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December 13, 1961

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ATOMIC ENERGY COMMISSION

STUDIES OF BIOLOGICAL CONSEQUENCES OF NUCLEAR WAR

Note by the Secretary

The General Manager has requested that the attached report by the Directors of Biology and Medicine, Military Application, and Operational Safety be circulated for consideration by the Commission at an early date.

W. B. McCool

Secretary

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ATOMIC ENERGY COMMISSION

DETERMINATION OF THE ROLE, PROGRAM, AND ORGANIZATION OF THE
ATOMIC ENERGY COMMISSION FOR STUDIES OF THE BIOLOGICAL AND
ENVIRONMENTAL CONSEQUENCES OF NUCLEAR WARFARE

Report to the General Manager by the
Directors of Biology and Medicine, Military
Application, and Operational Safety

THE PROBLEM

1. To determine the Commission's role and to establish the Commission's program and organization for studies of the biological and environmental consequences of nuclear warfare.

SUMMARY

2. From time-to-time the Atomic Energy Commission is called upon by the President, the National Security Council, and the Congress to provide information concerning the biological and environmental consequences of nuclear warfare, or to make judgments concerning the limits of massive, concentrated nuclear detonations and their by-product which could be tolerated by the peoples of the world and by the world itself.

3. In addition to these unscheduled requests, the Commission is asked to participate in the annual study of the Net Evaluation Subcommittee. This Subcommittee is assigned the task of evaluating for the President the over-all effects of a nuclear war in which specified stockpiles are expended by various nations under the most realistic assumptions which can be projected. The portion of the evaluation concerned with the effects of the war on the civil population of the United States has hitherto been divided into two parts. The first has consisted of an estimate by the Office of Civil and Defense Mobilization^{1/} of the

^{1/} This office was recently split into the Office of Emergency Planning in the Executive Office of the President, and the Office of Civil Defense under the Secretary of Defense.

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Action

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casualties resulting from blast, heat, and external gamma radiation up to 1 year following the attack. The second part of the evaluation of the civil effects has traditionally been the responsibility of the Atomic Energy Commission, and has consisted of assessing the fraction of the surviving population which might develop bone cancer, thyroid cancer, or leukemia, in estimating the expected life shortening of the survivors, and in determining the genetic consequences for their children and descendents.

4. In the past, all requests to the AEC for such studies of nuclear war have been met on a crash, ad hoc basis. The Division of Military Application has been assigned administrative responsibility for each project, and in turn has requested the services of one or two staff scientists from various divisions in AEC headquarters for a period of one or two months. Both the lack of time and special security requirements attached to these studies have had the effect of excluding the contributions of qualified staff scientists whose assistance would have been valuable. After the assigned deadline has been met, research directed towards an evaluation of the biological or environmental effects of nuclear war has been discontinued.

5. A further limitation on past studies of nuclear warfare by the Commission has been the omission of certain factors which individually or collectively could prove more important than the effects which have been taken into account. Factors which should be included in further studies which have not been included in past studies are:

a. the totality of malignant neoplasms and other biological effects which would affect the survivors, and the combined effect of external and internal exposure from α , β , and γ radiation in the production of each type of radiation-induced biological response;

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his needs
more explanation
- much
better
stated
on p. 9

total cast in
context of
radiation
damage

wording
is poor
here, cf.
p. 20

b. indirect effects on people resulting from direct effects of fallout and fire on wildlife, birds, insects, domestic stock, forests, and other factors of ecological importance, including local and global weather; and

c. the accuracy with which predictions of the biological and environmental consequences of nuclear war can be made, and the possible variations introduced in the final estimates by such factors as the state of preparation and warning time, the weather, the season of the year, and the weight and character of the attack.

the biological importance of economically? i.e. error analysis & sensitivity analysis

6. Still another uncertainty is present in the results we report to the Net Evaluation Subcommittee. The principal basis for the AEC's contribution to these studies is an estimate of the average dose to survivors, obtained from (the machine *calculative models developed* computations) performed by the National Resources Evaluation Center of the Office of Civil and Defense Mobilization. The dose required for the AEC calculation is the actual dose accrued, whereas the dose computed by the machine computing program has been an effective biological dose useful only for estimating the short term incidence of radiation sickness and death in the population. There is no satisfactory way of determining the actual dose to survivors from the effective biological dose, and both are highly dependent on guesses as to the degree of radiation shielding which would be available to various sections of the population. Because of the compartmentalized approach to the Net Evaluation Exercise, the AEC has never been able to achieve, in spite of repeated requests, either a breakdown of the actual doses received, or an opportunity to comment on the shielding assumptions used in the computer program.

irrelevant

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Note: shielding assumptions are readily available from NREC, or I can provide them - R.J.W.

