that of clouds containing industrial pollutants, so much so that the mathematical models developed for forecasting atmospheric pollution can be applied, with a few modifications, to toxic clouds. But the initial characteristics of the two are as a rule different. Characteristic features of chemical or bacteriological (biological) attacks are the multiplicity and high yield of the sources of emission and their very short emission time, all of which are factors making for a greater initial concentration in the cloud than the concentration of pollutants in industrial clouds.

246. Figure 4 indicates the order of magnitude of these phenomena, and demonstrates the schematic form, and for different atmospheric conditions, the size of area which would be covered by toxic clouds originating from a chemical attack using Sarin, with an intensity arbitrarily chosen at 500 kg/km. It shows that the theoretical distance of travel by the cloud, determined for bare and unobstructed ground, may exceed 100 km. In practice the atmosphere must remain stable for more than ten hours in order to enable the cloud to travel such distances, a condition which, although certainly not exceptional, is fairly uncommon.

247. This figure illustrates the effect of atmospheric conditions on the distance a toxic cloud can be carried by the wind.

248. The example chosen is that of a medium-intensity (500 kg) attack with Sarin on a circular objective 1 km in diameter. The wind velocity is 7 km/h.

249. Each of the lines represents a contour of the hazard zone, i.e. the zone in which any unprotected person would be exposed to the effects of the agent.

250. Under highly unstable conditions (for example, on a very sunny day), this hazard zone is no greater than the area of objective aimed at (the circle at the left end of the figure). On the other hand, in any other situation—(1) slighly unstable, (2) neutral, (3) slightly stable, (4) moderately stable or (5) highly stable—the distance travelled will be greater, and it may extend almost 100 km if conditions remain highly stable for a sufficiently long time. It must be noted, however, that the distance of 100 km could be reached only if a very marked inversion persisted for about fourteen hours (100+7); such a situation is quite rare.

251. Corresponding evaluations cannot be made for an urban area, since the parameters involved are too numerous and too little understood. But it may be presumed that most of the characteristics of the urban micro-climate would tend to increase the persistence of chemical clouds. This is serious cause for concern, when it is remembered that in highly industrialized countries 50 to 90 per cent of the population live in urban areas.

252. To sum up, a stable or neutral atmosphere in equilibrium might cause a toxic cloud produced by a chemical or bacteriological (biological) attack to persist for hours after it had exercised its military effect, which could generally be expected to materialize in the first few minutes following the attack. These conditions could obtain not only at night, but also during long winter periods over vast continental expanses. If a neutral atmosphere in equilibrium were associated with a light wind irregular in direction, then the area affected could be relatively large and, assuming an adequately heavy initial attack, the concentrations would be high.

5. Special Features of Bacteriological (Biological) Aerosols

253. So far as physical phenomena are concerned (horizontal and vertical movements, sedimentation, dilution, etc.), bacteriological (biological) aerosols

would be generally affected in the same way as chemical clouds of aerosol and vapour, but not necessarily to the same extent. But since the effective minimum doses for bacteriological (biological) agents are considerably smaller than for chemical agents, bacteriological (biological) aerosols would be expected to remain effective even in a very dilute state and, consequently, that they could contaminate much larger areas than could chemical clouds. An example is given in chapter II.

254. There would be no limit to the horizontal transport of micro-organisms, if there were none to the capacity of the organisms to survive in the atmosphere. Thus if the microbial aerosol particles were so small that their speed of fall remained close to the speed of the vertical air movements in the frictional layer (under average conditions this is on the order of 10cm/s), the agents, whether alive or dead, would remain suspended and travel very considerable distances. Even if bacteriological (biological) clouds were to move only in the air layer nearest the ground, they could cover very large areas. For example, in one experiment 600 litres of *Bacillus globigii* (a harmless spore-forming bacterium which is highly resistant to aerosolization and environmental stresses) were released off shore; bacteria were found more than 30 km inland. Organisms were found over 250 km^2 which was the entire area within which there were monitoring stations during the trial. The actual area covered was much more extensive.

255. On the other hand, most pathogenic agents are highly vulnerable when outside the organism in which they normally reproduce, and are liable to biological inactivation, which is sometimes rapid, in the aerosol state. This inactivation process is governed by several factors (such as temperature, humidity, solar radiation, etc.) which are now the subject of aerobiological research.

256. The size of the infective particles in a bacteriological (biological) aerosol is highly significant to their ability to initiate disease as a result of inhalation. It has been established that the terminal pars of the respiratory tract are the most susceptible sites for infection by inhalation. As with chemical agents, the penetration and retention of inhaled bacteriological (biological) particles in the lungs is very dependent on particle size, which is primarily determined by the composition of the basic material and the procedure of aerosolization, as pointed out in chapter I.

257. The influence of particle size on aerosol infectivity is illustrated in table 1, which shows that there is a direct relationship between the LD_{50} and particle diameter of an aerosol of *Franciscella tularensis*.

TABLE 1.—NUMBERS OF BACTERIA OF "FRANCISCELLA TULARENSIS" REQUIRED TO KILL 50 PERCENT OF EXPOSED ANIMALS

	Numbers of bacterial cells LD_{50}	
	Guinea pigs	Rhesus monkeys
Diameter of particles (microns):		
1	3	17
7	6,500	240
12	20,000	540
22	170,000	3,000

C. Influence of atmospheric factors on chemical agents

1. Influence of Temperature

258. An attack with a liquid chemical agent, as already pointed out, would as a rule result in the formation of a cloud of small droplets, aerosol and vapour in varying proportions, as well as in ground contamination, all of which would be affected by air temperature.

259. *Influence on droplet and aerosol clouds:* Only particles having dimensions within certain limits penetrate and are retained by the lungs. The larger ones are trapped in the upper part of the respiratory tract (e.g. nose and trachea), whereas the smaller ones are exhaled. Penetration and retention have maximum values in the size range of 0.5 to 3 microns.

260. Liquid chemical agents exercise their effects both by penetrating the skin and by inhalation. The material absorbed by the lungs acts immediately, whereas there is a delay before the effects become manifest from an agent absorbed through the skin or the mucous membrane of the upper air passages.

261. A high temperature favours the evaporation of particles which will decrease in size and thus reach the lungs, contributing to the immediate effect; an additional quantity of vapour is produced which contributes to the same effect.

262. *Effect on ground contamination:* The temperature of the air, and even more that of the ground, have a marked effect on the way ground contamination develops and persists. The temperature of the ground, which depends on the thermal characteristics of its constituent materials and on the degree of its exposure to the sun, either increases or reduces evaporation, and consequently decreases or increases the duration of contamination. The surface temperature is extremely variable from point to point, depending on the type and colour of the soil; a temperature difference of 20° has been noted between the asphalt surface of a road and the surrounding fields. The temperature gradient also varies during the course of the day; in clear weather the differences may range from 15 to 30°C in a temperate climate, and up to 50°C in a desert climate. High temperatures of both air and ground favour the rate of evaporation, thus reducing the persistence of surface contamination; wind, because of the mechanical and thermal turbulence it creates, has a similar effect.

263. To illustrate the effect of these variable factors, it is worth noting that the contamination of bare ground by unpurified mustard, at a mean rate of 30 g/m², will persist for several days or even weeks at temperatures below 10°C at medium wind velocities, whereas it lasts for only a day and a half at 25°C. Furthermore, because of accelerated evaporation at high temperatures, the cloud produced is more concentrated, and the danger of vapour inhalation in, and downwind of, the contaminated area becomes greater.

2. Influence of Humidity

264. In contrast to high temperature, high relative humidity may lead to the enlargement of aerosol particles owing to the condensation of water vapour around the nuclei which they constitute. The quantity of inhalable aerosol would thus diminish, with a consequent reduction in the immediate effects of the attack.

265. On the other hand, a combination of high temperature and high relative humidity causes the human body to perspire profusely. This intensifies the action of mustard-type vesicants, and also accelerates the transfer through the skin of percutaneous nerve agents.

3. Influence of Atmospheric Precipitation

266. Light rain disperses and spreads the chemical agent which thus presents a larger surface for evaporation, and its rate of evaporation rises. Conversely a heavy rain dilutes and displaces the contaminating product, facilitates its penetration into the ground, and may also accelerate the destruction of certain water-sensitive compounds (e.g. lewisite, a powerful blistering agent).

267. Snow increases the persistence of contamination by slowing down the evaporation of liquid contaminants. In the particular case of mustard gas, the compound is converted into a pasty mass which may persist until the snow melts.

268. Soil humidity, atmospheric precipitation and temperature also exercise a powerful influence on the activity of herbicides, which are much more effective at higher humidities and temperatures, than in dry weather and at low temperatures. This applies equally to preparations applied to plants and to those introduced into the soil.

4. Influence of Wind

269. As vapours emanating from ground contaminated by liquid chemical agents begin to rise, the wind comes into play. The distance the vapours will be carried depends on the wind velocity and the evaporation rate of the chemical, which will itself change with variations in ground and air temperatures. The distance is maximal (several kilometres) when there is a combination of the conditions promoting evaporation (high soil temperature) persistence of the cloud (stable atmosphere) and dispersal of the cloud (gentle winds). These conditions exist in combination at the end of a sunny day, at the time when a temperature inversion exists.

5. Influence of Soil—Dependent Factors

270. *Nature of the soil.* The soil itself, through its texture and the porosity of its constituent materials, plays an important role in the persistence of liquid chemical contaminants, which may penetrate to a greater or lesser extent, or remain on the surface. In the former case the risk of contamination by contact is reduced in the short term, but persistence will be increased to the extent that factors favourable to evaporation (temperature, wind) are prevented from acting. In the latter case, when the contaminant remains on the surface, the danger of contact contamination remains considerable, but persistence is reduced. Thus persistence in sandy soils may be three times as long as in clay.

271. *Vegetation.* Vegetation prevents a liquid contaminant from reaching the soil and also breaks it up, thus encouraging evaporation. But at the same time the short-term danger is enhanced because of the widespread dispersion of the contaminant on foliage, and the consequently increased risk of contact contamination.

272. The canopy of foliage in dense forests (e.g. conifers, tropical jungle), traps and holds a considerable proportion of a dispersed chemical agent, but the fraction which none the less reaches the soil remains there for a long time, since the atmospheric factors involved in the process of evaporation (temperature, wind over the soil, turbulence) are hardly significant in such an environment as compared with open spaces.

273. Too little is known about the absorption and retention of toxic substances by plants to make it possible to assess the resulting danger to the living creatures whose food supply they may constitute. Like certain organic pesticides, it is probable that other toxic chemicals may penetrate into plant systems via the leaves and roots. Cases could then arise where all trace of contaminant had disappeared from the soil but with the toxic substance persisting in vegetation.

274. *Urban areas.* It can also be assumed that, in spite of a surface temperature which is on the average higher, contaminants might persist longer in built-up areas than over open ground. There are two reasons for this. Structural, finishing and other building materials are frequently porous, and by absorbing and retaining liquid chemical agents more readily, they increase the duration of contamination. Equally the factors which, in open country, tend to reduce persistence (sunshine, wind over ground) play a less important part in a built-up city.

275. Climate, in general, may exercise an indirect influence on the effect of percutaneous chemical agents, simply because of the fact that in hot climates the lightly clad inhabitants are very vulnerable to attacks through the skin.

276. The predominating influence of climatic factors and terrain on the persistence of contamination indicates that the *a priori* classification of chemical agents as persistent or non-persistent, solely on the basis of different degrees of volatility, is somewhat arbitrary since, depending on circumstances, the same material might persist for periods ranging from a few hours to several weeks, or even months.

D. Influence of atmospheric factors on bacteriological (biological) agents

277. Infectious agents, when used to infect by way of food and water, or by means of animal vectors are, of course, hardly subject to the influence of climatic factors. But any large-scale attack by bacteriological (biological) agents would probably be carried out by aerosols, in which the agents would be more susceptible to environmental influences than chemical agents.

278. Physico-chemical atmospheric factors have a destructive effect on aerosol-borne micro-organisms. Their viability decreases gradually over a period of hours or days at a progressively diminishing rate. Some decay very rapidly; for example, certain bio-aerosols used for pest control in temperate climates, and dispersed under average conditions in the cold or transitional seasons, show a rate of decay of 5 per cent per minute.

279. This apparent vulnerability of micro-organism in aerosols might cast some doubt on the possible effectiveness of bacteriological (biological) attacks. However, there are various means by which the rate of decay in the aerosol can be considerably reduced. For example: the use of very high concentrations of agent; the use of suitably "modelled" pathogenic strains; or the protection of aerosol particles by encapsulating them in certain organic compounds.

280. These procedures, which prolong the survival of micro-organisms in air, could presumably also be applied to potential agents of bacteriological (biological) warfare. Means are also available for prolonging the survival of micro-organisms in water, soil, etc.

1. Influence of Temperature

281. The effect of temperature on the survival of micro-organisms in bacteriological (biological) aerosols in not highly significant in the temperature ranges generally encountered. As a general rule, aerosol-borne biological agents will be destroyed more rapidly the more the temperature rises. On the other hand, in some circumstances high temperatures may act on bacteriological (biological) aerosols in the same way as on chemical aerosols, that is to say, particle size will be diminished by evaporation, and thus their rate of entry into the lungs will be enhanced.

2. Influence of Humidity

282. Relative humidity is the most important of the atmospheric conditions which affect the rate of decrease of viability of micro-organisms in the air. The extent of its effect varies with different micro-organisms, with the nature of the suspending fluid from which the aerosol is disseminated, with the manner of its dissemination (as a spray or as a dry powder). As a general rule, the rate of inactivation is greater at lower relative humidity although with some organisms maximum inactivation occurs in the middle range of relative humidity (30–70 per cent). The rate of inactivation will, however, tend to decrease with time, and may become extremely low when a state of equilibrium (stabilization) between the particles and their environment has been established. This implies that irrespective of relative humidity values, the final infective concentration of a stabilized aerosol may still be above the threshold minimum dose for infection by inhalation. Even so, microbial survival in a stabilized aerosol may be further reduced by sudden variations in atmospheric humidity.

283. The effectiveness of aerosol-borne bacteriological (biological) agents depends not only on their capacity to survive in the air. Also important is their low rate of sedimentation, combined with the capacity of the micro-organisms to spread and penetrate into buildings, so contaminating surfaces and materials indoors as well as outdoors. The possibility that some infective agents can survive for a long time in such conditions, and the fact that environmental dust particles may exercise a protective influence on organisms have been demonstrated on many occasions. Studies made in hospitals have shown that surviving micro-organisms can be dispersed from sites which have come to be called "secondary reservoirs", and that they may become sources of new infections, carried either through the air or by contact.

3. Influence of Solar Radiation

284. The ultra-violet part of the solar spectrum has a powerful germicidal effect. Bacterial spores are much less sensitive to this radiation than are either viruses or vegetative bacteria, and fungal spores are even less sensitive than bacterial spores. The destructive effect of solar radiation on micro-organisms is reduced when relative humidity is high (over 70 per cent). Air pollution, including a high proportion of atmospheric dust, also provides some protection.

285. Ultra-violet light exercises its destructive effects on micro-organisms through the structural degradation of the nucleic acids which carry the genetic information. Most research on this subject has been carried out on microbes in liquid suspensions, but the results of studies of aerosol-borne microbes seem to lead to similar conclusions.

286. The germicidal effect of ultra-violet radiation has been known for a long time and used in combating airborne infections in schools, military buildings and hospitals. The problem of proper radiation dosage, and proper techniques, however, still remain to be solved.

287. The lethal effect of sunlight on micro-organisms is less marked, although still apparent, in diffuse light. This is why a bacteriological (biological) attack, if one ever materialized, would be more probably undertaken in darkness.

4. Influence of Atmospheric Precipitation

288. Rain and snow have relatively little effect on bacteriological (biological) aerosols.

5. Influence of the Chemical Composition of the Atmosphere

289. Little is known about the influence on the viability of micro-organisms of the chemical compounds present in the atmosphere. Oxygen promotes the inactivation of aerosol-borne agents, particularly in conditions of low humidity, and recent studies have also demonstrated that an unstable bactericidal factor (formed by combination between ozone and gaseous combustion products of petroleum) is present in the air, particularly downwind of heavily populated areas.

6. General Effects of Climate

290. Climate may also have a general and considerable influence on the development of epidemics and epizootics, in so far as the proliferation of vectors which spread disease may be encouraged, given the right conditions. This is indicated by the way myxomatosis developed in Australia. Although several attempts in 1927, and then from 1936 to 1943, to impart the disease to Australian rabbits failed, the epizootic spread rapidly from 1950 onwards, apparently for the sole reason that the summer, which was particularly rainy that year, was associated with an exceptional proliferation in the flooded Murray River valley of the mosquitoes which carry the disease.

291. Atmospheric humidity and temperature also have a strong influence on micro-organisms acting upon vegetation.

CHAPTER IV. POSSIBLE LONG-TERM EFFECTS OF CHEMICAL AND BACTERIOLOGICAL (BIOLOGICAL) WARFARE ON HUMAN HEALTH AND ECOLOGY

A. Introduction

292. So far this report has dealt essentially with the potential short-term effects of chemical and bacteriological (biological) warfare. The possible long-term effects of the agents concerned need to be considered against the background of the trends whereby man's environment is being constantly modified, as it becomes transformed to meet his ever-increasing needs. Some of the changes that have occurred have been unwittingly adverse. The destruction of forests has created deserts, while grasslands have been destroyed by over-grazing. The air we breathe and our rivers become polluted, and chemical pesticides, despite the good they do, also threaten with undesirable secondary effects. The long-term impact of possible chemical and bacteriological (biological) warfare clearly needs to be considered within an adequate ecological framework.

293. *Ecology* may be defined as the study of the interrelationships of organisms on the one hand and of their interactions with the physical environment in which they are found on the other. The whole complex of plants and animals within a specific type of environment—a forest, a marsh, a savannah—forms a community comprising all the plant life and all the living creatures—from the micro-organisms and worms in the soil, to the insects, birds and mammals above the ground—within that environment, and the understanding of their interrelationships also necessitates a knowledge of the physical characteristics of the environment which bear on the living complex. Ecological communities are normally in dynamic equilibrium, which is regulated by the interaction of population density, available food, natural epidemics, seasonal changes and the competition of species for food and space.

294. Man has his special ecological problems. His numbers are multiplying fast, and increasing population requires commensurate increases in food production. The production and distribution of adequate food for the population which is predicted for the latter part of this century, and which will go on increasing through the next, will allow no relaxation in the effort which has already proved so successful. Food production has increased phenomenally in the past fifty years, primarily because of (1) improved agricultural practices, and particularly because of a marked increase in the use of chemical fertilizers and pesticides; (2) the development of genetically improved plants, herds and flocks; and (3)

increased industrialization of food-producing processes. There is hope that steps such as these will continue to bear fruit.

295. But while the use of fertilizers, herbicides and pesticides has brought about a massive increase in food production, it has also added to the pollution of soil and water, and as a result has altered our ecological environment in an enduring way. So too have other features of our industrial civilization. The motor car has been a very potent factor in increasing air pollution in towns and cities. The increasing population of the world creates unprecedented wastes, and the methods used to dispose of it—burying it, burning it, or discharging it into streams or lakes—have further polluted the environment. The remarkable development of synthetic and plastic materials in recent years has also added a new factor to the short- and long-term biological effects on man. Every new advance on our technological civilization helps to transform the ecological framework within which we evolved. From this point of view the existence and possible use of chemical and bacteriological (biological) agents in warfare have to be regarded as an additional threat, and as a threat which might have enduring consequences, to our already changing environment.

B. Consequences to man of upsetting the ecological equilibrium

296. The chemical industry doubled its output between 1953 to 1960 and it is still growing fast but the useful results of its continued development are nonetheless of the utmost importance to man's future. The good effects on food production of the use of artificial fertilizers alone far outweigh any secondary deleterious consequences of their use. The facts are too well known to need spelling out. It is enough to point out, as one example, that maize production in the United States increased between 1923 and 1953, a thirty-year period, by barely four quintals per hectare, but that in the ten years between 1953 and 1964, when the use of fertilizers and more productive hybrid seeds became widespread, the increase was eleven quintals. This is characteristic of what has happened everywhere where fertilizers have been used on a large scale.

297. The beneficial effect of the use of modern chemical pesticides also does not need spelling out. It is estimated that the present annual world loss in production due to weeds and parasites is still approximately 460 million quintals of wheat and 360 million quintals of maize, and that to eliminate this waste will mean the use of even more pesticides than are now being consumed.

298. What has to be realized about modern agricultural practices is that without them the increases in the output of food which the world needs could never be achieved. Unless production mounts everywhere, those who have not yet cast off the burdens of living in a primitive agricultural world will never reach the level of civilization to which all aspire.

299. But, as already indicated, the great increase in the use of fertilizers, pesticides and herbicides does have deleterious side effects. For example, in Switzerland, surface waters and springs have been contaminated in times of high rainfall by excessive amounts of fertilizers corresponding to 0.3–0.5 kg of phosphorous and 45 kg of nitrogen per hectare per year. This kind of thing occurs elsewhere as well, and it cannot but help transform—for all we know adversely—the environment in which living matter including fish otherwise thrive.

300. The dangers of the side effects of modern pesticides are also beginning to be appreciated, and are already beginning to be guarded against in advanced countries. Except in high dosage, these substances act only on lower organisms, although some organophosphorous compounds are toxic to man and other vertebrates. Less selective agents may be toxic to soil bacteria, plankton, snails and fish. Chlorinated hydrocarbons, such as DDT, are toxic only in unusually high dosages, but accumulate in fat, and deposit in the liver and the central nervous system. Following surface application, pesticides enter the soil and seep into underground waters; or become washed by rain into rivers, lakes and reservoirs. It is theoretically possible that in some situations, in which non-selective chemical pesticides are used, disruption of the ecological equilibrium could lead to the long-term suppression of useful animals and plants. These are dangers which only constant vigilance will avert.

301. Detergents are another modern chemical development whose use has had to be regulated, since they have a direct short-term effect on certain types of natural food such as daphniae and the algae which are eaten by fish. The first

detergents which came on the market led to enormous quantities of foam on river, and this in turn reduced the supply of oxygen for organisms living in the water. They also damage the earth by affecting soil bacteria. Such detergents, which resist destruction even by the most modern water treatment methods, have all but disappeared from use and have been replaced by others, which can be almost completely destroyed by waste water treatment.

302. In the context of the possible long-term effects of chemical and bacteriological (biological) weapons, we have finally to note that towns and cities are growing all over the world, and that in the developed countries, conurbations (fusion of cities with loss of suburbs) have reached population levels approaching 50 million. Such great concentrations of people require very complicated arrangements for supply of food, water and other materials, transport and general administration. The use of chemical or bacteriological (biological) weapons against cities would undoubtedly have an exceptionally severe disorganizing effect, and the full re-establishment of the services necessary for health, efficient government, and the smooth operation of industry might take a very long time.

C. Possible long-term effects of chemical and bacteriological (biological) means of warfare on man and his environment

303. Chemical weapons, in addition to their highly toxic short-term effects, may also have a long-term effect on the environment in which they are disseminated. If used in very high concentration they might cause damage by polluting the air, by polluting the water supplies and by poisoning the soil.

304. Bacteriological (biological) weapons could be directed against man's sources of food through the spread of persistent plant diseases or of infectious animal diseases. There is also the possibility that new epidemic diseases could be introduced, or old ones reintroduced, which could result in deaths on the scale which characterized the medieval plagues.

1. Chemical Weapons

305. There is no evidence that the chemical agents used in World War I—chlorine, mustard, phosgene, and tear-gas—had any untoward ecological consequences. As already observed, over 120,000 tons of these agents were used during that war, and in some areas which were attacked, concentrations must have added up to hundreds of kilograms per hectare. These regions have long since returned to normal and fully productive use.

306. The organophosphorous, or nerve, agents have never been used in war, and no corresponding experience is available to help form a judgment about their possible long-term effects. But since these agents are toxic to all forms of animal life, it is to be expected that if high concentrations were disseminated over large areas, and if certain species were virtually exterminated, the dynamic ecological equilibrium of the region might be changed.

307. On the other hand there is no evidence to suggest that nerve agents affect food chains in the way DDT and other pesticides of the chlorinated hydrocarbon type do. They hydrolyze in water, some of them slowly, so there could be no long-term contamination of natural or artificial bodies of water.

308. The use of herbicides during the course of the Viet-Nam conflict has been reported extensively in news media, and to a lesser extent in technical publications. The materials which have been used are 2,4-dichlorophenoxyacetic acid, 2,4,5-trichlorophenoxyacetic acid, cacodylic acid and picloram.

309. Between 1963 and 1968 these herbicides were used to clear forested areas for military purposes over some 9,100 km². This may be divided by forest type as shown in the following table.

TABLE 1.—TYPE OF FOREST AND EXTENT AND AREA TREATED WITH HERBICIDES IN SOUTH VIETNAM, 1963-68

Type of forest	Extent km.²	Area treated km.²
Open forest (semideciduous)	50,150	8,140
Mangrove and other aquatic	4,800	960
Coniferous	1,250	0
Total	56,200	9,100

310. South Viet-Nam is about 172,000 km² in area, of which about one-third is forested. The area treated with herbicides up to the end of 1968 thus amounts to about 16 per cent of the forested area, or a little over 5 per cent of the total.

311. There is as yet no scientific evaluation of the extent of the long-term ecological changes resulting from these attacks. One estimate is that some mangrove forests may need twenty years to regenerate, and fears have been expressed about the future of the animal population they contain. Certain species of bird are known to have migrated from areas that have been attacked. On the other hand, there has been no decline in fish catches, and as fish are well up in the food chain, no serious damage would seem to have been done to the aquatic environment.

312. When a forest in a state of ecological equilibrium is destroyed by cutting, secondary forest regenerates, which contains fewer species of plants and animals than were there originally, but larger numbers of those species which survived. If secondary forest is replaced by grassland, these changes are even more marked. If one or more of the animal species which increases in numbers is the host of an infection dangerous to man (a zoonosis), then the risk of human infection is greatly increased. This is exemplified by the history of scrub typhus in South-East Asia, where the species of rat which maintains the infection and the vector mite are much more numerous in secondary forest, and even more so in grassland, so increasing the risk of the disease being transmitted to people as forest is cleared.

313. In high rainfall areas, deforestation may also lead to serious erosion, and so to considerable agricultural losses. Deserts have been created in this way.

2. Bacteriological (Biological) Weapons Against Man

314. New natural foci, in which infection may persist for many years, may be established after an aerosol or other type of bacteriological (biological) attack. This possible danger can be appreciated when one recalls the epidemiological consequences of the accidental introduction of rabies and other veterinary infections (blue-tongue, African swine fever) into a number of countries. The spread of rabies in Europe following World War II, as a consequence of the disorganization caused by the war, shows how an epidemiologically complicated and medically dangerous situation can emerge even with an infection which had long been successfully controlled. In 1945 there were only three major foci of infection in Czechoslovakia. In the following years, foxes multiplied excessively because farms were left unworked, because of the increased number of many kinds of wild creatures, and also because of the discontinuation of systematic control. Foxes also come in from across frontiers, and the epizootic gradually worsened. In the period 1952/1966 a total of 888 foci were reported, 197 new ones in 1965 alone. Bringing the situation under control demanded extraordinary and prolonged efforts by the health service: in 1966 alone, 775,000 domestic animals were vaccinated in affected areas of the country. None the less, the disease has not yet been stamped out. Natural foci cannot be eliminated without organized and long-term international co-operation.

315. Arthropods (insects, ticks) also play an important part, along with other creatures, in the maintenance of pathogenic agents in natural foci. A man exposed to a natural focus risks infection, particularly from arthropods, which feed on more than one species of host. A bacteriological (biological) attack might lead to the creation of multiple and densely distributed foci of infection from which, if ecological conditions were favourable, natural foci might develop in regions where they had previously never existed, or in areas from which they had been eliminated by effective public health measures.

316. On the other hand, the large-scale use of bacteriological (biological) weapons might reduce populations of susceptible wild species below the level at which they could continue to exist. The elimination of a species or group of species from an area would create in the ecological community an empty niche which might seriously disturb its equilibrium, or which might be filled by another species more dangerous to man because it carried a zoonosis infection acquired either naturally or as a result of the attack. This would result in the establishment of a new natural focus of disease.

317. The gravity of these risks would depend on the extent to which the community of species in the country attacked contained animals which were not only susceptible to the infection, but were living in so close a relationship to each

other that the infection could become established. For example, not all mosquito species can be infected with yellow fever virus, and if the disease is to become established, those which can become vectors must feed frequently on mammals, such as monkeys, which are also sufficiently susceptible to the infection. A natural focus of yellow fever is therefore very unlikely to become established in any area lacking an adequate population of suitable mosquitos and monkeys.

318. Endemics or enzootics of diseases (i.e. infections spreading at a low rate, but indefinitely, in a human or animal population) could conceivably follow a large-scale attack, or might be started by a small-scale sabotage attack, for which purpose the range of possible agents would be much wider, and might even include such chronic infections as malaria.

319. *Malaria* is a serious epidemic disease in a susceptible population, but it is difficult to envisage its possible employment as a bacteriological (biological) weapon, because of the complex life cycle of the parasite. Drug-resistant strains of malaria exist in, for example, areas of Asia and South America, and their possible extension to areas where mosquitos capable of transmitting the disease already exist, would greatly complicate public health measures, and cause a more serious disease problem because of the difficulties of treatment.

320. *Yellow fever* is still enzootic in the tropical regions of Africa and America. Monkeys and other forest-dwelling primates, together with mosquitoes which transmit the virus, constitute natural foci and ensure survival of the virus between epidemics.

321. Importation of this disease is possible wherever a suitable environment and susceptible animal and mosquito hosts exist. This occurred naturally in 1960 when a previously uninfested area of Ethiopia was invaded by yellow fever and an epidemic resulted in about 15,000 deaths. Because of the inaccessibility of the area, some 8,000–9,000 people had died before the epidemic was recognized. The epidemic was extinguished but it is likely that a permanent focus of yellow fever infection has been established in this area, previously free of the disease. It might be extremely serious if the virus were introduced into Asia or the Pacific islands where the disease appears never to have occurred, but where local species of mosquito are crown to be able to transmit it. Serious problems could also arise if the virus were introduced into the area of the United States where vector mosquitoes still exist, and where million of people live in an area of a few square kilometres.

322. Another consideration is the possible introduction of a new species of animal to an area to cause either long-term disease or economic problems. For example, mongooses were introduced many years ago to some Caribbean islands, and in one at least they have become a serious economic pest of the sugar crop, and an important cause of rabies. The very large economic effect on the introduction of rabbits to Australia is well known. Certain mosquito species (a yellow fever mosquito, *Aedes aegypti*, and a malaria mosquito, *Anopheles gambiae*) have naturally spread to many areas of the world from their original home in Africa, and have been responsible for serious disease problems in the areas that have been invaded. It is conceivable that in the war the introduction of such insects on a small scale might be tried for offensive purposes.

323. In addition to the development of new natural foci, another long-term hazard, but one which is very much more speculative than some of the possibilities mentioned above, is that of the establishment of new strains of organisms of altered immunological characteristics or increased virulence. This might occur if large numbers of people or other susceptible animal species became infected in an area through a bacteriological (biological) attack, thus providng opportunities for new organisms to arise naturally. The appearance from time to time of immunologically different forms of influenza shows the type of thing which might happen. Such altered forms of agents might cause more severe and perhaps more widespread epidemics than the original attack.

Against domestic animals

324. *Foot-and-mouth disease* is a highly infectious but largely non-fatal disease of cattle, swine and other cloven-footed animals. It is rarely transmitted from a diseased animal to man, and when it is, the order is a trivial one.

