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USE OF RADIOACTIVE MATERIAL AS A MILITARY WEAPON

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Summarized from a report written by Doctors James B. Conant, Chairman, A. H. Compton, and H. C. Urey, comprising the Subcommittee of the S-1 Executive Committee.

a. Availability of Radioactive Material.

In the near future it should be possible to produce in the United States quantities of radioactive material at a rate equivalent in radioactive effect to one ton of radium every four days. This material is approximately one hundred thousand times more active than radium. Consequently, a four-day production quantity would weigh about twenty grams in a pure state, or not more than one hundred pounds when mixed with a suitable chemical carrier.

There is no way of estimating definitely what the Germans are doing in producing such material. Very likely they are further advanced in their production schedule but probably will not be able to produce in quantities that are expected to be available in the United States.

b. Use of Radioactive Material in Warfare.

(1) As a terrain contaminating material, the radioactive product would be spread on the ground and would affect personnel by means of intensive rays similar to those produced by powerful X-ray machines. It is estimated that if a four days' production quantity (the equivalent of one ton of radium) were evenly spread over two square miles of average open terrain, one day's exposure to a human being would result in temporary incapacitation, and one week's exposure would result in death. Effects on a person would not be immediate, but would be delayed for days or perhaps weeks. Five to ten times the above described concentration would be lethal after one day's exposure.

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Areas so contaminated by radioactive material would be dangerous until decay of the material took place, perhaps for weeks or months. On a hard surface some decontamination could be accomplished by flushing with water, but for average terrain no decontamination methods are known. Further, no effective protective clothing for personnel has been developed, which would nullify the effects of the radioactive material.

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(2) As a gas warfare instrument the material would be ground into particles of microscopic size to form dust and smoke and distributed by a ground-fired projectile, land vehicles, or aerial bombs. In this form it would be inhaled by personnel. The amount necessary to cause death to a person inhaling the material is extremely small. It has been estimated that one millionth of a gram accumulating in a persons body would be fatal. There are no known methods of treatment for such a casualty.

Two factors appear to increase the effectiveness of radioactive dust or smoke as a weapon. These are: (1) It cannot be detected by the senses; (2) It can be distributed in a dust or smoke form so finely powdered that it will permeate a standard gas mask filter in quantities large enough to be extremely damaging. An off-setting factor in its effectiveness as a weapon is that in a dust or smoke form the material is so finely pulverized that it takes on the characteristic of a quickly dissipating gas and is therefore subject to all the factors (such as wind) working against maintenance of high concentrations for more than a few minutes over a given area.

c. Possible Use by the Enemy.

It is felt that radioactive warfare may be used by the Germans for the following purposes:

- (1) To make evacuated areas uninhabitable.
- (2) To contaminate small critical areas such as railroad yards and airports.
- (3) As a radioactive poison gas to create casualties among troops.
- (4) Against large cities, to promote panic, and create casualties among civilian populations.

For use in cities, it is estimated that concentrations would have to be extremely high to offset the shielding effect of buildings.

Doctors Compton and Urey, two members of the Committee, felt that radioactive material may be used by the Germans against United Nations in the autumn of 1943. Dr. Conant apparently does not concur in this opinion.

d. Possible Use by the United States.

It is the recommendation of this Subcommittee that if military authorities feel that the United States should be ready to use radioactive weapons in case the enemy started it first, studies on the subject should be started immediately.

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From consideration of the possible effects and uses of radioactive material in warfare, it is evident that considerable experimentation with actual field trials would be necessary to determine the optimum conditions under which radioactive dusts could be disseminated with lung contamination or ground contamination. Such tests could be very readily carried out by using very small amounts of radioactive material (tracer amounts) and studying the concentrations in the air or on the ground by means of sensitive physical instruments which are now readily available.

These studies could be carried out best by a group containing some men who are familiar with the particular project which is planning to produce this radioactive material, and others drawn from the National Defense Research Council, who are working on the developments of munitions and dissemination of dust and liquids, and still others from the NDRC who are familiar with the testing of chemical warfare agents.

e. Defensive Methods Proposed for the United States.

The Subcommittee feels that from a defensive point of view, one can consider it unlikely (the Chairman of the Subcommittee, Dr. Conant, feels that it is extremely unlikely) that a radioactive weapon will be used against the Continental United States. They further believe that if such a weapon were used against a populated industrial city, such as London, an automatic alarm would be provided by virtue of the fact that a concentration of material sufficient to cause serious damage to any portion of the population in a few hours, would also fog all photographic films and give strange effects in various pieces of equipment in the scientific establishments of the city. If the material came down from the air as a cloud of dust, it would also probably produce strange effects in the radar equipment.

The eventuality of enemy use of radioactive material to render evacuated areas uninhabitable seems to the Subcommittee sufficiently great to warrant the issuance of special instructions to at least one officer in each Division of any Army which might be faced with such an eventuality. Such an officer should be familiar with the ways of detecting and understand the reading of certain instruments which would give the effective radiation, and should be prepared to advise on the movement of troops in such a way as to avoid more than a passing exposure to high radiation. It would also be of great importance to see that the troops were equipped with the proper type of gas masks and that these masks were put on immediately so that dust could be kept out of the lungs.

It is the recommendation of the Subcommittee that a special committee composed of Dr. Stafford Warren and Dr. R. S. Stone be asked to prepare a report on both the use of detectors in the field and instructions which might be issued to a divisional officer, explaining under what conditions troops might be moved through various areas and what methods of decontamination could be tried under certain special circumstances. In short, this special committee should prepare a manual outlining a doctrine somewhat similar to that which already exists for the use of gas officers, and it is suggested that either a divisional gas officer or some special officer attached to the Corps or Army Headquarters be charged with the responsibility for these defensive measures. Such officer, or officers, would need to have instruments available and be given authority to traverse all areas which previously had been occupied by the enemy.

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