7. The scientific staff members responsible for the preparation of the reports described above, and the Director, Division of Biology and Medicine, feel that investigations made in this manner do not provide an adequate or sufficiently reliable basis for Commission positions on the effects of nuclear

hardly so "studies"

war, or on judgments relating to the degree of biological or environmental damage which might be considered compatible with varying degrees of human survival.

Unless and until more care is taken in the research and much more information has been developed in the three areas listed in 5. above, and perhaps in others as well, the government of the United States simply does not have an adequate basis for predicting the biological and environmental consequences of nuclear warfare.

which?

Are we sure these are the important ones?

how well founded is this? Who in the AEC knows what's going on? cf. p. 20

8. The courses of action which the Commission might now take with regard to a program of study on the biological and environmental consequences of nuclear war are:

a. To continue current procedures.

b. To indicate to the President, the NSC, and the JCAE that agencies other than the AEC can more appropriately perform studies of the consequences of nuclear warfare.

c. To suggest to the President the establishment of a high level, interagency or contract study group, reporting to the NSC, to deal with the biological and environmental aspects of nuclear war.

d. To engage a prime contractor or other outside organization to conduct such studies in behalf of the AEC.

e. To establish a study effort of its own within AEC headquarters.

AEC out
AEC in

consequences are
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9. The several advantages and disadvantages of each of these courses of action are discussed in Appendix "A". It is there concluded that the alternative most suited to fulfilling the responsibilities of the Atomic Energy Commission is that it should establish a study unit of its own within AEC headquarters (alternative e. above). Such a proposal was considered by the Commission on March 1, 1957 (AEC 604/23) and June 18, 1957 (AEC 604/31) without action. Alternative c. was considered by the Commission on October 17, 1956 (AEC 604/22) without action.

Alternative d. was discussed by the Commission on June 18, 1957, in connection with AEC 604/31 without action. Alternatives a. and b. are considered not acceptable.

10. Within the existing staff of AEC are several thoroughly competent persons who, if made available full time, could greatly improve our present capability to analyze the biological and environmental consequences of nuclear warfare. However, these persons are all engaged in essential work either in the Division of Biology and Medicine, the Office of Operational Safety, or the Office of Radiation Standards. In essence, without disruption of existing activities, there is only one person (Dr. Harold Knapp of DBM) who could be made available full time for this task. To do this, however, would interfere with present research on the fallout from nuclear tests. Further, assigning Dr. Knapp full time to this job would not produce a sufficient net gain in capability, as a substantial fraction of his time has already been devoted to this problem, and because it is the judgment of the Divisions concerned that a minimum of 4 or 5 especially qualified scientists, in addition to existing staff, is required to fulfill Commission obligations for nuclear warfare studies.

11. Since details of the Commission's program from nuclear warfare studies depend in part on the needs and related studies of other government agencies, it is recommended that comments and suggestions concerning the Commission's role and responsibilities in this area of study be invited from those agencies and individuals within the executive branch who are most directly responsible for determining the consequences of nuclear war, and utilizing this information for the development of national plans and policies.

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Good

12. The Directors of Biology and Medicine, Military Application, Personnel, and Operational Safety concur in the conclusions and recommendations of this paper.

CONCLUSION

13. By direction of the President and the National Security Council, by authority of the Atomic Energy Act, by reason of its responsibilities for research, development, testing, manufacture, and application of nuclear weapons, and because of its several pertinent research programs (e.g. meteorology; the distribution, uptake, and effects of radioactive fallout particles; the biological, environmental, and civil effects of radiation), the Atomic Energy Commission has both an established responsibility and a unique capability for the conduct of specialized studies on the biological and environmental consequences of nuclear warfare.

