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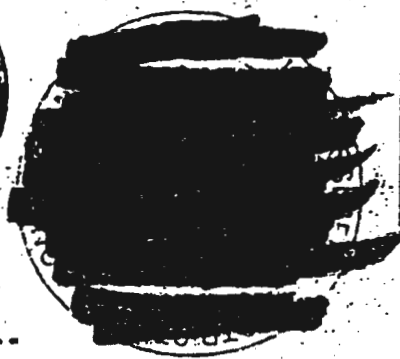
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DR. ROBERT E. BOYLE

*Report of
The Secretary of Defense's
Ad Hoc Committee on*

**CHEMICAL,
BIOLOGICAL,
and
RADIOLOGICAL
WARFARE**

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30 June 1950

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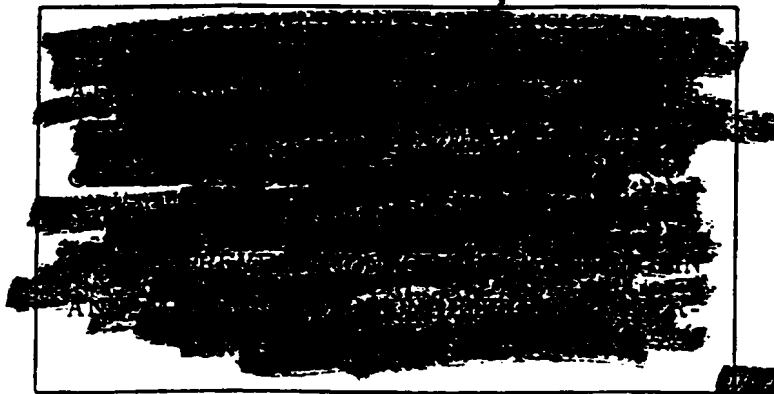
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**REPORT OF
THE SECRETARY OF DEFENSE'S
AD HOC COMMITTEE**

950

ON

**CHEMICAL, BIOLOGICAL
AND RADIOLOGICAL WARFARE**



30 June 1950



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LETTER OF TRANSMITTAL

30 June 1950

Dear Mr. Secretary:

Attached is the report of your Committee on Chemical, Biological, and Radiological Warfare. It includes the findings on the several assignments carried out by the Committee, in accordance with the instructions you gave us in December. It is in form a summary report, largely confined to discussion and recommendations pertaining to significant gaps in thinking and programming.

Your Committee has seen and studied the pertinent information in the files of the Department of Defense. We have talked freely with those persons, both military and civilian, who are most familiar with these weapons and with the plans and the state of military preparedness of the United States and certain other nations with respect thereto.

Your Committee does not believe that there is any likelihood of effective international control of these weapons prior to the settlement of the whole problem of armaments.

We do not believe that any useful distinction can be made between weapons on a moral basis.

If the United States or its allies were attacked, toxic chemical agents might be exceedingly important to us as a supplement to weapons now in general use for holding back the advance of enemy ground forces. Certainly, any nation which lacked these weapons or the will to use them would be at a great disadvantage in fighting against a nation prepared to use them.

We have, therefore, been disturbed to find that according to the best available information, Soviet military forces have substantial stockpiles of toxic chemical agents, together with production facilities for making them, operating or in condition to operate. In addition, the Soviet Union took over at the end of the war the German plants for making G-agents ("nerve gases"), together with German technicians and scientists associated with these plants. The U.S. Army Chemical Corps, although it has done an outstanding job in developing and improving the G-agent processes which were obtained from the Germans at the end of the war, has but limited stockpiles of toxic chemical agents, and has neither any stockpiles of, nor even production facilities for, G-agents.

We believe that this situation is the inevitable result of the United States policy of "use in retaliation only." Such a policy has resulted in the assignment of low priorities to the research, development, and production of chemical weapons. The security of the United States demands that the policy of "use in retaliation only" be abandoned.

Biological warfare is a weapon which may become exceedingly important. Present evidence indicates that it could be an effective weapon of war, but the degree of its effectiveness is unknown because it has never been used on a large scale or subjected to adequate field tests.

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There can be no doubt of the danger to the United States from enemy use of biological agents in sabotage or by other means of attack, either before or after a declaration of war, if the United States is not adequately prepared to protect itself. At present, not enough is being done to explore the offensive potentialities of this mode of warfare or otherwise to develop an adequate defense against biological attack, whether anti-personnel, anti-animal, or anti-crop.

Radiological warfare agents and atomic bombs compete for the same raw materials and facilities, and the production of radiological warfare agents in significant quantity is now precluded. This situation, however, is subject to change. Radiological warfare has potentialities sufficient to warrant constant study of its military worth to determine whether neutrons should be diverted from atomic projects for the production of radiological warfare agents.

The United States is not prepared for biological warfare and, for all practical purposes, is not prepared for chemical warfare. This state of unpreparedness is the result of the indecision that, during the postwar years, has permeated the area of the Committee's investigation. We believe the recommendations that we make would, if accepted, serve to break the deadlock and produce action. To carry out these recommendations will require an outlay of additional funds, but the relatively small cost appears to be a sound investment.

Sincerely yours,

R. Gordon Arneson

R. Gordon Arneson

Willis A. Gibbons

Willis A. Gibbons

Eric G. Ball

Eric G. Ball

Frederick Osborn

Frederick Osborn

Jacob L. Devers

Jacob L. Devers

Arthur W. Page

Arthur W. Page

Earl P. Stevenson

Earl P. Stevenson
Chairman

The Honorable
The Secretary of Defense
Washington 25, D. C.

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FOREWORD

Terms of Reference of the Committee

Acting for the Secretary of Defense, Dr. Karl T. Compton, then the Chairman of the Research and Development Board, in a letter of 25 October 1949, asked Mr. Earl P. Stevenson to form, and serve as Chairman of, an Ad Hoc Committee to undertake a full examination of all aspects of Chemical Warfare and report its findings and recommendations to the Secretary of Defense within six months.

The terms of reference were subsequently broadened and more specifically defined in two subsequent letters. On 7 November 1949, Dr. Compton wrote to Mr. Stevenson that the Committee should interest itself in biological and radiological warfare, as well as chemical warfare, to which it should give special emphasis. On 9 December 1949, the Honorable Stephen T. Early, Deputy Secretary of Defense, asked the Committee to give particular consideration to the national policy, public education, and national defense problems associated with chemical, biological, and radiological warfare, and to feel free to study and make recommendations on any aspect of these three types of warfare in which significant gaps in thinking were noted.

The Committee's Approach to the Problem

In its deliberations, the Committee has been mindful of the obligations of the United States within the United Nations and of the increasing commitments of the United States for the defense of Western Europe under the terms of the North Atlantic Treaty. It has been especially aware of the necessity of deterring Soviet armed aggression and, if we fail in this, of preventing the overrunning of Western Europe by the Soviet Army. In realization of the fact that in the event of such a catastrophe the United States would find itself alone in a hostile world, the Committee has given considerable thought to the possibilities of these weapons for defense.

The Committee, during its deliberations and in this report, has dealt primarily with the three weapons as separate entities. A discussion of the line of reasoning which the Committee followed in this approach will be found in the conclusions.

The Committee focused its interest in the chemical warfare field on the toxic agents because such chemical munitions as incendiaries, flame throwers, screening smokes, and shells containing white phosphorous, having been used extensively in World War II, have become integral and generally accepted weapons of combat.

The Committee noted that chemical warfare, with the exception of the above mentioned non-toxic weapons, has not been used since World War I; that biological warfare, except for a few isolated circumstances, has never been employed; and that radiological warfare, as such, has yet to be undertaken, although the atomic bomb explosions of World War II created certain radiological effects similar to RW. The Committee, being aware of the inactive status of the weapons it had been asked to consider, gave particular attention to whether they were being thereby neglected in present military planning.

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The Committee explored the interest of the military planners in the chemical, biological, and radiological weapons; the status of research programs on these weapons; and the present and near future availability of such munitions of war; together with the implications of national policies pertaining to such weapons. In addition, the Committee attempted to arrive at an understanding of the potential merit of these weapons in the event of a war with the Soviet Union and the consequent necessity of preventing the advance of Soviet troops into Western Europe. The Committee also attempted to assess the threat to the United States of an attack by these weapons.

It was appreciated from the beginning that existing agencies within the Department of Defense are also concerned with the merits of these weapons, and are better qualified than is the Committee to consider certain of their aspects. While it was felt that, from the information presented, the Committee could render opinions on certain national policy aspects of the chemical, biological, and radiological weapons, it was also felt that the technical evaluation of these same weapons should be made by especially qualified experts. The Committee is pleased to note the assignment of the Weapons Systems Evaluation Group to this task. It is expected that this group will present an interim report in July 1950, which will include a tentative evaluation of CW, and may also include a progress report of the BW and RW evaluation.

The Committee assigned tasks to its Panels and Sub-Committees, together with consultants, to make detailed investigations into areas of special interest to the Committee. Reports of the results of such investigations were made known to the full Committee during the regular meetings and by special reports between the meetings.

A synopsis of the Committee's activities is given as an Appendix, as are lists of persons interviewed and documents considered by the Committee.

All members of the Committee have participated actively in its investigations. An average of six of its seven members were in attendance at each of the meetings and, in addition, all members participated in Sub-Committee activities between meetings of the full Committee.

The Committee greatly appreciates the full cooperation and generous assistance which it has received from the agencies and departments of the Government, and from the private individuals and organizations from which it has requested information.