325. The milk yield of diseased cows decreases sharply and does not reach its normal yield even after complete recovery. Losses range from 9 to 30 per cent of milk yield. In swine, loss from foot-and-mouth are estimated at 60–80 per

cent among suckling pigs. Foot-and-mouth is endemic in many countries and breaks out from time to time even in countries which are normally free of the disease. Some countries let it run its course without taking any steps to control it; others try to control it by the use of vaccines; and some pursue a slaughter policy in which all affected animals and contacts are killed.

326. It is obvious that a large epizootic could constitute a very serious economic burden, for example, by bringing about a serious reduction in the supply of milk. It is in this context that foot-and-mouth disease could conceivably serve as a bacteriological (biological) weapon, especially since war conditions would greatly promote its spread. Efficient prevention is possible through active immunization, but the immunity is rather short-lived and annual vaccination is required.

327. *Brucellosis* is an example of chronic disease which could possibly result from bacteriological (biological) weapon attacks. There are three forms known, which attack cattle, swine and goats respectively. Any of these may be transmitted to man, in whom it causes a debilitating but rarely fatal disease lasting for four to six months or even longer. It is enzootic in most countries of the world, and an increased incidence of the disease resulting from its use as a weapon could be dealt with, after the initial blow, in the same way as is the natural disease. But the cost of eliminating disease such as brucellosis from domestic animals is very high.

328. *Anthrax* was described in chapter II and what concerns us here is that if large quantities of anthrax spores were disseminated in bacteriological (biological) weapons, thus contaminating the soil of large regions, danger to domestic animals and man might persist for a very long time. There is no known way by which areas could be rendered safe. The use of large quantities of anthrax as a weapon might therefore cause long-term environmental hazards.

Against crops

329. The *rust* fungus, as already noted, is one of the most damaging of natural pathogens which affects wheat crops. Each rust pustule produces 20,000 uredospores a day for two weeks, and there may be more than 100 postules on a single infected leaf. The ripe uredospores are easily detached from the plant even by very weak air currents. The spores are then carried by the wind over distances of many hundreds of kilometres. It is estimated that the annual total world loss of wheat from rust is equivalent to about $500 million.

330. Weather plays a decisive role in the epiphytotic spreading of rust. Temperature influences the incubation period and the rate of uredospore germination. Germination and infection occur only when there is a water-saturated atmosphere for three to four hours. Thus, epiphytotic spread occurs when there are heavy dews and when the temperature is between 10° and 30° C. The principal means of prevention is to destroy the pathogen and to breed resistant species. Recently, ionizing radiation has been employed to develop resistant strains.

331. The cereal rusts die out during winter unless some other susceptible plant host, such as barberry, is present, and therefore their effect on crops would be limited to a single season. As they are capable of reducing man's food reserves considerably, rust spores could be extremely dangerous and efficient bacteriological (biological) weapons, especially if deployed selectively with due regard to climatic conditions. Artificial spreading of an epiphytotic would be difficult to recognize and delivery of the pathogen to the target would be relatively simple.

332. Rust epiphytotics might have a very serious effect in densely populated developing countries, where the food supply might be reduced to such an extent that a human population already suffering from malnutrition might be driven to starvation, which, depending on the particular circumstances, might last a long time.

333. Another conceivable biological weapon, although neither a practical nor a bacteriological one, is the *potato beetle*. To use it for this purpose, the beetle would have to be produced in large numbers, and introduced, presumably clandestinely, into potato growing regions at the correct time during maturation of the crop. In the course of spread the beetle first lives in small foci, which grow and increase until it becomes established over large territories. The beetle is capable of astonishing propagation: the progeny of a single beetle may amount to 8,000 million in one-and-a-half years.

334. Since beetles prefer to feed and lay their eggs in plants suffering from some viral disease, they and their larvae may help transmit the virus thereby increasing the damage they cause. The economic damage caused by the beetle varies with the season and the country affected, but it can destroy up to 80 per cent of the crop. Protection is difficult because it has not been possible to breed resistant potato species and the only means available at present is chemical protection.

335. Were the beetle ever to be used successfully for offensive purposes, it could clearly help bring about long-term damage because of the difficulty of control.

3. Genetic and Carcinogenic Changes

336. The possibility also exists that chemical and bacteriological (biological) weapons might cause genetic changes. Some chemicals are known to do this. LSD, for example, is known to cause genetic changes in human cells. Such genetic changes, whether induced by chemicals or viruses, might conceivably have a bearing on the development of cancer. A significantly increased incidence of cancer in the respiratory tract (mainly lung) has been reported recently among workers employed in the manufacture of mustard gas during World War II. No increased prevalence of cancer has been reported among mustard gas casualties of World War I although it is doubtful if available records would reveal it. However, most of these casualties were exposed for only short periods to the gas whereas the workers were continuously exposed to small doses for months or years.

CHAPTER V. ECONOMIC AND SECURITY IMPLICATIONS OF THE DEVELOPMENT, ACQUISITION AND POSSIBLE USE OF CHEMICAL AND BACTERIOLOGICAL (BIOLOGICAL) WEAPONS AND SYSTEMS OF THEIR DELIVERY

A. Introduction

337. Previous chapters have revealed the extent to which developments in chemical and biological science have magnified the potential risks associated with the concept of chemical or bacteriological (biological) warfare. These risks derive not only from the variety of possible agents which might be used, but also from the variety of their effects. The doubt that a chemical or bacteriological (biological) attack could be restricted to a given area means that casualties could occur well outside the target zone. Were these weapons used to blanket large areas and cities, they would cause massive loss of human life, affecting non-combatants in the same way as combatants, and in this respect, they must clearly be classified as weapons of mass destruction. The report has also emphasized the great problems and cost which would be entailed in the provision of protection against chemical and bacteriological (biological) warfare. It is the purpose of this final chapter to explore in greater depth the economic and security implications of matters such as these.

B. Production

1. Chemical Weapons

338. It has been estimated that during the course of the First World War, at a time when the chemical industry was in a relatively early stage of development, about 180,000 tons of chemical agents were produced, of which more than 120,000 tons were used in battle. With the rapid development of the industry since then, there has been an enormous growth in the potential capacity to produce chemical agents.

339. The scale, nature, and cost of any programme for producing chemical weapons, and the time needed to implement it, would clearly be largely dependent on the scientific, technical and industrial potential of the country concerned. It would depend not only on the nature of the chemical industry itself, and on the availability of suitably trained engineers and chemists, but also on the level of development of the chemical engineering industry and of the means of automating chemical processes, especially where the production of highly toxic chemical compounds is involved. Whatever the cost of developing a chemical or bacteriological (biological) capability, it needs to be realized that it would be a cost addi-

tional to, and not a substitute for, that of acquiring an armoury of conventional weapons. An army could be equipped with the latter without having any chemical or bacteriological (biological) weapons. But it could never rely on chemical or bacteriological (biological) weapons alone.

340. Today a large number of industrialized countries have the potential to produce a variety of chemical agents. Many of the intermediates required in their manufacture, and in some cases even the agents themselves, are widely used in peacetime. Such substances include, for example, phosgene, which some highly developed countries produce at the rate of more than 100,000 tons a year and which is commonly used as an intermediate in the manufacture of synthetic plastics, herbicides, insecticides, paints and pharmaceuticals. Another chemical agent, hydrocyanic acid, is a valuable intermediate in the manufacture of a variety of synthetic organic products and is produced in even greater quantities. Ethylene-oxide, which is used in the manufacture of mustard gases, is also produced on a large scale in various countries. It is a valuable starting material in the production of a large number of important substances, such as detergents, disinfectants and wetting agents. The world production of ethylene-oxide and propylene-oxide is now well in excess of 2 million tons per year. Mustard gas and nitrogen mustard gases can be produced from ethylene-oxide by a relatively simple process. Two hundred and fifty thousand tons of ethylene-oxide would yield about 500,000 tons of mustard gas.

341. The production of highly toxic nerve agents, including organophosphorous compounds, presents problems which, because they are relatively difficult, could be very costly to overcome. To a certain extent this is because of the specialized safety precautions which would be needed to protect workers against these very poisonous substances, a need which, of course, applies to all chemical agents, especially to mustard gas. However, many intermediates used in the manufacture of nerve agents have a peacetime application: for example, dimethylphosphite, necessary for the production of Sarin, is used in the production of certain pesticides. But even leaving operating expenses aside, the approximate cost of acquiring one plant complex to produce munitions containing up to 10,000 tons of Sarin a year would be about $150 million. The cost would, of course, be considerably less if existing munitions could be charged with chemical agents.

342. A country which possessed a well-developed chemical industry could clearly adapt it to produce chemical agents. But were it to embark on such a step, it would be only the beginning. The establishment of a comprehensive chemical warfare capability would also involve special research centres, experimental test grounds, bases, storage depots and arsenals. The development of sophisticated and comprehensive weapons systems for chemical or bacteriological (biological) warfare would be a very costly part of the whole process. Nonetheless, the possibility that a peacetime chemical industry could be converted to work for military purposes, and of chemical products being used as weapons, increases the responsibility of Governments which are concerned to prevent chemical war from ever breaking out.

2. Bacteriological (Biological) Weapons

343. The microbiological expertise necessary to grow agents of bacteriological (biological) warfare exists to a large extent in many countries, since the requirements are similar to those of a vaccine industry and, to a lesser extent, a fermentation industry. Apart from the combination of the highly developed technologies of these two industries, there remains only a need for some specialized knowledge, expertise and equipment to permit the safe handling of large quantities of bacteriological (biological) agents. Consequently, existing facilities in the fermentation, pharmaceutical and vaccine industries could be adapted for the production of bacteriological (biological) agents. But the technological complexities of producing bacteriological (biological) agents in dry powder form are very much greater than for wet spray systems. Moreover, it would be desirable to provide an effective vaccine with which to protect production staff. The technical difficulties would increase with the scale and complexity of the weapons systems that were being developed. But the fact remains that any industrially advanced country could acquire whatever capability is set out to achieve in this field.

344. The difficulty and cost of providing for the transport and storage of bacteriological (biological) weapons are considerable, since special storage conditions, e.g., refrigeration, and stringent safety and security precautions are essen-

tial. In addition, testing to determine the potential effectiveness of the material produced would require considerable and costly testing facilities both in the laboratory and in the field.

345. Despite the fact that the development and acquisition of a sophisticated armoury of chemical and bacteriological (biological) weapons systems would prove very costly in resources, and would be dependent on a sound industrial base and a body of well-trained scientists, any developing country could in fact acquire, in one way or another, a limited capability in this type of warfare—either a rudimentary capability which it developed itself, or a more sophisticated one which it acquired from another country. Hence, the danger of the proliferation of this class of weapons applies as much to developing as it does to developed countries.

C. Delivery systems

346. Practically all types of explosive munitions (artillery shells, mines, guided and unguided rockets, serial bombs, landmines, grenades, etc.) can be adapted for the delivery of chemical agents. A modern bomber, for example, can carry about fifteen tons of toxic chemical agents, and it is estimated that only 250 tons of V-gas, an amount which could be delivered by no more than fifteen or sixteen aircraft, is enough to contaminate a great city with an area of 1,000 square kilometers and a population of 7 to 10 million. Were such a population mainly in the open and unprotected, fatal casualties might reach the level of 50 per cent.

347. Existing armaments which (with some modification) could be used to deliver agents in order to generate local outbreaks of disease, could also contaminate large areas with pathogens. For example, a single aircraft could cover with a bacteriological (biological) agent an area of up to 100,000 square kilometers, although the area of effective dosage might be much smaller due to loss of the infectivity of the airborne agent.

348. While the development and production costs of chemical and bacteriological (biological) agents might well be high, the cost of the complete weapons system (see chapter I) would be even greater. The cost of developing, procuring and operating a squadron of modern bombers far outweighs the cost of the bombs it could carry. However, for some purposes, an existing weapon system or a far less sophisticated means of disseminating might be used.

D. Protection

349. The measures which would be required to protect a population, its livestock and plants against chemical or bacteriological (biological) attack are immensely costly and complex (chapter I). At present, warning systems for the detection of aerosol clouds are fairly rudimentary. Systems for the detection of specific chemical and bacteriological (biological) agents might be devised, but again they are likely to prove very expensive, if indeed they are feasible.

350. With certain agents, contamination of the environment, for example of buildings and soil, could persist for several days or weeks. Throughout this period people would be exposed to the risk of contamination by contact and by inhalation. Protective clothing, even if adequately prefabricated and distributed or improvised, would make it difficult to carry on with normal work. The prolonged wearing of respirators causes physiological difficulties, and it would prove necessary to provide communal shelters with air filtration and ventilations systems for civil populations. Shelters would be extremely costly to build and operate, and a programme for their construction would constitute a heavy burden on the economy.

351. Even if protective measures were provided against known agents, it is conceivable that new ones might be developed whose physical or chemical properties would dictate a need for new individual and communal protective equipment. This could constitute an even greater economic burden.

352. Defensive measures, especially against chemical agents, would also have to include the extremely laborious and expensive task of decontaminating large numbers of people, as well as equipment, weapons and other materials. This would mean setting up decontamination centres and training of people in their use. Stocks of decontaminating agents and replacement clothing would also be required.

353. A very important part of a defense system against chemical or bacteriological (biological) weapons would be the means of very rapidly detecting an attack and identifying the specific agent used in an attack. Methods for doing this rapidly and accurately are still inadequate. Specific protection against bacteriological (biological) agents would necessitate the use of vaccines and perhaps antibiotics (see annex C of chapter II). Vaccines vary in their effectiveness, even against naturally-occurring infections, and even those which are highly effective in natural circumstances may not protect against bacteriological (biological) agents deliberately disseminated into the air and inhaled into the lungs. Antibiotics used prophylactically are a possible means of protection against bacteria and rickettsiae but not against viruses. But the large and complex problems of their use in large populations would be all but insuperable.

354. It would be extremely difficult to arrange for the medical treatment of a civilian population which had been attacked with chemical or bacteriological (biological) weapons. Mobile groups of specialists in infectious disease, of microbiologists, and of well-trained epidemiologists, would have to be organized to provide for early diagnosis and treatment, while a network of reserve hospitals and a massive supply of drugs would have to be prepared in advance. The maintenance of a stockpile of medical supplies is extremely costly. Many drugs, especially antibiotics, deteriorate in storage. Huge amounts would have to be discarded as useless from time to time, and the stock would have to be replenished periodically.

E. Cost to society

355. The extent to which the acquisition, storage, transport and testing of chemical and bacteriological (biological) munitions would constitute an economic burden, would depend on the level of a country's industrial and military capability, although compared to nuclear weapons and advanced weapons systems in general, it might not seem excessive. But the task of organizing delivery systems and deployment on a large or sophisticated scale could well be economically disastrous for many countries. Moreover the preparation of an armoury of chemical and bacteriological (biological) weapons would constitute a possible danger to people in the vicinity of production, storage and testing facilities.

356. Chemical and bacteriological (biological) attacks could be particularly dangerous in towns and densely populated areas, because of the close contacts between individuals, and because of the centralized provision of services for every day necessities and supply (services, urban transport networks, trade, etc.). The consequences might also be particularly serious in regions with a warm moist climate, in low lying areas, and in areas with poorly developed medical facilities.

357. The technical and organizational complexity, as well as the great financial cost, of providing adequate protection for a population against attack by chemical and bacteriological (biological) agents have already been emphasized. The costs would be formidable by any standards. The construction of a system of fall-out shelters to protect only part of the population of one large and highly developed country against nuclear weapons has been estimated at no less than $5,000–$10,000 million. Such shelters could be modified, at a relatively modest additional cost, to provide protection against chemical and bacteriological (biological) weapons. To construct communal shelters for a corresponding part of the population against chemical and bacteriological (biological) weapons alone would cost much the same as protection against nuclear fall-out. If all other necessary related expenditures are considered—such as detection and warning systems, communications, and medical aid—the total costs of civil defence against chemical and bacteriological (biological) agents would be greater than $15,000–$25,000 million for a developed country of 100–200 million people. But even if such a programme were ever planned and implemented, there could be no assurance that full protection could be achieved.

358. For whatever its cost, no shelter programme could provide absolute protection against attack by chemical or bacteriological (biological) agents. Protective measures would be effective only if there were adequate warning of an attack, and if civil defence plans were brought into operation immediately and efficiently. However many shelters were available, the likelihood would be that

large numbers of people would be affected to varying degrees, and would be in urgent need of medical attention, and once hostilities had ceased, that there would be large numbers of chronic sick and invalids, requiring care, support and treatment, and imposing a heavy burden on a society already disorganized by war.

359. It is almost impossible to conceive of the complexity of the arrangements which would be necessary to control the consequences of a large-scale bacteriological (biological) attack. Even in peacetime, the development of an epidemic of a highly contagious disease started by a few individual cases, introduced from abroad, necessitates enormous material expenditure and the diversion of large numbers of medical personnel. Examples of widespread disruption due to a few smallpox contacts are given in chapter II. No estimates are given of the actual costs involved in dealing with these events, but in some cases they must have run into millions of dollars. Large-scale bacteriological (biological) attacks could thus have a serious impact on the entire economy of the target country and, as is observed in chapter II, depending on the type of agent used, the disease might well spread to neighbouring countries.

360. Whatever might be done to try to save human beings, nothing significant could be done to protect crops, livestock, fodder and food-stuffs from a chemical and bacteriological (biological) weapons attack. Persistent chemical agents could constitute a particular danger to livestock.

361. Water in open reservoirs could be polluted as a result of deliberate attack, or perhaps accidentally, with chemical or bacteriological (biological) weapons. The water supply of large towns could become unusable, and rivers, lakes and streams might be temporarily contaminated.

362. Enormous damage could be done to the economy of a country whose agricultural crops were attacked with herbicides. For example, only ten to twenty grammes per hectare of 2, 4D could render a cotton crop completely unproductive (see annex A). Fruit trees, grape vines and many other plants could also be destroyed. Mixtures of 2, 4D, of 2, 4, 5T and picloram are particularly potent. The chemical known as paraquat can destroy virtually all annual plants, including leguminous plants, rice, wheat and other cereals. Arsenic compounds desiccate the leaves of many crops and make them unusable as food. There are no means known at present of regenerating some of the plants which are affected by herbicides. Experience has shown, however, that in the case of some species, either natural or artificial seeding can easily produce normal growth in the next growing season. But the destruction of fruit trees, vines and other plants, if achieved could not be overcome for many years. For most practical purposes, it would be impossible to prevent the destruction of cultivated plants on which herbicides have been used, and depending on a country's circumstances, widespread famine might follow.

363. If the induced disease were to spread, bacteriological (biological) weapons could affect even more extensive agricultural areas. The effect would, however, be more delayed and more specific to the crops affected. Annex A gives examples of the extent of the decrease in a wheat harvest and in a rice harvest affected by blast. The uredospores of the rust are easily transported by air currents so that downwind sections would be affected by rust to a considerable distance with a corresponding sharp reduction in the crop, while the upwind sections gave a good yield.

364. Over and above all these possible effects of chemical and bacteriological (biological) warfare on farm animals and crops is the possibility discussed in the previous chapter, of widespread ecological changes due to deleterious changes brought about in wild fauna and flora.

F. The relevance of chemical and bacteriological (biological) weapons to military and civil security

365. The comparison of the relative effectiveness of different classes of weapons is a hazardous and often futile exercise. The major difficulty is that from the military point of view, effectiveness cannot be measured just in terms of areas of devastation or of numbers of casualties. The final criterion would always be whether a specific military purpose had been more easily achieved with one rather than another set of weapons.

366. Clearly, from what has been said in the earlier chapters of this report, chemical weapons could be more effective than equivalent weights of high ex-

plosive when directed against densely populated targets. Similarly, so far as mass casualties are concerned, bacteriological (biological) weapons could, in some circumstances, have far more devastating effects than chemical weapons, and effects which might extend well beyond the zone of military operations.

367. From the military point of view, one essential difference between anti-personnel chemical and bacteriological (biological) weapons on the one hand, and a conventional high explosive weapon on the other (including small arms and the whole range of projectiles), is that the area of the effects of the latter is more predictable. There are, of course, circumstances where, from the point of view of the individuals attacked, an incapacitating gas would be less damaging than high explosives. On the other hand, whereas military forces can, and do, rely entirely upon conventional weapons, no country, as already observed, could entrust its military security to an armoury of chemical and bacteriological (biological) weapons alone. The latter constitute only one band in the spectrum of weapons.

368. As previous chapters have also shown, neither the effectiveness nor the effects of chemical and bacteriological (biological) weapons can be predicted with assurance. Whatever military reasons might be advanced for the use of these weapons, and whatever their nature, whether incapacitating or lethal, there would be significant risk of escalation, not only in the use of the same type of weapon but also of other categories of weapons systems, once their use had been initiated. Thus, chemical and bacteriological (biological) warfare could open the door to hostilities which could become less controlled, and less controllable, than any war in the past. Uncontrollable hostilities cannot be reconciled with the concept of military security.

369. Since some chemical and bacteriological (biological) weapons constitute a major threat to civilian populations and their food and water supplies, their use cannot be reconciled with general national and international security. Further, because of the scale and intensity of the potential effects of their use, they are considered as weapons of mass destruction. Their very existence thus contributes to international tension without compensating military advantages. They generate a sense of insecurity not only in countries which might be potentially belligerent, but also in those which are not. Neutral countries could be involved through the use of chemical and bacteriological (biological) weapons, especially those whose territories bordered on countries involved in conflict in the course of which chemical and bacteriological (biological) casualties had been suffered by garrisons and civilians close to frontiers. The effects of certain bacteriological (biological) weapons used on a large scale might be particularly difficult to confine to the territory of a small country. Large-scale chemical and bacteriological (biological) agents and chemical agents might be used for acts of sabotage. Such events might occur as isolated acts, even carried out in defiance of the wishes of national leaders and military commanders. The continued existence and manufacture of chemical weapons anywhere may make such occurrences more likely.

370. Obviously any extensive use of chemical weapons would be known to the country attacked. The source of the attack would probably also be known. On the other hand, it would be extremely difficult to detect isolated acts of sabotage in which bacteriological (biological) weapons were used, especially if the causative organism were already present in the attacked country. Because of the suspicions they would generate, acts of sabotage could thus provoke a conflict involving the widespread use of chemical and bacteriological (biological) weapons.

TABLE 2.—ECONOMIC LOSS DUE TO THE USE OF BACTERIOLOGICAL (BIOLOGICAL) WEAPONS AGAINST CROP

Plant	Type of agent	Losses		Loss in U.S dollars per hectare
		Percent	Tons per hectare	
Wheat	Cereal rust ("Puccinia graminis")	80	24	165
Rice	Rice blast ("Piricularia drizae")	70	35	294

TABLE 1.—ECONOMIC LOSS WHICH COULD RESULT FROM THE USE OF CHEMICAL WEAPONS DUE TO THE DESTRUCTION OF CROPS PER HECTARE OF LAND

ANNEX A

[Economic loss from possible use of chemical and bacteriological (biological) weapons against crops]

Type of plant	Average harvest (in tons per hectare)	Price of 1 ton in U.S. dollars	Sum total of losses in U.S. dollars per hectare
Cotton	3	600	1,800
Rice	5	84	420
Wheat	3	69	207
Apple tree	30	[1] 140	[1] 8,400

[1] Will not produce apples for 2 years.

CONCLUSION

371. All weapons of war are destructive of human life, but chemical and bacteriological (biological) weapons stand in a class of their own as armaments which exercise their effects solely on living matter. The idea that bacteriological (biological) weapons could deliberately be used to spread disease generates a sense of horror. The fact that certain chemical and bacteriological (biological) agents are potentially unconfined in their effects, both in space and time, and that their large-scale use could conceivably have deleterious and irreversible effects on the balance of nature adds to the sense of insecurity and tension which the existence of this class of weapons engenders. Considerations such as these set them into a category of their own in relation to the continuing arms race.

372. The present inquiry has shown that the potential for developing an armoury of chemical and bacteriological (biological) weapons has grown considerably in recent years, not only in terms of the number of agents, but also in their toxicity and in the diversity of their effects. At one extreme, chemical agents exist and are being developed for use in the control of civil disorders; and others have been developed in order to increase the productivity of agriculture. But even though these substances may be less toxic than most other chemical agents, their ill-considered civil use, or use for military purposes could turn out to be highly dangerous. At the other extreme, some potential chemical agents which could be used in weapons are among the most lethal poisons known. In certain circumstances the area over which some of them might exercise their effects could be strictly confined geographically. In other conditions some chemical and bacteriological (biological) weapons might spread their effects well beyond the target zone. No one could predict how long the effects of certain agents, particularly bacteriological (biological) weapons might endure and spread and what changes they could generate.

373. Moreover, chemical and bacteriological (biological) weapons are not a cheap substitute for other kinds of weapon. They represent an additional drain on the national resources of those countries by which they are developed, produced and stockpiled. The cost cannot of course be estimated with precision; this would depend on the potential of a country's industry. To some the cost might be tolerable; to others it would be crippling, particularly, as has already been shown, when account is taken of the resources which would have to be diverted to the development of testing and delivery systems. And no system of defence, even for the richest countries in the world, and whatever its cost, could be completely secure.

374. Because chemical and bacteriological (biological) weapons are unpredictable, in varying degree, either in the scale or duration of their effects, and because no certain defence can be planned against them, their universal elimination would not detract from any nation's security. Once any chemical or bacteriological (biological) weapon had been used in warfare, there would be a serious risk of escalation, both in the use of more dangerous weapons belonging to the same class, and of other weapons of mass destruction. In short, the development of a chemical or bacteriological (biological) armoury, and a defence, implies an economic burden without necessarily imparting any proportionate compensatory advantage to security. And at the same time it imposes a new and continuing threat to future international security.

375. The general conclusion of the report can thus be summed up in a few lines. Were these weapons ever to be used on a large scale in war, no one could predict how enduring the effects would be, and how they would affect the structure of society and the environment in which we live. This overriding danger would apply as much to the country which initiated the use of these weapons as to the one which had been attacked, regardless of what protective measures it might have taken in parallel with its development of an offensive capability. A particular danger also derives from the fact that any country could develop or acquire, in one way or another, a capability in this type of warfare, despite the fact that this could prove costly. The danger of the proliferation of this class of weapons applies as much to the developing as it does to developed countries.

376. The momentum of the arms race would clearly decrease if the production of these weapons were effectively and unconditionally banned. Their use, which could cause an enormous loss of human life, has already been condemned and prohibited by international agreements, in particular the Geneva Protocol of 1925, and, more recently, in resolutions of the General Assembly of the United Nations. The prospects for general and complete disarmament under effective international control, and hence for peace throughout the world, would brighten significantly if the development, production and stockpiling of chemical and bacteriological (biological) agents intended for purposes of war were to end and if they were eliminated from all military arsenals.

377. If this were to happen, there would be a general lessening of international fear and tension. It is the hope of the authors that this report will contribute to public awareness of the profoundly dangerous results if these weapons were ever used, and that an aroused public will demand and receive assurances that Governments are working for the earliest effective elimination of chemical and bacteriological (biological) weapons.

PROCOTOL FOR THE PROHIBITION OF THE USE OF IN WAR OF ASPHYXIATING, POISONOUS OR OTHER GASES, AND OF BACTERIOLOGICAL METHODS OF WARFARE; SIGNED AT GENEVA, JUNE 17, 1925

The undersigned plenipotentiaries, the name of their respective Governments:

Whereas the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world;

Whereas the prohibition of such use has been declared in Treaties to which the majority of Powers of the world are Parties; and

To the end that this prohibition shall be universally accepted as a part of International Law, binding alike the conscience and the practice of nations;

Declare:

That the High Contracting Parties, so far as they are not already Parties to Treaties prohibiting such use, accept this prohibition, agree to extend this prohibition to the use of bacteriological methods of warfare and agree to be bound as between themselves according to the terms of this declaration.

The High Contracting Parties will exert every effort to induce other States to accede to the present Protocol. Such accession will be notified to the Government of the French Republic, and by the latter to all signatory and acceding Powers, and will take effect on the date of the notification by the Government of the French Republic.

The present Protocol, of which the French and English texts are both authentic, shall be ratified as soon as possible. It shall bear today's date.

The ratifications of the present Protocol shall be addressed to the Government of the French Republic, which will at once notify the deposit of such ratification to each of the signatory and acceding Powers.

The instruments of ratification of and accession to the present Protocol will remain deposited in the archives of the Government of the French Republic.

The present Procotol will come into force for each signatory Power as from the date of deposit of its ratification, and, from that moment, each Power will be bound as regards other Powers which have already deposited their ratifications.

In witness whereof the Plenipotentiaries have signed the present Procotol.

Done at Geneva in a single copy, the seventeenth day of June, One Thousand Nine Hundred and Twenty-Five.

RESOLUTION 2162 B (XXI)

The General Assembly,

Guided by the principles of the Charter of the United Nations and of international law,

Considering that weapons of mass destruction constitute a danger to all mankind and are incompatible with the accepted norms of civilization.

Affirming that the strict observance of the rules of international law on the conduct of warfare is in the interest of maintaining these standards of civilization.

Recalling that the Geneva Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, of 17 June 1925, has been signed and adopted and is recognized by many States.

Noting that the Conference of the Eighteen-Nation Committee on Disarmament has the task of seeking an agreement on the cessation of the development and production of chemical and bacteriological weapons and other weapons of mass destruction, and on the elimination of all such weapons from national arsenals, as called for in the draft proposals on general and complete disarmament now before the Conference.

1. *Calls for* strict observance by all States of the principles and objectives of the Protocol for the Prohibition of the use in War of Aspyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, signed at Geneva on 17 June 1925, and condemns all actions contrary to those objectives;

2. *Invites* all States to accede to the Geneva Protocol of 17 June 1925.

1484th plenary meeting,
5 December 1966.

RESOLUTION 2454 A (XXIII)

The General Assembly,

Reaffirming the recommendations of its resolution 2162 B (XXI) calling for strict observance by all States of the principles and objectives of 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, condemning all actions contrary to those objectives and inviting all States to accede to that Protocol,

Considering that the possibility of the use of chemical and bacteriological weapons constitutes a serious threat to mankind,

Believing that the people of the world should be made aware of the consequences of the use of chemical and bacteriological weapons,

Having considered the report of the Eighteen-Nation Disarmament Committee which recommended that the Secretary-General appoint a group of experts to study the effects of the possible use of such weapons,

Noting the interest in a report on various aspects of the problem of chemical, bacteriological and other biological weapons which has been expressed by many Governments and the welcome given to the recommendation of the Eighteen-Nation Disarmament Committee by the Secretary-General in his Annual Report for 1967–68,

Believing that such a study would provide a valuable contribution to the consideration in the Eighteen-Nation Disarmament Committee of the problems connected with chemical and bacteriological weapons,

Recalling the value of the report of the Secretary-General on the effects of the possible use of nuclear weapons,

1. *Requests* the Secretary-General to prepare a concise report in accordance with the proposal in Part II of his Introduction to the Annual Report for 1967–68 and in accordance with the recommendation of the Eighteen-Nation Disarmament Committee contained in paragraph 26 of its report (document A/7189) :

2. *Recommends* that the report be based on accessible material and prepared with the assistance of qualified consultant experts appointed by the Secretary-General taking into account the views expressed and the suggestions made during the discussion of this item at the twenty-third session of the General Assembly.

3. *Calls upon* Governments, national and international scientific institutions and organizations to co-operate with the Secretary-General in the preparation of the report;

4. *Requests* that the report be transmitted to the Eighteen-Nation Disarmament Committee, the Security Council and the General Assembly at an early date, if possible by 1 July 1969, and to the Governments of Member States in time to permit its consideration at the twenty-fourth session of the General Assembly;

5. *Recommends* that Governments give the report wide distribution in their respective languages, through various media of communication, so as to acquaint public opinion with its contents;

6. *Reiterates* its call for strict observance by all States of the principles and objectives of the Geneva Protocol of 17 June 1925 and invites all States to accede to that Protocol.

1750th plenary meeting, 20 December 1968.