14. The Atomic Energy Commission should establish, within its headquarters staff, a group of qualified scientists responsible for study of the biological and environmental consequences of nuclear warfare. The object of their research should be to adequately discharge the following responsibilities:

(1) respond to the annual request to the Commission from the Net Evaluation Subcommittee for an analysis of the biological and long term effects of the radioactive fallout from a specific nuclear war situation,

(2) respond to such special studies as the President, the National Security Council, the Joint Committee on Atomic Energy, and the Commission itself have requested in the past -- e.g. determination of the "limits of massive, concentrated nuclear detonations and their by products which could be tolerated by the peoples of the world and by the world itself." (See Appendix "A" for details of this and other requests.),

(3) provide continuing guidance to the Commission with respect to problems arising from the Commission's program for the development and production of nuclear weapons which are related to the biological and environmental consequences of their military application.

of 19
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15. In addition to the establishment of a scientific staff, the Chairman should discuss with the Secretary of Defense the proposed role and responsibilities of the Commission in studies of the consequences of nuclear warfare. Following this discussion it would be desirable to formally request the comments and suggestions of the Secretary of Defense, the Director, Office of Emergency Planning, the Chairman, Net Evaluation Subcommittee, the Special Assistant to the President for National Security Affairs, and the Special Assistant to the President for Science and Technology.

*Budget
GAC, ...
... ..*

RECOMMENDATION

16. The General Manager recommends that the Atomic Energy Commission:

a. Determine that the Commission has a responsibility for sustained study and research on the biological and environmental consequences of nuclear warfare involving the factors and objectives described in paragraphs 5 and 14 above;

b. Note that the Chairman will discuss with the Secretary of Defense the proposed role and responsibilities of the Commission in studies of the consequences of nuclear warfare; that following such discussion, will formally request the comments and suggestions of the Secretary of Defense; the Chairman, Net Evaluation Subcommittee, the Special Assistant to the President for National Security Affairs, the Special Assistant to the President for Science and Technology, and the Director, Office of Emergency Planning, on the proposed role of the Commission in such studies in accordance with the draft letter of Appendix "B";

c. Note that the General Manager will establish within the headquarters staff a group of 4 or 5 qualified scientists responsible for continuing study and research on the biological and environmental effects of nuclear war;

d. Note that the scientists assigned to study the biological and environmental effects of nuclear war must have access to such highly sensitive information concerning nuclear weapons and their wartime use as they can demonstrate they need and as is within the power of the Commission to secure.

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ning, the Special Assistant to the
President for National Security Affairs,
and the Special Assistant to the
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APPENDIX "A"

BACKGROUND

1. Present Procedures. At the present time almost all *outside* requests for studies of the biological and environmental consequences of nuclear warfare are transmitted by the Chairman to the General Manager, who in turn assigns administrative responsibility for fulfilling the request to the Director, Division of Military Application. The Director, Division of Military Application, after consultation with the Director, Division of Biology and Medicine, and others, requests the services of 1 or 2 Headquarters Staff Scientists for a period of 1 or 2 months, depending upon the deadline stated in the request. Because of the security classification of the material involved, the staff scientists selected have been requested not to discuss their project with other members of the staff. Upon completion of the assignment, no further work is done until another request is received.

2. History of the Problem. Consideration of the biological and environmental consequences of nuclear warfare by the Atomic Energy Commission extends over a period of at least 12 years. In 1949 the first reasonably comprehensive inquiry into the nature of various large-scale disasters that conceivably might result from the detonation of large numbers of nuclear weapons was prepared under the code name of Project GABRIEL. Following the successful test of the Ivy-MIKE thermonuclear device at Eniwetok in November 1952, the first Project SUNSHINE conference was held in the summer of 1953 at the RAND Corporation.

3. In the summer of 1955 the Joint Committee on Atomic Energy recommended that the Atomic Energy Commission and the

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Military Establishment "intensify their efforts to determine the radiological hazards which might result from large scale use of nuclear weapons, and that such efforts take into account the dangers presented to both military personnel and civilian populations." The Committee also recommended that the Commission place greater effort on the development of clean weapons.

4. In a subsequent exchange of correspondence in the fall of 1955 between the Commission, the Department of Defense, and the Joint Committee on Atomic Energy, the Department of Defense suggested that the non-military consequences of nuclear warfare should be the responsibility of the Atomic Energy Commission. The Commission observed that it was "evaluating the feasibility of intensifying our efforts" in such work.