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Secretariat Assigned to the Committee

Lt. Col. Cuyler L. Clark, Office of the Secretary of Defense
Lt. Col. William E. R. Sullivan, Chemical Corps, Department of the Army
Maj. Wilbur W. Hurt, United States Air Force
Mr. Edward Wetter, Research and Development Board



MAJOR RECOMMENDATIONS

On the basis of its findings and conclusions the Committee has arrived at certain major recommendations which are here presented. Auxiliary measures which the Committee advocates are set forth in the sections containing the findings and conclusions.

The Committee recommends:

I

Deferred
That chemical, biological, and radiological weapons not be restricted by a policy of "use in retaliation only" and that the present interim policy regarding chemical warfare be changed accordingly.

II

That the necessary steps be taken to make the United States capable of effectively employing toxic chemical agents at the outset of a war.

III

✓ That construction be undertaken as soon as possible, followed by operation, of a plant to produce militarily significant quantities of G-agents ("nerve gases"), and that munitions and means of delivery for these agents be brought to a commensurate state of readiness.

IV

That the projected engineering studies and designs of facilities for the production of biological warfare agents be completed as soon as possible.

V

That field tests of biological warfare agents and munitions be carried out as soon as possible on a scale sufficient to determine the military worth of agent-munition combinations, their offensive uses and the means of defense against them, and to secure definitive information on other problems inherent in biological warfare.

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VI

That research programs on the defensive aspects of biological warfare be materially expanded.

VII

That, in view of the unique characteristics of radiological warfare, an appraisal be made now, and from time to time as neutron availability may change, of the comparative military worth of radiological agents, the atomic bomb, and other weapons, to include determination of whether fissionable material should be made available to support an RW munitions program.

VIII

That a coordinated program be established to guide releases of information on chemical, biological, and radiological warfare, and that this program be reviewed and revised periodically.

INDEX OF FINDINGS AND CONCLUSIONS

The Committee's main findings and conclusions, listed below in consolidated form, are discussed separately on the pages indicated.

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18. The engineering design for production facilities for BW agents should be completed as soon as possible. 16
19. Research programs on BW should be expanded, particularly with respect to the defensive aspects. 17

V

RADIOLOGICAL WARFARE SEEMS TO POSSESS UNIQUE MILITARY CHARACTERISTICS, AND FURTHER STUDY OF ITS POTENTIAL MILITARY WORTH SHOULD BE UNDERTAKEN, TO INCLUDE DETERMINATION OF WHETHER FISSIONABLE MATERIAL SHOULD BE MADE AVAILABLE TO SUPPORT AN RW WEAPONS PROGRAM.

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| 21. The silent, persistent nature of RW attack presents the possibility of introducing a major harassing factor into future warfare. | 19 |
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| 24. Public statements on these weapons have been ineffective as a means of educating the public. | 21 |
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FINDINGS AND CONCLUSIONS

I

A NUMBER OF MISCONCEPTIONS HAVE EVOLVED WITH RESPECT TO CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL WARFARE.

1. Chemical, biological, and radiological warfare have been mistakenly assumed to have enough significant characteristics in common to warrant their being grouped together as CEBAR for administrative and operational purposes.

In its examination of these three weapons, the Committee noted, on the one hand, certain similarities between the weapons, as pointed out in the Haskins Committee report,¹ and, on the other hand, the many dissimilar characteristics of the weapons apparent from the comparative evaluation of the weapons in the Noyes Report of 1 November 1948.² As its studies progressed, the Committee became aware of additional differences between the weapons, particularly where policy issues are concerned.

The Committee considered the argument which the Haskins report presents for handling the three weapons jointly in accordance with a unitary "CEBAR" concept, but cannot recommend that the idea be developed as an essential inter-relationship. Such a term may be helpful in some administrative respects, but many of the problems connected with these three weapons require totally different treatment.

The Committee questions any approach to the weapons which would produce in either the public or military thinking a feeling that there was an inseparable association between chemical, biological, and radiological warfare. While psychological and public information aspects are quite similar for the three weapons, there are fundamental differences in the situation with respect to each of them which call for different handling in research, development, and production programs. CW is a weapon of demonstrated military worth, but one that has been neglected. BW, on the other hand, is a weapon which has never been used openly or on a large scale, and hence is of unproven military worth. It requires a great deal more research, development, and testing. RW, while it would be of manifest value if agents were available in quantity, and may be of potential value with presently feasible quantities of agents, is dependent on decisions reached in the field of atomic explosives.

¹ Report of the Secretary of Defense's Ad Hoc Committee on Biological Warfare, July 1949.

² A Comparative Evaluation of Chemical Warfare, Biological Warfare and Radiological Warfare, 1 November 1948, submitted by Dr. W. Albert Noyes, Jr., and revised by the Research and Development Board as of 1 October 1949.

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In view of the foregoing, the Committee, during its deliberations and in this report, has dealt primarily with the three weapons as separate entities.

2. Chemical, biological, and radiological weapons have been erroneously considered to be "weapons of mass destruction".

These weapons have been listed in various statements as being "weapons of mass destruction". As a typical example, the Commission for Conventional Armaments of the United Nations adopted the following resolution on 12 August 1948:

"The CCA resolves to advise the Security Council ... that weapons of mass destruction should be defined to include atomic explosive weapons, radioactive material weapons, lethal chemical and biological weapons, and any weapons developed in the future which have characteristics comparable in effect to those of the atomic bomb or other weapons mentioned above."

Statements such as the above purport to define "weapon of mass destruction", but in fact merely name and group together certain types of weapons as belonging in that category. The Committee has not found any satisfactory definition, in absolute terms, of "weapon of mass destruction". The Committee presumes, however, that in its most meaningful sense, the term is meant to apply to weapons which can destroy a very large number of people, or a very large amount of material, or a very significant segment of the social or economic structure of a nation. Even so described, the concept does not appear to have any practical significance and should not pervade our thinking on these or any other weapons.

It would seem that there are a number of weapons which if used in suitable quantity, or in accordance with a suitable plan, could effect mass destruction. For example, the weapon, fire, whether disseminated by incendiary bomb or by numerous saboteurs, can cause vast damage, particularly because of its extensive spread from a small focus of initial application. Economic blockade or deprivation of a nation's critical materials could be, and has in history been, a "weapon of mass destruction", as in the starvation caused by cutting off a nation's food supplies. The advance of an invading army results in large-scale devastation of the territory which is the battleground. Gas chambers in concentration camps can be effective weapons for destroying masses of people. Modern total war itself is a "weapon of mass destruction", as applied to the economic resources or social structure of a nation.

On the other hand, certain weapons are very poorly suited to bringing about mass destruction, either because of the inherent nature of their effect or because of the logistic problem of delivering enough of them against a target.

Radiological agents, for instance, are very expensive and cannot now be produced in sufficient quantities to saturate very large target areas with an immediate-killing dose. Furthermore, in less than immediately lethal doses, they act so slowly that the target populace can detect their presence and move out of the danger area. They cannot be considered "weapons of mass destruction".

Chemical weapons are of many types, with varying effects, but none of them are well suited for mass destruction. Some (screening smokes) have uses other than the production of casualties; some (such as mustard) have injurious effects but are more often incapacitating than lethal; some (certain toxic gases and flame throwers) are highly lethal if properly applied to the target; but all are needed in such quantity to

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accomplish their effect that they can be considered "weapons of mass destruction" only to the degree that high explosives and firearms are so considered.

Any classification of biological agents as "weapons of mass destruction" must rest largely upon conjecture. No data exist which permit an authoritative assay of the lethal scope of these agents when disseminated in a willful manner. The opinion of experts is that there is no procedure which is certain to produce large-scale epidemics among human beings. The extent to which a disease may spread through a community or a nation is largely governed by factors still unknown. The direct contact of an individual with the disseminated material itself appears to be required if a reasonable degree of success in causing an infection is to be expected. Thus, except to the extent that the use of crop and animal agents may result in serious deprivation of food supplies, the classification of biological agents as "weapons of mass destruction" is unwarranted.

3. A fallacious concept has developed that weapons can be divided into moral and immoral types, and chemical, biological, and radiological weapons have been placed in the immoral category by many people.

In the days of the powerful states in Europe dominated by autocratic governments of kings, armies were raised and matters decided through trial by combat, with little participation by the people. Wars were professional and there was no need and no practice of destroying civilian life or production as a military measure.

But, beginning perhaps with the American Revolution, people en masse became more interested in the outcome of wars. In order to conquer a country it became necessary to conquer a people. To defeat a professional army was not enough. This ~~led~~ led to all-out wars.

Neither the people who defend liberty nor those who would destroy it can limit their efforts or their weapons in the contest; nor, as a matter of fact, have they.

The moralities and limitations discussed and, to a considerable extent, followed when trial by combat of professional armies was in vogue, still persist in discussion, but the conditions under which they could operate have disappeared. The desperate nature of war between peoples is such that the only result of agreement or exhortations to limit the "horrors of war" is to advantage the side that first chooses to use weapons which had been ostensibly banned. Restricting ourselves in the weapons we use merely means that we offer our enemy a better chance to kill our soldiers and civilians than we need to, out of deference to a habit of thought based on conditions of former times.

Chemical, biological, and radiological warfare, as well as the atomic bomb, have often been spoken of in terms that impute immorality to their use. In World War I, chemical warfare became a subject for propaganda directed at influencing neutral world opinion, and many falsehoods ascribing immorality to its employment were deliberately disseminated, without, however, deterring either adversary from employing toxic gases. More recently, all three of the weapons have been execrated in public statements. BW has been described as "a horrible idea", "a nasty weapon", "the terrible warfare weapon". A high governmental official has characterized CW and BW as "a means for mass murder of civilians". An editorial in a prominent newspaper referred to the "grisly little hint" that RW could be used as "a particularly vicious form of poison gas".