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Health Effects of Possible Use of Chemical and Biological Weapons—Report of a WHO Group of Consultants

1. INTRODUCTION

On 29 January 1969, the Secretary-General of the United Nations requested the Director-General of the World Health Organization to co-operate with the United Nations Group of Consultant Experts on Chemical and Bacteriological (Biological) Weapons in the preparation of a report on this subject. WHO was asked to provide such information as the Organization considered useful for the United Nations report, which was to be transmitted to the Eighteen-Nation Committee on Disarmament,[1] the Security Council and the General Assembly, if possible by 1 July 1969, as requested in Resolution 2454 A (XXIII) adopted by the General Assembly on 20 December 1968. . . .

In order to help WHO in this task, the Director-General appointed a number of consultants. In addition, liaison was maintained with the Disarmament Affairs Division of the United Nations (which serviced the Group of Consultant Experts appointed by the Secretary-General), the Food and Agricultural Organization of the United Nations (FAO), the Stockholm International Peace Research Institute (SIPRI), and the Pugwash Organization, in order to avoid unnecessary overlap in their respective contributions.

The possible development and use of chemical and bacteriological weapons and their destructive potentialities have been matters of concern to WHO for several years. In 1967, the Twentieth World Health Assembly, on a recommendation of the WHO Executive Board, adopted a resolution . . . . welcoming Resolution 2162 (XXI) of the United Nations General Assembly and calling upon all Member States of WHO to exert every effort to implement it. The Director-General was therefore glad to meet the request to assist the United Nations in this matter, and in late May 1969 an interim report was completed and forwarded to the Secretary-General. Some of the information contained in the WHO submission was incorporated into the final report of the United Nations Group of Consultant Experts on Chemical and Bacteriological (Biological) Weapons (hereafter referred to as "the United Nations report"),[2] which was released to the public on 2 July 1969 and transmitted to the Eighteen-Nation Committee on Disarmament for discussion during the summer of 1969 before being considered at the Twenty-fourth session of the United Nations General Assembly later in the year.

The relatively short period of time available for the preparation of the WHO submission to the United Nations did not permit the health and related scientific aspects of chemical and biological warfare to be covered to the extent and in the depth merited by the importance of the subject. For this reason and in pursuance of resolution WHA22.58 . . . . adopted by the Twenty-second World Health Assembly in July, 1969, a further study of the problem was undertaken with a view to expanding and revising certain sections of the interim report.

2. COMPARISON OF THE WHO AND UNITED NATIONS REPORTS AND THEIR CONCLUSIONS

The United Nations report presents a comprehensive review of the problem, and includes consideration of military aspects, plant and animal diseases, ecology, and economic and security aspects, along with implications to human health. The report was intentionally written in a style that would be easily understood by governments and by the lay non-specialist reader, and it does not attempt to present highly technical information or to provide a detailed analysis of public health considerations and medical effects.

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[1] Renamed on August 26, 1969, the "Conference of the Committee on Disarmament."

[2] United Nations (1969), *Chemical and bacteriological (biological) weapons and the effects of their possible use. Report of the Secretary-General*, New York (United Nations Publication, Sales No: E.69.I.24).

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The present WHO report, on the other hand, attempts to deal with the subject of chemical and biological warfare on a more technical level and to make quantitative estimates; it is addressed particularly to public health and medical authorities. Thus the WHO report and the United Nations report are complementary. Both arrive at essentially the same technical conclusions, although inevitably there are some differences with respect to the choice of emphasis and the assessment of possible effects on public health, which reflect the differing approaches and technical orientations of the groups that prepared the WHO and United Nations reports. It is hoped, therefore, that the present document will provide the Member States of WHO with the technical information that will enable them to appreciate more fully the public health implications of the possible use of chemical and biological weapons.

The following main conclusions emerge from the WHO analysis:

1. *Chemical and biological weapons pose a special threat to civilians. This is because of the often indiscriminate nature of such weapons, and because the high concentrations in which they would be used in military operations could lead to significant unintended involvement of the civilian population within the target area and for considerable distances downwind.*

2. *The large scale or, with some agents, even limited use of chemical and biological weapons could cause illness to a degree that would overwhelm existing health resources and facilities.*

3. *Large scale use of chemical and biological weapons could also cause lasting changes of an unpredictable nature to man's environment.*

4. *The possible effects of chemical and biological weapons are subject to a high degree of uncertainty and unpredictability, owing to the involvement of complex and extremely variable meteorological, physiological, epidemiological, ecological, and other factors.*

5. *Although advanced weapons systems would be required for the employment of chemical and biological agents on a militarily significant scale against large civilian targets, isolated and sabotage attacks not requiring highly sophisticated weapons systems could be effective against such targets in certain circumstances with some of these agents.*

These conclusions are in harmony with the conclusions of the United Nations Group of Consultant Experts on Chemical and Bacteriological (Biological) Weapons and with the hope for further action to deal with the threat posed by the existence of these weapons, as expressed by the Secretary-General, U Thant, in the foreword to the United Nations' report.

3. AIM AND SCOPE OF THE WHO REPORT

The present report attempts to analyse the health effects of the possible use of chemical and biological weapons on civilian population groups at different levels of social and economic development, and the resulting implications for WHO and its Member States. The assessment is confined to civilian populations, and no attempt is made to consider the purely military aspects of the problem, except insofar as they may relate to civilian populations as possible targets for attack. The military aspects of chemical and biological warfare are considered in the United Nations report and in a report being prepared by SIPRI. The report also makes qualitative and quantitative estimates of the health effects of selected chemical and biological agents employed under specified hypothetical conditions.

4. WORKING DEFINITIONS OF CHEMICAL AND BIOLOGICAL WEAPONS FOR PURPOSES OF THIS REPORT

Chemical agents of warfare include all substances employed for their toxic effects on man, animals, or plants.[1]

Biological agents include those that depend for their effects on multiplication within the target organism, and are intended for use in war to cause disease or death in man, animals or plants.[2]

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

[2] This definition therefore excludes toxins elaborated by some microbes (e.g., botulinal toxin and staphylococcal enterotoxin) when they are preformed outside the target organism. In some discussions of chemical and biological weapons, such toxins are classified as biological agents because the technology of their production resembles that of biological agents rather than that of chemical agents.

A lethal agent is one intended to cause death when man is exposed to concentrations well within the capability of delivery for military purposes.[3]

An incapacitating agent is one intended to cause temporary disease or to induce temporary mental or physical disability, the duration of which greatly exceeds the period of exposure.[4]

A harassing agent (or short term incapacitant) is one capable of causing a rapid disablement that lasts for little longer than the period of exposure.[4]

Casualties are deaths or disabilities.

5. SELECTION OF CHEMICAL AND BIOLOGICAL AGENTS AS MODELS FOR QUALITATIVE AND QUANTITATIVE ASSESSMENTS

There are many chemical and biological agents that are potentially suitable for use in war. A selection of some of the more likely candidates for possible use as lethal, incapacitating and harassing agents has been made for the purposes of this report, based on published information as well as on theoretical considerations.

The chemical and biological agents described in Annexes 1 and 2 have been selected to illustrate possible varieties of usage and effects: aerosol exposure; sabotage of communal water supply; quick or delayed action; essentially non-spreading and spreading types of infective disease; vector introduction. Qualitative descriptions are given for all of them, and a number of representative types have been selected for quantitative assessments of the effects of their possible use.

6. BASES OF THE ESTIMATES OF CASUALTIES

The actions and toxicites of the chemical warfare agents considered are reasonably well known. For many, there are generally agreed estimates of lethal doses, although it should be kept in mind that often these are based on assumptions concerning the relative susceptibility of different animal species, and that susceptibility varies between individuals. The clincal symptoms, the prognosis, and the general methods of treatment and prevention, if any, can be assessed from commonly available information.

The agents chosen for discussion as possible biological weapons are those whose clinical effects are well known; for some of them data on approximate infective doses by inhalation or ingestion are also available, either from published information about laboratory accidents or from studies in human volunteers. However, little is known about the susceptibility of man to artificial aerosols of infective agents, nor about the consequences of exposure to very high doses. This report is confined to a discussion of known agents with a wide range of infectivity and lethality. Other agents could conceivably be developed. In spite of these uncertainties, it has been considered useful to attempt to predict the range of immediate effects of the agents dealt with in this report.

It is considered unlikely that the general conclusions reached in this study would have been greatly modified if it had been possible to consult classified information concerning chemical and biological agents, although the assessments concerning the feasibility of their use in particular circumstances might have been made more realistic.

The estimates of casualties recorded . . . are based on the number of individuals within a segment of a particular population group exposed to a given chemical or biological agent. The assumptions made . . . deal with delivery, dissemination, and persistence of the agents; meteorological conditions; effective concentrations and doses; human infective doses, attack and case fatality rates; and chemotherapy. . . .

In the detailed analysis of hypothetical attack with tularaemia, pneumonic plague, and VX, the effects of the availability and use of health facilities on the outcome are considered. . . .

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[3] In lower doses, such agents can cause severe and sustained disability and certain of them may act predominantly in this way when employed in combat.

[4] No sharp line of demarcation can be drawn between lethal and incapacitating agents used in chemical and biological warfare, because incapacitating agents can be lethal or permanently disabling under certain circumstances (e.g., in the presence of malnutrition or pre-existing disease; in infants or the aged; or when there is exposure to unusually high doses, as in enclosed spaces or in close proximity to functioning chemical or biological weapons). For similar reasons, no sharp demarcation line can be drawn between harassing agents and other antipersonnel chemical agents; furthermore, harassing agents may be used in war in conjunction with high-explosive, fragmentation or other weapons to increase the lethal effectiveness of the latter—as distinct from their employment in riot control in order to reduce injuries and to save lives.

The estimates of casualties . . . are applicable to a surprise attack on an urban area that possesses no specific protection against attack with chemical and biological agents, and in which the buildings are freely ventilated. It will be seen that even where the target area is not very densely populated the effects of attack by a single aircraft could create health problems of unprecedented magnitude.

It is certain that the scale and effectiveness of an attack (and also the cost and feasibility) would depend upon military technology. To discuss this aspect in any depth is outside the terms of reference of this report. A limited attack on a civilian population using a pattern favouring the effectiveness of the weapons employed has therefore been chosen for consideration. In this way, it is hoped to illustrate the scale of the danger that could arise from the use of such weapons. Similar results could be produced by attacks on a larger scale if the circumstances were unfavourable for the pattern chosen.

7. LONG-TERM EFFECTS

A few general considerations regarding the possible long-term effects of chemical and biological agents should be noted. First of all, insufficient knowledge is available to allow reliable predictions to be made. In many cases, not much more can be done than to outline the various possibilities needing further study. Beyond that, there are problems of evaluation that, while still having a considerable technical component, also involve value judgements that are clearly beyond the scope of this report. For example, in comparison with the direct effects of a lethal chemical or biological attack, a limited risk of long-term harmful effects to health may seem relatively unimportant. On the other hand, the long-term effects of the military use of agents that are not directly lethal may be considered more important than their immediate effects. In the latter connection it should be kept in mind that non-military experience with disease-causing organisms and chemicals present in the environment may not be a good guide to the effects of those same agents under the quite different conditions and in the generally higher doses involved in their military employment.

Possible long-term health effects of chemical and biological warfare include (1) chronic illness caused by exposure to chemical and biological agents (see specific descriptions in Annexes 1 and 2); (2) delayed effects in persons directly exposed to chemical and biological agents; (3) creation of new foci of infective disease; and (4) effects mediated by ecological changes.

Delayed effects of direct human exposure

There is wide concern at present regarding the possibility that exposure to both infective and chemical agents already present in the human environment may cause harmful effects of a delayed nature. The effects of greatest concern are:

(a) *Carcinogenesis.* Both viral and chemical agents have been strongly implicated in the causation of cancer in man. Whether infection by any of the viruses contemplated for possible military employment can be carcinogenic in man is not at present known. A limited amount of information is available on the ability of certain classes of chemicals to induce cancer, mainly in experimental animals. For example, many alkylating agents have been found to be carcinogenic. Some compounds of military interest, such as mustard, CS, and others, are alkylating agents . . . there is evidence suggesting a significant increase in respiratory tract cancer among veterans exposed to mustard gas in the First World War, and a large increase in such cancers has been reported among workers engaged in the manufacture of mustard gas in the Second World War.

(b) *Teratogenesis.* Certain chemicals and infective agents can cause severe damage to the developing human foetus. Thalidomide and the rubella virus are particularly well known teratogens. It is not known whether any agents likely to be used in chemical or biological warfare would have teratogenic effects at the doses likely to be received by pregnant women in civilian populations under direct attack with or unintentionally exposed to such agents during wartime. In this regard, it may be noted that the use of 2,4,5-trichlorophenoxyacetic acid, an anti-plant chemical that has been extensively used for both military and non-military purposes, has recently been restricted by the United States Government because experiments have shown that relatively high oral doses of this compound are teratogenic in mice and rats.

(c) *Mutagenesis.* Until recent years little attention has been given to the possibility that infectious diseases or chemicals in the environment might cause detrimental alterations in the human genome. Several chemicals are known to induce such changes in experimental organisms and in cultured human cells. Infection with certain viruses causes extensive chromosome breakage in man, but it is not known whether any heritable effect results. At least in the case of measles, it can be said that genetic damage is not massive, although the induction of a lower but nevertheless significant frequency of mutations cannot be excluded.

New foci of infective disease

As discussed in Annex 2, biological warfare would entail a risk that new foci of infective disease might be established, either in human populations or in lower animals, including vector arthropods. This possibility has been discussed in the United Nations report:

"A bacteriological (biological) attack might lead to the creation of multiple and densely distributed foci of infection from which, if ecological conditions were favourable, natural foci might develop in regions where they had previously never existed or in areas from which they had been eliminated by effective public health measures."

Effects mediated by ecological change

The possibility of the direct establishment of new foci of disease has been referred to immediately above. New foci might also be established as the result of ecological changes following the use of biological agents infective for man and animals. This possibility has also been discussed in the United Nations report:

". . ., the large scale use of bacteriological (biological) weapons might reduce populations of susceptible wild species below the level at which they could continue to exist. The elimination of a species or group of species from an area would create in the ecological community an empty niche which might seriously disturb its equilibrium or which might be filled by another species more dangerous to man because it carried a zoonosis infection acquired either naturally or as a result of the attack. This would result in the establishment of a new natural focus of disease."

As for anti-personnel chemical warfare, it can at least be said that the massive dissemination of several chemical agents during the First World War has not apparently caused any major long-term ecological damage in Europe.

However, new foci of human disease may also be produced as a result of the use of anti-plant agents. Extensive damage to the flora over large areas may create conditions favouring the establishment of new vectors or reservoirs of disease infective to man. One example of the way in which damage to plant life can create new health hazards is cited in the United Nations report:

"When a forest in a state of ecological equilibrium is destroyed by cutting, a secondary forest regenerates, which contains fewer species of plants and animals than were there originally, but larger numbers of those species which survive. If secondary forest is replaced by grassland, these changes are even more marked. If one or more of the animal species which increases in numbers is the host of an infection dangerous to man (a zoonosis) then the risk of human infection is greatly increased. This is exemplified by the history of scrub typhus in south-east Asia, where the species of rat which maintains the infection and the vector mite are much more numerous in secondary forest, and even more so in grassland, so increasing the risk of the disease being transmitted to people as forest is cleared."

Finally a profound long-term adverse effect on human health could result from any major reduction in the quality or quantity of the food supply. This could occur directly from the use of anti-crop agents or indirectly through ecological changes that might result from chemical or biological warfare.

8. SUMMARY

A. Qualitative considerations

Chemical and biological agents that might be considered for possible use in warfare are described . . . and pertinent assumptions and other background factors are considered earlier in this text . . . Also of importance, although more difficult to assess, are the possible long-term effects referred to . . . and the

psychosocial consequences associated with the problem of chemical and biological weapons. . . .

The rapid action of the lethal *chemical agents* . . . . would preclude any large reduction of mortality by specific treatment. Possible protection by gas masks or shelters requires a highly disciplined and prepared population, a condition that is not fulfilled in most countries today, and it would pose serious economic and psychosocial problems if such a defence programme were to be implemented.

The outstanding characteristics of *biological weapons* . . . . for potential use in warfare are the following:

(*a*) The large variety of biological agents and the possible combinations available for such purposes.

(*b*) The possibilities for manipulating currently circulating strains of micro-organisms for warfare purposes, by producing antigenically modified or antibiotic-resistant types (tularaemia, plague, anthrax, influenza) that would by-pass available prophylactic or therapeutic procedures.[1]

(*c*) The unpredictability of the direct effects. A biological attack intended to be highly lethal might prove relatively ineffective, whereas an attack intended to be merely incapacitating might kill an unexpectedly large proportion of the target population. Also, certain agents (anthrax, coccidioidomycosis) could persist for long periods in a resistant spore form, which could be spread over very large distances by wind carriage in the course of time.

(*d*) The unpredictability of secondary effects such as the likelihood of contagion and the danger that epidemics might be initiated. There is the additional danger that epidemics might occur unintentionally through escape of virulent strains being purposely sought in laboratories.

(*e*) Although biological agents themselves are easy to produce, complex production and delivery systems are needed if even minimal reliance is to be placed on the outcome of an attack, except perhaps where the intention is simply to produce social disruption by a limited sabotage effort (e.g., smallpox).

Of the above characteristics, (*a*) and (*b*) would favour the attacker, whereas (*c*) and (*d*) would reduce the value of biological weapons from a military point of view.

B. Quantitative estimates (Tables 8, 9 and 10, Annex 3)

1. Assessments have been made of the primary effects of possible small-scale airborne attacks on cities of 0.5–5 million population in industrially developed and developing countries. The postulated mode of attack consisted of one or a few bombers dispersing specific chemical or biological agents along a 2-km line perpendicular to the direction of the wind. On the basis of the particular assumptions employed, the following conclusions have been reached:

(*a*) Of the known chemical warfare agents, only the nerve gases, and possibly botulinal toxin, have a casualty-producing potential comparable to that of biological agents.

(*b*) Under atmospheric conditions favourable to the attacker, an efficiently executed attack on a city with 4 tons of sarin (requiring some 15–20 tons of weapons) could cause tens of thousands of deaths in an area of about 2 km^2. Even in unfavourable conditions there could be thousands of deaths. If 4 tons of VX were used in such an attack, the casualties would not be appreciably greater in unfavourable meteorological conditions, but in favourable conditions this small attack would affect an area of about 6 km^2 and could cause anywhere between 50,000 and 180,000 deaths.

(c) If a suitably stabilized botulinal toxin or a fine aerosol of VX (particles of 5μ diameter) were developed and 4 tons were employed, several hundreds of thousands of deaths could result because of the greater coverage possible with such agents—12 km^2 for botulinal toxin and 40 km^2 for monodispersed VX aerosol. A larger total weight of weapons, perhaps 2–3 times that needed for the agents in (*b*) above, would have to be used to deliver these forms of botulinal toxin and VX.

(*d*) If a biological agent such as anthrax were used, an attack on a city by even a single bomber disseminating 50 kg of the dried agent in a suitable aerosol form would affect an area far in excess of 20 km^2 with

[1] Mass immunizations would be of doubtful protective value because of the multiplicity of agents and strains that might be employed, quite apart from the adverse immunological side-reactions to be expected.

tens to hundreds of thousands of deaths. A similar attack with any one of a number of other more labile biological agents could affect from 1 km^2 to more than 20 km^2, depending upon the agent used, with tens to hundreds of thousands of casualties and many thousands of deaths.

2. Limited sabotage of a communal water supply with the typhoid fever bacillus, LSD, or a stable botulinal toxin, could cause considerable disruption and deaths in a large city . . . affecting tens of thousands of people.

3. Sabotage-induced or open attacks, causing the secondary spread of epidemics of yellow fever, pneumonic plague, smallpox or influenza, might under certain conditions ultimately result in many millions of illnesses and deaths. . . .

4. The numbers of potential casualties and deaths recorded in this report represent the possibilities arising out of a very small and limited attack already well within the capabilities of a number of nations, with the possibility that an ever-increasing number of countries will acquire similar capabilities. With technologically advanced weapons and a larger scale of attack, achievable without too much difficulty by militarily advanced powers, the magnitude of destructiveness attendant upon the use of chemical and biological weapons would be considerably increased.

9. IMPLICATIONS FOR THE WORLD HEALTH ORGANIZATION AND ITS MEMBER STATES

According to Art. 2(*c*) of WHO's Constitution, WHO shall ". . . furnish appropriate technical assistance and, in emergencies, necessary aid upon the request or acceptance of Governments". The use of chemical and biological weapons would unquestionably result in extensive health and medical emergencies, including mass illnesses, deaths and epidemics, that WHO might be called upon to help overcome. An attempt to assess the magnitude of public health problems with respect to a minimal attack with selected examples of agents (tularaemia, plague, VX) is contained. . . . This limited assessment, supported by analyses made in other parts of this report and in the United Nations report, reveals the very large and essentially wasteful effort that would be involved in undertaking elaborate measures for defence against specific agents. Also, as pointed out . . . such measures could well add credibility to projected fears of annihilation in other countries. The resultant reciprocal fears between nations might contribute in turn to a proliferation of chemical and biological weapons and an accelerated arms race, resulting in vastly increased danger of accidental or deliberate release of chemical and biological agents.

Certain measures could, however, be taken within the framework of existing needs and resources that would redound to the benefit of health and preventive medical activities currently underway, and would not give rise to fears of this kind. These measures include the improvement of rapid detection and diagnostic facilities for air pollution and for communicable diseases, which would obviously be of value for health and laboratory services in general; improved medical management for natural disasters, including decontamination procedures; and the wider use of safety features in buildings (ventilation filters) and for communal water supply systems. . . . While such measures might act as a partial deterrent to irresponsible groups and might significantly reduce casualties from a very small attack or from the spreading effects of an attack on a neighboring country, they cannot be relied upon to afford major protection to a country subjected to a determined attack.

As long as chemical and biological research directed specifically to military use is continued, it will be considered necessary by some countries to continue research towards detection of and protection against such agents. This research could in itself point to agents more destructive than those now existing. In view of the power of existing agents in conditions favourable to their use and the possibility of developing new and even more dangerous weapons, it is imperative to find ways of abolishing any presumed need for this militarily orientated research as soon as possible.

It is therefore clear that in the last analysis the best interests of all Member States and mankind in general will be served only through the rapid implementation of the resolutions on chemical and biological warfare adopted by the United Nations General Assembly and the World Health Assembly . . . and through any additional steps that would help ensure outlawing the development and use in all circumstances of chemical and biological agents as weapons of war.

Finally, there is the possibility that WHO might be called upon by the United Nations to help deal with allegations of use of chemical and biological weapons between nations and to assist in the limitation of chemical and biological weapons, and disarmament. The technical resources of WHO [1] could contribute greatly to the resolution of many of the difficulties that are associated with these problems and are now being discussed within the framework of the United Nations.

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[1] An example of such technical resources is the collection of epidemiological information on communicable diseases that has been made by WHO for many years, through its serum banks and its surveillance programmes involving specific diseases. This information provides an invaluable background and potential for determining changes in communicable disease patterns, as well as for obtaining knowledge of diseases already existing in a community. Apart from its general epidemiological value, expansion in the accumulation of such data could be very useful for investigating any possible future allegations of use of biological weapons.

APPENDIX E

Proceedings of the Conference on Chemical and Biological Warfare, Sponsored by the American Academy of Arts and Sciences and the Salk Institute, July 25, 1969, House of the Academy, Boston, Mass.

FOREWORD

Both the American Academy and the Salk Institute believe that the level of understanding of public issues is raised through non-partisan research, discussion, and analysis of questions of public policy. The resolution of such issues should be left, of course, to the public through its official representatives in Congress and the Administration.

Accordingly, the Academy and the Institute are pleased to make available this transcript of a conference on chemical and biological warfare, held at the House of the Academy, July 25, 1969. Among those invited to the conference were a number of scholars representing various disciplines which are involved in research and development on chemical and biological weapons, international lawyers, political scientists, and students of military strategy and disarmament.

We feel that the ensuing discussion was a penetrating and illuminating review of the important issues with regard to policy on chemical and biological weapons. The views expressed are the views of the participants, and neither organization endorses or supports any particular conclusion or policy recommendation, nor does either organization have any mechanism for endorsing the results of such a study.

Joseph E. Slater,
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Conference Secretary: Alexandra Oleson, Staff Associate, The American Academy of Arts and Sciences.

Introduction

Slater. It is a great pleasure to welcome the authority, responsibility, and activism represented at this meeting on the vital issue of chemical and biological warfare. The interest of The Salk Institute in this subject centers on our desire to identify specific areas where more research and work needs to be done and to develop briefings on these important matters for the leadership elements of our society. The pros and cons of issues can be brought forward and made the basis of an intelligent debate within the society. We also hope that the debate this group helps engender will result in some sound, concrete recommendations.

This is a propitious time for an intensive study of chemical and biological warfare. There is now a better chance to see movement in this area realized in the next few months than at any time in many years. As a result of this meeting and of recommendations that emerge from it, a program should be developed to increase the debate around the country on this subject and also to get some experience for educational efforts, generally concerning the implications of modern biology on society. We should determine how and where biological knowledge can help solve some of the most pressing international social and humanistic problems we face.

Meselson. This meeting is the result of discussions among Joseph Slater, John Henahan, Paul Doty, John Voss and myself. We feel that it is an opportune time for a meeting on this subject. Several things have happened recently to make necessary some important policy choices about chemical and biological weapons. There is the resolution of the United Nations General Assembly of December 5, 1966 which supports the Geneva Protocol and invites nations which have not yet ratified it to do so. There is the recently issued United Nations report on the effects of CB weapons. There is the United Kingdom Treaty presented two weeks ago at the ENDC that would prohibit the possession of germ weapons. And there is the review that has been ordered by the new Administration and the important fact that it is a new administration.

There is clearly a great deal of congressional and public interest, stimulated not only by the dead sheep in Utah and by the plan to ship obsolete nerve gas bombs across the country, but also by a growing and genuine interest in the Congress and in the press regarding the aims of United States CBW policy, the importance of the Geneva Protocol and other basic matters. We are heading for a time perhaps before the year is up, when important choices will have to be made.

Against this backdrop we saw a situation in which very few members of the arms control community had thought much about CB weapons. So we decided to arrange a small conference to begin to remedy the situation. We don't plan to reach consensus today—that is not our purpose—but we hope to lay some groundwork on which future consensus can arise.

THE CHARACTERISTICS OF CHEMICAL AND BIOLOGICAL WEAPONS

This presentation was to have been made by Ivan Bennett, Director of the New York University Medical Center and a member of the President's Scientific Advisory Committee. Unfortunately some pressing problems at the Medical Center have unexpectedly prevented him from being here—so I will try to fill in with a rather truncated presentation on the characteristics of CB weapons.

CHEMICAL WEAPONS

The United States has seven standardized gases. Actually, at room temperature and pressure, they are all liquids or solids, but they are called gases anyway. Of the seven, two are highly lethal. These are the organophosphorous nerve gases, VX and GB. Both are liquids. VX is the less volatile of the two and can contaminate an area for a period of days. It kills when deposited on the skin and when inhaled. It was VX that escaped during a test of an aircraft spray system at Dugway Proving Ground and led to the death of 6,400 sheep over an area of about 200 square miles. GB is more volatile than VX and is much less persistent in the field. It is primarily active by absorption through the lungs. GB kills within a very few minutes, VX somewhat less rapidly. GB is the German Sarin, one of a family of compounds developed in World War II by Germany but not used. VX was developed a few years after the war in Britain and elsewhere. These agents are hundreds of times more poisonous than the lethal gases used in World War I.

The next agent, designated HD, is the mustard gas of World War I, and is essentially obsolete. It causes blisters on the skin and takes a few hours to act. It can be used as a lethal agent if massively dispersed as an aerosol to be inhaled. Like VX it can contaminate an area for days.

The fourth standardized agent is BZ which is classed as an incapacitant. It enters the body through the lungs and interferes with normal mental and bodily functions. Its effects can last for several days after exposure.

The next three are classed as "riot control" agents although "harassing agents" would be a more accurate designation so far as military use is concerned. The first is DM or Adamsite. It was developed at the end of World War I. It is a member of a family of arsenical sternutators, several of which were used in World War I. DM causes intensely painful irritation of the upper respiratory tract (that being the definition of a sternutator), vomiting, weakness, and, in large quantities, death. The next agent is CN or chloroacetophenone, a tear gas developed at the end of World War I. Similar tear gases were used in great quantity in World War I. CN is the familiar police tear gas.

The third agent is CS, a more recently developed substance which can act either as a tear gas and sternutator, or, if finely enough powdered, can penetrate to the deep recesses of the lungs and act as a lung irritant. It is considerably more irritating than CN at the same concentration. It is not lethal when used in the open in police-type operations. Heavy exposures, as in confined spaces or after massive application, can kill.

All seven standardized chemical warfare agents are available in a variety of munitions. Unclassified information about them is contained in Army Field Manual 3-10, "The Employment of Chemical and Biological Weapons" the latest edition of which is that of March 1966. The munitions include hand grenades, mines, artillery shells, mortar cartridges, rockets, bombs and bulk disseminating devices for ground or airborne dispersal.

For the attack of cities, under meteorological conditions favorable to the attacker, approximately one ton of nerve gas munitions would be required per square mile of target area. This is comparable to atom bombs of the Hiroshima type, in terms of the weight of weapons required for the attack of a given area. However, meteorological conditions unfavorable to the attacker can decrease the area coverage by a factor of ten or more. Of course, future developments in the toxicity of chemical warfare agents could lead to a significant

increase in the area coverage capability of lethal chemicals, thereby enhancing their attractiveness as strategic weapons for non-nuclear nations.

Defense against all known chemical agents can be quite effective, but it requires advance warning, proper equipment and rigid discipline. Existing gas masks provide protection against all known antipersonnel chemical and biological agents except those chemical agents which act through the skin. A protective suit or a shelter of suitable design can protect against those.

Protective suits are extremely cumbersome. There are two kinds. The impermeable type is impossible to wear in warm weather for any length of time. The permeable type is coated with materials that react with chemical agents and is also cumbersome but can be worn for a longer time in warm weather.

The problems associated with detection of chemical weapons are still serious in the sense that it is not wise to expect an alarm in time to don protective equipment. In the field, in a chemical war, it would almost certainly be necessary to wear protective equipment all the time.

The complexity of decontamination and defense is very great. Tactical chemical warfare enormously complicates ones own operations and has rather little predictable utility against an enemy that can protect himself and retaliate in kind.

Biological weapons

Biological weapons have the capability of covering large areas with much less weight of agent than that required for chemicals. For example, Field Manual 3–10 states that a single fighter plane spraying a lethal biological agent could cause fifty per cent mortality over an area of 300 square miles. This is hundreds of times the area that could be attacked with the same quantity of nerve gas. Protection of civilians would be a massive undertaking. The population would have to be disciplined to use masks or to go into shelters upon appropriate warning.

Two or more days would pass before the casualty effects of biological weapons occur so that, generally speaking, these weapons wouldn't have any use in close fighting. The mode of attack most commonly envisaged would employ an aerosol cloud to be inhaled by the target personnel. Such a cloud can be created by a variety of munitions including spray tanks or bomblets dispersing either liquid or powdered biological material.

A variety of diseases can be contemplated for use as weapons. Very little is known about the effects when administered through the pulmonary route in man because that is not the route by which most diseases are normally contracted. Among the diseases discussed in the UN report is anthrax. If dispersed and inhaled by a target population it could be highly lethal.

There are other diseases that should be less often fatal if inhaled. For example, Venezuelan equine encephalitis is a disease normally transmitted by mosquitoes and not often fatal. If the course of the disease when inhaled were the same as its course when transmitted by mosquitoes, then one would expect a case fatality rate of perhaps a per cent or less. But the effects of exposure to a military BW aerosol cannot be predicted with any confidence. That is a property of biological weapons in general: it can't be said with any confidence what will be the percentage of infection and what will be the fatality rate following the exposure of a human population to an aerosol attack. There are too many variables and no directly applicable experience.