5. In June 1956 the National Academy of Sciences - National Research Council issued a report to the public on the Biological Effects of Atomic Radiation. The report noted that:

"Behind any discussion of radiation must necessarily loom the specter of full-scale atomic war. That a single thermonuclear weapon can cause severe radiation damage hundreds of miles beyond its area of immediate devastation is all too well known. That enough such weapons exploded in an all-out war might render the entire earth, or large parts of it, uninhabitable, is at least conceivable.

"The actual results would depend on the number, the types and the location of the explosions that actually took place. There has been comparatively little attempt in the study thus far to estimate the possible courses of atomic warfare or to assess the biological consequences."

6. In July 1956, Commissioner Thomas E. Murray proposed that the Commission undertake a study of the biological consequences of nuclear warfare. The staff prepared proposals on how this might best be accomplished. The General Manager proposed to the Commission that the possible need for such a study be called to the attention of the National Security Council. The Commission

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requested that the staff determine the possibility of carrying out the study within the AEC. The Director of Military Applications prepared suggestions on how this might be done (AEC 604/31). Commission discussion of this proposal indicated that there was doubt as to what such a study might accomplish because of the many assumptions which would be necessary, and whether or not the Commission could obtain the necessary classified material from other agencies to make realistic assumptions.

7. In October 1957, the General Manager dropped AEC 604/31 from his list of papers to be considered by the Commission on the grounds that the Commission had just completed a report for the Net Evaluation Subcommittee. No further action was taken on the 1956 proposal by Mr. Murray.

8. In May 1958, the National Security Council requested the Atomic Energy Commission "to undertake, in consultation with the Special Assistant to the President for Science and Technology, a study appraising the upper limits of massive concentrated nuclear detonations and their by-products which would be tolerated by the peoples of the world and the world itself." This study was to be submitted to the NSC by July 1, 1958. Such a study was prepared and transmitted to the NSC. After critical discussion of the report transmitted, General Cutler suggested that Commissioner Libby give a 5 or 10 minute oral report to the President and the National Security Council on the subject of the request made to the Commission, and that Dr. Libby should avoid all detail, as that would tend to confuse or divert the Council. Dr. Libby gave his report on July 14, 1958, the principal conclusion of which was as follows:

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"The worldwide effects of a 15,000 MT nuclear war fought with dirty bombs of 50% fission yield would constitute a serious hazard to health but most certainly not be the end of life on earth. The non-biological or physical effects--principally on the weather-- would be minor. What the upper limit of massive nuclear detonations which can be tolerated is, is not very clear; but it seems that something like 50,000 MT of dirty bombs or 500,000 MT of clean ones with 5% fission would be about it. It would push the people of the world toward the limit of tolerance."

The basis for the judgments contained in this briefing have never been documented.

9. In May 1959, President Eisenhower asked Chairman McCone the status of AEC's studies on the world-wide effects of a nuclear war from the standpoint of poisoning the entire atmosphere. The Chairman replied that the studies were under way but not completed. Work was initiated under top priority, and the results were presented to the President in June 1959, by Dr. Gordon Dunning, then of the DBM staff, and Colonel Charles Stewart then of DMA.

10. In the fall of 1959, a Fallout Studies Branch was organized in the Division of Biology and Medicine. The mission of this new branch is to "conduct continuing studies and research -- theoretical, laboratory, and field -- on the physical and chemical nature, distribution, environmental concentrations, radiation doses, and hazards to man of atmospheric radioactivity and radioactive fallout from any source, and on the implications of such hazards for the development and exploitation of both peaceful and military uses of atomic energy, and make recommendations and reports thereon, as appropriate, to the Commission, its staff, other Executive Agencies, the Congress and the public." That portion of the charter calling for studies of nuclear warfare has never been implemented.

Point of departure

has

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not clear in charter?