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It is not a fact that these or other modern weapons in themselves have increased the horrors of war. From the time that wars became total struggles between peoples, wars have gone on until the suffering and losses of the people on one side or the other have been sufficient to produce surrender or collapse. The march of the German armies from the Soviet border to Leningrad and Stalingrad produced as much destruction and suffering as did the bombing of Germany. Whatever methods or weapons are used, wars between peoples are terrible wars, and if the people, whether from wisdom or ignorance, firmly embrace a cause, the ensuing war will be one of general destruction.

Immorality attaches to those who initiate a war of aggression. Once the immorality of aggression has been committed, one cannot usefully dwell on the morality or immorality of specific weapons.

II

THE POLICY OF "USE IN RETALIATION ONLY", WHICH IN LARGE PART HAS GOVERNED OUR PROGRAMS WITH RESPECT TO CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL WEAPONS, IS DETRIMENTAL TO OUR NATIONAL SECURITY.

4. The "use in retaliation only" policy, as applied to CW and BW, has resulted in the United States not being in a position to retaliate.

Our present policy is to wait until we suffer an attack by these weapons before we use them. Our present state of unpreparedness to use either CW or BW appears to be in large degree the consequence of this policy of "use in retaliation only" which has been directly applied to CW, and which has tended to include BW. Other factors are more determining in the case of RW, though it suffers by association.

The fact that we are not in a position to retaliate is the direct consequence of the reluctance of those responsible for the allocation of funds to support research, munition development, field testing, and procurement of weapons in areas tagged with the prohibitive label of for "use in retaliation only". All of those queried on this point have agreed to this conclusion. It follows that if we persist in this policy, with its derivatives of indecision and non-support, this country will continue to be in the position of being unable to retaliate with these weapons when and if the need arises.

5. The United States policy of "use in retaliation only" means, in practical effect, that our use of certain weapons is subject to the permission of our enemies.

With the Soviet Union our only major potential enemy, this policy is particularly unrealistic. Having no reluctance to use their effective propaganda machinery for spreading any lies that serve their purposes, the Soviets could claim that the United States had first used a weapon which they might wish to employ on a large scale. Certainly, the Soviets need not, and will not, wait for a "go-ahead" from us before using any weapon when it is to their advantage to do so.

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6. The United States must not arbitrarily deny itself the use of weapons, such as chemical, biological, and radiological agents, which take advantage of this nation's great technical and industrial potential.

The Committee has considered the relative abilities of ourselves and our enemies to produce these weapons in quantity. Intelligence on Soviet activities is limited, but indicates that the Soviet Union is considerably weaker than the United States in technical and industrial organization and capacity. We have a strong chemical industry capable of manufacturing CW agents, a vigorous anti-biotics industry with knowledge which can be utilized in making and defending against BW agents, and extensive atomic energy facilities which could be used for making RW agents. In view of the fact that we cannot hope to attain numerical equality with the Soviets in manpower, it would be a mistake not to maximize the advantage which we now hold in scientific, technical, and industrial potential.

Furthermore, an adversary which is inferior to the United States in production capabilities may more rapidly be brought to a condition of industrial exhaustion as the number and variety of effective weapons employed in a war is increased.

III A

THE UNITED STATES SHOULD BE PREPARED TO USE CHEMICAL WARFARE WEAPONS AT THE OUTSET OF A FUTURE WAR.

7. The toxic chemical agents may have significant uses in both-offensive and defensive operations.

While toxic chemical agents were not used in World War II, the Committee, after hearing many explanations as to why this was so, concluded that military considerations, rather than moral issues, determined such restraint. Since in another war the same military considerations may not prevail, toxic chemical agents may be employed by either side from the very outset of hostilities.

They may be used to delay the movement of enemy troops or deny an area to them, to break up concentrations of troops or tanks, to open lanes for attack through enemy positions, or wipe out troops emplaced in strongpoints. The Committee is of the opinion that toxic chemical agents are primarily weapons to be used on the battlefield.

It is the thinking of some that any general toxic chemical attack is best delivered from the air. However, if field tests confirm the effectiveness of the G-agents against the crews of armored vehicles, such toxic agent shells and anti-tank rockets could profitably be used by field artillery and rocket units, as well as by tactical air forces.

8. The G-agents ("nerve gases") give promise of increasing the effectiveness of toxic chemical warfare.

While, in the period between World Wars I and II, extensive studies of toxic chemical warfare were made by all nations, only the Germans were able to develop a really new and significant agent - one that was several times more lethal than anything hitherto known. This was GA, the first of a series of G-agents, or "nerve gases", so called because they cause incapacitation or death through physiological disturbances of the

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intricate chemistry of the nervous system. The Committee has learned that since the war American and British research efforts have succeeded in developing more potent varieties of the G-agents.

These G-agents, which are extremely difficult to detect in the field, are rapid in their action and have a powerful lethal effect even in low concentrations. Upon the evidence presented, it would appear that they are about ten times more toxic than previously available military gases. In less than lethal doses, they will cause extensive, though temporary, incapacitation of those persons within the target area unless highly efficient protection devices have been employed. The canister of the standard gas mask affords as effective protection against the G-agents as it does against the other toxic chemical agents. However, even the best designed masks do not fit perfectly on all who must wear them. Leakages which are insignificant in exposures to other toxic chemical agents may become significant in exposures to the G-agents. The high lethality of the latter, together with the rapidity with which they act upon the optic nerves, even in minute concentrations, may make the G-agents a menace even to masked troops.

Further, it should be noted that the nature of the physiological reactions to these agents is such as to enhance the psychological effects of gas warfare.

9. Available evidence indicates that the Soviets are well prepared for toxic chemical warfare and have given particular attention to the G-agents.

Reports indicate that the Soviets have many plants, either in production or readily convertible to production, for the manufacture of toxic chemicals. Chemical warfare agent manufacture appears to be an integral part of the expansion pattern of the Soviet chemical industry, since many of the principal chemical plants are reported to include facilities for the production of chemical warfare agents.

The two German production plants for nerve gases, one for GA and the other for GB, were captured by the Soviets, and their staffs, equipment, and stocks removed to the USSR. Reports indicate that the GA plant has been placed in operation, and that the GB plant will be in production this year. It appears that the Soviets are shifting their emphasis on production of chemical warfare agents to G-agents.

Stockpiles of the more common chemical warfare agents and munitions are available in great quantities to the Soviets, and they are believed to have considerable amounts of G-agents ready for use.

Soviet training manuals emphasize the significance of toxic agents in warfare, and instruction given in the Soviet military school system stresses training in the tactical employment of such weapons. Other intelligence reports point out the emphasis which the Soviets are giving to training their troops and their civilian population in chemical warfare protective measures.

Although considerable intelligence data on the Soviet position relative to chemical warfare has been presented, the Committee has noted with concern that much information vital to a complete evaluation is lacking.

10. The toxic chemical munitions could probably be significant weapons in countering the threat of aggression by the Soviet Army.

The Soviet Army, which is apparently ready to strike if the time becomes propitious, is a strategically located force in being. It has tactical air support available and masses of infantry, armor, and artillery trained, equipped, and ready to move. A major military problem which has been presented before the Committee is how these units can be prevented from overrunning Western Europe.

If we do not develop our chemical warfare munitions to the point where we are ready to deliver them in quantity, we may be denying ourselves the use of some of the most promising weapons for retarding the aggressive movement of Soviet troops. The saturation of transport centers and bottlenecks with mustard gas, and the strafing of troop concentrations with the more lethal gases would, in the opinion expressed by those who will have to combat such enemy action, be an effective support to render to our allies in the opening phases of another war.

The British have conducted tests which indicate that the G-agents might be extremely valuable if used in anti-tank munitions, since their action is substantially independent of the thickness of tank armor. If United States tests substantiate the British reports, a weapon of this type might be significant in reducing the Soviet advantage in masses of available armor.

11. The United States cannot rely on having the time to develop means for producing the new agents after war begins.

If today the necessary actions to authorize the construction of a production plant for GB were taken, 24 to 30 months would be required to construct the first plant and to place it on an operating basis.

Even under the leverage which could be provided by high wartime priorities, 20 months would be required before such a plant could be placed in operation. Other plants of the same type could be built and put into production within shorter additional periods of time.

III B

THE UNITED STATES IS NOT MAKING ADEQUATE PREPARATIONS FOR THE USE OF CHEMICAL WARFARE IN THE EVENT OF ANOTHER WAR.

12. The present position of the United States on toxic chemical agents is weak.

No facilities for production of G-agents, other than small-scale experimental research units, exist either within the United States or its allied nations. The United States has no current production programs for toxic chemical agents.

Large quantities of toxic chemical agents (chiefly mustard) were produced in the United States during World War II, and many of these stocks are still available, though in a deteriorating state. Production of these agents could be resumed within a short period of time within the production facilities presently maintained in standby condition. However, existing production facilities would not be able to meet mobilization requirements.

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Moreover, stocks on hand or to be produced could not be used in the early stages of an emergency because the bombs, rockets, and shells necessary to carry these agents to the targets would not become available for many months. Munitions for the G-agents are still in the development stage. While munitions which were originally designed for the standardized toxic agents are on hand in limited quantities, they must be modified in order to be used with the newer agents.

13. There is a serious gap in our planning on chemical warfare, which can be filled at a moderate cost.

The present policy of "use in retaliation only" has resulted in a lack of activity with respect to toxic chemical agents and munitions, which has produced a virtual state of disarmament in this field. The situation at present is that we are likely to find ourselves at war, without G-agents, production facilities for them, or munitions to deliver them; and also probably without planes adequately prepared to carry these and other toxic chemical weapons to the targets. Production of G-agents should be coordinated with the development of means for their employment.

These new agents, together with their munitions, must be given extensive field tests in order to obtain the necessary data upon which the planners can base their evaluation of the military worth of these weapons. Adequate testing facilities are not now on hand.