AGENT CS

I'd like to return to the consideration of the so-called "riot control" agents, and particularly the one called CS. The letters stand for the names of the American chemists who first reported its synthesis in 1928, Corson and Stoughton. The material was developed for use in riot control by the British in the 1950s and has been used by British colonial police forces on numerous occasions to disperse demonstrators.

It is massively used in Vietnam. When its use in Vietnam came to the attention of the press in 1965, the Secretary of State and other officials of the Administration said that it would be used only in riot control situations or situations analogous to riot control and that it would not be used in ordinary military operations. Yet what has happened in Vietnam is very far beyond the originally announced policy, as I shall describe.

CS is a solid, not a gas. When dispersed as fairly large particles, 60 microns or thereabouts, it is largely filtered out before it reaches the depths of the lungs. In that form, it irritates the upper respiratory tract and it irritates the eyes.

However, if the particle size is made sufficiently small, about one to ten microns, it penetrates to the deep recesses of the lungs, and this is very much more painful. The material used in Vietnam is of the latter type. Some CS is used in Vietnam in order to reduce the use of lethal conventional weapons when civilians are mingled with enemy soldiers. But relatively little is used in this manner. From our point of view, the most serious use of CS, that which comes closest to lethal gas warfare, is its employment to force personnel from protective cover and thereby enhance the lethal effects of conventional high explosive weapons. High explosive munitions are sometimes unable to kill dug-in military personnel. If they are not dug-in too deeply, CS can make unmasked men leave cover and become vulnerable to bomb bursts, artillery strikes, and flame weapons. This use of CS in Vietnam has grown very rapidly since 1965.

SLATER. This is what goes in caves and bunkers?

MESELSON. Yes, CS is used to drive persons from caves and bunkers.

SLATER. And that comes under the rubric of riot control?

MESELSON. It has escalated far beyond anything that could be called riot control. It has escalated basically in three dimensions. The first is the quantity employed. The amount procured and used by the Army since 1964 is fourteen million pounds. Some rough comparisons show that it is a very large amount. The total tonnage of mustard gas used in World War I by both sides was about twenty-four million pounds, so this amount of CS is a little more than half that total. The amount of CS used in the last fiscal year was about six million pounds, almost half the total for the period 1964–1969. Thus, the rate at which it is being used has been rising quickly. If disseminated in its micropulverized form by the Army's helicopter-mounted M5 disperser, the amount required to cover four-tenths of one square mile is fifty pounds. The micropulverized CS that we have purchased for use in Vietnam adds up to about nine million pounds, an amount sufficient to cover about eighty thousand square miles, using the M5. This is a little more than the total area of South Vietnam which is sixty-six thousand square miles. This is not to say that we have covered all of South Vietnam with CS, or that we have even covered that area in multiple use. Indeed, the M5 disperser is more efficient for disseminating CS than are numerous other munitions and devices which are also used in Vietnam. However, this is one of the simplest rough indications I could come up with to illustrate that a large amount has been used.

Major escalation has also occurred in the way in which CS is used. It is now being used mainly for purposes that are very different from riot control. This has been indicated by the rapid development of munitions for dispersing CS. Army Training Circular 3–16 issued in April, 1969 is entitled "The Employment of Riot Control Agents; Flame, Smoke, Anti-plant Agents, and Personnel Detectors in Counter-Guerrilla Operations." It illustrates the very rapid development of new munitions for the dispersal of CS. It is important because it reflects the fact that, for the first time since World War I, gas weapons have been integrated into ordinary military operations. The previous edition of TC3–16, issued three years ago, listed only CS hand grenades, a projector for hurling them some distance, and three bulk disseminating devices that can be mounted on vehicles or on slow-moving aircraft. The new addition lists eighteen new munitions covering the entire range of tactical weaponry. There are grenades, mortar shells, rockets for both single and multiple launchers, 105–mm and 155–mm howitzer projectiles, with ranges up to 15 km, and bulk dispersers and various types of aircraft bombs and bomblet dispensers with ratings up to 1000 lbs.

The third kind of escalation which has taken place involves the nature of the agent itself. Powdered CS has been made relatively moisture resistant by treatment with silicone compounds. This enables it to remain active for several weeks in the field. If a wind comes up or activity occurs on the ground, it is reintroduced into the atmosphere. This modified CS is called CS–2. Since 1968 nearly all powdered CS procured for Vietnam has been CS–2. It is used on a large scale for purposes of territory denial in support of regular military operations.

SWYTER. May I add that last year about three quarters of the six million pounds of CS was essentially used to kill people. It was used to make ordinary conventional artillery and bombs more effective, rather than for any kind of humanitarian purposes, no matter how far you push the definition of humanitarian.

GALSTON. Would it be appropriate merely to insert a footnote here. You have not discussed herbicides which are chemical weapons in widespread use in Vietnam today. They tend not to be discussed in the same context as the weapons that

you have just been talking about because they are not poisonous to humans or to animals, but they can produce very widespread consequences for the area which is dosed with them, and they need to be discussed.

MESELSON. I left them out because we plan to ask you to speak about them a little later.

FELD. Napalm generally seems to be excluded from discussions of chemical weapons. Can you give the rationale for that?

MESELSON. Chemical agents work because of their irritant or toxic action on human beings, plants or crops. Napalm and other flame weapons exert their effect primarily by heat.

EDSALL. It is perhaps fair to point out that nuclear weapons, insofar as they produce fallout, are also chemical weapons. Strontium 90 and other such things are poison, although one does not think primarily in these terms about nuclear weapons.

LURIA. In talking about chemical weapons you listed those which you say have been standardized. This presumably means they have been prepared, stockpiled, and deployed in one way or another.

MESELSON. Yes.

LURIA. What is known about such things as toxins?

MESELSON. I know of no information in the open literature as to whether or not there are any standardized toxins.

LURIA. One more question. Would it be correct to say that, for example, a toxin is a potential weapon that would be anti-population rather than anti-military personnel, in general? Would it presumably have to be dispersed over reservoirs?

MESELSON. Toxins could be dispersed as an aerosol to be inhaled by the target population. They could be used against civilian populations or against soldiers, although the latter would be easier to defend. The stability of the toxin would be very important. Under laboratory conditions, some toxins are more toxic than VX by perhaps a factor of a hundred. If this toxicity could be maintained under military conditions, toxins would certainly qualify as strategic weapons. Toxins are sometimes defined as chemical agents and sometimes as biological ones. The United Nations report calls toxins chemical agents. U.S. field manuals describe them as biological agents. Toxins are poisons produced by living organisms but they are not themselves alive.

NEWMAN. Is there any relation to the materials used in capital punishment?

MESELSON. Cyanide gas was of interest to the French years ago as a war gas.

NEWMAN. I was interested in why you left out the death camps in your testimony.

MESELSON. Because I didn't see them as part of the arms control problem.

NEWMAN. Is it only myth that gas was used in the Warsaw ghetto?

MESELSON. I don't know. I have never heard that.

NEWMAN. I haven't been able to trace it, but it is in Uris's novel.

MESELSON. You notice that the use of gas in the death camps in Germany is mentioned in the United Nations report.

NEWMAN. Some of the blacks were talking about it. That is why I brought it up.

MESELSON. I see. The Geneva Protocol which will be discussed by George Bunn proscribes the use of CB weapons only in war.

SLATER. I have two questions but they may fall under the third point. First, could you characterize the trend of development of these weapons, and second, could you describe the attitude of the military toward their development and use.

MESELSON. In the 1950s we produced a lot of poison gas munitions. The munitions that were to be dumped in the ocean earlier this year afford an example. These included about twenty-two thousand M34 cluster bombs, each with seventy-six small GB nerve gas bombs inside. The M34 cluster bombs are one of about twenty standardized poison gas munitions listed in the current field manual. Whether or not the others are stockpiled in that quantity is not stated there. It has been stated on an unclassified basis that certain munitions are still being filled with nerve gas at Rocky Mountain Arsenal, and that bids have been solicited for the development of new kinds of lethal nerve gas munitions. As for military attitudes toward gas, we should hear more about that later on today.

SLATER. Why are they now disposing of the M34 cluster bombs?

MESELSON. They are still functional weapons, but they are unsuitable for dropping by high speed aircraft.

SLATER. How stable would they be if they were merely stored?

MESELSON. Almost as stable as they were at the start. The leakage rate has gone up a bit through the years since they were made.

SLATER. Then why, even from the public relations point of view, is there all this fuss about whether they are dumped in the Atlantic or Colorado or Utah?

MESELSON. Mainly because of the concern that if these munitions are shipped by rail and then dumped in the ocean, the gas might come out. These are munitions with explosives in them, so it is conceivable that one of the 1.6 million bomblets might go off. Sympathetic detonation might then set off the neighboring bomblets in a railway car or in the hold of a ship. They can be destroyed much more safety right at Rocky Mountain Arsenal.

DOTY. We probably ought to stop at this point and proceed to George Bunn but there will be time for more questions later.

INTERNATIONAL LEGAL HISTORY OF CHEMICAL AND BIOLOGICAL WARFARE PROHIBITION

BUNN. I am going to give a bit of a chronology of the legal history of gas and bacteriological warfare. The first and really major use of chemical weapons was in World War I. Minor uses since then (putting aside the Vietnam experience) include Ethiopia and Yemen. The Japanese used chemicals against the Chinese early in World War II, at least there is some indication of that from Russian war crimes trials of the Japanese. There has been no major use of biologicals in war, although it is said that brave Lord Jeffrey Amherst shipped contaminated blankets to the Indians.

INITIAL INTERNATIONAL AGREEMENTS ON GAS AND GERM WARFARE

The history of man's attempts to deal with this problem is a long one. At the Hague Conference in 1899 a declaration was drawn up which required the countries that adhered to it to abstain from the use of projectiles the sole object of which was the diffusion of asphyxiating or deleterious gases. The Hague Declaration was relevant during World War I. Probably the first use of gas during World War I was by the French and it was tear gas on a small scale. The French police had been using tear gas for some time, and it is said that some policemen brought their grenades to the front lines and experimented with tear gas. The French, of course, said this was not deleterious or asphyxiating and therefore did not violate the 1899 declaration.

The first major use of lethal gas in World War I was the German chlorine attack. Germany took the view that since the containers from which this gas was released were merely big cylinders sitting on the ground, they could not be considered projectiles as defined in the declaration. The net result was that the declaration was brushed aside and had very little impact on the use of gas during the First World War. At the end of the war, the blame for all of this was placed on Germany and in the Treaty of Versailles Germany was prohibited from manufacturing, importing, or using poison gas. The phrase used to define the main prohibition in the Versailles Treaty is the same phrase used in later treaties including the Geneva Protocol: "asphyxiating, poisonous or other gases," and there is some added language about "analogous liquids, materials, and devices." It is this language that has led some to question whether tear gas is prohibited under the Protocol. The French text of both the Treaty of Versailles and the Protocol contains the word "similaires" in place of the word "other" but there is no record that the draftsmen at Versailles recognized any difference in meaning between the two terms. Whether "other" and "similaires" include tear gas is not clear.

At the time it did not look as if the Treaty of Versailles was intended to preclude tear gas to the Germans but the negotiating history is very unclear, and the later treaties did not clarify the issue. In 1922 there was another treaty which was the outgrowth of a period in history much like the present, I think, in that there was a big argument over the military budget. The country was fed up with war and with militaristic views; in those days it was ships rather than missiles that were the big item in the military budget. A major argument over the cost of building more ships centered on the naval appropriations bill for the year ending July 1, 1922. During this debate the Senate made clear its views on the mounting cost of Navy shipbuilding. Senator Borah who was a member and soon to be Chairman of the Foreign Relations Committee introduced an amendment into the appropriations bill which authorized and requested the Executive

Branch to invite Great Britain and Japan to a conference charged with reaching an agreement to limit ships, and thereby to reduce the military budget. This conference produced the 1922 Washington Treaty on submarines and noxious gases. The chairman of the American delegation to that conference was Senator Elihu Root. Secretary of State Hughes and President Harding made an effort to secure a great deal of support for the treaty from around the country, and it went through the Senate without a dissenting vote.

Between 1922 and 1925 there was a conference of experts similar to the one Ivan Bennett has just attended as the United States representative. This group of experts discussed tear gas and other irritating agents. They indicated that tear gas was then in use by the police to control riots of the domestic population but it is unclear from the experts' report whether or not they felt tear gas should be prohibited in war. They also discussed anti-plant herbicides, that is, gases or biologicals that might be used against plants. None of the experts were aware of any chemicals that might be injurious to plants; they indicated that all the chemicals they knew about would work only on people. In addition, most of them could see no bacteriologicals that could affect plants. Professor Cannon of the Harvard Medical School, however, visualized that parasites might be dropped from airplanes so the experts' report did at least raise the possibility of anti-plant biologicals.

THE GENEVA PROTOCOL OF 1925 AND ITS EFFECT ON THE PRACTICES OF GAS AND GERM WARFARE

In 1925 there was a subsequent conference, in Geneva, dealing largely with trade in weapons. The American delegation again raised the question of a prohibition on gas, because by this time it was apparent that the French were not going to ratify the 1922 treaty, not because of its provisions on gas but because of its provisions on submarines. As a result, the 1925 Geneva Protocol was adopted. It included the same language as the Versailles Treaty on chemicals and, at the suggestion of the Poles, there was added a broad ban on bacteriological warfare. However, Secretary of State Kellogg and President Coolidge did not make the same effort to mobilize public opinion that Secretary Hughes and President Harding had done earlier, and the Senate failed to ratify the Geneva Protocol. I think the temper of the country had changed some. The fact that a Senator did not head the delegation probably made a difference from a Congressional relations point of view. To Senators on the Senate Foreign Relations Committee a member of the House heading the delegation must have seemed a terrible thing. The Army's Chemical Warfare Service mounted an intensive campaign against the treaty and was permitted to do so. The American Legion, the VFW, the American Chemical Society and the chemical industry all were heard against it. Senator Wadsworth who was chairman of what was then called the Military Affairs Committee rather than the Armed Services Committee led the attack against the treaty in the Senate. Finally, the Chairman of the Foreign Relations Committee withdrew the treaty from Senate consideration. The proponents must have realized they lacked sufficient support to assure passage and the matter was never put to a vote. Subsequently, when Senator Vandenberg took over as Chairman of the Foreign Relations Committee and was cleaning up the docket of old treaties that were never acted upon, he asked the Executive Branch to take them back. They were, in fact, returned to the other end of Pennsylvania Avenue.

In any event, the 1925 Protocol came into force without the ratification of the United States. It now has over 60 parties, including all members of NATO except us, all of the Warsaw Pact members, all the European countries except Albania, and all nuclear powers (including China) except the United States.

In 1930 there was an attempt by the United Kingdom to resolve the question of tear gas. The British sent a memorandum to a number of countries stating that, in their views, tear gas was prohibited by the Protocol. The French took the position that the English and French texts were identical in meaning and that tear gas was prohibited in war. Ten other countries agreed with the British position. The United States was the only country to disagree. I think the reason was largely that, at this point in time as now, people did not want to preclude the use of tear gas by police. Even though the Protocol fairly clearly prohibited the use of gases in war and said nothing about what you could do at home on your own population, the American delegation maintained that it made no sense to prohibit the use in war of materials that could be used on your own population.

Many of the countries at this conference took no position at all, and the question was left open.

During the disarmament conferences of the thirties, there were attempts to devise another prohibition on gases which would be part of a larger arms treaty. Finally, toward the end of those discussions, the American delegation declared that it was prepared to go along with the prohibition on tear gas in war provided it could still be used by the police on our own population. But the disarmament conference came effectively to a halt in the thirties when Germany withdrew. No agreement was reached.

As you know, gas was not used during World War II. There has been a debate as to whether it was the Protocol or the fear of retaliation which was the significant factor preventing the use of gas. I think they were both important. You had to have a rule beforehand. The fear of retaliation was no doubt the sanction but the Protocol itself established the norm. At the very beginning of the war, the British, French, Italian, and German governments exchanged pledges to observe the Protocol during the war. Japan, the only other major industrial country besides ourselves which was not a party to the Protocol, replied evasively to the UK request and did not join the pledgers at that time. As I indicated, Japan was believed to have used gas against the Chinese. In any event, in the early forties, shortly after we got into the war, the Chinese asked Roosevelt to issue a statement making clear to the Japanese that the United States would retaliate against Japan if Japan used gas on China. Roosevelt did issue such a statement in 1943. Then in 1944 the Japanese, using diplomatic channels, said they wouldn't use gas if we didn't, and thereafter, so far as I have been able to determine, it was not used.

Gas was not used in the Korean War although it has been reported that American field commanders did, in fact, request tear gas as well as stronger gases. In justifying the use of tear gas in Vietnam, the United States declared that it was not prohibited by the Protocol. We didn't take the view that we could use it because we were not party to the Protocol; we took the view that it wasn't prohibited by the Protocol—a view consistent with the position we had taken in 1930. We attempted to draw a line, particularly in the UN discussion, between the kinds of gases used in World War I (other than tear gas) and agents that governments around the world commonly used to control riots by their own people. That division would have justified the use of CN and CS, or at least the initial forms of CS, but not Adamsite which was used very briefly, I think, in Vietnam and which is essentially a respiratory irritant and a vomit-producing agent. The use of Adamsite was an escalation, a minor escalation perhaps, but of the kind that is likely when *some* gases are permitted. It was the kind of escalation that, in the thirties, seriously worried people who wanted the Protocol to be interpreted to prohibit all gases, including tear gas. At that time those countries that took the view that the Protocol should cover everything did so for one major reason: they believed that if the Protocol did not cover everything, there could easily be an escalation. As soon as you had some gas, it was hard to draw the line. It was a very simple thing to say just "no gases."

DOTY. In the discussions in the UN in 1966, was there any discussion of the crucial relationship between the use of such incapacitating gases and the increasing battlefield casualties? Was that point, which is now so obvious, ventilated at that time?

BUNN. Not much was said because, at that point in time, I believe that this kind of an escalation had not yet occurred. Since then there have been statements to that effect from the Soviets.

UNITED STATES POLICY REGARDING RATIFICATION OF THE GENEVA PROTOCOL

SLATER. Could you describe or characterize what has been the opposition in the last ten years or so to United States' ratification of the Geneva Protocol? What is the situation now?

BUNN. I speak as one who was trying for a long time within the government to get the Protocol submitted to the Senate again. All during the Vietnam War there has been a problem in that the U.S. really wanted to avoid discussions of gas warfare as much as possible because it was an embarrassing subject to us both at the UN and at the Geneva Disarmament Conference. Those who might have been sympathetic to submitting the Protocol to the Senate were concerned that the Foreign Relations Committee would use it as another springboard to attack U.S. policy in Vietnam which, I think, certainly would have happened.

And then there were other things that seemed more important. Last year, for example, there was a good deal of sympathy within the Arms Control and Disarmament Agency for submitting the Protocol to the Senate, but the nuclear nonproliferation treaty came first. There has always been something of that kind to submit first. Part of the Nixon review referred to earlier will be to determine whether or not the Protocol should be submitted to the Senate. A letter sent by the director of the Arms Control Agency to Congressman Richard McCarthy of New York contained the first announcement of this review including notice of the intention to include in this review a discussion of whether or not the Protocol should be resubmitted. There would still be a problem, I suspect, as far as the Foreign Relations Committee is concerned, although, if things are going a little better in Vietnam and soldiers are coming home, it may not produce the same kind of excitement it would have a year ago. As far as our debates in the UN are concerned, it is perfectly clear that they will continue whether or not we ratify the Protocol, and we would be better off if we were submitting it to the Senate than if we weren't.

SLATER. Why was this issue dormant between 1945 and 1960, before Vietnam?

BUNN. It wasn't completely dormant; there were some debates in the UN. I remember my first acquaintance with the subject in 1961. People were saying: "It is silly to submit to the Senate a treaty that was rejected in 1926; it is a very old treaty; it is out of date; and, in any event, the Senate will never ratify it." That was the feeling then. The people in the arms control business at that time would have been very happy if the United States had been a party to the Protocol because the fact that we were not was always a subject of criticism.

SLATER. Why would you assume that the Senate wouldn't ratify it?

BUNN. Just because they hadn't earlier.

SLATER. It was a whole different generation.

BUNN. True, but this was before people got into it very deeply. Han Swyter may know more about this: From the Department of Defense's point of view there would certainly have been opposition. At that time there was not the interest in gas warfare that there is now. There wasn't the popular feeling that may now influence the Senate to ratify it and might tone down DOD criticism now.

SWYTER. I think the military was against submitting the Protocol then. Military men oppose it today simply because it reduces our options, and, from their viewpoint, we shouldn't reduce our options. Today they would probably be willing to reduce our options if we were to get something useful in return, but they don't think we'd get anything useful by ratifying it, by discussing it at the UN, or by doing anything else.

BLOOMFIELD. I think that in the 1950s, from the State Department's point of view, the United States was faced with charges of germ warfare in Korea and this set up a kind of backfire against any U.S. initiative in reopening that subject. There was a very lively Soviet propaganda program that ran for about two years, from about 1952 to 1954, and included international investigations and committees of jurists. So there was a great disinclination on the part of people preparing position papers in State (where the business was at the time) to take any initiative in that area.

BUNN. Toward the end of that period, probably as a result of this, a resolution was introduced in the House by Congressman Kastenmeier who was concerned (after studying some DOD statements) that we were changing our policy from a no-first-use policy to one of holding open the option to first use. As a result of his resolution, President Eisenhower was asked in a press conference to comment on whether there was an attempt to change the United States "no-first-use" policy. President Eisenhower said that his own "instinct" was "not to start such a thing first" but that no recommendation on the subject had been submitted to him by his staff. Subsequently, the DOD and State both replied to the inquiry from the House Foreign Affairs Committee requesting their views on the Kastenmeier resolution. Both departments replied that these weapons were like other weapons in that we would not use them except in self-defense, that is, we would not use any weapons except in self-defense. In other words, they are in the same category as other weapons.

WIGGINS. May I interject one interesting thing on the UN report? This document which the Soviet representative signed is categorical acknowledgement that there is no clear evidence that bacteriological or biological weapons have been used since World War II, despite the fact that the Russians and North Koreans very aggressively made that allegation during the Korean War.

SLATER. Was the U.S. accused of using these weapons in Korea?

WIGGINS. Yes, we were actively accused by the Soviet Union and by Korea.

SLATER. What happened? That just fizzled out as a charge?

WIGGINS. Yes and it is acknowledged in the UN study released on July 2, 1969. There is no evidence that they were used, in spite of the hysteria with which this allegation was once made.

SLATER. I remember I was in Germany at a time when the United States was accused of dropping beetles on the potato crops in Eastern Germany. There was a joke around that that wasn't the case at all, that the crops were in such poor condition that the Americans were dropping potatoes on the beetles that were already there.

WIGGINS. I think it is very interesting that finally that allegation has been put to rest.

DOTY. Except for the Chinese position.

BUNN. Yes, the Chinese and North Korean authorities refused to let a UN investigating commission enter their territories to determine the truth of the germ warfare charges they had made against the United States during the Korean War.

GALSTON. You mentioned earlier that the American Chemical Society opposed the Geneva Protocol in 1925. If one can judge from editorials and other articles in such publications as *Chemical and Engineering News*, that attitude still prevails. On what is this opposition based? Is it simply that the profession doesn't want to see its skills demeaned in the art of waging war, or is it linked more closely to the industrial and profit aspects of the selling of chemicals?

BUNN. I am certainly not the one to answer that question. I would judge from reading the Congressional debates of 1925, the letters and so forth, that it is related to the interests of major industries. I don't think it is as important to industry now but maybe others who are chemists can speak to this question.

WATSON. I think there would be very strong lobbyists for this sort of reason.

MESELSON. I think it is a fraternity of people, some of whom have been involved with this, who don't want to look back on their previous activities as something that was wrong because they believed and do believe that they were patriotic and, in fact, that the weapons are relatively humane. I think it's that—a kind of old boy fellowship, which could exist in any organization. However, if a few very distinguished chemists were to speak up in favor of the other direction, it might change the thinking of others.

HENAHAN. As far as the editorial comment you are talking about in *Chemical and Engineering News*, I am sure that was the personal conviction of the man who wrote that piece and nothing else because I have had rather intense discussions with him about this.

DOTY. There is also the fact that the headquarters of the American Chemical Society in Washington built about ten years ago is the only building in Washington with gas proofing. . . .

FELD. With respect to the attitude in the United States toward the Protocol in the fifties, wouldn't you agree with my feeling that the negative attitude was related to the fact that there was an argument going on in the disarmament forum of the UN between the United States and Russia concerning the control of nuclear weapons? The Russians took the ban-the-bomb attitude while we were insisting that you couldn't have any agreement without some kind of controls, inspection, and so on. The Protocol has very much the aura of a ban-the-bomb kind of thing.

BUNN. I think that's a good point.

BLOOMFIELD. We used the phrase "other weapons of mass destruction" in that period to subsume chemical and biological weapons and radiological ones too, and just sort of lumped them all together with programs for controlling nuclear weapons. There was a lack of awareness of the special interests of this problem.

SCOVILLE. I think that came along a little later, the "other weapons of mass destruction". . .

BLOOMFIELD. I had the feeling that it appeared in some of our documents in the fifties but I'd have to check that.

BUNN. I know that Bernie Feld's point is true. I know when I first got into this business myself a lot of people spoke of the Protocol as something we certainly couldn't join because if we did that would pull the rug out from under us in all our arguments against "banning the bomb." It was a very strong feeling in those days.

SOHN. Throughout United States history since 1899 there has been a general trend toward consistently opposing any prohibitions on weapons which, to some extent, would affect technical skills, inventiveness, ability, and so on. I remember the instructions of our government for the Hague Conference in 1970: "Do not agree to anything that would inhibit the inventive genius of the American people." That applied to bombing from the air because airplanes might be something we would want to invent. Throughout the history of all the negotiations, there has always been that streak that maintains we are so much better at inventing new things or making them better that we should not put inhibitions on it.

MESELSON. That is certainly true, but I think it is accurate to describe it as a streak and not the entire picture because after all it was the United States which proposed the prohibition on gas in Washington in 1922. It was the United States which insisted on the Geneva Protocol in 1925, so I think there are really two very different elements there.

BADER. In my opinion, there is no "Vietnam problem" that would block careful consideration of the Geneva Protocol by the Senate Foreign Relations Committee if the Administration should decide to submit it. The Vietnam inhibition is not there at the moment, although it could build up depending on the course of the war.

BUNN. Perhaps within the next few months the Committee may submit a resolution requesting that the Protocol be submitted.

BADER. That becomes very complicated, but I don't think the Vietnam issue should scare off the Administration.

HENAHAN. How about increased riot usage of chemical agents? Isn't that an argument that comes up again with even greater force now?

BUNN. Hopefully we can instruct people that there is a difference between use in war and use at home. If the Executive Branch wishes to keep open the option to use tear gas in war, then there is no problem of using it at home. But if it is prepared to come around and prohibit it in the Protocol, it does not mean that it can't be used by police forces. Now I know that is a difficult concept for the average American citizen to grasp. A couple of Senators we have talked to have said it is just impossible to educate citizens to this distinction but I haven't given up.

WIGGINS. You mean making the distinction between military and civilian use?

BUNN. Yes, that it is prohibited to us something in war which you can use at home on your own students.

BLOOMFIELD. George, how about the middle ground of international peace keeping? Have the lawyers faced that one?

BUNN. I haven't seen any discussion of that.

WIGGINS. George, you might crawl behind the North Vietnamese description of the war in South Vietnam as an internal civil uprising. It isn't war, therefore, you are free to use it.

SWYTER. Let me add something to what Bill Bader said. I think there will be a strong reservation from the Defense Department regarding the ratification of the Protocol because of tear gas, CS—particularly as it is being used in Vietnam. When you ratify the Protocol you immediately have to face the issue of whether riot control agents, specifically CS, will be illegal. If it were illegal to use CS in combat, then the United States would immediately be in the position of having violated international law, or, at least if we were to continue, we would be violating something that we had agreed to. This makes us lose face, and there will be pressure from the Defense Department not to get into the issue certainly while Vietnam is going on. That will delay ratification for several years at least, and preferably forever because everybody knows that we have used CS in very great quantities in Vietnam. I think there will be a strong reservation on the part of the Administration on the question of ratification.

SLATER. Would the Defense Department try to separate BW from CW and say that we will agree to certain bans on BW but not on CW?

SWYTER. I don't know. On the basis of my own policy preferences I don't think the Arms Control Agency should let them do that. I think we ought to lump it all together, but this is an option that Defense has. I don't think they will take it. I don't think they will initiate it, but I think they would accept it as a compromise if somebody else suggested it.

RECENT HISTORY OF CHEMICAL AND BIOLOGICAL WARFARE PROHIBITION

BUNN. I will now say just a few words about recent events, including the use of herbicides in Vietnam. We justified this use in the UN and in statements by Secretary Rusk and Secretary McNamara on the grounds that the Protocol didn't

apply to herbicides because they involved the same chemicals and had the same effect as those used domestically in the United States and the Soviet Union and many other countries to control weeds and unwanted vegetation. This was similar to the tear gas justification: that the Protocol does not prohibit something which is used at home for civilian purposes. This might have justified the use of herbicides in Vietnam along roads to kill the cover which was being used by snipers or behind which the Vietcong hid and ambushed our troops. But there was an escalation again in the use of herbicides after this justification was made. Herbicides were then used to kill rice crops. This certainly doesn't seem to fit within the justification.

In 1966 there was also a UN resolution, voted for by ninety countries including the United States, which called for strict observance by all states of the principles and objectives of the Protocol, condemned all actions contrary to the objectives, and invited those who had not yet joined the Protocol (most importantly the United States and Japan) to do so. The U.S. representative said that we supported the principles and objectives of the Protocol and that the Protocol didn't apply to tear gas and herbicides. The U.S. representatives said each nation had to decide for itself, through its own constitutional processes, whether to ratify the Protocol if it had not yet done so. At that point in time, people weren't at all sure that the Protocol should be submitted to the Senate again. After this UN vote there was a letter from the State Department to a Congressman which stated the view that the Protocol had been so widely accepted by so many countries and observed (with only a few exceptions, such as Ethiopia and Yemen) over such a long period of time that it was now considered part of customary international law. If this is true, then the United States is really bound by the Protocol almost as if we were party to it.

There have also been recent proposals by the United Kingdom which I'll summarize very briefly. The treaty which has just been tabled at Geneva by the United Kingdom had a precursor—a working paper submitted a year ago to the Geneva Conference. The United Kingdom proposed to deal with biologicals, bacteriologicals, or what they called microbiologicals then, separately from the chemical field. They had, I think, a very real political problem at home, an important laboratory which deals in microbiologicals. In any event the U.K. representative took the view that the chemicals and biologicals should be separated and that you could not only prohibit the use of biologicals, but could prohibit production, research, and stockpiling as well. There is now a draft treaty to that end which has been tabled by the British at Geneva. That general idea has been for about a year the subject of argument in Geneva and at the UN. The Soviet Union has taken a hostile view on the basis that to deal with biologicals separately from chemicals would subvert the Protocol. The United States has taken a sort of "I'm from Missouri" view, and I think we will continue to hold that position at least until the fall sometime when the review within the Nixon Administration is over.

NEWMAN. One problem that has concerned me as I have been reading through the background materials is a great lack of discussion of the domestic law that is correspondent to the international law. In general, we are guided only by the basic rule that deadly force can be used only when it is necessary to overcome deadly force. Are we back to those old common law cliches?

BUNN. There was a Hague convention rule to that effect, and I think it came out of the 1899 conference. You find commentators in the international field talking that way.