11. Alternate Courses of Action. The alternative courses of action which the Commission might now take with regard to its program of research on the biological and environmental consequences of nuclear war are:

a. To continue the current procedures of hurried, ad hoc responses to specific requests, with no sustained research effort continued between requests,

b. To suggest to the President, the NSC, and the JCAE that such agencies as the Department of Defense and the Office of Civil and Defense Mobilization can more appropriately perform studies of the consequences of nuclear warfare.

c. To suggest to the President the establishment of a high level, interagency or contract research group, reporting to the NSC, and/or to the Scientific Advisor to the President, and charged with the responsibility for fulfilling requests from the President or the NSC concerning the biological and environmental consequences of nuclear warfare.

d. To engage a prime contractor or other outside organization to conduct studies for the Commission on the biological and environmental consequences of nuclear warfare.

e. To establish a research effort of its own, within AEC headquarters, defined as to scope, magnitude, and relation to the programs of other governmental agencies, and charged with the responsibility of preparing such reports on nuclear warfare as are requested of the Commission or by the Commissioners, ²for reporting to the Commission on such matters relating to the biological and environmental consequences of nuclear warfare as its researches indicate warrant their attention, and ³for the supervision of special research projects on the biological or environmental consequences of nuclear war which the Commission may wish to sponsor with government agencies or private organizations.

loosely worded on 2, how can Commission be sure it is fulfilling its responsibility? 3 won't the group help to determine what is to be sponsored how plan this thing?

12. Advantages of Each Course of Action.

a. The advantage of continuing the current procedure of hurried, ad hoc responses, is that it requires no additional expenditure of manpower or funds. Further, it is not yet certain that the Net Evaluation Subcommittee will continue in existence, or that the present administration will make requests of the AEC relating to the biological or environmental consequences of nuclear warfare.

b. A request to the President that the Commission be relieved of responsibility for study of the biological and environmental consequences of nuclear warfare might be granted, and the problem specifically assigned to

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the Department of Defense and/or the Office of Civil and Defense Mobilization. This could both relieve the Commission of a burdensome chore, and settle the problem of who is responsible for study and analysis in this area of research.

Other agencies already have some such responsibility

c. A high level research group under the National Security Council, or the Scientific Advisor to the President would be able to conduct studies of the biological and environmental consequences of nuclear war under many advantages; (1) it would have the necessary prestige to obtain top level scientists; (2) there would be no question about its access to sensitive information; (3) it could presumably obtain funds with relative ease; (4) there would be a direct line of communication with the President and the NSC; the group could always be aware of the problems of the President; and their results would be readily accessible to him; (5) the conclusions of such a group would achieve ready acceptance at all levels of the government; (6) the group would not be under pressure to produce results favorable to a particular governmental agency.

doubt this very much

not obvious

not obvious

d. The advantages to the Commission of engaging a prime contractor or other outside organization to make studies of the biological and environmental consequences of nuclear warfare are essentially those of letting a contract for any complex and difficult research problem. The capabilities of the Commission's weapons laboratories or the AEC national laboratories are well known and respected, as are those of such outside groups as the Rand Corporation and the Stanford Research Institute.

OK

e. The following factors weight in favor of locating scientists responsible for studies of the biological and environmental consequences of nuclear warfare within the Commission headquarters staff.

NADL?

(1) The scientists who conduct the analyses would be in a position to have a full understanding of the responsibilities and problems of the Commission by having ready access to files, correspondence, and personnel of the Commission. It also gives the Commissioners and members of the staff ready access to the scientists, thereby facilitating the interpretation of their work and its impact on Commission policy. Within the AEC the Headquarters Staff is the only location where very highly classified information on weapon design, the size of nuclear stockpile, and the military application of weapons can readily be made available. Several features of the Commission's weapons design, development and production programs (e.g., the development of clean weapons, the fission fraction of normal weapons, the highest yield weapons under development, and the total number and total fission yield of the stockpile) are strongly influenced by the biological and environmental consequences of their large scale use, so that the Commission has an important stake in, and a need for ready access to, the information developed on these aspects of nuclear war.

if important, all AEC studies should be done here

not LRL

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*really very limited
no relation to the
post-war recovery problem*

(2) The scientists will require ready access to the specialized, and in many respects unique, scientific knowledge available from the biomedical, environmental, and fallout research programs of the Commission, and they should be in a position to provide direct motivation and guidance for those aspects of the Commission's extensive biomedical, environmental, fallout, and civil effects research programs which bear on the subject of nuclear warfare. A headquarters location enables the scientists involved to be in a position to supervise and administer any special research contracts necessary for fulfilling the Commission's obligations for the study of nuclear war. It also enables them to represent the Commission in technical discussions with other agencies.