It is the opinion of the Committee that to provide our military commanders with a weapon which has great potential value a United States production plant for these agents should be constructed and placed in operation without delay.

Conclusions with respect to the feasibility of such action were arrived at, not only after an evaluation of the information presented by the appropriate agencies, but also after studying the report prepared by a panel of experts established under the auspices of the Committee to conduct independent investigations of the research and development on, and production feasibility of, GB. The Committee did not attempt to make a determination of the quantity of G-agents which would be militarily significant. The Committee has satisfied itself, however, that a plant with the capacity of 750 tons per month would be of a size suited to efficient operation, and that this quantity of GB could be produced without serious dislocation to the chemical industry of the United States. A plant of this capacity, utilizing the DMHP, or five step, process would require an expenditure of the order of \$32,000,000 for engineering design, construction, and six months of test operation. Further operation at the designed production rate would require \$2,250,000 per month.

The Committee has noted that, while operation of this plant would not place any great drain on our chemical industry, the matter of fluorine availability to the United States must be carefully considered in the event of further expansion. The Committee has explored this question, and feels that the problem can be met.

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IV A

THE UNITED STATES SHOULD BE PREPARED TO DEFEND ITSELF AGAINST BIOLOGICAL WARFARE AND TO WAGE BIOLOGICAL WARFARE OFFENSIVELY.

14. From research data and the results of limited field trials, it must be assumed that biological agents are potential weapons of war.

Biological agents have never been used on a significant scale in warfare and have been incompletely explored as weapons. However, the potential worth and the dangers of BW appear to be great. We cannot afford, therefore, to neglect the adequate exploration of this new mode of warfare.

Evidence from various sources supports such a conclusion. Precise and quantitative data as to the effects of certain biological agents have been obtained in the laboratory, and less conclusive, but nonetheless indicative, data have been gathered from limited field trials conducted upon animals and crops. While no tests as such have been performed on human beings, there is considerable information available as to the probable effects on them of certain BW agents. The results of laboratory accidents, together with the voluminous data which are available on naturally occurring diseases, can be used to indicate the possible effects of certain of the BW agents.

Large-scale production of several BW agents seems to be feasible. Several means for dissemination of BW agents have been developed and tested. These tests showed that these agents can be dispersed in aerosols. Actual trials have been carried out which indicate the vulnerability of air-conditioned buildings to sabotage attacks using BW. Field tests have shown that BW aerosols will drift with the wind over bodies of water and enter ships through their ventilating systems.

From information such as the above, the Committee has arrived at the conclusion that BW could be an effective means of warfare.

15. There are indications that the Soviet Union is prepared in the BW field and will not hesitate to use BW if she deems it to her advantage to do so.

The Committee has been informed that the Soviets have been engaging in BW research at least as long as has the United States (since 1942) and that the Soviets have a research and development program on BW that has probably progressed as far, if not further, than the Anglo-American one.

With the Soviet proclivity for undercover operations, and the relative ease with which BW agents can be clandestinely produced and disseminated, the Soviets are not likely to overlook the sabotage potentialities of biological warfare.

It is believed that military considerations alone will determine whether or not the Soviet Union would employ BW in a future conflict.

While the Committee has been presented with the best available intelligence in this field, the information has been indicative rather than conclusive. More precise knowledge of the Soviet position with respect to BW is essential.

16. The United States is vulnerable to both overt and covert BW attack.

A large proportion of our population and industries are in concentrated areas which present attractive BW targets. The demonstrated vulnerability of our numerous air-conditioned buildings to BW attack further contributes to the weakness of our position.

There are no methods for the detection of BW agents which rapidly signal the presence of such agents and identify them so that proper protective measures can be undertaken. This means that the appearance of casualties might well be the first evidence of a BW attack.

While much has been achieved in the field of immunization and treatment, a great deal remains to be done. Physical protection devices, such as masks and special clothing, and decontamination measures need further development.

Our procedure of bringing together large masses of cattle which are later redistributed creates ideal targets for both overt and covert BW attack. Our cattle are particularly vulnerable to foot-and-mouth disease and rinderpest, and we do not possess the needed vaccines in this country.

Our agriculture is such that, in many instances, genetically related crop varieties are planted over large areas; thus diseases to which such varieties are susceptible could spread widely and rapidly.

IV B

INCREASED EFFORT IS REQUIRED TO PREPARE THE UNITED STATES DEFENSIVELY AND OFFENSIVELY FOR BIOLOGICAL WARFARE.

17. More field test data on biological warfare are needed for planning purposes.

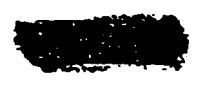
While data are available to indicate the potentialities of BW as a weapon of war, the data are not complete enough to be used as a basis for operational planning. Conclusive information on the military worth of the biological weapons is not likely to be found short of their use in war. Nevertheless, many of the data needed to determine their operational feasibility and effectiveness could be obtained if the BW agents, together with their munitions, were subjected to large-scale field tests.

The present biological warfare programs are insufficient to produce these data. Moreover, adequate field testing facilities are not now available. The Committee feels that such facilities must be provided without delay, and that large-scale field tests on the BW agents and munitions should be carried out as soon as possible.

As a supplement to field tests, studies should be conducted to obtain information on the probable results of BW attacks upon a nation's economy.

18. The engineering design for production facilities for BW agents should be completed as soon as possible.

It would take about a year and a half to accomplish the engineering studies of large-scale BW production plants. Such projects should be undertaken now to gain the



necessary knowledge about the unique problems involved in construction and safe operation of a factory that can produce virulent biological organisms in quantity.

A plant can be designed that will not be limited to the production of a single type agent but will be adaptable to the production of various agents that later may be adopted for use.

The cost of such design is small in comparison with the saving in time which would be achieved by obtaining this design prior to a possible war.

Approval of the engineering study and design should include authorization to construct and operate one production unit as a pilot line from which production data can be obtained.

The Committee feels that the next step, actual construction of a large-scale BW plant, is not warranted until more data have been gathered and evaluated. In the meantime, it is imperative that a beginning be made.

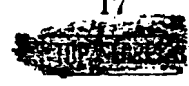
19. Research programs on BW should be expanded, particularly with respect to the defensive aspects.

Research and development on biological warfare does not entail large amounts of money. About seven million dollars has been allocated to BW research and development during the present fiscal year. The Committee has not made a comparative examination of the funds being allotted to other fields, but feels that the amount allotted to BW research is small, considering the potential threat of BW as a new and relatively unexplored method of warfare on which much vital information is still lacking.

The Committee notes that this amount is to be materially reduced in the proposed appropriations for the next two years. While realizing that part of this reduction is due to the over-all reduction of research and development funds, the Committee believes that rather than being decreased, the monies allotted for BW research, and particularly those for study of its defensive aspects, should be increased.

While advocating an increase in funds, the Committee ventures the opinion that with better defined military objectives in this field some economies can be effected in the present programs and consequently more effort be made available within present funds on the more promising or critical projects. To this end, research work directed toward the offensive use of anti-crop and anti-animal agents might be reappraised.

Because of the large varieties of agents which might be used against us, and our lack of precise intelligence on Soviet activities, research in the defensive area should go forward on a wide front.



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V

RADIOLOGICAL WARFARE SEEMS TO POSSESS UNIQUE MILITARY CHARACTERISTICS, AND FURTHER STUDY OF ITS POTENTIAL MILITARY WORTH SHOULD BE UNDERTAKEN, TO INCLUDE DETERMINATION OF WHETHER FISSIONABLE MATERIAL SHOULD BE MADE AVAILABLE TO SUPPORT AN RW WEAPONS PROGRAM.

20. RW, as a new means of warfare possessing pronounced limitations and promising but untested capabilities, has not yet been fully evaluated.

In making a study of the basic facts concerning RW, the Committee has been informed of certain of the advantages and disadvantages of this new mode of warfare. The Committee is pleased to note that many of these have been explained to the public in the last Semi-Annual Report of the Secretary of Defense.

With respect to its advantages, the Committee has learned:

- a. that RW acts in a silent manner against living targets, with its presence and the bodily damage it causes being initially undetectable by the human senses;
- b. that gas masks and special clothing do not provide protection against the effects of RW, and that only large or dense material barriers do provide protection;
- c. that the decontamination of areas subjected to RW attack is difficult and expensive, and is likely to become more so as new techniques of dissemination are developed;
- d. that RW agents are compact, with pounds rather than tons being necessary to secure contamination ranging in effect from harassing to major casualty producing;
- e. that, though the presence of RW agents can be detected readily with instruments, such instruments must be available at the exact location where the presence of RW is being investigated;
- f. that instruments which give an on-the-spot reading of radiation dosage are expensive to produce and difficult to provide in sufficient quantity in every area which might possibly be subjected to RW attack;
- g. that, without the destruction of property, RW seems to have the capability of denying areas or installations to an enemy over appreciable periods of time; and
- h. that RW, as a new weapon about which most people are poorly informed, is potentially valuable for harassment through rumor.

On the disadvantages side, on the other hand, the Committee has learned:

- a. that RW competes with development of other atomic weapons for raw materials, production facilities, and specially trained personnel;

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- b. that the monetary cost of RW approaches in magnitude that of other atomic weapons if planned for on a major scale;
- c. that there is a stockpiling problem because of the short half life of most radioactive isotopes which are suitable for use in radiological warfare;
- d. that there are shielding and other ordnance and logistic problems associated with the delivery of RW agents; and
- e. that there is delay in appearance of RW casualties of an order that makes it of questionable value for use in tactical situations.