NEWMAN. What guides policemen? In other words, if the formula for the United States is anything we use in the streets is OK to use in war, what is the limitation on what is used in the streets? Is there anything in the U.S. code?

BUNN. No, I am not aware of anything.

NEWMAN. I do know of a case where the New York government was held for sloppy or negligent use of tear gas.

WIGGINS. There are police regulations against the use of excessive force beyond the necessity of subduing a prisoner.

NEWMAN. Yes, and that is what I am referring to. We have a tremendous amount of law that deals generally with this sort of thing, but nothing that deals specifically with gas.

BUNN. I am pretty sure there is nothing in the code.

NEWMAN. I don't want to press this at the moment but it seems to me that here is a terrible gap in our information. We have this open-ended formula. The

formula of the United States in the United Nations discussions is anything that is OK on the streets is OK, yet we have no rules at all except these old common law things on what is OK on the streets. Is there a rule against use of lethal gas by police?

SWYTER. I think it is a matter of practicality. Lethal gas could kill innocent bystanders. As long as you are going to do that, you might as well use a machine gun because you can control it a lot better.

NEWMAN. Not if you corral people, and there have been some experiments with that now. I am using the word lethal as the extreme. I assume there are still some potential gases in between, for example, this blister gas.

SWYTER. There is a real incapacitant, BZ, and LSD would have been very nice except for its side effects.

WATSON. Well, BZ is just totally impractical.

NEWMAN. Unless we have standards I think we are going to be in trouble in the long run.

WATSON. The striking thing is the existence of so few weapons. We have been trying very hard and very little has been developed. We have nerve gases and tear gases, but there really isn't that much.

BUNN. You mean few for riot control purposes?

WATSON. The whole spectrum is rather limited. I don't know of anything that has come up within the last fifteen years.

MESELSON. There is some technical justification for that. Aside from irritants which operate at the surface, any of the centrally-acting chemicals (and that is what you talk about when you talk about incapacitants) that might affect behavior or muscle motion also affect vital systems. For example, there is no known way that you can affect the muscles of the legs without affecting the muscles of the rib cage that are needed for respiration. You can stop a man from running but his breathing will also stop and then he'll die. So far as I know, exclusive of skin and surface effects, every pharmacological target is ubiquitous enough so that vital targets will simultaneously be affected. Beyond that there is the problem of the vast spread of dosage that occurs with any military use. In military operations there is no way of administering material to some persons at a given level without giving ten or a hundred times that level to others. Under the conditions of military use, there are no known completely non-lethal or non-permanently disabling chemical agents.

This also applies to biologicals. The UN report mentions staphylococcus entertoxin and says it might be considered as an incapacitating agent. This appears to me to be a mistake. There is in the open literature a report that a substantial fraction of monkeys exposed to this toxin died. With live BW agents one is even less sure that death could be avoided.

BUNN. That point relates both to your question and to the question Frank Newman raised. Things like tear gas, the CS that is being used in Vietnam, have a tendency to find their way into domestic use. The Army sees to it that police departments are aware of these refinements. In Madison, the police were given tear gas of a somewhat refined kind by the Army at no cost.

MESELSON. The Army has given several hundred CS mace canisters to domestic police forces.

BUNN. The Army does this because, from their point of view—and this is exactly the point that Frank Newman just made—if they can establish that this gas is used domestically, or at least is stocked by police departments all around the country, then it becomes more acceptable for use in combat. I think the Army has probably sent Adamsite, the vomit gas, to some police departments. I have heard of it being used in some instances in riot control. It is not something that is used all around the world for that purpose, but I think it has been used by some police departments. That would be another minor escalation, perhaps, but nonetheless an escalation.

SLATER. So CS2 might turn up in People's Park?

NEWMAN. CS1 did.

SLATER. Yes, but CS2 is different.

MESELSON. These are both micropulverized forms of CS. In dry climates they are not very different. CS2 is more moisture resistant. Even CS1 is persistent for weeks in a climate that is reasonably dry.

NEWMAN. My question I think is most pointed. If there is nothing in domestic law that prohibits the use of either BZ or Adamsite by police, nothing whatsoever even with respect to CS, then finally it will be agreed that CS is like tear

gas. It has already been suggested that the technique of use may affect the casualty rate. You pointed out that Adamsite, for example, can cause death. Now we have learned that the police are developing new techniques of use, or perhaps new methods of control is what I should say. There is no law except old common law police restrictions that covers quantity control in a room, in a car, in how much gas you throw in. Let me give a more extreme illustration: We had our Black Panther shoot-out about a year ago, and it was a very bloody affair. Certainly there are weapons now that could shoot a cyanide pellet into a room and I can see no law that prohibits it. The big question is do you let these guys come out shooting, seriously endangering the police or, if it is that kind of deadly situation, is it much better just to kill them in the room? Is there any domestic law against that? I don't think so, and I think that affects our formula.

MESELSON. From a medical point of view there is no very good way of investigating the toxicology in humans. For CS the lethal doses that are talked about are drawn from experiments with various animals. Different species have very different sensitivities. The estimates made for man may be wrong. Even at quite low doses of CS, the Army has found that some volunteer test subjects become very fearful and are unable to inhale or exhale until removed to fresh air. Another point is that there are no published long-term toxicity studies on CS. When CS penetrates to the alveoli of the lungs it exposes a very large surface area of the body. It is an alkalating agent and many alkalating agents cause cancer. So far as I know—I have searched the literature and asked other people who know, but there may be a paper that has escaped us—there is not a single long-term toxicity study of CS.

FRAMEWORK FOR ANALYZING MILITARY REQUIREMENTS FOR CHEMICAL AND BIOLOGICAL WEAPONS

SWYTER. One of the issues involved in this whole problem is whether the United States needs its chemical and/or biological capability. This is a problem that President Nixon will have to face in his review. As a matter of fact every President faces it every year when he has to ask for appropriations. I think the discussion Jim Watson started was very pertinent. We could easily spend several hundred million dollars on research in the hope that, given enough money, we will find new incapacitating chemicals just as enough money got us to the moon. This is becoming more and more of an issue that both the President and the Defense Department must face as we increase the amount of money we spend on CBW from ten million dollars in the early fifties to about three or four hundred million dollars a year at present. In order to cost this properly, as the Defense Department is now doing but not publishing, we shouldn't cost it the way Congress does. Congress is out of date from an accounting viewpoint but that is another issue.

BADER. Two years ago we tried to get an amendment to the Defense Authorization Bill which would have called upon the Defense Department to give full particulars on what was being spent and where. It was an amendment designed by Joe Clark and Mark Hatfield and accepted by Senator Russell on the floor. This very detailed amendment was quietly dropped in conference, and now there is simply no way of determining from material that is presently available to the Congress, just exactly how much is being spent for what purposes.

SWYTER. We are spending several hundred million dollars, but for practical purposes, certainly in the past four years, this has not been enough to argue about. As far as the Defense Department is concerned, several hundred million dollars is chicken feed when we are dealing with an eighty billion dollar budget. You have to keep this in mind when we come to determining priorities about what to fight for and against. There is a possibility that pressure could be applied to the Defense Department to give up a portion of this appropriation in return for something that is, in its view, more worthwhile like the ABM which produces a great deal more funding.

I want to describe to you an analytical framework for looking at the question of whether we need a chemical and biological capability. Let me open with some remarks about four basic concepts that will turn up in the analysis. First, I am talking about having a capability, not about using it. We have talked about a no-first-use policy and we have talked about ratifying the Geneva Protocol. We

could, at least theoretically, have a capability independent of whether we had a no-first-use policy and whether we ratified the Geneva Protocol. You have to think of this in terms of having a capability that gives the President certain options in certain queer situations. I think it is quite practical in this country to ratify the Protocol; to have a no-first-use policy, as in practice we do, with the exception of CS; and to have a substantial capability. What we must decide is whether we should have a capability, and, if so, how much money we should spend on it.

The second concept, and this is perhaps the area in which I can make the largest contribution, is an analysis of the distinction among four kinds of chemical and biological capabilities; chemical, biological, lethal, and incapacitating. You may have a lethal biological capability, a lethal chemical capability, an incapacitating biological capability, and an incapacitating chemical capability. This distinction is for requirement analysis purposes. Later I'll point out I don't think we should make this distinction in terms of a no-first-use policy, but only in terms of thinking about what we need, if anything. We gain something by distinguishing among these four types.

Thirdly, I think we can learn something by analyzing these four groups in terms of the scenarios in which they might be used. By identifying specific situations in which you might use each of these four kinds, you can become a lot more informed about the need for them.

Fourth, we can evaluate, at least qualitatively, our requirements in terms of the three basic objectives of United States policy in this area. The first objective is to prevent proliferation of CB weapons. The more countries that possess a chemical or biological capability, the more likelihood there is that these will be used in warfare. I think it is in our national interest to deter proliferation, and certainly, in thinking about having and using a capability, to be concerned about the consequences of proliferation. The proliferation problem is of particular importance here because chemical and especially biological weapons are effective against cities. Whereas conventional weapons aren't a very serious threat against cities (although in World War II we did try firebombing), nuclear weapons are clearly a large threat to cities, and biological and chemical weapons also fall into that category.

If we fail to prevent proliferation, our second objective is to deter use. The Geneva Protocol is directed toward deterring use of these weapons, but indirectly it is aimed at the capability.

The third objective, which I won't touch on during the rest of the discussion, is to limit damage in the event that we become involved in chemical warfare. This is why, from the military viewpoint, soldiers should be able to defend themselves. I did not mention the objective of retaliation because I do not consider retaliation a particularly useful national objective although it may help, as it does in the nuclear case, with deterring use. Basically there are three objectives: nonproliferation, deterrence, and limitation of damage.

The rest of my remarks are divided into four categories. First, I shall discuss the need for lethal biologicals and I will talk about these in order of their complexity.

Lethal Biologicals

Lethal biologicals, and I am including lethal toxins under this category, are basically population killing weapons. The effects of an attack are measured in thousands of square miles and there can be multiple attacks. Assuming that such weapons can be made technically feasible, they would serve basically as strategic weapons to be used against the population of countries.

The difficulty in attacking a nation the size of the Soviet Union on a large scale is that you would need quite a few bombers flying over. The Russians are sure to know that there are bombers up there but they may not know what the bombers are doing. If the bombers come and go with no nuclear weapons dropped, I am sure the Soviet Union would suspect a biological attack.

An attack could come from fairly low if one used disseminating devices that fall a great distance, and then before landing, would issue the biologicals in bomblets. Since Israel and Egypt have planes flying over each other's territory as a matter of routine, it would be relatively simple for them to attack each other. Several days later you would discover a lot of people sick. The problem is that people don't die instantly and they may seek to retaliate. Clearly if both sides have a biological capability, you could launch your own biological capa-

bility against an enemy after you discovered you had been attacked. You'd have to do that relatively fast, but sick people can fly aircraft, particularly in the early stages, and particularly if they suspect that they will not survive anyway.

WATSON. I think one should say that, in the case of Israel or in part of the Egyptian delta, some strategic biological weapons could be used. I would be very surprised if they were used against China, Russia, or the United States to the extent that they could really cover a large fraction of the country.

SWYTER. Let me put it this way. If our intention is to kill the Chinese population, it would be much more cost effective to do it with biologicals than with nuclear weapons, simply because the Chinese population is spread out all over the country. We can destroy China's industrial capability very easily because there isn't much. But when it comes to killing people, assuming that is your objective, we can act against China a lot more efficiently by using biologicals because we can penetrate Chinese air space. It is much more difficult to penetrate Russian air space because the Russian air defense is modern, but it can be penetrated. Ours can also be penetrated. Now the Chinese would know that we were there. You can't keep it a secret, but there is not much they could do about it. The Russians can retaliate with nuclear weapons and I suspect we ought to plan on their doing that.

SOHN. Isn't there also the point about using biologicals as a subsequent weapon? You start with nuclears and continue with chemical and biological weapons to take care of the rest.

SWYTER. Yes, this is quite feasible, assuming your objective is to kill people. If your objective is to destroy industrial capability, to knock down buildings, biologicals won't help you. There is also an even more contorted argument that, in a a period of crisis—if we or the Russians dispersed our populations to the farmlands—a much larger proportion of them could survive a nuclear attack and fallout, even if we did ground bursting. If you want to be sure to destroy a high proportion of the population you ought to attack with biologicals.

The logic I had in mind for a biological capability is this: Our strategic nuclear capability, the B52's, the Poseidon, Minuteman, give us an option, the capability to kill population if that is what we want. We maintain this nuclear capability anyway as a deterrent to a nuclear attack and we will continue to do so. A biological capability to kill people would be an additional cost; it would not be a replacement. If we were to retaliate against some country for a biological attack and destroy their population, we would have the nuclear capability, and therefore we do not need a lethal biological capability. That is a fairly simple minded straightforward piece of logic.

Lethal Chemicals

We can go on to a lethal chemical capability and review briefly what Matt said about the characteristics of chemical weapons. These are basically tactical weapons for use against land forces, against Army targets. They are delivered principally by artillery, by short range rockets and missiles, and by aircraft. For all practical purposes the chemicals or gases involved are nerve agents; that is all that we would consider procuring at this point, all that the Russians would consider in additional procurement. With respect to the lethal chemical capability, you have to remember the Russians have a very substantial stockpile. This came about because in the late forties and early fifties, particularly in the early fifties, we threatened to destroy the Soviet army in Europe if they invaded Europe with nuclear weapons. At that time the Russians could not afford comparable tactical nuclear weapons, and they built up a very substantial chemical capability in response. The nice thing about chemicals is that they last forever, and so this stockpile is still around. A great many comparisons have been made between the U.S. and the Soviet stockpiles but that is very classified information. The existence of a Soviet stockpile is relevant in this argument; they do have a substantial capability and so do we.

Chemicals are much more cost effective than conventional fragmentation weapons. The cost of killing soldiers is much lower with chemical weapons than with nuclear weapons provided the soldiers are not defended and provided they do not wear gas masks or protective clothing. Once a soldier wears protective clothing, he is essentially invulnerable to chemical attack, but unfortunately he also becomes a much less effective soldier. To put it in simple terms, if you put all your soldiers in rubber suits, they are not susceptible to casualty by chemicals, but the moment they move around they build up such a high

temperature that they cannot operate. One of the projects the Army is currently working on is the invention of a protective suit that will let heat out without letting chemicals in and the development of doctrine for this trade-off. Basically a battalion commander or a company commander, who has been assigned to take an objective, will be willing to operate his troops in a chemical environment and to lose half of them. In terms of companies and battalions, these commanders are quite willing to take fifty per cent casualties if the objective is very worthwhile. We should not assume that just because troops are in protective clothing they will one hundred per cent stop operating. This is simply not the way the Army works. The Army is making progress, so are the Russians, in inventing a defensive protective clothing in which a reasonable amount of exertion is possible, in which troops can both exist and function. The military tradition has been to avoid warfare any more complicated than it already is. In the military view, if we can avoid using chemicals and thus keep the battlefield relatively simple, that will be fine.

SLATER. So the chemicals stay around? What happens when the clothing is removed? Is it all dispersed quickly?

SWYTER. As Matt pointed out, VX will last several days; GB lasts ten minutes. The problem with a battlefield is that you occasionally have a shell bursting nearby. As a soldier in Vietnam you just hope that they will all land more than twenty yards away and you just don't worry about it. In a chemical environment you have to worry about it because a shell that lands even half a mile away will create a cloud that can drift downwind. When you discover you are fighting a chemical war, you become more prepared to either put on your clothing or to keep it on constantly.

BLOOMFIELD. Isn't it true that field commanders, particularly at the tactical level, have always opposed the use of chemical weapons because of the uncertainties of wind and the threat to their own troops? This has been very prominent in the thinking of men at that echelon.

SWYTER. I think it still is, but I think you can also visualize advantages to the use of these weapons. In the regular Army, the disadvantages are believed to overwhelm the advantages, but you don't always have a choice because the other fellow may use it first. If no country had a chemical capability, or if everyone were sure that no one would use it, this would be a simple problem. I don't think the Americans would seriously want to use it first.

Our real objective in having a chemical capability is deterrence, particularly against the Soviets in Europe. Let me describe a scenario in which this option is alleged to be useful to us. It gets into the question of the relative balance of forces in Europe and the potential for using nuclear weapons against such forces.

What we have in Europe is a situation in which the Warsaw Pact land forces are about equal to the NATO forces in terms of size and of capability. This is a much argued point: whether they are exactly equal or not doesn't make much difference; they are roughly equal. Both sides have what is called a tactical nuclear capability, meaning they can use nuclear weapons up to fifty kilotons, which are hardly tactical, on each other's forces. Should that happen, we run a great risk that this war will get out of hand, because the Russians can fire their tactical missile at a two hundred mile range into the battlefield area in West and East Germany. There would then be a great deal of pressure on our local commander in Europe to go after those missile launchers. A missile launcher is found on the German-Polish border and so the Russians move it back. Pretty soon there is a missile launcher sitting outside of Minsk, firing into the nuclear battlefield in Germany. We attack this missile launcher outside of Minsk and, as an incidental aspect of that, we destroy Minsk itself. This is what happens when tactical nuclear warfare gets out of hand. It is likely that Germany could be destroyed in the same incidental way.

In the fifties and early sixties we said that if the Russians attacked Europe through Germany, we would use our nuclear weapons against them. Somehow we convinced ourselves that this would stop the Russian invasion. The Defense Department has now come to the conclusion that this isn't necessarily so. The Russians might stop, not because they were forced to but because somehow they lost their nerve. We no longer have a nuclear option to stop a Russian invasion, first because it is no longer feasible. We could blow up Europe in the process and that is a hell of a defense. Second, we may be afraid to use our tactical nuclear capability against the invading Russians. Our action might escalate into an at-

tack on Russian cities and then an attack on American cities. We might no longer feel that a limited Russian objective in Europe is worth that cost. The Russians may claim that all they want to do is reunify Germany, which some people think is a very Christian objective anyway and that they are not interested in the rest of Europe. The President then faces the problem of whether he should attempt to use nuclear weapons on the invading Russian forces. The Russians are very well aware of our predicament.

Here the chemical capability can make the difference. If we had no chemical capability and the Russians did, they could very well use lethal chemical weapons on our forces, giving them a tremendous advantage, while still deterring us from using nuclear weapons. If we had no defense we would simply be overwhelmed; it would just cut great holes in our forces, and the Russians would be able, with their maneuver capabilities, to invade Europe.

SLATER. They could do that from some distance?

SWYTER. If you had two forces facing each other on the East-West German border and the NATO side had no defensive equipment, no gas masks, nothing, while the Russians used chemicals, the soldiers on the front line and the ones immediately behind it would withdraw, leaving a hole.

SLATER. How far can they penetrate with short range missiles containing nerve gas?

SWYTER. Thirty miles. That pretty well takes care of the front line. What you do is simply continue to pose this threat. Anybody who gets in your way, gas them.

BLOOMFIELD. Yes, but you are making an argument for a defensive rather than an offensive capability.

SWYTER. There are two arguments. First of all, if we have no gas masks and no protective clothing, we are very vulnerable. So that immediately tells us that we should have gas masks and protective clothing. I believe that's logical. In that case if the Russians attack with chemicals, our troops would not die and we would not have an immediate hole. However the Russians would still have a very substantial advantage because our troops would have to be in very bulky, very hot protective clothing, using their conventional weapons and artillery, their machine guns and their rifles, while the Russians, knowing that they would not be under chemical attack, could wear very light protective clothing simply to get themselves through this. If you use GB which is not a persistent agent in a given area, troops can go through that same area several hours later without any protection. The Army is convinced, and I too have become convinced from looking at their classified matter, that they, the U.S. Army, would be willing to go through this kind of area with very light protection if the objective was important enough. They are convinced the Russians would do the same. Consequently if we cannot force the Russians into a protective posture similar to the one we have been forced to assume, they will be able to maneuver much more freely than we, and therefore gain a major advantage.

DAHLER. I don't understand. If our aim is to protect ourselves with rifles and machine guns, that implies that this invading force had to get close enough to be brought under attack by rifles and machine guns. If that occurs, they are going to get gassed too. So I don't see how you can put together our forces having to hide in this protective covering and defending themselves with conventional weapons and an invading force that somehow feels it can merely walk through without any such protection.

SWYTER. The principal element here is that you do not know you are under chemical attack. All you know is that artillery shells are exploding around you. We are working on alarms but even that isn't really going to solve the problem. As the Russians continue to fire an occasional artillery shell in, we basically have no way of knowing if that is a chemical shell or a fragmentation shell; it is very hard to tell by just looking at the explosion what it is. So in defense the NATO forces will tend to protect themselves relatively heavily. The Russians know where and when they are placing their chemical attack. They have a fairly good idea of the wind direction, and so they know the safe and unsafe areas.

The problem of two hundred man rifle companies and where you move these tactically can also be solved. Company commanders and battalion commanders know how to solve this problem—at least well enough to enable them to carry out orders if they were told to do so. The Russians would have to defend themselves but not as much because they know where the chemical attacks are and we don't. What you then have is a conventional engagement of forces, tanks and

armored personnel carriers invading, artillery retaliating and eventually hand combat if necessary to deal with this invading force. But our forces are hindered because they are burdened with protective clothing and thus much less flexible in their movements than the enemy. The tactic of that kind of warfare suggests that in an area of a couple of square miles the side which has the greater amount of usable force has a tremendous advantage.

BUNN. Couldn't you use some of these same arguments to justify our first use of nerve gas against a Russian invading force in Europe? We don't want to jump to nuclears.

SWYTER. I believe that is correct. We could not be very confident that we could stop an invasion with nuclear weapons. The Russians today have very little confidence that a conventional invasion would succeed. This is the general belief throughout Europe yet the communications the Army directs to the public fail to emphasize this fact because it would immediately create pressure to withdraw U.S. forces and cut down the size of the Army. Basically there is on both sides enough force readily available with more after a buildup to give the Russians relatively low confidence of success. We think, in most cases, the Russians are not willing to do something that we claim would threaten our vital interests unless they are relatively confident that they can succeed. In regard to a conventional attack, plenty of evidence has been published and sent to them suggesting that they have low confidence to succeed.

Until recently the option we have fallen back on is to use nuclear weapons and somehow blow up all the Russian forces so they can't invade. The problem with this kind of reasoning is simply that the Russians could still use the weapons back on us and blow up all our forces. If they are then able to bring more forces to bear faster than we are by reinforcing primarily from reservists in Europe and reinforcements from the United States, they can then use the second wave of forces for their conventional invasion and go right through the nuclear battlefield.

We gain no advantage either place by using chemical weapons first. We don't need them for the conventional defense; chemical weapons don't give us any particular advantage against the Russians because they can use chemical weapons back on our forces and then we will both be sitting around the battlefield in our rubber suits.

If we had no capability, and what we are discussing is our capability, the Russians with their capability would have that option. Now that may sound pretty queer. Things like this don't happen, you may say, but look back on Vietnam—that logically shouldn't have happened and yet it sure did. War is the queerest thing in the world. Of course, military people will be the first to tell you that when they ask for money; you have to be careful of that argument. But, logically, if you believe that there is an intermediate step between conventional warfare and nuclear warfare, particularly in Europe, then there is a rationale for a chemical capability. We should have a chemical capability large enough so that the Soviets can see it and come to realize that if they use chemicals on our forces and compel us to assume a protective posture, we can respond with chemicals and put their forces in the same protective posture. Thus they gain no advantage by using the chemicals.

MESELSON. Is there very much difference in the munitions requirements between the amount we would need to make the Soviets jump into their suits and the amount they would need to do the same to us?

SWYTER. No, it is about the same on both sides. Let me remind you of something about chemical capability. Let us assume for the moment that for the whole German front you need a thousand tons of chemicals for a one day war. If you planned on a two day war you would need two thousand tons, a three day war, three thousand tons. One of the issues here is how long a war, or how big a stockpile is needed to convince the Russians not to start. The ultimate military argument is clear superiority: they can last only for a year and we should be able to last for infinity or until we can replenish from production. In my view this is just nonsense, but it boils down to a judgment of whether you need a one or 10 day or 90 day or 180 day chemical war fighting capability in addition to your conventional war fighting capability. We happen to have a practical cutoff there because the Defense Department has already decided, for planning purposes, how long a conventional war to stockpile for in Europe. You don't need to stockpile for a longer chemical war. When you run out of food, water and gasoline, additional chemicals don't do you any good. But if you bought that

level of chemical capability for a long war, you would literally be talking about several billion dollars a year in chemical procurement. Let me remind you that the Dutch, French, and British also defend part of the line of the North German plain. If they didn't have an offensive chemical capability, then the very logical Russians would not attack the U.S. Army, but would simply go across the North German plain and cut us off.

MESELSON. Several billion a year? But the gases can be stored so . . .

SWYTER. Once you build it up, it comes to a ten year cost of several billion dollars to buy and keep that kind of chemical capability. The exact price depends on the number of days and on how fancy these gadgets get. If you buy VX and put it in 155 shells, that's a straightforward procurement, but clearly the Army thinks that as long as you are going to spend that kind of money you might as well get some very fancy things. The military has a great tradition, going back to World War II, of getting new fancy gadgets and making them very complicated and very expensive.

MESELSON. The binaries on which development bids are out are certainly examples of that.

SWYTER. Yes, but there is a rationale for that.

SOHN. What is a binary?

MESELSON. It is a weapon that does not contain poison gas itself but rather two non-poisonous materials which, when mixed, make poison gas. This gets around the problem of leakage in storage but it may not get around the problem of accidental explosion.

FELD. Presumably we know that the Russians are stockpiling lethal chemical weapons in Europe; perhaps we have to assume it without knowing it. More to the point, would we know it if they weren't?

SWYTER. We would know it if the weapons were in quantity. From an intelligence viewpoint chemical stockpiles are great big buildings. The Russians put everything in buildings because it snows in Russia and that takes up a lot of area. You can walk through East Germany and Poland, take pictures of big buildings, and then watch what goes in and out of them. The intelligence community does just that.

FELD. What I really was asking is suppose both the Russians and we agreed to stop stockpiling? Is that possible? What are the Soviets saying about this in meetings, in private and public?

MESELSON. If there are any experts on this they can't talk. But in a recent editorial article in the *Washingtaon Post*, it was stated that the Russian capability has been considerably exaggerated.

KENNEDY. May I ask a question about the basic logic beneath this scenario? In effect you are saying that if the NATO forces did not have lethal chemical weapons at their disposal, then the Russians, possessing such weapons, might, with some confidence, launch an attack at this level without incurring an immediate escalation to atomic weapons. It seems to me that the probability that they would be able to do so with any confidence whatsoever is so small that the weapons on both sides are not really vital. That doesn't mean that they won't stockpile them or that they haven't stockpiled them.

SWYTER. You are quite right in thinking that we are dealing with a situation that is improbable. I think most people would say a war in Europe, at least an intentional one, is very unlikely. The Russians wouldn't do that sort of thing. Let me assure you that those same people, looking at the buildup of Russian forces on the Czech border, told themselves and the President that a Russian invasion was very unlikely. War is not a likely thing; it is irrational. Who the hell would go to war, particularly in this day and age? In the first place, the outbreak of serious conflict has small probability and an even smaller part of that is whether chemicals would be used given the outbreak of war or the fact that the Russians seriously contemplate being the first to fire a shot. The use of chemicals has a small probability, but the payoff could be very high, provided you believe that the tactical nuclear option is a very dubious option either because (1) it won't work, or (2) it will escalate.

Now you could also argue, as we did all through the 1950s, that if the Russians were to invade any part of Western Europe, any square inch of Germany including Hamburg, we would use tactical nuclear weapons on their forces and be prepared to destroy Moscow in the process. You must be willing to say that and willing to do it. Idle threats are easy but if you are willing to go all the way, or at some point in the war, say, "all right, Europe is yours, we give up," then

you don't need the chemical option. However, there is a good deal of weight on the side of those who argue that you should not make that decision today. You should give the President an option: if his forces are attacked with chemicals he should have the option to respond at that level of violence rather than escalate. The United States since World War II has been willing to spend money to give the President all kinds of options because money is one of the advantages we have over everybody else in the world including the Russians. We spend far more money than any other nation on military things; some of them very worthwhile, some of them worthless. Several billion dollars is a small fraction of the current budget. If you want to pick a realistic defense budget of forty or fifty billion dollars a year (I am being very radical here) we are still talking about a small additional percentage. How much do you want to spend for that option? The calculation is very simple. You can determine the amount of chemicals that would be needed along the whole German front for a day to force the Russians to put on heavy protective clothing should they wish to penetrate this. Then the judgment is simply how many days are you willing to tell the Russians we are capable of going through if they force it.

BLOOMFIELD. Isn't the implication of your entire argument that the United States probably would benefit from not accepting a no-first-use. I think first of all, your analysis of deterrence must rest on the notion of uncertainty. The key to both your nuclear point and your CW/BW point is the knowledge that the other side is uncertain about what the U.S. will do. You deprive yourself of that if you go for a no-first-use agreement. But much more to the point, if your tactical scenario is correct, it seems to me that the United States clearly benefits and the Soviet Union does not benefit from a gas war in Europe for the simple reason that the side that has to be mobile, the side that is moving, is the side that is most profoundly disadvantaged by being encumbered by all this protective equipment. The side that is defending is in a much better position, both sides being equally hampered. This seems to me to be an argument, by your strategic analysis, in favor of the United States using chemical warfare first if the Soviets invade. To me that is the inescapable conclusion to be drawn from your scenario.

SCOVILLE. There is one thing in addition. Meteorology would certainly help the U.S. In general, the winds are going to be blowing in the Russians' faces, and, as a result, they will be much more susceptible to an attack, even to one of their own attacks.

MESELSON. They could use non-volatile substances. VX is not very volatile. It can be dispensed in a droplet size such that it simply settles and doesn't drift much with the wind. The Russians could do that and then the meteorology becomes less important. They know where it is, and they know it is going to stay there, but we wouldn't know where it was until we found it.

SWYTER. Let me address your point, Lincoln. I have left out two arguments. First of all, there is a fact about the size of the Russian stock-pile relative to ours which weakens your argument substantially. I don't want to dwell on that fact but the Army is very much concerned, however exaggerated it is. Secondly, there is no need for us to turn to a very uncertain, very complicated, very miserable sort of warfare when we are quite capable of defending Western Europe on a conventional basis.

BLOOMFIELD. That is a highly disputed proposition as you know.

SWYTER. I am aware of that. Let me say this. Neither I nor the Army nor the Defense Department wants that first use option. What we are saying is if the Russians use it first, we should have the capability to respond in kind—but only for lethal chemicals. You must remember we are talking just about lethal chemicals. Somebody mentioned the disarmament possibilities. They are tremendous provided you can convince the Russians.

There is an additional problem about the location of the stockpiles. In order to have this option in the early part of the war, we must have a major part of this chemical capability located in Europe, and we also have to be willing to let the Germans have this at some point. Theoretically you can say we will maintain control of these weapons until the war starts, just like the matter of keeping control of nuclear weapons until the war starts, but you have to face the possibility of eventually having the Germans shooting chemicals. That is going to give the French a lot of trouble.

The logic is very simple and straightforward. A chemical capability gives us the option of deterring the use of chemicals by the Soviets and of keeping at the level of chemical violence rather than escalating to nuclear weapons.

This is a deterrent argument. If you have a ten day capability as I have described, this is deterrence; this is not war fighting capability. I am quite willing to say deterrence is enough. The whole strategy in Europe is based on deterrence being sufficient because we do not want to destroy Europe in the process of defending it.