*How much of the
total picture is the
group supposed to
have? All of it,
taken people.*

(3) The Commission's own operations in the event of nuclear war are not based on any clear concept of the environmental conditions likely to pertain in the event of an all-out war. Such benefits as could accrue to Commissions post-attack operations from better prediction of post-attack conditions would be most easily achieved if the warfare study group were at the same location as that part of the staff responsible for post-attack operations.

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13. Disadvantages of Each Course of Action.

a. The disadvantage of continuing the present procedure of hurried, ad hoc responses to specific requests lies primarily in the possibility that the President of the United States, and thereby the people of the United States and the world, may receive inaccurate or inadequate information concerning the biological and environmental consequences of nuclear war, or a false impression of the reliability of such estimates as can be made. Any U. S. policy or action based on incomplete, false, exaggerated, or minimized estimates concerning this subject could lead to disastrous decisions or miscalculations.

b. The disadvantages of a request to the President to be relieved of responsibility for study of the biological and environmental consequences of nuclear warfare are; (1) much of the scientific talent available to the government in this area of research is currently involved in Commission work; (2) it would appear as an unwillingness to accept responsibility for an area of investigation for which the President, the National Security Council, the Joint Committee on Atomic Energy and the public have traditionally looked to the Atomic Energy Commission for guidance; (3) it would tend to place beyond the control of the Commission those features of the Atomic Energy Commission's weapons design and production programs which are affected by the biological or environmental consequences of nuclear warfare (-- e.g. the clean weapons program, the maximum yield, total numbers and total yield of all weapons produced, and the fission fraction of normal weapons.)

c. The disadvantages of a high level, interagency or contract study group reporting to the NSC or to the Special Assistant to the President for Science and Technology are illustrated by the present situation. The NSC presumably believes it now has, in its Net Evaluation Subcommittee, a satisfactory interagency mechanism for evaluating specific nuclear war situations. Yet as noted in the introduction and appendices of the AEC's latest submission to the NESC, it has neither answered nor even posed some of the more difficult problems relating to the biological and environmental consequences of nuclear war. Further, the results of its deliberations are so highly classified that they have not been subjected to the criticism or participation of such experienced and high level study groups as the Weapons Systems Evaluation Group in the Office of the Secretary of Defense. Even if the security classification surrounding its efforts were greatly relaxed, such a group would have greater difficulty in utilizing information from and in providing guidance to, the biological, environmental, fallout, and weapons research programs of the Atomic Energy Commission than would a group within the Commission itself. The output of the group would not be as available to the Atomic Energy Commission as would analyses performed by the Commission. Finally, there is such a strong tendency -- and need -- to make the work of such high level groups broad enough to include the military, economic, political, and social effects of nuclear war that it would be extremely difficult, even under the best of circumstances, to give adequate attention to the very important biological and environmental consequences.

d. The disadvantages of having the Atomic Energy Commission conduct analyses of the biological and environmental consequences of nuclear warfare under a prime contractor or other outside organizations would arise from the inability of a group outside Commission headquarters to adequately fulfill the conditions as described in Par. 11. e. above.

e. The disadvantages of establishing a study effort within AEC headquarters are (1) the possible difficulty of obtaining acceptance of the conclusions by other agencies or by the public, and (2) the study group must contain persons who have a competence in some specialty such as radiation biology, meteorology, nuclear physics, and operations research, and at the same time have an ability to apply their specialized knowledge to broad and complex problems of governmental policy and operations relating to the design, use, and effects of nuclear weapons. Such a group is difficult to find and assemble under any circumstances. To the extent it might be necessary to staff it with persons with established reputations in science who are also familiar with nuclear weapons, their military application, and the broad problems they pose for governmental plans and policies, the salary limitations of any sustained employment at AEC headquarters might prove restrictive.

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mean
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military
social
uses?

or 12 e.?

radiation & health?
non-radiation bio?

how about "ceiling"?
how about lack
of research
surroundings?

comments seem vague
complete. See for
.19.

IMPLEMENTATION

14. Of the alternate courses of action described in paragraph 8, the only one which appears adequate to fulfill the Commission's responsibilities is that the Commission should establish its own study effort, within AEC headquarters (alternative e.).

15. It is evident that the responsibility of the Commission in this area of study is not independent of the responsibility of other government agencies, particularly the Office of Emergency Planning (formerly the Office of Civil and Defense Mobilization) and the Department of Defense. The exact role of these and other agencies in the study of the biological and environmental consequences of nuclear warfare has never been defined.