The Committee does not feel competent to weigh the capabilities and limitations of RW and arrive at an evaluation of its feasibility as a weapon or of its value in comparison with other weapons. The Committee is aware that well qualified groups are performing research on RW, that other well qualified groups are now attempting to evaluate its worth, and that changes which may occur with respect to the availability of RW agents will be taken into account. The Committee has, however, arrived at certain views with respect to RW which appear in the conclusions which follow.

21. The silent, persistent nature of RW attack presents the possibility of introducing a major harassing factor into future warfare.

If it is accepted that RW agents can be produced, and that they can be dropped silently into areas occupied by the enemy, then it would seem that the time is past when there will necessarily be a tell-tale "bang" or visible fire to indicate enemy attack.

With the advent of this mode of warfare, any time a single enemy plane passes over an area the occupants of that area may logically ask whether RW agents are dispersed among them, silently and continually damaging their bodies. Any time troops move into an area formerly occupied by the enemy, they can reasonably wonder whether there are hidden radiological agents present, adding hourly to their jeopardy. These questions can be positively answered by the use of radiation detection instruments. However, it is the necessity of making a painstaking instrument survey every time a possibility exists that RW attack has taken place which is the complicating, harassing factor. After RW has once been employed against any city, anyone may well be loathe to proceed with his business after any attack until he has made certain that radiological agents are not silently radiating the location he occupies. A negative report from a check-point a mile away will not be sufficient to reassure the individual householder who considers that only an instrument reading in his own home will certify that his family is not being irradiated in the hours subsequent to a raid. The rumor of the presence of radiological agents should be a potent form of psychological warfare against both troops and civilians.

Harassment from RW, seems likely, then, on a large scale. The effect of such harassment upon a nation's will to wage war may be out of all proportion to the effort of delivering or threatening to deliver the agents. The actual dislocations which might result from positive radiation readings in a great number of key industrial communities, and the effect of this upon a nation's economy, are among the more significant questions to be investigated. The need is apparent for early appraisal of the potential military worth of RW, whether used for harassment or area denial, to determine the extent to which it may introduce a new factor into war. If the dispersal

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over a target area of radiological agents in concentrations below those required to produce early casualties is estimated to be militarily significant, greater attention to the earlier development of RW munitions would be justified.

22. A determination should be made of whether the quantity of radioactive products resulting from fission, or agents made from presently available neutrons, are sufficient to achieve any militarily useful result.

The fission by-products accumulating at the production sites, and the stray neutrons that may be used to irradiate various elements, have in the past been looked at from the point of view of whether they would provide sufficient RW agents to cover target areas with lethal doses of radiation. Another look at these sources should be taken to determine whether they can provide RW agents, at a minimum of cost, to capitalize on the psychological effects and harassing possibilities of RW.

In addition to the possibilities for silent or harassing attack discussed above, there is a possibility that through the use of relatively small quantities of radiological agents, combined with other munitions such as high explosives and incendiaries, the duration of the effect of the latter weapons could be increased. The complications to restoring a damaged area that may result from the presence of radiological agents might materially increase the time that the enemy would be deprived of the effective use of the area.

The Committee notes especially the apparent unique utility of radiological agents as weapons that could be used against an installation vital to an enemy where the use of destructive weapons would be either politically unwise or not expedient in a military sense.

23. More consideration should be given to the question of whether a portion of the production facilities for fissionable material should be used for the production of RW agents.

The discussion in earlier paragraphs has dealt largely with the employment of RW in small or token quantities for harassing or psychological effects. A larger question is that of the use of RW agents in quantity to saturate key areas with lethal doses of radiation. At present, preparation of RW in quantities sufficient for such use would compete directly with the production of atomic bombs. It is apparently a policy that materials are not to be diverted from the atomic bomb program for RW agents at this time.

The Committee suggests that this policy be looked at critically by a competent group, and that, as a part of an evaluation of the relative military worth of the atomic bomb and RW, a determination be made of whether some of the present production facilities for fissionable material should be used for making radiological agents.

The evaluation should be repeated from time to time as there are changes in the atomic bomb stockpile, the availability of neutrons, and rate of production of fission products.

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VI

OFFICIAL RELEASES OF INFORMATION REGARDING CW, BW, AND RW SHOULD BE MADE IN ACCORDANCE WITH A PLANNED PROGRAM DESIGNED TO PREPARE THE PUBLIC FOR INTELLIGENT ACTION.

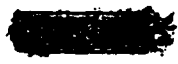
24. Public statements on these weapons have been ineffective as a means of educating the public.

The Committee has had studies made of the various statements, both official and unofficial, which have been made in recent years regarding CW, BW, and RW, and of the press comments on these statements. (The substance of these studies is contained in a document entitled "What the Public Has Been Told About Chemical, Biological, and Radiological Warfare," prepared by a panel of the Committee.) These studies show that a considerable amount of information has already been released regarding these weapons. They further show, however, that official statements, originally intended to give accurate information to the public concerning these weapons, usually have reached the public in edited and interpreted accounts which contain misquotations and misinterpretations. Frequently, publicized articles have been contradictory, exaggerated, distorted, and highly sensational, with the result that the public has been misinformed, rather than accurately apprised of the facts regarding the new weapons.

25. A coordinated program for public information and education concerning these weapons is desirable.

There should be a coordinated program for official releases, which would take into account the following factors:

- a. These releases should be associated with related matters, such as defense instructional activities, and developments in the field of defense against these weapons.
- b. Statements concerning these weapons should have consistency. This can be achieved by having a common source of releasable information which could be drawn upon by all official spokesmen, either for purposes of issuing statements or of making comments to the press regarding statements already released. Statements by high governmental officials can reach a large audience and, if consistent with one another, should be a means of disseminating accurate information.
- c. For public information to be effective, statements need to be repeated at intervals. It is essential that the same story be told by all speakers, and repeated again and again, in order to counteract the effects of misinterpretation by press and radio commentators that often accompany single pronouncements. By borrowing the advertising technique of repetition, the government might have greater success in transmitting information accurately to the public.
- d. The program should be reviewed and revised periodically in accordance with changing conditions. For example, new developments, particularly those regarding defenses against these weapons, may make it desirable to release further information. Developments in the international situation may require a change in emphasis. Likewise, the needs, interests, and attitudes of the public,



as revealed by Defense Department clipping files and other sources, should be constantly considered.

26. Various defense activities require the release of authoritative information and offer excellent media for educating the public in terms of action, with a minimum of adverse effects at home and abroad.

Local governments and volunteer groups must be given information on emergency measures to be taken in case of attack by any of these weapons. The effects of such dissemination would be to familiarize the public with the characteristics of these weapons, and to accustom them to the thought that they may be used in the next war, thereby placing the general thinking concerning new weapons on a more realistic basis, less subject to speculation and freer from emotion.

The Committee notes with approval the current programs to educate responsible government officials with respect to defense against BW, and feels that these programs should be continued and expanded.

Instruction regarding CW, BW, and RW, as a part of the regular training of ROTC, Reserve, National Guard, and State Guard, offers another medium for reaching the public, although indirectly, in terms of action.

Similarly, advantage should be taken of our numerous technical societies. Their widespread membership, possessing a technical background, offers another medium for calm presentation and discussion of information regarding these weapons.

A great deal of information on these weapons is now available to people who have the time and inclination to search through the material which has appeared from time to time in a variety of media. This information might well be consolidated and reissued, so as to provide the public with an easily accessible source of information on the fundamental capabilities and limitations of the new weapons. The Committee notes with approval steps already being taken in this direction, particularly with respect to atomic and radiological warfare, in the forthcoming public document, "The Effects of Atomic Weapons".

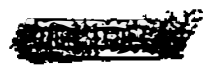
It is felt that official statements concerning CW, BW, and RW, if made in connection with civil defense instruction, would tend to mitigate unfavorable reaction abroad. Since most major countries have civil defense organizations, information released in this connection would not be as readily adaptable to exploitation for propaganda purposes against the United States as are random statements.

VII

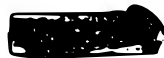
SPECIAL ATTENTION SHOULD BE GIVEN TO THE PSYCHOLOGICAL ASPECTS OF CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL WARFARE.

27. Each of these modes of warfare has an unusually high anxiety-causing potential.

The Committee agrees with the general belief that toxic chemical, biological, and radiological weapons have a pronounced capability for causing psychological effects



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and, in particular, have a strong potentiality for creating anxiety. Presumably these attributes derive from the following generalized characteristics:

- a. Each weapon is relatively new and hence plays upon peoples' fear of the unknown.
- b. Each is mysterious and, to varying extents, delayed in its action - the victims do not know initially whether they have been exposed.
- c. Each is insidious in its action in that it functions primarily against the victims' internal bodily processes instead of causing external wounds.

The Committee devoted comparatively little time to these or other psychological aspects of the weapons because the subject was thoroughly studied and reported on by the Haskins Committee, both in its final report of July 1949 and in its report of May 1949 entitled "Public Relations Aspects of Biological Warfare". The Committee endorses the conclusions on psychological aspects of the weapons in the above reports.

All weapons have, of course, both psychological and physiological effects, but in varying proportions. The Committee feels that the psychological factor is likely to be present in a very significant proportion with the chemical, biological, and radiological weapons, and that this factor must be taken into account in any action concerning them. Some measure of the psychological effect of these weapons might be indicated by the fact that during and after World War I many men were treated as gas casualties who were never in areas which had been subjected to gas attack.

With respect to the use of these weapons in strategic bombing, it should be borne in mind that the net psychological effect of the use of these or any other weapons against civilian populations might be to stiffen civilian resistance.

28. Chemical, biological, and radiological weapons have characteristics which may make them particularly adaptable for use in combination with other munitions or other materials to achieve psychological effects.