LURIA. I'd like to go back to the question that Gene Kennedy asked because it seems to me that you are making a very good logical argument without carrying it all the way, and that argument involves the whole spirit of deterrence. Let's say nuclear weapons would not be used because of the danger of escalation to a general nuclear war. You are saying if we don't have a chemical deterrent, there is a danger that a chemical weapon might be used as a first-strike in order to win a war in Europe. It seems to me that instead of separating the various deterrents we should consider them all together. Isn't the nuclear deterrent sufficient to deter chemicals even if we didn't have a chemical capability? Since the nuclear deterrent is something that does exist, which has been announced, and which is obviously sufficient in present times, it seems that it would be sufficient to prevent a conventional or semi-conventional land war in Europe. We could take it from here and try to move back toward disarmament instead of keeping additional options open. It seems to me a logical fallacy to define deterrence only within categories rather than to consider it as a long span operation.

SWYTER. That's an excellent counter argument. The matter boils down simply to this: if you are a bit uncertain about Salvador Luria's deterrence, you ask how much am I willing to spend to have some additional deterrence. Now my view is, "not much," but I am willing to spend some, and if you could get the Russians disarmed to some extent, I would be willing to spend nothing. If that chemical option costs you a lot, if you are talking about a far fighting capability involving billions of dollars a year, then I would clearly say that it is not worth it. But if you can bring that down to a nominal amount as far as part of the defense expenditure is concern, then I am willing to say I am sufficiently uncertain about Salvador's deterrence logic sufficiently rich to spend some money. But you all should recognize that if you take Salvador's argument to its logical extreme, you deter everything by threatening to blow up Moscow. This is a strategic deterrent.

DAHLER. Is the offensive force of the Russians with respect to the lethal gases something that exists at the present time? If so, then I presume it has existed for a long time and there may be something to be learned from the fact that to date they haven't used this as a threat.

SWYTER. It came into existence in the early or mid-1950s because it wasn't until then that the Russians could afford anything. They had a paper army back in the 1940s, but we didn't realize that until the early 1960s. I suspect there were people in the academic community who suspected that the intelligence was terrible, but the defense establishment didn't come to that recognition until the early or mid-1960s. The Russians, when they started spending money and getting a conventional land force capability in the early fifties, were faced with American nuclear weapons, and they figured that a chemical capability was a second best thing. When they got a little richer in the early 1960s they went ahead and bought the tactical nuclear capability, while maintaining the chemical capability. Once you have it, it doesn't cost you much to maintain those stockpiles, and they had all the doctrine and training programs set up anyway.

DAHLER. In this context it seems that people are very busy trying to find new things to frighten you, in the sense that the threat has apparently existed for a long time and a response of buying more chemicals just because the nuclear deterrent has been degraded in our minds. . . .

SWYTER. Don't misunderstand me. We have had a chemical capability for a long time. I believe I am presenting to you a logical rationale for that chemical capability, a more articulate, more logical rationale than the Army used when it acquired the capability. Nonetheless, the Army had the capability long before it had my rationale.

SLATER. What do the Russians say at places like Pugwash or Geneva when there is talk about both sides deescalating?

BUNN. There has been little talk on gas warfare.

MESELSON. There have been some private discussions with Soviet scientists. Whether or not they knew the gas capability of the U.S.S.R. I do not know. They said some interesting things, however. They mentioned that this is not good for

defensive war because it gets on your own civilians, nor is it good for fighting inside Russia which is the way Russia usually fights. They never said anything about whether or not they had a capability.

SLATER. Looking to the future, what did they say about treaty provisions?

MESELSON. The Soviets have always had the same point of view about the Geneva Protocol, that is, that everybody should ratify it and that nothing should be done that would weaken or erode it. They have maintained that position since the twenties when Litvinov advanced it at the League of Nations.

GALSTON. Isn't there another factor that enters the power equation that you have been sketching for us? The stockpiling and deployment of these weapons depends to a very large measure on the secrecy surrounding the entire issue. The recent revelation of a minor nerve gas accident on Okinawa has sufficiently exercised not only the Okinawans and the Japanese, but also Germany as well, so that now guarantees are being requested that these materials will not be stockpiled in the forward areas where presumably they will have to be used. I do believe there is a factor of public opinion which has to come into this in the same way that the largely unchanneled public revulsion against the war in Vietnam has had a very significant political effect. I can foresee that the abhorrence with which most ordinary people view the use of these weapons may become a significant political factor against their deployment in countries where we would have to stockpile them in order to make them militarily effective.

SWYTER. If you are willing to decide ahead of time not to stockpile these weapons in Western Europe where they would logically be needed, then you are basically giving up that option. If you are willing to take that risk, then you should not have the weapons in Germany. If you don't have them in Germany, then you don't need them.

GALSTON. That is exactly the point I am making, but it may be that we are prevented from having them in Germany.

MESELSON. Can you tell us whether lethal chemicals and biologicals are cost effective for other countries?

SWYTER. The biologicals are simply because you can create an unsophisticated simple-minded capability by growing the agent in public health laboratories, foregoing testing, of course, and then simply renting an airliner from Boeing or PanAm, putting a big tank in it, and flying over your neighboring country's city. There is an unusually bizarre scenario in which you can rent a candy factory in Brooklyn, and simply pump this agent up the stack and diffuse it throughout the New York metropolitan area. You can probably kill three or four million people. That may be a very unsophisticated capability, not enough to destroy the U.S. population or the Soviet population, but certainly Nigeria, Ghana or other small countries could use that kind of capability to kill off several American metropolitan areas on the seacoast. They would have more trouble with the Russians because it is harder to get close enough to Russia, but they could give us and they could certainly give each other, problems at a very low cost.

A nuclear capability is quite different. That first bomb or that first group of bombs is a high cost. Now the cost is going down unfortunately, but if you try to buy yourself a standard American gold-plated capability, it could be very expensive. What we are now facing is a potentially less stable world in which small powers can threaten their neighbors and us with substantial pain as they wield power all out of proportion to their size. If we knew that Nigeria had attacked New York City, we might say "let's wipe out Nigeria with our nuclear weapons." A biological attack invites retaliation from those countries that can retaliate, assuming that you know where the attack came from. In the candy factory case you don't. You simply have no idea. You immediately suspect the Russians and start nuclear war. It is irrational to attack each other's cities; it is irrational for Egypt to attack Israel, particularly Israel's cities, but the trouble is that irrationality happens.

BADER. Isn't this trend going to force more countries to develop atomic weapons?

SWYTER. I fear that very much, so that is why we have a nonproliferation treaty.

LURIA. Earlier you made the point that the stockpiling of lethal chemical weapons in the Soviet Union may be readily detected by intelligence.

SWYTER. It may be readily detected but it can not be readily reported by intelligence. The intelligence community could give me, on a classified basis when I was at Defense, some fairly detailed evidence of gross measures of the Russian

capability, but they cannot publish that because the intelligence sources are not identifiable.

LURIA. I'm sorry, I did not mean publishable. But is it a fact that, in general, a large lethal chemical capability can be monitored?

SWYTER. Yes.

LURIA. Well, it seems to me that, in the light of your scenario, this is a very important point to make largely because of the possibility of treaties. As we know from the whole history of the test ban and so on, the ability to detect stockpiling is as important as the ability to detect testing. A large chemical lethal capability sufficient to act as a first strike against the United States is something which is verifiable and therefore subject to disarmament control. Is that a correct statement?

SWYTER. That is correct. But the deployment of these weapons is somewhat different. One can, over a period of a couple of months, move the Russian Army and the weapons into Eastern Europe. Now the movement of the Russian Army is very detectable but the kind of weapons it moves is simply not detectable in a useful amount of time.

It is cheaper to kill people with chemicals than it is to kill them with fragmentation weapons, whether you look at it on a weapon cost or on a system cost basis, simply because for the same amount of money you can cover a much larger area with lethality.

BADER. Against unprotected personnel.

SWYTER. Yes. Against protected personnel the cost is essentially infinite, and that part is of major importance. It is relatively cheap to acquire chemicals in your artillery. Most industrial nations have a chemical industry and that same chemical industry can manufacture GB and VX as well as the industrial chemicals. Now the United States because of its wealth can overwhelm any other country in a conventional war because we have more manpower and more fire power to bring to bear. Essentially we can drown the other fellow in money. When we get to a very large country like China or Russia, it becomes more difficult, but basically our wealth gives us a strong conventional advantage that small countries can whittle down somewhat with a chemical capability because the cost per fatality falls. A second aspect, somewhat less important than the cost factor, is that the American Army and, to an almost equal extent, the Russian Army have become very mechanized, very dependent on a large logistics complex with all kinds of equipment and gadgets, which is very difficult to operate when you are wearing a rubber suit. Now a less sophisticated enemy like North Vietnam that simply has soldiers on foot with rifles has a somewhat easier time of it in a chemical war, because all they have to do is walk around and operate rifles. They don't have to operate tanks, trucks, and do all the things that we have become accustomed to. So, in terms of relative advantage, a proliferation of chemical capability is less advantageous for us than it is for other countries. It changes the balance of power.

Incapacitating Chemicals

SWYTER. I want now to turn to incapacitating chemicals which are somewhat more complex in their logic than lethal chemicals. Matt told us this morning that currently we have two kinds of these weapons in the U.S. inventory. One is called BZ which basically affects the mind, and the other is various forms of tear gas, CS, CN, and the vomiting agent, DM. They are called riot control agents because that is a psychological way of making them more acceptable. The Defense Department is working on numerous other agents some of which, I am told, show promise, but I think Jim Watson questions that. From the military point of view, it would be nice if we had an agent that would be of longer duration and more incapacitating than either CS or BZ.

WATSON. BZ is enormously long lasting. It can put you to sleep for three days.

SWYTER. The problem with BZ is that some people do not get enough of it to go to sleep and they act in very irrational ways.

WATSON. Yes. One can be out of control for days.

SWYTER. That duration is fine as far as the military is concerned. CS has a duration of only minutes; that is not long enough. Theoretically, the nice thing about incapacitating chemicals is that they could make combat more humane since there would be many fewer fatalities than there are with conventional weapons, but humanitarian considerations are not really the main attraction of incapacitating chemicals. They are sold on that basis, however; they were in-

troduced in Vietnam on the basis of humanitarian considerations, but that is not why the military is interested in them. Situations occur in which enemy troops or insurgents are mingled with civilians. With conventional weapons the military must go ahead and accept civilian casualties and fatalities. In Vietnam, one or two Viet Cong may be mixed with a hundred women and children in a cave, or a small number of North Vietnamese may hide in a village; you either go ahead and burn down the village with the North Vietnamese usually running away, or you forego engaging the enemy. In general, the military prefers to engage the enemy wherever they find him. It breaks them up terribly if they find the enemy mingled with civilians. Once an enemy figures out that you have created a haven for him, he is going to be more interested in finding mingled situations than he otherwise might be. The military is really bothered by the mingled situation because they find they have to make a trade off each time, whether they just go ahead and kill civilians or whether they let the enemy go.

Remember we are dealing here with an enemy that is basically unprotected, and typically consists of either very unsophisticated or poor troops who cannot afford this equipment or who do not think it worthwhile to spend the money, or insurgents who, for practical purposes, cannot carry around with them all the bulky equipment that is required for defense. A good insurgent does not slip in and out of the civilian economy carrying a gas mask under his arm. Sophisticated enemy troops like those of the Soviet Union could not be attacked effectively with incapacitating chemicals. They are well prepared to defend themselves: if we should use tear gas or BZ or some other chemical on Soviet troops, the first time we attacked we would probably incapacitate that particular unit quite successfully; if we attacked them with lethal chemicals, we would probably kill them. But then everybody would know that chemical warfare was going on and they would promptly take steps to defend themselves.

In the strategic sense, incapacitating chemicals provide us with the option of attacking an unsophisticated enemy mingled with civilians. This is a first-use—we should be very clear on this point. With incapacitating chemicals we are able to attack an enemy in South Vietnam without killing civilians. The alternatives are simply to kill the civilians or not to attack the enemy at all. The military is very interested in getting an option that lets them have their cake and eat it too; *that* is the real attraction of incapacitating chemicals.

The real cost of incapacitating chemicals, the capability as well as use, is proliferation. After all, very few countries, until the last few years at least, had thought about or secured any kind of chemical or biological capability. As best as I can tell, the reasons for this were not very rational. These were terrible weapons; they were illegal; and they were complicated. People did not understand them, and many countries simply did not think it worthwhile looking into the issue. The chemical corps in each country tended to get less than a fair hearing. However, interest in this kind of capability has increased as military establishments have observed how well CS is working in Vietnam.

Clearly if capabilities in incapacitating chemicals build up around the world, potentially defending countries will have to take steps to protect their soldiers. If you take the step to protect your own soldiers, you will want to do it thoroughly so you have to have an offensive capability also. Then you might as well go ahead and get a lethal capability, and as long as you do that you might as well look into biologicals since the popular concept is that chemical and biological warfare go together. Earlier I pointed out that a biological capability, particularly in the hands of other countries, along with a lethal chemical capability, would not be particularly advantageous to the United States. In the case of incapacitating chemicals, the main issue is whether to spend money today to have a capability so that when you get into the intermingled situation, you will have the capability of going through military operations without killing civilians. You can buy quite a decent capability for tens of millions of dollars a year. Of course, if you use it often, even insurgents will learn to protect themselves. But if you get into a situation where you think it is really worthwhile, you dispense with your national policy or you bring out the humanitarian conditions and say, look, we just had to go through with this military operation, and, for the good of a hundred civilians, we used CS. That is basically what we did in Vietnam. We said we had to get those two Viet Cong out of that cave because it affected the national security of the United States, and so we were willing to forego all kinds of things to use this option. CS is basically a unique weapon for it gives you a capability you would not otherwise have. If we can decide ahead of time that

when we get into one of those situations we will take one of the two other alternatives, either kill some civilians or forego the operation, then we do not need these weapons and we do not need a capability. Since we are basically trading off, at the most, several hundred civilian lives lost in the battlefield for a step toward discouraging proliferation, my own conclusion is that we can easily forego the incapacitating chemical capability.

If we really have to, we just kill several hundred civilians now and then who are unfortunate enough to be on the battlefield. I would go a step further and say that, in most cases, we could just as well forego those particular military operations so that the situation would not occur very often. You have to judge the worth of a small number of civilian lives, occasionally found in the battlefield mixed with an unsophisticated enemy.

WATSON. Is there any evidence that CS really has been useful in saving civilians?

SWYTER. Oh yes, it was introduced into Vietnam in this way.

DOTY. And to what extent is it successful?

SWYTER. The original case, as I recall, was either a cave or tunnel that held a large number of women and children and perhaps two or three Viet Cong. I believe it was some lieutenant colonel who finally got up enough nerve and heaved in a hand grenade. Everybody came running out and we took several Viet Cong as prisoners.

MESELSON. When CS is pumped into tunnels to drive people out, as we do with the Mighty Mite blower, it might be killing more civilians than it saves. Still, I agree that at least in theory CS could be used to save some civilians in war. I just wonder how often the theory works out.

LURIA. There is a definite distinction as to use. There is the use in hand-to-hand combat situations in order to selectively separate prisoners who are soldiers from a group of civilians and soldiers, and then there is the use as an adjunct of bombardment to increase the nondiscriminating effect of the bombardment.

SWYTER. Right. Now I am talking only about the situation in which civilians are mingled with enemy soldiers. I am not talking about the bombardment issue. Here we have a group of civilians in a cave or possibly in a village and enemy soldiers are mixed in with them. You can go ahead and bomb that village and you may kill the enemy but you are certainly going to kill a lot of civilians. Or you may just walk away and let the bad guys stay there. Or you can attack that group with an incapacitating chemical, everybody falls asleep, and you walk in and pick up . . .

WATSON. But CS does not make you go to sleep.

SWYTER. I am not talking about CS in particular.

WATSON. Well, that is all we have. We do not have a sleep-producing agent.

SWYTER. But what we are talking about is spending several hundred million dollars each year on research. We are not spending that today but the Army is quite prepared to let contracts to develop a good chemical.

WATSON. But there is no reason to think we will get a good chemical any more than you get an anti-cancer drug.

SWYTER. The military argument is that we have to try. We are a rich country and able to spend the money, but in the meantime, let us buy some more BZ and CS.

WATSON. What is the justification for BZ? Its employment under any circumstances seems to be criminal.

SWYTER. The best argument I can make for having an incapacitating chemical is the mingled situation.

WATSON. I do not think it is fair to talk about the general thing. You have to talk about a given agent, and that particular one is just a disaster.

SWYTER. I'll agree with you there.

WATSON. We are putting BZ into munitions. You could have a war crime on that basis.

SWYTER. It is true that we have BZ in munitions. I will agree with you that it is questionable but I do not think the issue is just whether we ought to get BZ out of munitions.

WATSON. We ought to get it out as soon as possible.

SWYTER. That is not an intellectual issue; that is a technical issue. BZ is a bad agent, and the Army made a bad mistake and if everybody writes his Congressman we could get BZ out of munitions. The point is whether the Army should spend lots of money to look for a long-lasting agent that does not have

the bad side effects of BZ and when they find it, go ahead and build up a capability.

WATSON. But a long-lasting agent would be used out in the desert and someone would die of thirst after six hours. It would be used to kill people and not to incapacitate them.

SWYTER. I will agree with you. I come down on the side of not having any incapacitating chemical capability, including BZ, including CS. But I think you ought to realize the rationale.

WATSON. You can only reply to that rationale by taking a specific weapon and pointing out what it will do.

FELD. What we are saying is that we do not seem to be able to avoid the next step even if we take the rationale on which it starts. The next step is to escalate its use. If you give the military permission to use the weapon under some circumstances, they will expand the circumstances.

NEWMAN. Maybe not if that use is considered a war crime and you have the machinery for enforcement. We had Nuremburg and now everybody says that was just for the Nazis, and then there were trials in Tokyo too that we do not know much about, but we tend to say it would never apply to us. Until we change that idea, the scientists are going to be in charge. We have to reintroduce that idea into our discussion. Whether or not it is defined as a crime is a very important point because if it were, then even the generals might not do it.

SWYTER. But if it is criminal, why bother to have the capability at all? Why don't we say in disarmament circles not only that we will never use incapacitating chemicals first, but that we don't even have any in our stockpile and that we intend to save the money to boot?

NEWMAN. But yet that is not a definition of a crime.

SOHN. If we say we will use incapacitating chemicals only in places where they have a humane effect, we cannot define that as being a crime, but we can then add that if somebody goes beyond it and uses such chemicals in cases such as Matt has mentioned, then it is a crime for which the user should be punished.

MESELSON. I think that if you allow any use of gas in combat at all, you will inevitably start doing the things that are prohibited. I think there is no way to make this distinction, although the Army has tried by allocating funds for the development of CS grenades with soft plastic jackets so as not to kill people.

SWYTER. We have them in our inventory by the thousand.

MESELSON. Nevertheless, that rationale is an extremely dangerous one because no constraint on munitions, even small ones, will work. When actually used in war they will be used to kill. I think it is a myth that they can be used in war to save lives, taking into account their over-all effect. A great deal of tear gas was used in World War I but not to save lives. Hitler's Germany produced (but did not use) a large quantity of tear gas munitions during the war, certainly not to save lives. And even though our initial policy in Vietnam was different, we have been the ones to make the most massive and sophisticated use of tear gas for lethal purposes in war.

SOHN. In the United States the most lethal weapon at present is an automobile. It kills more people than anything else, but still we permit its use on the assumption that in most instances it is used for a proper purpose. However, if you go over the speed limit and break a law, then you are punished for it.

MESELSON. But cars are a real benefit. Tear gas is at best only a marginal benefit in war. The presumed benefit of saving a few civilian lives should not deceive us, because even that may not be real and the military benefit will decrease toward zero as the enemy masks. Meanwhile we pay the price in terms of escalation and proliferation, ending who knows where.

BUNN. But if you did have effective war crimes mechanisms—and it may be completely unrealistic to think of having them—you could make these distinctions. In fact the kind of distinction that the UN attempted to make was the distinction that Han has made between these two uses, and it is supported by the Geneva convention on prisoners of war. You can argue quite effectively that if you attacked a soldier with CS and put him out of combat and then came along and shot him with a fragmentation bomb you would have violated a convention to which we are party, that you would have committed a war crime. If you were caught and convicted, it might be effective. The problem is not that we cannot make the distinction; it is the fact that we have no enforcement mechanism.

SWYTER. The distinction is not very practical for a reason. We are committing what you would call war crimes in Vietnam today when we flush out enemy

soldiers and shoot them on the spot. There are plenty of cases were we could take prisoners but we kill them instead because it is a lot more convenient. In the technical sense that is a war crime.

NEWMAN. One picture showing that might have helped the anti-Vietnam cause as much as any single thing.

SWYTER. When you are using a chemical weapon, gas, it is unclear as to what is right and what is wrong. The enemy says the hell with the law, I have got to defend myself against gas. As long as I am going to spend the money to defend myself against gas, I might as well think through this thing logically and see whether it is worthwhile getting a capability. The result can be a proliferation of chemicals. Today the Viet Cong occasionally shoot a rocket into a city to remind the Vietnamese of just who is running that country. It would be a lot more efficient if we used a GB shell because then we would be assured of casualties or fatalities on each shot; the alternative is to shoot something into an awkward place and not have the fragments kill anybody. When you use any chemical agent in combat, you are engaging in chemical warfare, and this leads to more chemical warfare, to a buildup of chemical capability around the world. As long as the world is building up its chemical capability, it might as well think about its biological capability.

I would contend that a biological capability is a useful power tool, a lever by which small countries can increase their influence. I think it may be an ineffective weapon, just as I think one or two nuclear weapons in the hands of the Egyptians or the Israelis are probably ineffective because they would incur retaliation; however, you would certainly get a lot of leverage out of them. That is my concern about incapacitants and about any chemical or biological agents. As long as I cannot gain any major advantage (and I do not think a few hundred civilians every now and then is a major advantage), I am willing to forego that capability.

Incapacitating Biologicals

The remaining question is the option of having incapacitating biologicals. Here again let me present to you the most plausible case for having such a capability. This is again a first-use case. Nobody is seriously trying to advocate retaliation against an incapacitating biological attack. The best retaliation to an incapacitating biological attack is no action at all, just get well and forget it.

The issue here, as in the case of incapacitating chemicals, is saving human lives. I am going to paint for you a scenario in which we might save the lives of several thousand U.S. soldiers. This is a very unlikely situation, even more queer than the one for incapacitating chemicals, but it could occur. In Southeast Asia we are not dealing with a nuclear power; we are not dealing with a power that could retaliate with nuclear weapons. Remember, as an aside, that during an attack with biologicals there is no way for the attacked country to be sure that the attack is incapacitating. You can invent machines, and we are trying very hard to do so, that tell you you are under biological attack but so far the technology is such that the determination of what constitutes an attack requires an incubation period. Even if the attacker says that it is just incapacitating, you, as a nuclear power, may not believe that. You may do what, subsequently, may be considered irrational and unfortunate. However, in Southeast Asia, we could be faced with a situation in which our forces are somehow pushed off the peninsula. Somehow the enemy was able to bring force to bear. Now I know this sounds incredible, but it could happen.

SOHN. It almost happened in Korea.

SWYTER. Yes, and I assure you that five years ago in Vietnam five hundred thousand soldiers and two hundred to five hundred American casualties a week sounded unbelievable. No President in his right mind could spend thirty billion dollars a year on that war. But we're there.

If we were about to be pushed off the peninsula, several things could happen. We could get several hundred thousand of our soldiers slaughtered in the process—and there might not be enough time to be able to reinforce with whatever it is we could use as reinforcements. Reinforcement in quantity would be a matter of a few weeks at least. We would have several alternatives. We might use nuclear weapons on the invading force that is pushing us off the peninsula. The disadvantage here is that it would destroy South Vietnam and kill most of the South Vietnamese in the process and that is undesirable. We could continue to fight on in the hope that somehow we could pull off another Korea and not

get pushed off. But there is another possibility and that is to launch an incapacitating biological attack, incapacitating because it is more humanitarian and it doesn't kill a lot of South Vietnamese.

WATSON. One per cent.

SWYTER. Two per cent. The Defense Department definition is two per cent. We expect not more than two per cent fatalities. That is the definition of incapacitating.

What you pose to the President at this point is if you had an incapacitating biological capability, you could temporarily bring this whole thing to a halt by making everybody sick with VEE today. We can say publicly we will never use these weapons, but the question is should we spend the money to give the President the option, the capability, at some queer time in the future, of being able to protect those several hundred thousand American boys from possibly being slaughtered as opposed to his other options which would be to fight bravely on and pull off another Korea, use one nuclear weapon to scare the hell out of them, or, if that didn't work, blanket the peninsula with nuclear weapons.

BLOOMFIELD. Or withdraw.

SWYTER. There is no way to withdraw except to swim. That is the most attractive situation I can describe. On that point I simply conclude that I am willing to sacrifice the several hundred thousand American troops if that is what it takes rather than go ahead and have that capability. I am willing, should we get into that queer situation, to make that sacrifice in the hope that not having the capability will be a step toward nonproliferation. I want you to understand that the tradeoff as I see it here is between the potential of saving a relatively large number of American lives . . .

WATSON. You will kill more than you will save. You are not going to slaughter five hundred thousand, you are going to slaughter at least forty thousand innocent civilians unless you are fighting the whole thing in the Libyan desert.

MESELSON. Also men with fevers sometimes fight harder for a while than men who are not ill.

WIGGINS. What you are really saying is that under the most favorable circumstances for employment that you can imagine, you would still be against it.

SWYTER. Yes.

BLOOMFIELD. What about retaliation? Can you make the same kind of analysis that you made with the European scenario where people moving in rubber suits are almost as bad off as people not moving in rubber suits and so on. Suppose there is retaliation, is it still a good option?

SWYTER. Yes, because retaliation from the proponents' viewpoint—but not from mine—is still a worthwhile option. The argument is you don't use this option very often so nobody else, particularly this mythical poor nation, would have a biological capability, so there is no way of retaliating.

BLOOMFIELD. That is cheating, isn't it? Their allies have supplies of poison gas.

SWYTER. But there is no incentive for them to retaliate because once you retaliate, you are simply attacking the Americans in the field with a biological capability. Then everybody is sick, and in thirty days the war goes on again.

BLOOMFIELD. How about attacks in the continental U.S.?

BUNN. How about using nerve gas on the Americans?

SWYTER. The problem with all of this and the reason I will agree to do away with several hundred thousand American soldiers if necessary is because it does lead to proliferation, and proliferation I think ultimately leads to use. Once we use this weapon other countries will find out that it might have at least a political advantage and we will have let the cat out of the bag. I am willing to make a decision today that the advantages I can gain from incapacitating biologicals are insufficient to justify ever using them. As long as we don't ever use them, why bother to have the capability? We can say publicly not only have we never and will we never use an incapacitating biological, we don't ever have the stuff. The same statement can be made for lethal biologicals. We can unilaterally say that we have never used and we will never use a biological agent of any kind and we don't even have the capability. And then we can add it is not worthwhile, it is not humane because our objective is nonproliferation.

WIGGINS. It is clear there is a difference in your thinking on the lethal chemical agents as opposed to the biological agents. You are proposing a separate and distinct treatment between chemical and biological.

SWYTER. I believe in going through this analysis of whether we need lethal biologicals, lethal chemicals, incapacitating chemicals, and incapacitating biologicals, because the scenarios are different. After going through that analysis, we should make a basic policy decision to establish a chemical and biological fire break or to reinforce that. One of the steps in reinforcing that is saying publicly we will never use biologicals first; we will get rid of all the biological capability and we won't bother with an incapacitating capability. The only difficult problem is what to do about the lethal chemical capability. The critical factor is what Salvador Luria brought up this morning: How much additional deterrence do you add to chemical warfare by having an offensive chemical capability yourself?

WIGGINS. But that is the difference I see in your view. This morning you really were arguing for not the use but the possession of lethal chemical weapons. You are now arguing against even the development or possession of biologicals. I am trying to say there is a difference between your view on biologicals and your view on chemicals.

SWYTER. I tried to present the case this morning, and personally I have come to the conclusion very reluctantly that I am persuaded there is a case for possession of lethal chemicals. It is a very marginal case and I am not willing to spend very much money on it. If you can show me that we gain major political advantages by also dispensing with that capability, I could easily be persuaded but I have not been persuaded yet.

WATSON. What would you estimate to be the number of civilian casualties if West Germany were defended by using nerve gas?

SWYTER. That can be calculated fairly simply. Go through a number of scenarios as we have done with nuclear weapons. When you go through the nerve gas scenario, assume you establish a stable front line with both sides having a defensive capability and both sides forcing each other into a defensive capability—you end up with a relatively stable front line. Now not everybody believes this.

WATSON. What if it moves back and forth?

SWYTER. If it moves back and forth, I think, out of the two hundred million West Europeans (I guess there are about three hundred million Europeans all together) you could easily kill a hundred million of them.

MESELSON. Especially with things like our Sargent missiles with more than a hundred kilometer range and loaded with GB.

SWYTER. There would be pressure by the military commanders to attack each other's rear line. If in addition to that you did not have a stable situation but movement back and forth you could then cover even more area.

DAHLER. How much do you have to lower the utility to bring it off the marginal level? I don't see anything marginal about having such a weapon at all.

MESELSON. Han is talking about having it as a deterrent, not necessarily about using it.

SCOVILLE. If it involves killing a hundred million people in Europe, then it doesn't seem to me that it is any better deterrent than nuclear weapons themselves.

SWYTER. The advantage is this. We won't kill any Russian civilians or any Americans as long as we are talking about tactical gas weapons. But the problem with tactical nuclear weapons is that you can very easily escalate to attack Russian cities.

LURIA. In my mind the confusion that your presentation creates centers on the existence of a qualitative difference between escalation from use of the nerve gases and that from the use of tactical nuclear weapons. But it seems to me now that the size of this potential escalation of nerve gas in terms of number of Europeans killed is such that it is inevitably going to bring into play tactical nuclear weapons. I doubt very much that anybody would refrain from using tactical nuclears, unless fifty or a hundred million Europeans are to be sacrificed in order to try to save Moscow and New York.

SWYTER. If one side has a chemical capability and the other side does not, if the Russians have chemicals and we do not, it will be a short war; there will be few civilians killed; and the Russians will occupy Europe. They have an option, that is, they can use chemicals and it will be a shorter war, unless we retaliate with nuclear weapons, but if we retaliate with nuclear weapons we are talking about hundreds of millions of casualties.

WATSON. There are a hundred million casualties either way we retaliate.

SWYTER. No there aren't because . . .

MESELSON. You are not really threatening to hurt the Russians much with this nerve gas. But if you don't have it, as Han was saying, and they do, you are tempting them.

SWYTER. If the Russians have a chemical capability and we do not, it would take very little chemical and very few civilian casualties to defeat the American Army.

WATSON. But we say we will retaliate with tactical nuclear weapons.

BADER. I don't think there is a *real* distinction among kinds of nuclear weapons. I simply don't think field commanders are going to be able to make a distinction in a field situation.

THE OBJECTIVES OF U.S. POLICY ON CHEMICAL AND BIOLOGICAL WEAPONS

DOTY. Let's move on to a discussion of the objectives of United States policy concerning these weapons, keeping in mind the various alternations that Han has just presented.

Interpretation of the Geneva Protocol and the Possibility of Eventual Ratification by the United States.

LUBIA. If there were a strong effort to get ratification of the Geneva Protocol because of the way in which CS is used in Vietnam, there would have to be a clear understanding that ratification would cover the incapacitating chemicals, isn't that correct?

SWYTER. From a theoretical viewpoint, yes. In terms of actually getting the Protocol ratified, the proponents might have to make some compromise.

LUBIA. I think we ought to be very clear on this point because that kind of compromise is a phony compromise.

SWYTER. General Wheeler would fight very hard about explicitly saying we would not use CS in Vietnam. He would not want the U.S. to acknowledge that it had done something wrong.

DAHLER. I find it incredible that one could really convince the military to say they don't want these things. That is certainly not what one can hope for in a realistic way, so what General Wheeler argues can't be a determining factor in what one would try to do.