16. For the most part, the Office of Civil and Defense Mobilization has concerned itself only with the direct effects of blast, heat, and external gamma radiation (from both the initial burst and the resulting fallout) on the inhabitants of the United States who survived for 1 year following a nuclear attack on this country, and with the impact of these direct weapon effects on the material resources necessary for the conduct of a war and for national recovery thereafter.

17. The Department of Defense has devoted its attention primarily towards the short-term military affects of blast, heat, and external gamma radiation on the military forces and war potential of countries attacked, but with ever increased concern over the short-term effects of external gamma radiation from fallout on friendly or neutral populations in the neighborhood of military targets located near the borders of the Soviet Union

and Red China. There has been some DOD interest in the world-wide and long-term effects of fallout, but its magnitude and scope as applied to the consequences of a nuclear war have been limited. The Department is currently organizing a 111 man Damage Assessment Center under the Defense Atomic Support Agency. This center will have both a pre attack and a post attack mission to study and report on the military consequences of hypothetical or real nuclear strikes by all combatants at all parts of the globe.

18. Past studies by the Commission have consisted primarily of estimates of the long-term biological effects on people in the U.S. and in countries outside the U.S. not directly attacked, and have been limited almost exclusively to estimates of the incidence of leukemia, bone cancer, life shortening, genetic effects, and effects on the thyroid of infants which might be experienced by a normal, healthy population that has taken no special precautions against nuclear attack and that is subject to the average doses of radiation estimated for the survivors. *under the assumption of no protection?*

19. The Commission cannot by itself clarify the appropriate roles of the various government departments with respect to studies of the biological and environmental consequences of nuclear warfare. It can, however, propose its own program of study and research in this area, establish liaison with the other governmental agencies, and if necessary, request with these agencies a determination from the President as to the appropriate assignment of responsibilities. To this end, it is proposed that concurrent with the actions recommended in this paper the Commission consult with the individuals and agencies in the government who are most concerned with this subject, and who have the greatest interest in the Commission's program in this area of study.

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OK. The first set of letters have been written. Some replies have been received. Now, working on lead relationships must be set up

Good idea

20. It should be noted that there is no way to completely separate the area of primary interest to the AEC in studies of the biological and environmental consequences of nuclear warfare from that of other agencies. One of the biological consequences of nuclear warfare is the number of persons who are killed or injured from the initial ionizing radiation, blast, and thermal effects of nuclear attack, and from the external gamma radiation from the early (within 24 hours) fallout. Estimates of these numbers may vary drastically depending on the targeting and weight of attack, the extent to which the population is prepared for an attack, upon the amount of warning time available, upon the recovery measures taken after the attack, and on the weather and the season of the year. Preparation of such estimates for the population of the United States lies more in the area of responsibility of the Office of Emergency Planning and the Department of Defense than of the AEC. The Commission, however, is the primary source of much basic information on the physical, radiological, and chemical properties of fallout, and of the biological effects of different types and duration of exposure to radiation. It further has a specialized program in environmental sciences, fallout studies, and civil effects, which provides information to the persons and agencies primarily responsible for estimates of initial casualties. Since accurate estimates of early exposure and contamination levels are necessary for any evaluation of (long-term) biological effects, the Commission must assure itself that the techniques and assumptions of other agencies are sufficiently well founded to use in its own program. Accordingly, while there are large areas of research in the biological consequences of nuclear warfare in which the Commission would be expected to have neither the primary interest nor responsibility, its broad assignments require it to have a capability for critical analysis in any of the areas important to the completion of its own work.

*Why not
all to
deposited on
"early fallout"?*

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*very little
except for
CETG*

*? It would
seem that if
the sub. is
adequate for
the purpose for
which it is
being gotten for
AEC could, to
a first approx
use it. We
need not
push
for super-detailed
super-accurate
analysis capability
for people!*

*First
time this
appears!
of p. 6
of 23*

21. Some of the biological and environmental consequences of nuclear war which should be included in further studies and which have not been included in past studies are:

a. the totality of malignant neoplasms and other biological effects which would affect survivors and the combined effect of external and internal exposure from α , β , and γ radiation in the production of each type of radiation-induced biological response,

b. indirect effects on people resulting from direct effects of fallout and fire on wildlife, birds, insects, domestic stock, forests, and other factors of ecological importance, including local and global weather,

c. the accuracy with which predictions of the biological and environmental consequences of nuclear war can be made, and the possible variations introduced in the final estimates by such factors as the amount of preparation and warning time, the weather, the season of the year, and the weight and character of the attack.