In examining these weapons, the Committee has speculated on various specialized uses that might be made of them to capitalize on their potential psychological effects. For instance:

- a. The use with high explosive and incendiary munitions for harassing psychological effects against troops, and to hamper the repossession of damaged areas.
- b. G-agents dissolved in heavy oils or other materials to achieve persistency at concentrations below lethal, but sufficient to produce mild physiological effects, and hence psychological effects, in a given area over a long period of time.
- c. The building up of artificial odor associations so that attacks could be simulated in areas where later access for our troops is desirable, or so that available supplies of chemical, biological and radiological agents could be stretched by giving the impression that they are being used where they are not.

The Committee found evidence of imaginative thinking on this subject, but no indication that munitions development is being undertaken to exploit the psychological characteristics of these weapons.



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APPENDIX A

SYNOPSIS OF THE COMMITTEE'S ACTIVITIES

The Committee met initially in Washington, D. C. for a two-day session on 5 and 6 January 1950, to plan its course of action and to begin its hearings. At this meeting, the Committee heard from Rear Adm. A. C. Davis, who presented the current thoughts of the Joint Chiefs of Staff on chemical, biological and radiological warfare; from Maj. Gen. A. C. McAuliffe, who explained the responsibilities of the Chemical Corps in these three fields; from Dr. Vannevar Bush, who spoke on the varied facets of the problems facing the Committee; from Dr. W. Albert Noyes, Jr., who gave a resume of the other studies that had previously been undertaken in the area of interest to the Committee; and from the Honorable Marx Leva, Assistant Secretary of Defense, who outlined the necessity for the establishment of the Committee.

At its first meeting, the Committee assigned tasks to Panels and Sub-Committees, together with consultants, to make detailed investigations on reports of committees previously engaged in these areas; to prepare comprehensive papers on the methods of warfare under consideration; to appraise the present status of the research and production programs on G-agents, together with related economic and logistic studies; to review and analyze what the public has been told about these three weapons; to study what has been done or proposed on the psychological aspects of these weapons.

These groups contacted and sought advice from the Atomic Energy Commission, Armed Forces Special Weapons Project, State Department, National Security Council Staff, Central Intelligence Agency Staff, National Security Resources Board Staff, National Research Council; various agencies of the Office of the Secretary of Defense, British Joint Services Mission, engineering universities such as Massachusetts Institute of Technology and the University of Illinois, industrial firms which have been engaged in research contracts in the fields of interest to the Committee such as the Monsanto Chemical Company and the Shell Development Company, and others. In addition, conferences were held between meetings with many individuals who possess specialized knowledge of the subjects under consideration. Detailed reports on the results of these investigations and conferences were made to the full Committee. Lists of those persons contacted by individual members of the Committee or Sub-Committees are included in Appendix B.

The second meeting of the Committee, also a two-day session, was held in Washington, D. C. on 27 and 28 January 1950. During this period, the Committee received an orientation on chemical warfare from Col. W. M. Creasy, Cml C, who reviewed in detail the present status of chemical warfare activities within the United States, and from Dr. M. Pratt, of the Central Intelligence Agency, who presented a paper on the Soviet situation with respect to chemical warfare; and heard from Brig. Gen. D. T. Spivey, USAF, who spoke on the air aspects of the three weapons; and from Capt. C. B. Martell, USN, who explained the tentative Navy policy on these weapons.

The third meeting was held on 24 February 1950 in Washington, D. C., and was devoted to receiving information on both biological and radiological warfare. The BW

aspects were presented by Col. W. M. Creasy, Cml C, who gave an overall account of the United States' status, and by Dr. F. L. Campbell of the Central Intelligence Agency, who presented a paper on the Soviet situation. The RW presentations were made by Brig. Gen. (then Col.) J. P. Cooney, MC, of the Atomic Energy Commission, who explained the basic facts of RW and also discussed its production phases; by Col. W. M. Creasy, Cml C, who spoke on the delivery, dection, and munitions production aspects; by Dr. Herbert Scoville, of the Armed Forces Special Weapons Project, who discussed the close relationships existing between the atomic bomb programs and the radiological warfare programs; by Mr. E. R. Trapnell of the Atomic Energy Commission, who outlined the public information problems and programs on RW; and by Lt. Col. W. K. Benson, of the Central Intelligence Agency, who presented a paper on the Soviet situation with respect to RW.

The fourth meeting, held on 9 and 10 March 1950, consisted of a two-day field trip to Camp Detrick, at Frederick, Maryland, and to the Army Chemical Center at Edgewood, Maryland. Detailed presentations on biological warfare were given by Dr. O. C. Woolpert and his staff at Camp Detrick. The Committee also examined the operational facilities, equipment, and programs of this station. At the Army Chemical Center, the group heard presentations and viewed demonstrations on varied phases of chemical warfare by Col. J. R. Wood, MC, and his staff of the Medical Division, and by Col. J. A. McLaughlin, Cml C, and his staff of the Technical Command. Group discussions on the potentialities, limitations, and status of the chemical, biological, and radiological weapons were held with Maj. Gen. A. C. McAuliffe, Brig. Gen. E. F. Bullene, and many of the other senior officers of the Chemical Corps.

At the fifth meeting, held on 31 March 1950, in Washington, D. C., Col. F. P. Munson, Joint Staff, presented an estimate of Soviet military capabilities and intentions; Dr H. S. Craig, of the Joint Staff discussed Soviet economic and political strength; Lt. Gen. J. E. Hull, USA, explained the mission and operations of the Weapons Systems Evaluation Group, and its studies with respect to the chemical, biological, and radiological weapons; Brig. Gen. C. V. Schuyler, USA, of the Office of the Asst. Chief of Staff, G-3, U. S. Army, described the status of Army planning with respect to these weapons.

The sixth meeting was held at Governors Island, New York, on 21 April 1950, and was devoted to a discussion of the Committee's findings to date and to preparation of the outline of its final report.

The seventh meeting was held in Washington, D. C. on 9 May 1950. Discussions were held with Rear Adm. L. G. Stevens, of the Joint Subsidiary Plans Division, JCS, and Dr. Hans Speier, Chief, Social Sciences Division, RAND Corporation, on the psychological aspects of the three weapons; with Dr. David Miller, Dr. H. I. Cole, and Dr. H. N. Worthley, all of the Research and Development Board, on the Board's operations in the three fields; and with Lt. Col. B. W. Beers, Office of Civil Defense Liaison, OSD, on the present status of Civil Defense Planning. The Committee also continued work on its report, and agreed upon certain conclusions and recommendations to be included in the final document.

The eighth meeting, held on Governors Island, New York, on 31 May 1950, and the ninth meeting, held in Washington, D. C., on 19 and 20 June 1950, were devoted to reviewing previous drafts and finalizing the various sections of the final report.

[REDACTED]

APPENDIX B

LIST OF WITNESSES

BEERS, Lt. Col. Barnet W. -- Assistant for Civil Defense Liaison, Office of the Secretary of Defense

BENSON, Lt. Col. W. K. -- Central Intelligence Agency

BLACK, Col. Henry M. -- Chief, Supply and Procurement Division, Office, Chief of Chemical Corps

BULLENE, Brig. Gen. Egbert F. -- Commanding General, Army Chemical Center, Maryland

BUSH, Dr. Vannevar -- President, Carnegie Institution of Washington

CAMPBELL, Dr. Frank L. -- Central Intelligence Agency

CHAMBERS, Dr. Leslie A. -- Camp Detrick, Maryland

COLE, Dr. H. I. -- Executive Director, Biological Warfare Committee, Research and Development Board

COONEY, Brig. Gen. James P. -- Chief, Radiological Warfare Branch, Military Applications Division, Atomic Energy Commission

CRAIG, Dr. Horace S., Jr. -- Consultant to Director of Joint Intelligence Group

CREASY, Col. William M. -- Chief, Research and Engineering Division, Office, Chief of Chemical Corps

DAVIS, Rear Adm. A. C. -- Director of Joint Staff

FOTHERGILL, Dr. LeRoy D. -- Camp Detrick, Maryland

GREBE, Dr. John J. -- Dow Chemical Company, Midland, Michigan

GUILD, Col. Walter L. -- Office, Chief of Chemical Corps

HULL, Lt. Gen. John E. -- Director, Weapons Systems Evaluation Group

KAYSER, Mr. Wendell H. -- Camp Detrick, Maryland

KIRNER, Dr. Walter R. -- Director, Chemical-Biological Coordination Center, National Research Council

LEVA, Hon. Marx -- Assistant Secretary of Defense

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MARTELL, Capt. C. B. -- Office, Chief of Naval Operations

McAULIFFE, Maj. Gen. Anthony C. -- Chief, Chemical Corps

MILLER, Dr. David C. -- Chief, Plans Branch; Planning Division, Research and Development Board

MUNSON, Col. Frederick P. -- Joint Intelligence Group

NORMAN, Dr. A. Geoffrey -- Camp Detrick, Maryland

NOYES, Dr. W. Albert, Jr. -- Department of Chemistry, University of Rochester, New York

PARSONS, Rear Adm. William S. -- Weapons Systems Evaluation Group

PRATT, Dr. Malcolm -- Central Intelligence Agency

ROWAN, Col. Hugh W. -- Chemical Corps Board, Army Chemical Center, Maryland

RUEGGERBERG, Dr. Walter H. -- Medical Division, Army Chemical Center, Maryland

SCHUYLER, Brig. Gen. C. V. -- Chief, Plans Division, Office of the Assistant Chief of Staff, G-3, U. S. Army

SCHWAB, Dr. John L. -- Camp Detrick, Maryland

SCOVILLE, Dr. Herbert -- Technical Director, Armed Forces Special Weapons Project

SPEIER, Dr. Hans -- Chief, Social Sciences Division, RAND Corporation, Washington, D. C.