SWYTER. His is a foregone conclusion, but he wields influence. He influences Senators who say: "Well, if you think so, General, I'll vote against it."

BUNN. The Joint Chiefs make the difference between getting two thirds or only a majority in the Senate. If you had the Joint Chiefs fighting this treaty you wouldn't get two thirds in the Senate. You would not have gotten two thirds on the test ban treaty or the nonproliferation treaty if the Joint Chiefs hadn't supported it.

SLATER. What is the character of the compromise that would allow ratification?

BADER. Well, the disapproval of only one third of those Senators present is necessary to defeat the treaty. The opposition of the Joint Chiefs would be enough to assure defeat.

BUNN. The character of the compromise that you would have to make would be to permit tear gas on the basis of the same argument we used in the U.N.—the "humanitarian" case in which civilians are mixed with military.

SOHN. Can you draft a provision like that?

BUNN. You could do it by negotiating quietly with at least some other countries beforehand.

SLATER. Are you saying that only tear gas is involved?

BUNN. That is the compromise I would make if I had to make a compromise. I wouldn't go any further than that. I would do it on the justification that it was a gas used for riot control purposes by countries all over the world, and on that basis you can't go beyond tear gas. It is not just our police force or our Army that determines it so we should look at other countries.

GALSTON. Matt has pointed out that you can filter out these particles effectively with a layer of felt.

MESELSON. I think you can, I don't really know if the vapor pressure of CS is enough to allow a significant amount of CS through.

GALSTON. Let's assume that you can. Let's assume if this war were to continue for a long time and the use of CS were to continue, there would eventually be found ways to filter it out so it didn't get into the respiratory . . .

MESELSON. We would then be tempted to escalate the nature of the agent so that it would overmaster the defense. Maybe there is a way through this problem

as follows: In 1930, the British stated their view that the Protocol prohibited tear gas. Eleven other nations agreed. At the time Hugh Gibson, the American ambassador, said that it was a complicated question for he felt that countries might have difficulty foregoing the use in war of what their police used at home. He said everyone should think about it and then talk about it again. Two years later, they did talk about it again.

The focus had shifted from the Geneva Protocol to the World Disarmament Treaty then under negotiation. There was set up a committee of technical experts that included two American military men. This is summarized in the memorandum you received entitled *The Position of Various Nations During the Interwar Period Regarding the Prohibition of the Use in War of Tear Gas Under the Geneva Protocol of 1925.* The technical committee was asked the question: what gases should be prohibited in war? This committee unanimously responded all gases should be prohibited and it specifically included tear gas. This recommendation was then unanimously accepted by the political body to which the United States had sent an Ambassador as its representative. The political body of the League of Nations Disarmament Conference then addressed a second question to the technical committee where the United States was represented by a military officer. The second question was: what gases should be prohibited from being manufactured during peace? The committee concluded that the manufacture of poison gas should be prohibited but not the manufacture of tear gas because tear gas had legitimate police purposes. But the committee went on to reemphasize its unanimous view that in actual war you must prohibit the use of tear gas because of the impossibility of making a distinction. This conclusion then went back to the political body where it was accepted unanimously. Then the American ambassador, Hugh Wilson, said, in two different speeches, that the United States accepts the principle that tear gas should not be used in war, but maintains that its production for legitimate domestic purposes must not be prohibited. A treaty was then drafted and approved in first reading. It contained two relevant articles: one saying that tear gas is forbidden in war, and the other saying that tear gas may be produced for domestic police purposes. At that point the conference was disbanded by the approach of World War II.

What I am getting at is that, in a sense, we have been through this before. The U.S. could take the position that the question is still open. It is not a moral problem because certainly the use of tear gas in war is hardly less moral than other things that go on in war today. But we could go on to say that it is an important technical problem. The technical problem is to prevent escalation and proliferation of CB capability. We could declare our willingness to abide by whatever uniform and workable rule the majority of the parties to the Protocol decide. At the outset of the discussions we could propose several rules, one of which would be "no gas" just to show we would be willing to do that, and then we could have technical discussions. If it is agreed that tear gas should be kept out of war, we could say afterward that we have studied this question in great detail, we have thought about the escalation hazard, have consulted with other nations and we agree that henceforth the use of all gas in war should be covered by the Protocol. I don't see that we should be embarrassed to take this course. We would emerge as leaders in the control of CBW. We wouldn't lose anything that way. We would gain by strengthening the Geneva Protocol, by giving it a uniform interpretation. I think this is a way of dealing with the problem.

SCOVILLE. Isn't there another way of doing it by getting around the two thirds vote in the Senate? If the President decides that he no longer wishes to use CS in conjunction with bombing raids, he can unilaterally order an immediate halt. He doesn't have to get two thirds vote in the Senate to go along with that. If this were established as an agreed U.S. policy and procedure, it might be much easier to get ratification of the Geneva Protocol banning something which we already had given up.

MESELSON. He'd have to do that first. It would be a wise course.

SCOVILLE. He'd have to do that first and get it well established and quieted down.

BUNN. Would you agree then that the Protocol banned all tear gas in war?

SCOVILLE. I think at that point you could play it either way.

SOHN. There is one more point, namely, the question of using tear gas for riot control in enemy occupied territory.

SWYTER. That is clearly military police use. I don't think it would create a problem to the military, for if their police are tossing out burning hand grenades

at rioters, they are quite capable of doing that without taking the same grenades and throwing them at soldiers. We went through all of World War II with very few tear gas hand grenades ever thrown at a German, but we were quite capable of using them against the French population. The military establishment quite clearly understands the distinction and if they are told what the rules are, they are quite capable of enforcing them, although they are also willing to come out and say "this is an impossible situation."

BUNN. What happened with the tear gas rule then, Han, when it was justified by the Secretary of Defense and Secretary of State and the people at the UN?

SWYTER. As long as we are discussing how to put an end to the use of tear gas and CS in Vietnam, we should understand that the use of CS is presently authorized by the Secretary of State and the Secretary of Defense jointly to the Ambassador and Commander in Vietnam. If the Ambassador should withdraw his approval, that would stop it; if either Secretary Rogers or Secretary Laird withdrew their approval, that would stop it. So there are ways of getting to this without having the President make an announcement on television. We can get the President out of this entirely.

WIGGINS. Are you sure of your distinction between combat use and civilian use? What if the Israelis were to use it in Jerusalem to suppress a petty uprising? Do you call that civilian or military use?

SOHN. That is related to the question I raised before—the use not against enemy soldiers but against enemy civilian populations.

LURIA. It seems to me that this is a very good question because after all the war in Vietnam, in a certain sense, is not a war. It seems to me that as far as the treaty is concerned, it is better not to complicate it with borderline cases. Don't you think so?

BUNN. It is better if you can get it through the Senate that way.

MESELSON. If your real interest is arms control then forget about these fine points. If you have other interests, then you behave differently.

WIGGINS. You are really saying that you don't think it is worthwhile to get a ban on the other agents if you can't get a ban on tear gas.

MESELSON. I am saying it would be worthwhile if it would work, but I don't think it will. If you got a ban which said it was OK to use tear gas, we and some others would then probably exercise that option very vigorously. If we did that, it would be worse than not ratifying the Protocol but using tear gas only gingerly. What really bothers me is the use of it in large size munitions by regular military officers who decide that it is good for fighting. Then enemy and other military forces watching also decide that it is good for fighting and appropriations for research, development, and procurement in other countries go up. That is the real hazard.

DOTY. That is past tense isn't it?

MESELSON. No, the longer this goes on, the stronger the forces will be to get other countries to do this. In this country very few people even know about it and if it were to stop soon, it is very possible that that would be the end of it. If it goes on in this war and future wars, it won't be the end of it.

BUNN. But even if you could limit tear gas, there are still an awful lot of countries that are using tear gas at home on their own populations.

SWYTER. It is chemical warfare when you load an artillery shell with tear gas.

BUNN. All right, but I am talking about the more limited kind.

WIGGINS. What you'd like him to say is that military use of disabling or lethal gas weapons will be abolished. That would leave the question of using it against civilian populations in an occupied zone or against your own civilians.

NEWMAN. There is an alternate approach that sounds very impractical but what has happened in the last ten years, I think, indicates it should be considered. There are now treaties on human rights that have as much impact on the world as the 1925 treaty, for example, on slavery, on forced labor, and now we have a very interesting new experiment on racial discrimination. One way to get out of this mess, where we are on a seesaw or worse than that, would be to say that there exists a human right everywhere, in warfare, in armed conflict, among civilian citizens, not to be hurt by gas of more than a certain amount, which must be considered as a technical problem.

MESELSON. It is an impossible burden for the technical or military man to maintain those lines. We did without tear gas in war from 1919 until 1965—forty-six years. Why start now?

SWYTER. Schelling had a great idea. "Gas is gas."

MESELSON. The big difference between this and civil rights is that the other countries that have ratified the protocol, all 65 or so of them, don't use it in war. Australia is a user nation as is the Republic of South Korea but, aside from these, no nation has publicly supported our position on tear gas. The British have tried not to embarrass us but they have never said that the use of tear gas in war is allowed by the Protocol. They say only that questions like this should be answered by the majority of the signers of the treaty. And their policy is that their own interpretation of the Protocol keeps them from using it in war. As the issues become known, I think many nations will come out against the use of any gas in war. If we insist on exceptions for certain gases, we will isolate ourselves and, more important, we will be working against our own best interests.

NEWMAN. As has been suggested several times today, it is difficult, especially in these years of riots, to get across the idea that what you take for granted at home you can't use to protect your own soldiers abroad.

DOTY. It depends on the context of use. The battlefield is different from city streets.

MESELSON. The principle was observed for forty-six years. Tear gas has been used by police for forty-six years and not in war until Vietnam. It is not so hard.

SWYTER. Let me suggest another case. I believe I am correct in saying soldiers are not permitted to use shotguns just like they are not permitted to use dum dum bullets. Now most police don't use dum dum bullets although some do.

WIGGINS. They are all using shotguns.

SWYTER. Yes. Every soldier is quite capable of having his mother send him a shotgun and shells and some do it. In fact, I have worked with colonels who took their own shotguns over there because they thought they were effective weapons, but this doesn't happen very often. We don't have much use for shotguns in war. In the old days when we had good old conventional soldiers and tanks, shotguns didn't do much for you. In Vietnam they are great because you are in very close combat where you can't see the enemy because he is shooting at you from behind a leaf so shotguns do work. Yet the U.S. Army is not issuing shotguns.

NEWMAN. That is a very good example, but I don't think it is pertinent to the point on how you get those extra votes in the Senate.

MESELSON. You don't have to have a two thirds majority for a qualification. The treaty itself has to have two thirds.

NEWMAN. Louis, technically, how would we do it? Given the history, wouldn't it have to be a reservation?

SOHN. The difference is that the reservation has to be approved by the other parties. The voting in the Senate is no different, but in order for the reservation to be valid, it has to be accepted by the other parties to the treaty. If they reject it, the treaty is not binding between those parties and ourselves.

NEWMAN. Is that in the text?

BADER. That's a very difficult point. If the other parties decide that an interpretation or an understanding strikes into the heart of the treaty, they can put such a construction on it and say that it is the same as a reservation. If you masked a genuine reservation to a treaty in the guise of an interpretation, you would be taken to task by the other parties. So if there is a substantive difference it would have to be so considered whatever the labels.

SOHN. I think it would depend, to a large extent, on whether the other parties think it is more important for us to be bound by the treaty in the first place, even with this exception, or whether they feel so strongly about the exception that they would rather not have us bound at all.

BADER. It depends on whether they feel confronted by it.

NEWMAN. Matt, is your assumption that the other nations will push us on the no use of tear gas?

MESELSON. Sweden has proposed at the ENDC to open up a register at the United Nations which those nations who believe that tear gas is prohibited by the Protocol would sign, thereby declaring that to be the case. Presumably no one would open up the opposite kind of register so gradually a number of signatures would accumulate. However, Sweden hasn't put the register on the table yet. Whether they will or not I don't know.

Another interesting thing here is the comparison between the British draft treaty when it was a working paper a year ago and as it stands today. There is a very important shift. A year ago, August 1968, the British were saying that the Geneva Protocol had defects. It hadn't been ratified by everyone: how it

stands on tear gas is not clear; whether it applies to things that aren't really wars is also not clear and there are several other problems. In the present treaty they have completely deleted the whole preamble and substituted instead a statement praising the Protocol. Beyond that the British even say that they don't wish to make any permanent separation between chemicals and biologicals. The change has been toward a more universal interpretation of the Protocol and toward greater reliance on it.

LURIA. Matt, your argument is strengthened by what was said before. In Vietnam the use of CS has been of a different nature from riot control, because in riot control you want to apprehend a rioter without damage or injury, whereas in Vietnam, CS has been used to kill. This is a point that has to be kept in mind in support of the Protocol.

NEWMAN. I can't agree on the purpose of riot control. I don't think it is apprehension; I think it is dispersion.

LURIA. All right, dispersion rather than vulnerability.

DOTY. I don't think we should mask the basic contradiction here. On the one hand, movement toward ratification within the next six months may be possible only if the Joint Chiefs came along and their support would certainly rule out any understanding that the Protocol does not apply to tear gas. Yet, if we were to succeed in this, it might produce the atmosphere that Matt speaks of: energizing, still further, attempts to show the utility of tear gas under the interpretation or lack of it that made ratification of the treaty possible and we would, from the general point of view of those in this room, be worse off. What motion is possible then?

BADER. As you know any Senator can offer a reservation or interpretation to a treaty. It takes no impetus from the Administration. So you have to assume that if you take the Protocol to the Senate floor a number of reservations and interpretations will be offered. The question is whether these motions can be defeated on a majority vote.

MESELSON. Then is it true it takes only 51 per cent to defeat it, not two thirds?

DOTY. What if the opposite interpretation is offered and that is also defeated?

BUNN. If the Executive Branch had foresworn the use of tear gas, at least under most circumstances, and if you had persuaded the Foreign Relations Committee to adopt the Executive Branch position and the report of the committee reflected that, you might have a good chance of defeating it.

DOTY. This also would require cooperation between the Senate Foreign Relations Committee and the Administration of which there is no recent precedent.

BUNN. Well, the nonproliferation treaty got two thirds, and every single reservation and understanding was knocked down.

DOTY. Yes, that's true.

RICH. Isn't an important consideration here the evolution of our involvement in Vietnam? For example, if there is a marked deescalation and withdrawal and perhaps a cessation of heavy bombing raids and use of CS, then it seems to me we would be in a much stronger position in terms of securing approval for excluding the use of tear gas. On the other hand, if the war is being actively pursued, it might be more prudent not to try to push the Protocol. Taking the point of view that the only realistic way in which it could go through with a tear gas prohibition is in a circumstance in which we are not using it, I think it is unlikely to happen. The only thing that is both possible and realistic is that the fighting diminish to the point where tear gas is not being used, and, at that stage, one can take it as an open issue.

DOTY. But I think, Alex, the point is whether there is any likelihood that the use of CS would diminish more rapidly than the use of other munitions in the deescalation of the fighting.

RICH. I don't know. It is hard to predict, but I think it is possible that we may deescalate to the point of halting massive bombing raids.

WIGGINS. What about a forward dated ban? After all, we are interested in the long run, not the immediate. What about a Protocol that states after 1970 there shall be no military use of any disabling or lethal gas of any kind. Forward dated to a given date would take the Joint Chiefs of Staff off the hook on two grounds: apology for current usage and confession of past abuse.

DOTY. But it does look awfully hypocritical to the outside world.

MESELSON. I think everyone understands that after laws are made you don't violate them, but before they are made it is all right.

WIGGINS. It is all right to use them to a certain date and after that it isn't. In this way you really take yourself out of the whole argument on current use.

It seems to me that many treaties do come into effect at a subsequent time giving countries the chance to alter their weapons systems and to plan military tactics that no longer contemplate the use of prohibited materials.

SCOVILLE. That is very interesting, but I don't think you could buy off the Joint Chiefs on that basis. I think the Joint Chiefs are even more unlikely to give up future options than they are to give up things they are doing right now.

WIGGINS. I think it would really diminish the force of their argument, however, and would not provide many people in the Congress with a different attitude.

BADER. That could be done technically by a committee recommendation to the President that he withhold ratification until such and such a date.

BUNN. Making clear why he has chosen this line of action.

LURIA. There is another point that I would like to make. It seems to me that the initial suggestion about Executive action has another possibility in line with what Alex was saying before. I do think that the President is searching for deescalation acts in order to try to bring peace, and as such I think that if a proposal to refrain from the use of tear gas were brought to the White House, the President would find it a highly acceptable part of his attempt to bring the war to a negotiated conclusion. In a sense it is part of the principle of unilateral small step deescalation which has always had appeal in international negotiation.

EDSALL. By using gas, even riot control agents, we are encouraging escalation in the use of more deadly gases by other nations. The danger of such escalation is surely a greater threat to the future security of the United States than any short term gains from the use of gas by us in war can justify. This argument might not appeal to the Joint Chiefs of Staff—though I would not include the possibility that it would—but some of the Senators who would ordinarily go along with the Joint Chiefs might still find this reasoning convincing.

KENNEDY. It may be true that if the President did decide to stop the use of this gas in Vietnam, it would be, in a way, the most effective action that could be taken toward eventual ratification. But if, on the contrary, he were presented with this option and he decided not to adopt it, then the possibility of putting such an instrument through the Senate against the opposition of the Administration would be zero anyway. From that point of view it would seem to me that the President's option, in relation to what Luria said, is a hopeful possibility. If indeed the President were to take this action, it would almost certainly improve the chance of getting the kind of treaty one would want, and if he didn't, that would virtually end the possibility of getting it through the Senate. So in a way it is a crucial decision.

BLOOMFIELD. Can I just pick that up and back up a little further? I sense from this discussion that the most important thing to do is to get the United States to ratify the 1925 Protocol with an interpretation that incapacitating chemical agents be prohibited. Has the case really been made for this? Is that the objective, or is the objective to get the U.S. to ratify the Protocol with the best deal we can get? From the argument made here, it is difficult to be persuaded that barring the proliferation of incapacitating agents is more important than not having any Protocol at all that bars lethal chemical agents.

SLATER. You mean you would settle for three quarters of a loaf?

BLOOMFIELD. I want to know what the loaf is. There is an implicit assumption before us that I think ought to be made explicit. I think it gets back to Han's presentation. What is the principle objective in your mind, Matt? Is it to get the Protocol ratified by the U.S. with one interpretation only?

MESELSON. To me the principle objective is to prevent the proliferation of chemical capabilities, and to prevent ourselves from becoming pioneers in that direction. If the Protocol were ratified without any reservation at all (since no one else has said anything about tear gas in ratifying it) and we were to stop what we are doing with CS, I think that would be the best solution. The only case that has been made for why one would not like to have the Protocol ratified with a specific reservation allowing the use of tear gas in war is that if it is like underground testing, we will vigorously exercise the option.

The whole form of the Senate debate and the whole conditioning that will be brought about in the military community will center around the feeling that the trade-off has given us much more latitude on those things that we are still allowed to do than we had before and more funds if that should be necessary;

what we are giving up is that we now promise not to use the forbidden things first. In that situation expenditures on non-lethals would go up. Han or people like him would not be able to veto the proposals for contracts to be let, and the R&D community would then mobilize itself to produce all kinds of new agents and munitions and would use some of them in war, sell them to allies, distribute them throughout the world and bring us to the point where the very next step up to poison gas would be extremely easy. So I think we would be worse off with a specific statement about tear gas than we would be by waiting. You can always ratify the Protocol a little later, but you will never undo a reservation.

DOTY. But you do have to admit, Matt, that even if we took this course, our signing on to the convention would reinforce the fire break between non-lethals and lethals.

MESELSON. I don't want to see that fire break reinforced; that's the wrong place for it. It cannot last there for long. For years there has been a fire break between "gas" and "no gas." Let's keep it. In this business you can't keep two fire breaks. If we try to get a new one, we lose the old one. And I think the old one is the only one that will work.

BUNN. . . . the line would be drawn at a worse place, from his point of view, between lethals and non-lethals, rather than in the way that it was attempted to be drawn in the UN discussion which would be better. Instead of say 75–25 per cent, it would be 90–10 per cent.

WIGGINS. In other words you are saying that if we get the Geneva Protocol with the reservation allowing non-lethals we would have nothing more than we have now.

NEWMAN. It would be less.

WIGGINS. Actually it would be less because it would encourage the spread . . .

SOHN. I think the point made in George's paper is very good. It is already customary international law that the use of lethal gas is prohibited.

WIGGINS. What we are really taking about is the non-lethals.

SLATER. This is a query, not a statement. If you got action on the Geneva Protocol in a climate of studying the whole arms race picture, to what extent would this have a political psychological effect of some value, and does that value have to be weighed against the risk that there would be an attempt to find new ways of developing non-lethal gas? In other words you have a political psychological reaction that starts other things in motion. What value does that have to an Administration looking for something related to other parts of the arms race? How do you put it in context?

MESELSON. I think the answer to the question of concomitant benefits depends very much on the spirit of the debate in the Senate and on the spirit of the country's ratification. We could do it with the view that this is our treaty, we wrote it, but for constitutional reasons that are obscure and buried in isolationism we never did get around to ratifying it (although we did once when it was called the Washington Treaty) and now we have chosen to ratify it with great enthusiasm. If we did it in this way, we would probably create an atmosphere which would have some arms control benefits in other areas. I am not so sure about how big they would be, but I am sure of the reverse. That is, if we had a long and nasty debate in the Senate, if the outcome of it was to justify something that was then really in the public eye—namely the way we use CS in a war that has received such serious criticism—we would then have lost. We would have thrown away the possible benefits that ratification could have brought us.

SOHN. I think that argument goes even one step further. Remember the test ban debate in Congress, when for a time afterward there was a feeling that it would be best not to present anything to Congress for at least a year or two until we recovered. You might have the same reaction here if you had a bad debate in the Senate.

MESELSON. It could be bad not only in the general world community but also in the more cynical international military intelligence community in the following way: if we ratified the treaty allowing ourselves the use of incapacitating gas and made increased appropriations for incaps, then intelligence and military communities in other countries would cynically say it is clear that the Americans are attempting to carve out a new military custom and they might use this as an argument in order to get more funds for their own CB enterprises.

SLATER. What does Russia want at this point?

BUNN. Well, they certainly want us to ratify the Protocol. They want to get as many countries as possible to ratify the Protocol without any interpretations or exceptions for anything.

BADER. But there isn't any particular Soviet pressure.

DOTY. For the first time, a month ago the Academy of Sciences came out with a strong anti-CBW statement. Such top figures were involved that it must have been orchestrated from the top, and one could well ask why because they seldom use the Academy of Sciences in this way.

BADER. I think we are seeing with the antiballistic missile issue the problems of a forced march on an issue, and the polarization that such a march creates without a prolonged period of public education. We may be running into some of the same liabilities with the CBW question. The Administration took a position on the anti-ballistic missile issue which forced a tough political fight within the Senate. If the Administration does the same thing with the CBW issue, there may be some of the same results.

DOTY. So your optimal prescription for this issue would be . . .

BADER. Very roughly it is that groups such as this do their best if they engender sensible public discussion of the issue, follow that process with rather long and hopefully useful Congressional hearings on the whole question of chemical and biological warfare, and then hope to develop some sort of a national consensus before they push to a Senate vote. Hopefully the Vietnam war will be resolved during this process, because I can now see the conservative Senators charging that full adherence to the Geneva Protocol would deprive our boys in Vietnam of weapons that are keeping them alive, and that the Senators who are pushing for this Protocol are really asking for the casualty rates to go up from 240 to 340. What would have been the cost of Hamburger Hill if we didn't use CS to flush the enemy out?

WATSON. We'd have never gone up it.

DOTY. The other side of the coin is that if the war were over, the amount of time you could still keep public attention on this subject would be very small.

BADER. I don't think public attention has focused on the CBW issue as a result of the Vietnam war.

SLATER. Aren't there two factors? Living in different parts of the country for the last few months it seems to me the tremendous expenditures of the military coupled with a rising distrust of their constant demand for the newest and the latest weapons systems is bringing the whole question to the forefront. If it is not a crescendo, at least it is a major change in the last four to six months. Aren't we reaching a boiling point in terms of over-all defense expenditures and the country's attitude toward that and, as a paragraph in that chapter, the whole attitude toward these weapons in particular. In other words, won't this debate be taking place in a rapidly changing political environment?

DOTY. That leaves the other question. Is there any practical consequence of the hold-up on funding in the Senate?

BADER. I think these are all important factors and they are a reflection of the emotions involved. But what I think we are all talking about is how we can bring about an orderly debate that doesn't destroy the long range objectives I think most of us share. If you had an impassioned Senate debate on this issue and you won by a few votes after conceding a reservation which would allow certain chemical weapons, then all the consequences that Dr. Meselson has been talking about would follow.

We had the Finletter Commission in 1948 and we had the Gaither Commission ten years later, we *should* have had an ABM Commission in 1968. Perhaps what we really need is a broad-gauge, blue-ribbon consideration of the CBW issue. If you got the right sort of men together in a national commission to look at the CBW issue and then brought the conclusions to the Senate in perhaps a year, I think this would make a considerable contribution to orderly debate.

LURIA. A specific, short, well-documented argument as was presented here today.

BADER. You have to look very carefully at the pressures that are forcing a decision on the CBW issue. I don't think the pressures are that strong with regard to the Protocol. After all, the Protocol has been around for a good long time. The administration does not have to make a rushed decision on CBW as the Nixon Administration felt it had to on the Sentinel system. As I am sure many of you know, the basic position of the Senators who made the fuss in January and

February was that the Nixon Administration did *not* have to make a rushed decision on whether to deploy the ABM system or not. I don't see a need for the Nixon Administration to make a decision on chemical and biological warfare in the next six months, but they may make it. It might come in two or three months, and it could come to the Senate in the form of a recommendation for the ratification of the Protocol with the reservation referred to by Professor Meselson. This could be the worst possible situation.

Other Issues Involved in Executive Branch Review of United States CW/BW Policies

SCOVILLE. We tend to concentrate on the Protocol but clearly there are many other elements involved in the whole BW/CW policy that are going to be considered in the review. I think the point that Matt made earlier regarding the general bias of reviews conducted solely within the Executive branch is a very good one, having seen it occur very often and also having been, I guess, a victim of it. I think one of the main dangers of this kind of review, and I am not quite sure how you correct it, is that the basic papers which will funnel up to the NSC mechanism will be drafted by the proponents, because after all the experts in the BW/CW field are the military, and they will be the ones who are probably going to be drafting the basic papers. It is not that easy to change those basic papers. I have a suspicion that we would find that the various alternative postures presented to the NSC are not going to be so attractive, at least we wouldn't think them so attractive. How from the outside you make sure that the issues don't get lost in the discussion and how you get proper decision-making by the President, I am not sure. I think it is true that the Administration, and this is true probably of all administrations, does not look very kindly on outside advisors. They like to feel that they are doing these things themselves.

BADER. You are not talking about a national commission idea . . .

SCOVILLE. I think it may be possible to pick out a few really key issues and proposals which perhaps might be lost in the shuffle during the Executive review, perhaps because the proponents of these proposals don't feel that they can put them forward. They could be put forward with the pros and cons in a reasonable way so that they attract attention and funnel into the system as papers of interest to the people who are involved in the review. In such a way you might make sure that at least those ideas are considered.

SLATER. That would be in addition to the Protocol, the whole field?

BLOOMFIELD. One thing that has come out of this discussion could well be missed in a good staff review, even by the White House staff which mobilizes all the technical, military, strategic and economic pros and cons. That is the argument that transcends all of those considerations—a psychological argument. It is analogous I thing to the nuclear weapons problem in which the debates on tactical nuclear weapons have been subject to a lot of argumentation within the government. The arms controllers could argue against the military, and the military could argue tactically against each other. But the transcending argument was to maintain the fire break, not between tactical and strategic nuclear weapons but between conventional and nuclear weapons. I think that is now happening and the significance of most of the arms control agreements of the sixties is just that. It has not changed any weapons inventories, but it has reinforced the expectation that something will be done to avoid the use of nuclear weapons. I think the collapse of the tactical nuclear strategies is, in part, the result of this extremely important attention to the psychology of it.

I take from what I have read and learned and heard now that the most important thing to be done is not technical, not legal, but psychological. It is to reinforce the expectation that CW/BW will not be used, to reinforce the inhibition against it. Some slippage has occurred as a result of the use of tear gas in Vietnam, and that is eroding an inhibition which has existed for forty years quite successfully, given the stockpiles on both sides. If there is one thing that any group can do, it is first, to support that inhibition regardless of what form it takes, and second, to attack this erosion which gets directly at current U.S. policy in Vietnam, and third, to do what good outside groups have always done with internal government arguments which is to support the position of the good guys who have already made the case within the government. It is not a new position that they frame and it is going to need a lot of reinforcement from the outside because the experts are those who want to keep their options open. It is the same issue we have always faced in the weapons field. The people who want to keep the

President's options open, that's the fancier way of saying it, tend to carry the day in decision-making. That is the thing that has to be countered, not the technical arguments as to why they shouldn't keep the options open. We need something that reinforces the general expectation that these weapons will not be used.

SWYTER. Let me reemphasize what Lincoln Bloomfield said. After thinking about this problem for two and a half years, part of the time on the government payroll, the fire break that is known as the gas and bug break is really the clearest, easiest, simplest way of separating the stuff—just don't use it. You solve a lot of problems, and using it doesn't gain you much. It doesn't, however, resolve the issue of whether you should have a capability in the lethal chemical situation which I described, and this again is the Presidential option argument which, I guess, Lincoln tried to demolish, and it probably ought to be demolished.

SCOVILLE. I think there is one rather fortunate thing about this particular area. CBW really doesn't have a political constituency the way the ABM had a political constituency and the way so many of the other weapons systems have. The basic political constituency is pretty small and there is general popular revulsion against BW and perhaps also to a lesser extent against CW. In addition, the present Administration hasn't taken any stand on any part of this problem other than to actually pull back from things that the previous Administration had done, such as to pull the gas out of Okinawa and a few things like that. So in a sense you haven't yet built up deep-seated opposition within the Administration to suggestions and I think the more the proposals are made to look constructive and a part of or in support of the Administration, the more likely they are to be considered seriously.

RICH. From that point of view the most constructive thing that might happen now would be this review pointing toward reinforcement of the fact that we have indeed observed the Geneva Protocol in a sense, leaving open and purposely evading the question of CS in Vietnam, simply reinforcing the psychological fire to break so to speak, and looking toward a post-Vietnam period when one could properly have a go at the Protocol and the proper prohibition against tear gas. It seems to me that any attempt to force an issue now against the Joint Chiefs would be doomed to failure and would be counter-productive. But if in fact the administration took the point of view that indeed they have always honored the Protocol without actually trying to push it through the Senate and were withdrawing these weapons from abroad and so on, this would be a constructive move. It would not be the optimal move, but it might be the most feasible one we could make now. It seems to me difficult to try and get the Senate to pass something when the military is actually using tear gas now.

SCOVILLE. I think I agree there, but I don't think it is quite hopeless in terms of getting the Executive to make some unilateral decisions in this area. They are looking for ways of deescalating the Vietnam war. The policy now in effect wasn't their policy and so far they have not come out and made a pronouncement in favor of this. Once they have this review and it becomes the present Administration's policy, then it is going to be ten times harder for them to adopt new policies.

RICH. The question really is the Joint Chiefs and how much they are going . . .

SCOVILLE. The Joint Chiefs aren't that sold on BW/CW. After all, they are shopping for a lot of other things.

LURIA. Not only that, but the Joint Chiefs probably have much more of an investment in keeping the issue open on a long term than in maintaining the use specifically in Vietnam which is what you are suggesting the President may discontinue. It might be more acceptable to the Joint Chiefs to discontinue the use in Vietnam without any implication at this time of a long term policy.

