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11 May 1948 OF 5 COMES. SERIES A

*District Engineer*  
Sgt. T.O. Jones, Capt. C  
11 May 1948  
U-34-KXVIII

Classification (~~Secret~~) (Changed to ~~SECRET~~)  
By Authority of *Ch. A.E.C. (11-35-48)*  
By *JOSEPHINE L. ...*  
MEMORANDUM FOR BRIGADIER GENERAL WAO

DECLASSIFIED

EO 11652  
NND 730039  
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in accordance with our discussions May 10th I am submitting the following brief summary of the radiological effects to be expected from the special bomb. This may be of use to the services concerned in the operations, and should probably be brought to their attention.

A. The bomb under consideration differs from normal explosive bombs in that its detonation involves the production of radiation and of radioactive substances.

1. The active material of the bomb itself is toxic. There is about  $10^9$  times as much toxic material initially in the bomb itself as is needed for a single lethal dose.

2. During the detonation, radiations are emitted which (unless personnel is shielded) are expected to be injurious within a radius of a mile and lethal within a radius of about six-tenths of a mile.

3. After detonation, highly radioactive materials are produced. The activity decreases inversely with the time. One second after detonation there will be the equivalent of about  $10^{12}$  curies of radium. After a day this will fall to about 10 million curies.

B. The circumstances of delivery of the bomb should not normally lead to the deposition of a large fraction of either the initial active material or the radioactive products in the immediate vicinity of the target; but the radiations emitted during detonation will, of course, have an effect on exposed personnel in the target area. The actual physical distribution of the radioactive products is not known to us, since it depends in detail on meteorological conditions as well as on the specific air mass motions induced by the explosion; these latter have not been experimentally studied. It is, however, likely that most of the activity will rise to a considerable height above the target and will remain as a fairly compact cloud for a period of hours after the detonation. The subsequent history depends essentially on temperature and wind conditions. If the bomb is delivered during rain, or under conditions of such high humidity that it itself causes rain, it may be expected that most of the active material will be brought down by the rain in the vicinity of the target area.

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Memo for General Farrell

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6. In practice, the following three precautions will have to be observed:

1. Aircraft must maintain a minimum distance from the detonation in order to avoid radiation. Taking into account the dilution of the atmosphere, this minimum distance is about two and one-half miles. Operations should be conducted so that this distance is exceeded if the operations proceed according to plan.

2. Following aircraft must avoid coming close to the cloud of active material, and monitoring to determine the extent and disposition of the activity will be necessary if aircraft are to enter the area within hours of the primary detonation.

3. Certainly if there has been rain, and conceivably without this, some activity may reach the ground in the neighborhood of the target area. Monitoring will be necessary if this area is to be entered within some weeks of the primary detonation. The probable results of monitoring will be that it is quite safe to enter.

J. R. Oppenheimer

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