SPIVEY, Brig. Gen. D. T. -- Chief, War Plans Division, Air Force Directorate of Plans and Operations

STEVENS, Rear Adm. Leslie G. -- Joint Subsidiary Plans Division, Joint Staff

STUBBS, Col. Marshall -- Army Chemical Center, Maryland

SWAIN, Dr. Robert C. -- Chairman, Chemical Warfare Committee, Research and Development Board

TRAPNELL, Mr. E. R. -- Associate Director, Public and Technical Information Service, Atomic Energy Commission

WOOD, Col. John R. -- Medical Division, Army Chemical Center, Maryland

WOOLPERT, Dr. Oram C. -- Technical Director, Camp Detrick, Maryland

WORTHLEY, Dr. H. N. -- Executive Director, Chemical Warfare Committee, Research and Development Board

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APPENDIX C

**INDIVIDUALS INTERVIEWED BY SUB-COMMITTEES
OR BY INDIVIDUAL MEMBERS OF THE COMMITTEE**

BALLARD, Dr. Seaver A. -- Shell Development Company, Emeryville, California

BEALL, Mr. Issac N. -- Research and Engineering Division, Office, Chief of
Chemical Corps

BEELEER, Lt. Col. George W. -- Advanced Study Branch, Joint Staff

BRONK, Dr. Detlev V. -- Director, National Research Council

CHUBBUCK, Lt. Col. J. B. -- Atomic Energy Commission

COINER, Col. Richard P. -- Atomic Energy Commission

COMPTON, Dr. Karl T. -- Former Chairman, Research and Development Board

- CONANT, Dr. J. B. -- President, Harvard University, Cambridge, Mass.

COPE, Professor Arthur C. -- Massachusetts Institute of Technology, Cambridge, Mass.

DEWEY, Mr. Bradley -- President, Dewey and Almy Chemical Company

DOCHEZ, Dr. Alphonse R. -- Division of Medical Sciences, National Research Council

FELLENZ, Lt. Col. Lloyd E. -- Joint Staff

FRYE, Mr. William -- Former Director, Office of Public Information, Department
of Defense

GILFILLAN, Dr. Edward S. -- Operations Research Office, Department of the Army

HALL, Col. Donald F. -- Army Field Forces, Fort Monroe, Virginia

HARDY, Dr. Edgar E. -- Monsanto Chemical Company, Anniston, Alabama

HASKINS, Dr. Caryl P. -- Haskins Laboratories, New York, N. Y.

HEINZ, Cmdr. Luther C. -- Office, Navy Personnel Reserve Training

JOHNSTONE, Dr. Frazer -- University of Illinois, Urbana, Ill.

KINGAN, Mr. Robert C. -- British Joint Services Mission, Washington, D. C.

LARSEN, Mr. Paul -- Director, Office of Civilian Mobilization, National Security
Resources Board

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APPENDIX D

DOCUMENTS PREPARED FOR THE COMMITTEE

<u>TITLE & DATE</u>	<u>AUTHOR & OFFICE OF ORIGIN</u>	<u>CLASS.</u>
(1st Mtg)		
Remarks by Admiral Davis 6 January 1950	Rear Adm. A. C. Davis Director of the Joint Staff	TS
Outlines the present policy approved by the Joint Chiefs of Staff with respect to chemical warfare. Discusses the evaluation of CW, BW, and RW weapons which was sent to the Joint Chiefs by the Research and Development Board, and reports on action on the document.		
(2nd Mtg)		
Air Aspects of the CEBAR Weapons 27 January 1950	Brig. Gen. D. T. Spivey, USAF Chief, War Plans Division Air Force Directorate of Plans and Operations	TS
Outlines the planning organization within the Department of Defense and the Air Force role in same. Discusses the nature of a future conflict, the problems inherent in air warfare, the need for a capability in being with which to strike back. States desired military characteristics for biological weapons.		
Tentative Navy Policy on Chemical, Biological and Radiological Weapons 27 January 1950	Capt. F. S. Withington, USN Deputy Director, Atomic Energy Division, Office Chief of Naval Operations Presented by: Capt. C. B. Martell, USN	TS
Points out fundamental differences in requirements in the field of chemical, biological, and radiological warfare between land and sea forces. Discusses offensive and defensive aspects of the three types of warfare from the Naval point of view. Summarizes status of Naval training and facilities and lists Navy research projects.		
Chemical Warfare Intelligence on the USSR (An Estimate of the Current Situation)	Dr. Willard Machle Office of Scientific Intelligence, CIA Presented by: Mr. Malcolm Pratt	S
Estimates present Soviet stockpiles of toxic agents. Summarizes Soviet policy toward CW, position taken in the United Nations, and possible intentions to use such weapons. Discusses strategy, tactics, and military doctrines of the Soviets. Describes Soviet organizations concerned with CW. Analyzes CW resources of Soviets.		

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TITLE & DATE

AUTHOR & OFFICE OF ORIGIN

CLASS.

Summary of the Chemical
Warfare Field
27 January 1950

Col. William M. Creasy, Cml C
Chief, Research and Eng. Div.
Office, Chief, Chemical Corps

TS

Provides a general indoctrination in the field of chemical warfare including:
(1) enemy vulnerability, (2) military usefulness, (3) history of CW,
(4) Russian capabilities, (5) chemical agents - production and character-
istics, (6) probable targets - strategic and tactical, (7) United States capa-
bilities to deliver CW agents, (8) research and development activities in
CW, and (9) cooperation with Canada and the United Kingdom.

(3rd Mtg)

Radiological Warfare - Basic
Information and Production Aspects
24 February 1950

Col. James P. Cooney, MC
Chief, RW Branch, Military
Application Div., AEC

S

Contains a short explanation of what RW is and how it effects the human
body, the amount of radiation required to produce desired results, and the
problems in producing such dosages. Discusses the RW program as to
probability of future use, our capability of production, the effectiveness
of the weapon and its cost.

Radiological Warfare - Detection
and Production Aspects
24 February 1950

Col. William M. Creasy, Cml C
Chief, Research and Eng. Div.
Office, Chief, Chemical Corps

TS
Res. Data

Gives status of research and development of RW munitions program in
general and describes several prototypes. Discusses the employment
of RW, strategically and tactically, giving agent requirements, possible
targets, defensive measures and capabilities of delivery. Discusses
logistic factors such as handling, filling, storage and transportation.

Radiological Warfare
21 February 1950

Dr. Herbert Scoville
Technical Director
Armed Forces Special
Weapons Project

S
Res. Data

Describes the position of RW in the military arsenal and the present
status of the RW program. Outlines following technical aspects of RW:
(1) biological effects, (2) requirements for agents and difficulty of pro-
duction, (3) dissemination, (4) military use and problems of defense.

Soviet Potentialities to
Conduct Radiological Warfare
23 February 1950

Lt. Col. W. K. Benson, GSC
Office of Scientific
Intelligence, CIA

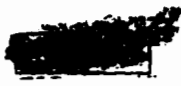
TS

Outlines the information available on Soviet RW production capabilities,
policy and propaganda, and defensive measures taken by the Soviet
Union against an RW attack.

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<u>TITLE & DATE</u>	<u>AUTHOR & OFFICE OF ORIGIN</u>	<u>CLASS.</u>
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Biological Warfare Intelligence on the USSR (An Estimate of the Current Situation) 24 February 1950	Dr. F. L. Campbell Office of Scientific Intelligence, CIA	S
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Summarizes the type of information available on Soviet BW, contrasts the type of information the Soviet Union has on our program. Discusses the Khabarovsk trials. Describes limitations of U. S. knowledge concerning the Soviet BW program.

Biological Warfare 24 February 1950	Col. William M. Creasy, Cml C Chief, Research & Engineering Div., Office, Chief, Chemical Corps	TS
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Constitutes a general indoctrination of the entire field of biological warfare, including: (1) BW agents - anti-personnel, anti-animal and anti-plant; (2) production of BW agents; (3) dissemination of biological agents; (4) defensive aspects; (5) offensive BW operations - tactical, strategic and sabotage; (6) logistic and operational implications of a BW attack; and (7) research and development activities in BW.

(5th Mtg)

A Political & Economic Intelligence Estimate on the USSR 31 March 1950	Dr. H. S. Craig Consultant to Deputy Director for Intelligence, Joint Staff	S
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Describes the factors which guide Soviet foreign policy. Indicates the balance of power existing today. Analyzes the Soviet economy, pointing out strong points and weaknesses.

Army Planning with Respect to the CEBAR Weapons 31 March 1950	Brig. Gen. C. V. Schuyler, USA Chief, Plans Division, G-3, U. S. Army	TS
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Examines the role of CW, BW and RW in future war. Describes how CW, Bw and RW could be used in specific operations to accomplish certain objectives. Discusses Army interests in these weapons, inter-service policy, and procurement and stockpiling.

(7th Mtg)

What the Public Has Been Told About Chemical, Biological and Radiological Warfare May 1950	Panel of the Secretary of Defense's Committee on Chemical, Biological and Radiological Warfare	R
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Quotes and summarizes previous official and unofficial statements on CW, BW and RW, together with excerpts from press and radio coverage



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of these statements and editorial comment on them. Analyzes comments and coverage, and draws conclusions as to present status of public information on these means of warfare.

The Present Status of Research and
Development On, and Production
Feasibility of GB
2 May 1950

Panel of the Secretary of Defense's
Committee on Chemical, Biological
and Radiological Warfare

S

Describes the various methods for preparation of GB, the problem of raw material supply, the present status of research, the practicality and cost of plant construction. (Includes bibliography of technical documents on G-agents.)