22. Because of the omissions noted above, and because of the haste and limitations of such studies as have been made, it is concluded that the government of the United States simply does not have an adequate basis for predicting the biological and environmental consequences of nuclear warfare.

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APPENDIX "B"

DRAFT LETTER TO THE SECRETARY OF DEFENSE, THE CHAIRMAN, NET EVALUATION SUBCOMMITTEE, THE DIRECTOR, OFFICE OF EMERGENCY PLANNING, THE SPECIAL ASSISTANT TO THE PRESIDENT FOR NATIONAL SECURITY AFFAIRS, AND THE SPECIAL ASSISTANT TO THE PRESIDENT FOR SCIENCE AND TECHNOLOGY

1. From time-to-time over the past six years, the Atomic Energy Commission has responded to special requests from the President, the National Security Council, the Net Evaluation Subcommittee, and the Joint Committee on Atomic Energy to provide evaluations of the biological and environmental consequences of nuclear warfare. An example of such a request is the directive received by the Commission from the National Security Council asking in May 1958 that the Commission

"...undertake, in consultation with the Special Assistant to the President for Science and Technology, a study apprising the upper limits of massive, concentrated nuclear detonations and their by products which could be tolerated by the peoples of the world and by the world itself."

2. The Commission's responses to such requests have been prepared on an ad hoc basis by various combinations of its staff under tight deadlines for completion of the work requested, and without the benefit of full liaison with the scientific staff of other government agencies.

3. It has become increasingly evident that the scope and complexity of these requests warrant continuing study and evaluation. The Commission is now proposing to conduct such continuing studies. In so doing it is not the intent of the Commission to limit in any way the activities of the other government agencies with respect to studies of the biological and environmental effects of nuclear war, but rather to assure itself that its own

responsibilities in this area are adequately discharged, and to clarify the interests, roles, and responsibilities of the AEC and other agencies.

4. The purpose of this letter is to acquaint you with the Commission's proposed action, and to invite your comments and suggestions concerning improvement of the scope of the study and analysis of the biological and environmental consequences of nuclear war. We would also raise the related question as to how the programs of the various government agencies in this area of study can best satisfy the needs of the government, and assure that the information supplied to the President and the National Security Council is accurate and complete.

5. Past studies by the Commission of the biological effects of nuclear war have been confined to estimates of the extent of leukemia, bone cancer, life shortening, genetic effects, and effects on the thyroid which might be experienced by a normal, healthy population subjected to the average doses of radiation estimated for the survivors of an attack. These computations are subject to inherent uncertainties due both to the available biological data upon which they are based, and to the estimates of the average dose to survivors. In addition to further work to support such estimates, the Commission feels there is a need to consider the following:

- a. the totality of malignant neoplasms and other biological effects of external and internal exposure from α , β and γ radiation in the production of each type of radiation-induced biological response,
- b. indirect effects on people resulting from direct effects of fallout and fire on wildlife, birds, insects, domestic stock, forests, and other factors of ecological importance, including local and global weather,

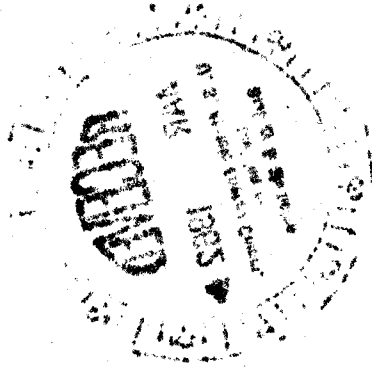
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- c. the accuracy with which predictions of the biological and environmental consequences of nuclear war can be made, and the possible variations introduced in the final estimates by such factors as the amount of preparation and warning time, the weather, the season of the year, and the weight and character of the attack.

6. To our knowledge, no comprehensive study has been undertaken which attempts to include these factors as well as the short-term effects of blast, heat, initial radiations from weapons bursts, and early nuclear radiation from fallout.

*i.e. both long- and short-term.
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