KENNEDY. It seems to me that operationally the review that the Administration is now having is critical. The timing is definitely critical because if a review is undertaken and then accepted by the Administration and the policy is hardened on the basis of what is accepted in that review the ball game is almost over in terms of politics or actually changing our policy in Vietnam.

Desirability of a Unilateral Declaration Against the Production and Use of Biological Weapons

WIGGINS. I'd like to know how many would be interested in having the United States—unambiguously and without exception—agree to forego the production, manufacture, storage, and use of biological weapons, on the basis that they are, even more than chemical and even more than thermonuclear weapons, beyond

control once they have been utilized and unpredictable in their effect on the people in the target area and their epidemic spread elsewhere in the world. How many here think we could afford, as a great power, to announce to the whole world that, without any conventional treaty or protocol whatever, we are willing to forego forever the use of biologicals as an instrument of warfare?

BLOOMFIELD. Use and what?

WIGGINS. Manufacture and use, no stockpiling, no manufacture.

SCOVILLE. It would require some additional action. You'd have to give up the stockpiles which you already have.

WIGGINS. I am talking about the whole hog

SCOVILLE. I would support you and I think everybody else would.

MESELSON. It is the British draft treaty. . . .

WIGGINS. The British draft treaty has a fatal defect in it. That fatal defect is the presumption that there is a means of discovering whether anybody is manufacturing it or not. I wouldn't require anybody else to promise not to manufacture it; I would just say we are not going to do it. It is offensive to me to have nations subscribe to a document involving an agreement to do or not to do something on which there is no means of inspection or discovery and no means of enforcement because it creates an illusion of security that doesn't exist.

MESELSON. And if the other side is doing it, you still don't want to do it.

WIGGINS. I would just say I don't care what they do. I would say that this country as a leading power in the world has chosen, for humane and human considerations, not to engage in this kind of warfare.

BUNN. Politically this is much more likely to be acceptable than the British draft treaty.

WIGGINS. This country has no real vested interest in biological weapons and no other country has either. I don't know whether our action has to be coupled with a further statement that we reserve the right to take other forms of reprisal against any nation that indicates its complete primitive savagery by employing biologicals.

BUNN. But we would retaliate with something else.

WIGGINS. I would just say that any nation that unleashed upon the world an infectious disease for the furtherance of its national aims is so far beyond the pale of civilization that we would feel obliged to retaliate with appropriate weapons not of this character.

BLOOMFIELD. I gather that you can't inspect biological weapons now any better than you could when I looked at the question seven years ago. At least no one has mentioned here that you can. Could you not combine this with a proposal to reveal and turn over to some international agency on a matching basis stockpiles which could then be disposed of?

WIGGINS. I don't know of any international agency that I would trust with biologicals.

MESELSON. It detracts from the high tone of what you are saying to ask for such a quid pro quo.

WATSON. I would think at the same time a real decision to open up Fort Dietrick should be made. That doesn't mean there can't be other labs that do minor things in secret. But something the size of Dietrick should be opened up as an international pathological lab. It would not harm the security of the United States and it should have an enormous good effect on world opinion.

DOTY. Fortunately there still persists a strong feeling in most scientific communities everywhere that there is a real distinction between making and working and manipulating biological as against chemical materials. It does bring in the medical aspect which has its own traditions of working to save life instead of the opposite. The ultimate consequences of developing successive generations of biological weapons probably do go far beyond what we can expect out of the chemical side because the diversity with which one can work is much greater.

WIGGINS. I think it goes even farther than the fallout from nuclear weapons. If you had a catastrophic nuclear exchange, world wide fallout, the minute it was over that would be the end of the damage that was done. There would be sickness, but you might have survivors somewhere in the world. I know that there is a dispute about whether incapacity induced by biologicals is contagious but it certainly is possible that ultimately biologicals would be used not only to inflict incapacity and death upon those directly hit, but also to inflict diseases that would be communicable and contagious. It is conceivable that ultimately,

if pursued far down this road, some nation will set loose a contagion that will rage unchecked until the whole population of the world is destroyed. In other words it is less within the capacity of the authors of this destruction to limit its consequences than it is for them to limit the consequences of either chemical warfare or thermonuclear warfare. From this unlimited character derives a degree of horror that none of the other weapons really possess.

RICH. I have only one reservation which is the historical linking of chemical and biological weapons and the fact that biological weapons, because of their unknown quality, really do inspire a sense of repulsion. I think that the only disadvantage of a proposal like this would be a separation of chemical and biological weapons with the possible consequence of increased use of chemical weapons.

WIGGINS. I think it might more logically operate in the other direction. Once our lead was taken and other nations fell in behind it, it might be possible, after an interval, to proceed on to the chemical.

MESELSON. Do you think that would be more true, Mr. Wiggins, if we first ratified the Protocol?

WIGGINS. I don't object to the ratification of the Protocol, but I do quarrel with the Defense Department statement of 1960 that it can conceive of no reason why biological and chemical weapons should be singled out for discriminatory treatment. I see reasons why biologicals ought to be distinguished from chemical weapons, and why chemical weapons ought to be distinguished from other weapons. It seems to me the moral and practical position of the Defense Department in 1960 was completely in error on this.

MESELSON. When he introduced the British draft treaty on the tenth of July, Mr. Fred Mulley stated: "A second point I should like to make is that though we think the best course is to tackle biological weapons first, this does not mean that we are prepared to accept the present position with regard to chemical weapons without trying to do anything about it. We are not." He went on to say: "If we do this"—meaning if we agree on the BW Treaty—"I would expect that at our next session we could be able to follow it up with a similar measure covering chemical weapons so that this can be considered by the General Assembly in 1970." With that kind of approach the danger that what you are proposing might be misinterpreted would be reduced.

WIGGINS. I agree. I don't mean to diminish regard for the other at all. I just think that when we have a situation in which no country in the world is far into this dreadful traffic, it would be easier to stop it at the start, to use Churchill's phrase, "to smother the baby in the cradle," than it would be to wait ten or twenty years hence when military figures will have made a large investment of prestige and money in laboratory development and field trials in these weapons. Then it would be much more difficult to stop. We would be in happier circumstances if we had cut off chemical warfare fifty years ago.

SCOVILLE. If one prepared reasoned and carefully thought out papers supporting a proposal like this, and had them made available publicly and also circulated privately to people in the Administration, it could be quite useful.

WIGGINS. You prepare the reasoned part of it and I'll prepare the emotional part!

LURIA. It seems to me that there is a real tactical danger here. If two suggestions—the one you made earlier about a cut-off date on the use of CS in Vietnam, and the unilateral decision not to use biological weapons—were presented together, I think there would be a danger that the first one, which is really of much greater immediate importance in the light of its current use, might be compromised in favor of the second. Also I believe that influencing the Administration may best be done in a private, non-propaganda way.

WIGGINS. This group should not form a national committee to outlaw biological warfare and have a big fanfare. What good is an Administration going to get out of embracing a doctrine after somebody else has sprung it? Acceptance would be much more likely if you had a small group with the importance of the thermonuclear scientists (who didn't do what they should have done) that could get to authority to argue against employment of the weapons. A group of knowledgeable and competent scientifically-informed people should be able to get to the proper agencies in the Administration, and point out that this action could be taken without jeopardizing the security of the country, that there is no reason to assume that the employment of these weapons would further the national interest, but rather that there are a great many reasons to believe that

employment would not only risk the opinion of mankind but might even physically damage our own country. I should think that such a group may be very persuasive at this juncture.

FINAL COMMENTS AND SUGGESTIONS FOR FURTHER STUDY AND ACTION

DOTY. We have come to the point where we must soon bring the formal part of the meeting to an end. Perhaps the best way of evening the score for everyone concerned is to go around the table and ask each person to say something that he hasn't had an opportunity to say or to comment on what he thinks are our highest priorities in terms of study or action.

FELD. There are two problems that have been on my mind. The first concerns the question raised earlier about retaining lethal chemical weapons because of their deterrent value in view of the fact that the Russians have a stockpile in Europe. It seems to me that here one runs into the same danger that we have run into in the nuclear weapons field. If you maintain a large stockpile of such weapons in military readiness in Europe without, at the same time, announcing, very clearly, a doctrine of no-first-use, then the military situation becomes very ambiguous. In fact the dangers of these weapons being used are greatly enhanced. My own feeling about retaining battlefield stores of lethal chemical weapons is that this would not present a major danger and might even have a certain marginal usefulness as a deterrent, provided it were coupled with a clearly announced stated doctrine of no-first-use. Otherwise it could be a very dangerous thing.

The other question that I had in mind was related to a point that Jim brought up earlier concerning the fact that there are no qualitatively new, effective chemical incapacitants on the horizon. Now I don't really know myself what the situation is with respect to biologicals, lethal or non-lethal. I have a suspicion that it is much less clear than in the chemical area. Since biology is in a state of rapid development it would be difficult to make any clear statement at this point on whether biological weapons will remain in the indefinite future in the category of useless weapons that we would be better off doing without. It seems to me that under these circumstances the community of biologists has a real responsibility in the sense that they have to understand (and the understanding has to be spread through the profession) the dangers that would be inherent in such advanced developments in this area, especially if such developments are being carried on in secret. Somehow we must encourage the feeling that all this has to be open, that the biological community bears a real responsibility in this regard.

WATSON. Mr. Wiggins' proposal makes enormous sense to me because I think it could be done almost without complications and it would achieve a great deal. It would make us think about the chemical weapons. I think in trying to do both at one time, especially as the war is going on, such enormous vested interests by the military in the use of these agents now would result in nothing more than a bitter fight. Until six months ago, I didn't think we would dare attempt to renounce BW. So if we could do it I think it would be a very good thing.

GALSTON. As you know, I had hoped that there would be some discussion of herbicides at this meeting. I am terribly disturbed at the omission, not only because we didn't discuss an important matter, but because in all the talk about chemical warfare in Vietnam the only agent that anyone in this very enlightened group has mentioned is CS. There have been fourteen million pounds of CS used in Vietnam, but there has been almost ten times that quantity of herbicides sprayed over an area about the size of Massachusetts. I would hope that if there were any detailed thinking about treaties, about weapons limitation, and about denial of first strike capacities, that herbicides would be included. We must remember that we all live in an environment with which we need to come to terms; we are discovering that we can't forever abuse the environment without its recoiling and striking back. I am convinced that herbicides may have done very serious damage to the ecology of Vietnam. I would hope that we would support measures such as that proposed by Representatives Koch and McCarthy to have an on-the-scene ecological investigation in Vietnam as soon as circumstances there permit. In addition, the deliberate use of chemicals to kill food crops is to me a very deplorable practice which may possibly be considered a war crime. I think the deliberate use of chemicals to kill vegetation which will not

come back for several decades—vegetation being an ecological niche for the production of very important food crops, both animal and vegetable—is a terribly serious problem. I would remind you that in terms of tonnage it is about ten times the size of the CS problem. We must not ignore it when we are thinking about chemical warfare in Vietnam.

DOTY. I think we have to accept this, both the facts and the spirit, seriously. And I am sorry that I did not provide time for it. If we do meet again we will certainly put this in a prominent forward position.

HENAHAN. I have a quick question and perhaps Dr. Meselson can give me a quick answer on it. How do you interpret this recent cutback in expenditures on offensive research? Is there any significance to that?

MESELSON. Yes, Senator McIntyre was interested in doing a good job as the chairman of a newly created committee and he wanted that committee to do something. He looked into the subject of CBW. The result was this cut.

HENAHAN. It doesn't reflect any change in the thinking in the country?

MESELSON. I think the only thing you can say is that it reflects a willingness on the part of the Armed Services Committee to think about cuts in this area. But no one will get up on the floor of Congress and urge that money for offensive chemical and biological weapons research be reinstated.

BUNN. The danger is that it might get put back in spite of Congress.

MESELSON. There are ways the Army can put it back, but the spirit of the Committee is quite clear.

RICH. I am very impressed by the short time scale between now and September or whatever the date is for this Executive review. It seems to me that if the members of this group are to be effective, the only thing we can do is use what contacts we have with people in the Administration who are connected with this review. It seems to me we have generated several ideas and we ought to look seriously into ways of getting these ideas to those people in the government who can directly influence policy. I don't think that a public statement would have any effect. However, we might actively do something in terms of feeding in a number of inputs without trying to give outside advice. We could simply say that having done a background study or having thought about the problem, here are various additional alternatives which should perhaps be considered. In my more optimistic moments I think that President Nixon might do something along the lines of this idea so it would be a mistake for us not to try and do something right away.

DAHLER. I too feel very strongly that with the recent history of numerous military bumblings the time is right to arouse the public about these issues and to try to maneuver for support. I think that the emotional approach suggested by Mr. Wiggins is the best in a way. It is rather hard to approach such an irrational subject as mass murder with a rational detached argument.

BLOOMFIELD. I feel that the main objective is to be damn sure we keep this animal in the cage and that we keep our eye on it. However, I disagree with what was just said, because it seems to me that there is a very special presentational problem here, and frankly I am no longer impressed with arm-waving on any subject involving weapons. I have had twenty-five years of it, and it is not good enough. On this subject in particular I have a box of material on CW/BW that goes back fifteen years, and I still don't have the piece of paper which, if I were a member of Congress who had not done his homework or the president of a company or the editor of a paper or an editorial writer, I would turn to for a succinct presentation of the problem. I think perhaps the most important thing that could be done is for Matt to take his excellent testimony and boil it down to a question and answer document that can be widely used. Otherwise we are going to be limited to moral arguments or analytical strategic arguments, neither of which has proven sufficient to carry the day. I think what is needed is a marriage of the two, and perhaps a good journalist ought to be asked to prepare such a document.

Finally, all the attention has been on great power use of CW/BW, but the wars that do get fought involve a lot of other countries. There have been fifty-five of those wars since World War II. I would like to see on your action list of things to do, apart from Mr. Wiggins' suggestion and a lot of others, the possibility of regional agreements along the lines of the Latin American nuclear free zone, for example, where initiatives are taken elsewhere than in Washington or in Cambridge or in New York to begin to fortify and reinforce this terribly important fire break which is beginning to slip a little.

DOTY. It may be that the American population and its elected officials are sufficiently diverse that one needs both of these arguments.

KENNEDY. I would just like to echo what Alex Rich said. I think that the ongoing review by the Administration of this whole picture is a great opportunity but it will be an opportunity completely missed if the President's action consists simply of making some compromise among the positions of the departments and agencies which are undertaking this review. Any mechanism at all which would allow the President to get some over-all view of this situation would be of great importance.

SCOVILLE. I think it would be extremely useful if one could prepare a two or three page paper with good solid arguments, particularly as to the security aspects of giving up BW and get the paper to the right people. I do think a couple of other things might be usefully said, although I think they have lower priority. The discussion we had on the Protocol was rather useful; we came up with some slightly different ideas than some people have had before, and it might be helpful if that were passed on. I think the idea of people recognizing and getting the cost of what is really going on in Vietnam with CS is also another important thing. But I don't think it should be allowed to interfere with the basic BW presentation which I think has a real chance of success because it should be politically attractive.

GUHIN. Might I simply express my thanks for having the opportunity to attend and listen.

WIGGINS. One matter that we didn't get to that I intended to say something about is the secrecy in connection with these weapons. They have been cloaked in more secrecy than any other weapon except thermonuclear devices. That is now beginning to break down and I think it would be worthwhile if we could exert pressure to place the development of such weapons absolutely in the open, because there is really no argument for complete secrecy in the disclosure of these weapons. I am reminded of Lloyd Berkner's statement about the excessive secrecy surrounding radar: he said that if the Japanese had known that we had radar they never would have attacked Pearl Harbor. If our chemical weapons are supposed to be justified for their deterrent effect alone, no one can argue that the less the world knows about what we've got the better. I think most people would be horrified to discover that under the cloak of secrecy we have apparently dispersed some of these weapons quite widely in the world. I wonder if that ever would have happened if the American people had been aware of it.

BUNN. I've learned a lot at this meeting and would like to suggest that, when we get the problem of CBW solved, maybe next year sometime, we hold a similar conference on the problems of napalm and white phosphorous.

DOTY. At that rate we'll end up with general disarmament.

MESELSON. As far as the Executive review goes, there is a great need to put some good papers before the Administration. In addition, the level of public discussion of the issue must be raised. It is still true that most newspaper and public discussion are based on dead sheep and leaky gas bomb. Those are real things that happened and they started people thinking, but until CB arms control is thought of in the way the non-proliferation treaty was thought of, namely as something that is serious and sober and involves the best interests of the United States, it will not mobilize the efforts of other people like ourselves, and those efforts are indispensable if we are ever to get anything through the Senate. The apparent likelihood of getting something through the Senate may very well influence the recommendations that are put before the President as to what he should do in the first place.

A related need is to increase the number of persons concerned with these questions. There are many thousands of people who need to be told about this in a straightforward fashion and who can understand it if given some information. This could be done through the efforts of such organizations as the Council on Foreign Relations, the Carnegie Institution, the Ford Foundation, the American Academy, and more recently, the Salk Institute and the United Nations Association. It would be best if several of them would get together and sponsor a study which could end up as a book that could be criticized and discussed and made available.

SLATER. I think it would be useful to find one clear cut move of some importance, such as Mr. Wiggins suggested, based on some real study and facts and make sure it was on solid ground in terms of the whole arms control political and psychological mood of the period. To be able to move forward with something concrete like that would be of tremendous importance in this coming period.

Second, I think there should be some system of briefings, of basic education, to deepen the thoughts and broaden the circle of people informed about this issue. I would appeal, in the first instance, to leadership elites in different parts of the country. Perhaps a very simple primer would be required to do this, some basic document that has the pros and cons clearly stated. By the way, I think there is a need, with respect to a lot of biological developments in general, not just biological warfare, to understand what some of these concepts are, some of the pros and cons. A primer plus some elite briefings are essential.

Lastly I would also think that a small gold ribbon committee under impeccable auspices, as you have suggested, should be organized to put together a document relatively quickly in terms of the time frame that would set forth some of the pros and cons and come up with some recommendations. This could be given not with great fanfare but rather privately to the group that is studying the matter within the government. Within the next ninety days we should come out with a statement that raises four, five or six points that people on the outside could put into focus—points that might not necessarily be generated within a government review.

BADER. I would underline the clear need for informed public, Congressional and Executive dialogue on this issue. In my view, it would be most unfortunate if the Executive Branch at this stage moved rapidly to make some very hard decisions. I think we have time for considered national discussion of the BCW issue and there is no reason for the White House to feel it must make hard decisions in the next two or three months. There is a reservoir of talented men in this country who could add a great deal to the Executive Branch's deliberations, and the Administration should reach out for them. The confrontation over the ABM issue, it seems to me, was entirely unnecessary. I think that a dialogue could have been carried on without the Safeguard decision being put up for everyone to shoot at.

On the question of secrecy, my own experience over the last fifteen years has convinced me how little of the information branded top secret or sensitive, once it is exposed to public light, is actually judged to be of a nature that would jeopardize the national security. In fact the information adds to the national security by increasing the population's understanding of the problems. It seems to me that most of what is being done in the BCW field could be open to the public, could be open to analysis by many of the people around this table. I think any decisions that are make nationally after that process is completed would not only be better decisions but decisions that the population and the Congress would be able to accept. I am very disturbed by the thought that we will wind ourselves into another ABM hassle over biological and chemical warfare with a hard Executive position in opposition to that of the academic and Congressional community: the result could be a bitter fight, a vast outpouring of emotion and a badly damaged Protocol. I would hope the Administration would move slowly on this issue and seek outside assistance and help.

SWYTER. As we take steps to get an Administration position on this, I hope we keep in mind that our basic objective, and I think that most everyone here agrees, is to keep these weapons from proliferating and, therefore, to keep them from being used in mass killings of civilian populations. I think that Lincoln really hit on a key element here, and that is we should strengthen the barriers to all chemical and biological warfare. We should emphasize that the fire break includes defoliants. We didn't talk about it, but we should have. Defoliants are certainly a part of chemical warfare and are probably being interpreted that way by less friendly nations. We can easily, as a country, come out with a no-first-use policy. We are not giving up worthwhile options in that regard, and I think we ought to emphasize this to the White House. This Presidential option thing is a very real force in Washington. I'm afraid I got caught up in it myself when I was there, and it doesn't really make sense in this case. Certainly we can agree to give up any kind of first-use option with any kind of a chemical or biological weapon, and we ought to do that.

GUBMAN. It has been a very useful afternoon. I think the papers that have been proposed, both on BW and on the Protocol, would be helpful in connection with the Executive Branch review. There is more pressure in Washington than you have recognized this afternoon for acting on the Protocol soon. One hundred members of the House have already sponsored resolutions calling on the President to resubmit the Protocol to the Senate. Whatever papers you wish to submit should be prepared quickly.

EDSALL. I would like to strongly support Mr. Wiggin's proposal. It has obvious emotional appeal but it also I think can be defended with very powerful rational arguments in view of the extreme uncertainty of the consequences of the use of biological weapons and the great hazards involved. I think we would have a good many military men strongly with us in supporting a proposal like that. Going along with it, I certainly agree we should urge the opening up of Fort Dietrick and other centers where secret research of that sort is going on. And I do think we should make every effort to prevent the Administration from bringing up the Protocol for ratification if it is brought up with reservations regarding tear gas. If we can get them to hold off, it would be much better to have no action at all than to have it approved with that reservation for reasons Matt has so well presented. I would also like to strongly second Arthur Galston's statement about the importance of the herbicide question which we should certainly keep as a major item.

VOSS. As I have been listening to this discussion, it seems to me that there are at least two and perhaps three separable issues. One of them is what happens immediately in terms of the White House Review and in terms of the ratification of the Geneva Protocol. In looking at the material that has been sent around, and reading Matt's testimony, it seems to me that there is a clear need for some kind of a white paper, a position paper, which would make some of these issues much clearer than they have been made and serve as the kind of document that newspapers and editors could use. But at another level there is a more substantial issue. I suspect that even if the best scenario takes place within the next twelve months that CBW will still be a major kind of issue that will not disappear after the Senate ratifies a treaty or the White House issues an announcement. There are some very substantial issues that need clarification on the model of the *Daedalus* issue on Arms Control that came out about ten years ago and served as a way of getting good ideas into communication and into currency. It is not an easy subject, it may be relatively easy to pull together the pros and cons at one level for certain kinds of policy reviews and for the public, but on another level we ought to take a longer look at some of the broader issues. I would therefore urge that the Academy and this group look to the possibility of a thorough examination of this complex issue. At a third level, and I am not sure whether I am right about this, it seems to me that perhaps we have been dealing with yesterday's technology. As Bernie Feld has said, advances, particularly in biology, will constantly create new problems particularly on the level of biological warfare and perhaps even chemical warfare, and therefore what we are talking about is a special instance of the larger problem of some of the consequences of technology in society. May I add that the Academy was pleased to serve as co-sponsor of this conference. We trust that the results of the meeting will find a wide audience.

SOHN. There was one issue that I think was not sufficiently raised today and that is the question of whether the testing of biological weapons can be detected. I have the feeling that once you come to Congress with a proposal on this subject they will want to know whether, if we refrain, the others will follow and if the others don't, can we at least know about it, even if we can't do anything about it. I think the work that Matt has been doing with the Pugwash Committee on the subject shows that there is some hope of finding ways of monitoring not production itself, but testing, especially large scale testing, and I don't think the military is crazy enough to use this kind of weapon unless they have tested it somewhat. This is a crucial point. Monitoring might be possible and perhaps more studies could be done on that particular aspect. In trying to persuade Congress on the subject, the fact that you know you can do something about one crucial area would be very important.

LURIA. Just two quick points. I do think that if by any chance there were a decision by the President not to use tear gas in Vietnam that would probably be the most effective way of limiting its irrational use by police forces in this country, but I don't think one should attempt to tie up the domestic use of tear gas with other issues. The second point is in connection with what was said before about the Chemical Society. I think there is a very good chance of support for any deescalation in this direction judging from my own experience in the American Society of Microbiology where there has been a complete change of mood in the last two years. Things that would not have come up without being ruled out of order two or three years ago are now greatly encouraged. I saw, for example, how Matt was received when he spoke at the annual meeting this

year. I think there is a change of mood mainly because I think the general public influences the profession.

SLATER. I have one sentence or so about the question of timing. We heard a minute ago that there is pressure for some kind of decision or action in the fall. That is all very well and good, provided the decision finds a climate of understanding and acceptance in the country and around the world. But if the wrong decision is made (or what looks like a hurried decision or a decision made by a very small group without proper consideration), I think, given the mood of the country, one might see some very unfortunate consequences. If there were a well-informed group working in this area, and if there were a genuine debate in the next months, there would be a lot better chance that what decisions were made would be sounder and less divisive within the country as a whole. In other words, just getting decisions qua decisions because of the increasing pressure doesn't strike me, in the last analysis, as the argument which should prevail. Rather, what require attention are the questions that are asked, how well the issues are understood, and how thoughtfully the debate is received. A simple paper and some sort of primer should be prepared with some urgency. This conference certainly has been educational for those of us who aren't experts in this area. I am deeply grateful to Matt and Paul for pulling such a good group together. I think it has been an extraordinarily productive day.

38-044—70——33

APPENDIX F

TABLE 1.—SOME CHEMICAL AGENTS

[By Julian Perry Robinson, Science Journal, April 1967]

U.S. Army code	Trivial name	Smell	Disseminated form	Symptoms	Time of onset of symptoms	LD^{50} inhalation (mg.-min/m³)	1st use or country of first development	Remarks
CG	Phosgene	New-mown hay; imparts metallic taste to tobacco smoke.	Gas	Lethal: coughing, retching, frothing at mouth; cyanosis; asphyxia; pneumonia.	Generally delayed for several hours.	3,200	Germany, 1915	Produced 80 percent of World War I gas fatalities; extensively stockpiled in World War II.
AC	Prussic acid.	Bitter almonds	Vapor	Lethal: giddiness, convulsions, unconsciousness, asphyxia.	Immediate	5,000	France, about 1865; France, 1916.	Stockpiled by the United States from 1942 on.
HD	Distilled mustard.	Faint garlic	Vapor liquid	Harassing: eyes—inflammation, photophobia, ulceration, blindness.	Delayed 1–48 hours.	1,000	German, 1917	Most widely stockpiled agent of World War II.
T		None	Liquid aerosol	Skin: redness, irritation, blisters	Delayed	About 400	United Kingdom, United States pre-World War II.	Used mixed with mustard; their production methods yield such mixtures; British stockpiled 60/40 HT during World War II.
Q	Sesqui-mustard.	None	Aerosol	Lethal: resembles CG in its action on lungs; other systemic effects.	Delayed	About 300	United Kingdom, United States, Germany pre-World War II.	
HN3	Nitrogen mustard.	Faint geranium smell.	Vapor liquid aerosol.		do	1,000	United Kingdom, United States, Germany pre-World War II.	Less smell than HD, so even more insidious.
GA	Tabun	None to fruity	do	Harassing: eyes—pupils constrict, vision blurs and dims, eyeballs hurt.		150	Germany, 1937	Standard German tabun contained 20 percent chlorobenzine.

GB	Sarin	Almost none	Vapor liquid	Respiration: chest tightness, difficulty in breathing.	Up to 10 minutes following inhalation, or up to half an hour following percutaneous absorption.	70	Germany, 1938	Germans stockpiled large quantities of its intermediates but could make only ½ ton.
GD	Soman	Slightly fruity to caemyhor-like.	Vapor liquid aerosol.	Lethal: drooling, sweating, nausea, vomiting, cramps, involuntary defection or urination, twitching, jerking, staggering, headache, confusion, drowsiness, coma, convulsions, asphyxia.		About 70	Germany, 1944	Highly resistant to oxime therapy.
GE			do				United Kingdom, United States, Canada, early 1950's.	
GF	CMPF		Liquid vapor aerosol.					Harder to treat than GB.
VE			Liquid aerosol					
VX			do					
CA	BBC Camite.	Soured fruit	Vapor aerosol	Harassing: burning feeling in mucous membranes, severe eye irritation and lachrymation, headache.	Immediate	3,500	France, 1918	Useful as a persistent harassing agent.
CN	CAP	Apple blossom	Aerosol	Harassing: burning feeling on moist skin, copious lachrymation.	do	8,500	United States, 1918	
DM	Adamsite	Almost none	do	Harassing: headache, sneezing, coughing, chest pains, nausea, vomiting.	Up to 3 min	30,000	United Kingdom, United States, 1918.	
CS	OCMB	Peppery	do	Harassing: stinging and burning feeling on skin, coughing, tears, chest tightness, nausea.	Immediate	Very large	United Kingdom, early 1950's	
BZ			do	Slowing of physical and mental activity, giddiness, disorientation, hallucinations, occasional maniacal behavior.			United States, middle 1950's	Only standardized incapacitating agent by 1963.

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TABLE 2.—SOME BIOLOGICAL AGENTS

Disease	Organism	Infectivity	Effects	Vaccines	Therapy	Epidemicity	Remarks
Bacterial diseases:							
Anthrax	Bacillus anthracis	20,000 organisms of <2μ inhaled.	Respiratory form normally fatal if untreated.	Available	Antibiotics	Low	One of the most stable agents.
Brucellosis	Brucella melitensis	High; 1,300 organisms?	Long lasting, recurrent severe fever; rarely fatal.	Available in U.S.S.R.	do	do	Affects both man and domestic animals.
Cholera	Vibrio cholera	Low by ingestion	Severe intestinal infection; sometimes fatal.	Vaccine reduces severity and incidence.	Difficult	High	Unlikely to be effective via water systems.
Glanders	Malleomyces mallei	High; 3,200 organisms inhaled.	In acute form, severe fever often fatal.	Unsatisfactory	Antibiotics	Low	Affects both man and domestic animals.
Melioidosis	Whitmorella pseudomalle.	High	Normally fatal fever, producing mania and delirium.	do	Difficult	do	Very rare and little-known disease.
Plague	Pasteurella pestis	High; 3,000 organisms	Very severe, often fatal	Available	Antibiotics	High	Only pneumatic (respiratory) plague likely to be of BW use.
Tularemia	Pasteurella tularensis.	Very high; <50 organisms inhaled.	Severe fever; 5 to 8 percent fatal.	do	do	None	Good BW agent, apart from doubts concerning stability.
Viral diseases:							
Breakbone fever	Dengue viruses	High; single mosquito bite; 2 organisms inhaled?	Most incapacitating fever known; very rarely fatal.	Available	Difficult	Low	Might be useful as an incapacitating agent.
Psittacosis		High	Mild to severe pneumonia; sometimes fatal.	Unsatisfactory	Antibiotics	High	Birds act as reservoir o disease.
Smallpox	Poxvirus variolae	High; a "few" organisms.	Severe; often fatal	Mass produced	Difficult	do	Generally, immunity too widespread, but see text for possible use in United States and Europe.
Yellow fever		High; single mosquito bite.	Jaundice-type fever; 30-percent mortality	do	do	None	Naturally a subtropical disease; a strain which could survive in temperate climate might be dangerous.
Rickettsial diseases:							
Q-fever	Coxiella burnetii	Very high; 1 organism inhaled(?); 10^{-6}g infected tissue.	Fever for 1 week; 1 percent mortality.	Available	Antibiotics	do	Very high infectivity.
Epidemic typhus	Rickettsia prowazeki	High	Severe; often fatal	Mass produced	do	High, but cannot spread man to man.	Unlikely BW agent; poor stability.
Fungal disease: Coccidioidomycosis.	Coccidioides immitis	1,350 spores	Mild to severe fever; rarely fatal.	Unsatisfactory	Antibiotics(?)	Low	Highly stable; suitable agent if a vaccine were produced.
Toxin Botulism	Clostridium botulinum.	Toxic dose 0.12u g(?)	Severe poisoning; 60-70 percent mortality.	Available as toxoid	Difficult	None	Acts more quickly than any other BW agent; troops could invade after 24 hours.

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