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APPENDIX E

OTHER DOCUMENTS CONSIDERED BY THE COMMITTEE

GENERAL	Classification
<u>Civil Defense for National Security (Hopley Report)</u> <u>Office of Civil Defense Planning, 1948</u>	U
<u>Comparative Evaluation of Chemical Warfare, Biological Warfare</u> <u>and Radiological Warfare, 1 Nov 48, submitted by Dr. W. Albert</u> <u>Noyes, Jr., and revised by the RDB as of 1 Oct 49.</u>	TS Res. Data
<u>National Security and Our Individual Freedom,</u> <u>Research Policy Committee of the Committee for</u> <u>Economic Development, December 1949</u>	U
<u>Secretary of Defense's Semi-Annual Report, 22 Apr 50</u>	U
<u>Soviet Dependence on the West, Its Nature and Implications,</u> <u>Intelligence Report, Serial No. 145049, from Moscow, 21 Sept 49</u>	C
CHEMICAL WARFARE	
<u>Appreciation of Chemical Warfare, Finkelstein, Leo</u> <u>(Cml C Tech Command) 1950</u>	TS
<u>Appreciation of Potential CW Value of Nerve Gases,</u> <u>Childs, A. E., 30 Jun 49</u>	S
<u>Chemicals in War, McGraw, Hill, 1927, Prentiss, A. M.</u>	U
<u>Chemical Warfare Operations, RDB 162/14</u>	S
<u>Chemical Warfare Service in World War II, Reinhold</u> <u>Publishing Co., 1948</u>	U
<u>Comparative Study of World War Casualties, Gilchrist,</u> <u>Col. H. L., Chemical Warfare School, 1928</u>	U
<u>Extract from Congressional Record, 9 Dec 1926 (pp. 141-154)</u> <u>transcribing Senate discussion of protocol for prohibition of use</u> <u>in war of asphyxiating, poisonous or other gases, and of bac-</u> <u>teriological methods of warfare.</u>	U

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Medical Division Report 201 - CW Agents - Toxicological and Medical Considerations, Army Chemical Center, 7 Sept. 1948

S

Report on Integrated Program of Research and Development in the Field of Chemical Warfare, 1949, 21 Feb. 1949

S

Symposium on Psychological Research
Army Chemical Center, 22 Oct 1948

S

U. S. Chemical Warfare Committee Periodic Report on Readiness for CW, OC Cml C - 1945

S

BIOLOGICAL WARFARE

Biological Warfare, Committee on BW, RDB, 18 Apr. 1949

TS

Biological Warfare, A report by a Committee on Review of the Division of Medical Sciences, National Research Council, 19 May 1950

S

Biological Warfare Operations, Consolidated Technical Estimates, RDB, 1949

TS

Correspondence between the Chairman, NSRB, and Secretary of Defense regarding Biological Warfare, 28 Dec. 1949 - 2 Feb. 1950

R

International Aspects of Biological Warfare, RDB document CX 11/3

TS

Press release by the Secretary of Defense on Biological Warfare, 12 March 1949

U

Program Guidance Report, 1950, Committee on BW, RDB, 24 Jan. 1950

TS

Public Relations Aspects of Biological Warfare, Secretary of Defense's Ad Hoc Committee on BW, 6 May 1949

S

Report of Secretary of Defense's Ad Hoc Committee on Biological Warfare, 11 July 1949

S

Report on National Policy on Biological Warfare, Committee on BW, RDB, 14 Oct. 1947

TS

Report to the Secretary of War, Merck, George W., 3 Jan 1946

U

RADIOLOGICAL WARFARE

Basic Considerations Underlying Radiological Warfare, Gilfillan, Edward S., 17 Feb. 1950

S
Res. Data

Chronological Summary of Actions Taken with Respect to Radiological Warfare, Military Liaison Committee, 8 Feb. 1950

TS
Res. Data

Effects of Atomic Weapons, Joint Department of Defense - Atomic Energy Commission Document, to be published August 1950

C

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AUTH CS, USAF

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MEMORANDUM FOR LT COLONEL CLARE E. HUTCHIN, JR.
ASSISTANT TO DIRECTOR OF ADMINISTRATION
OFFICE, SECRETARY OF DEFENSE

SUBJECT: Report of Secretary of Defense's Ad Hoc Committee on
Chemical, Biological and Radiological Warfare,
Implementing Actions and Progress

1. I have studied your draft of a consolidated report to the Secretary of Defense, attached hereto as Inclosure 1, in light of our discussion on 9 November 1951 and your stated desires to indicate to the Secretary of Defense some of the shortcomings and deficiencies of the Service programs that are not indicated in the formal reports. I am also cognizant of your desire for recommendations for action to be taken by the Secretary of Defense on these matters.

2. In the first place, I believe that it would be appropriate for the Secretary of Defense to issue a new memorandum, supplementing the memorandum of 27 October 1950, directing the three military departments, the Joint Chiefs of Staff, the Research and Development Board, and other key Defense agencies to undertake further specific actions within their respective fields of responsibility in light of the new developments since his approval of the Stevenson Committee report.

3. I cannot recommend on each short notice explicitly how and by whom each of the problems described below should be resolved. But I believe the Secretary of Defense should be made cognizant of these critical shortcomings and deficiencies and initiate some action to insure that the problems will be resolved immediately:

a. An isolated testing area for "hot" tests must be provided. This might be done through over-water tests with the Navy having primary responsibility and/or securing an island test site in the Caribbean or the Pacific for a semi-permanent or permanent installation or for the conduct of tests on a safari basis.

b. Tests with human beings on a volunteer basis must be conducted. This might be accomplished by securing a request from Public Health Service to conduct such tests for Civil Defense purposes or it might be initiated directly through the Joint Chiefs of Staff.

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Entry 199

Box # 1-1951
3 Aug 94

Copied by: Lt Col Brown
USAF Col Merritt

~~TOP SECRET~~

c. The research and development of agents and munitions must be greatly accelerated, possibly through increased contracts by the Chemical Corps to civilian laboratories, educational institutions, and industry. At present the Chemical Corps is spending approximately 25% of the R&D budget in this field on a contract basis. General Crensy has stated that it would be possible for the Chemical Corps to "buy time" by increasing considerably the number of civilian contracts and by being furnished additional R&D funds.

d. This raises the problem of the imperative need for considerably increased funds for research and development. The Air Force provided .8 tenths of one per cent of its total R&D program budget for FY 52. If it is accepted at the highest level that BW and CW have such a great potentiality and that the Services will develop a combat capability as soon as possible, then increased funds for R&D should be authorized.

e. Increased numbers of qualified personnel, civilian as well as military, must be made available for the BW-CW research and development program. In this respect some action must be initiated to insure that the Department of the Army will authorize the employment of the necessary numbers of technical specialists for Camp Detrick Biological Laboratories. In a formal presentation to the BW Committee on 12 October 1951, Mr. Woolpert indicated very forcefully that the restriction or ceiling, as well as the frequent freezes, on the employment of high-grade personnel, made it practically impossible for the BW program to proceed as rapidly as the present facilities might permit. He pointed out that a large building program was in progress at Camp Detrick which would materially increase their capability to accelerate the program, but without the necessary personnel to man these facilities, they were little better off than before.

Obviously there is a critical shortage of technically-qualified officers in the Services for the accelerated BW-CW program. As noted in the report, the USAF has taken definite steps to provide large numbers of such personnel through the medium of reassignment and crash training as well as long-range training in this field.

4. It should be noted that the foregoing comments reflect only the personal views of the undersigned and cannot be, in this form, in any way construed as official Air Force views. It is the personal opinion of the undersigned that the above comments would reflect official Air Force views if requested through normal channels.

1 Incl
 Draft of Rpt to
 Sec of Defense
 (not attached)

ARTHUR E. HOFFMAN
 Lt. Col. USAF
 Deputy Chief BW CW Division
 DCS/O Assistant for Atomic Energy

~~TOP SECRET~~

Source : RG 341
 Entry 199

Box # 1-1951
 3 Aug 94

Copied by: H. G. Brown
 USAF

Col Merritt

~~TOP SECRET~~

C O P Y

(RESTRICTED when not with attachments)
OFFICE OF THE SECRETARY OF DEFENSE
Washington 25, D. C.

25 October 1951

COPY No. 15 of 15
copies

MEMORANDUM FOR:

SUBJECT: Report of Secretary of Defense's Ad Hoc Committee on
Chemical, Biological and Radiological Warfare,
Implementing Actions and Progress

1. In accordance with the Secretary of Defense's request of 4 September 1951, the reports on this subject from the three military departments and the Director of Public Information have been received, and have been seen by the Secretary or the Deputy Secretary depending upon the day of receipt.

2. Attached here is a First Draft of a consolidated report to the Secretary of Defense on the implementing actions taken and progress achieved. Basically, it is a compilation of the reports from the three military departments. As a compilation, it is intended for use in final form by the three military departments as well as for discussion with Mr. Stevenson.

3. It should be noted that the reports received made no recommendations for action to be taken by the Secretary of Defense. It is recognized, however, that there are still some shortcomings and deficiencies in our various programs, shortcomings which for the most part, are not reported in the reports received. I hope we have covered this in paragraphs 5 and 6 by indicating that the shortcomings are known, and that plans are under preparation to overcome them.

4. I would appreciate your comments, additions, deletions, and/or concurrence to this draft report for the Secretary of Defense. At that time the draft report should be returned to this office for destruction.

HUTCHIN

1 Incl

Cpy No. 15 of 1st Draft Memo
to Sec/Def w/3 incls (Tabs A-H)

(RESTRICTED when not with attachments)

~~TOP SECRET~~

Source : RG 341
Entry 199

Box # 1-1951
3 Aug 94

Copied by: Lt Col Brown Col Muntz
USAF