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FALLOUT STUDIES FOR HARDTACK

This document consists of 2 pages
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SYMBOL: DBM:REWB

The following are my thoughts and understanding concerning fallout studies for Operation Hardtack:

It has not been finally decided which shot will be used as the "land" shot for the program of fallout studies recommended by AFSWP, but probably will be

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There is some slight possibility yet remaining to tag a land shot in as much that an additional land detonation of [redacted]DELETED may be fired for a foreign observers program. Tracer material in sufficient amounts could be added to this weapon, but if the program is carried forward, a part of the proposal would be for other nations to tag this weapon with their own tracers. If they were to do so, which they probably would, our tracer experiment probably would not succeed. There seems little likelihood at this time that an additional shot could be added to Hardtack for the sole purpose of fallout studies.

The other consideration that have been in the mill were to tag the

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The amount of radioactive material needed to be produced is difficult to estimate precisely, but the attached annex gives some feeling for the order of magnitude. Using NYOO's estimate that the lower limit of detection of

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These crude estimates indicate that we are close enough to proceed with the method, but also shows the need for more effort to pin down activation numbers, feasibility or very low level counting, etc. At our meeting on October 4, 1957 (Drs. Potts, Western, Holland, Klement and Dunning) it was tentatively agreed that we would recommend [redacted] in the high altitude shot (125,000 feet). If this recommendation is accepted, there remains a considerable amount of planning yet to be done, i.e., who will head up the field of effort to see that the job is done, what will be the sampling program and who will do it, who will perform the analyses, and who will pay the bill. Too often in the past such efforts have suffered from lack of assigning specific responsibilities.

cc: Dr. Dunham
Dr. Shilling
Dr. Potts

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2 Enclosures:
1. Table
2. Annex

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TABLE

Factor Difference: Amount near bomb / Amount per Sample	Lowest Limit Detection per Sample	Amount Used Near Bomb	Amount Available
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AEC

Basic Considerations as to Needed Amounts of Materials Produced by Bomb

A. Assumptions:

1. 50% of the tracer goes into the stratosphere.

2. 50% of that in the stratosphere falls uniformly on one-quarter of the earth's surface (in the same general latitude as the detonation).

3. The mean storage time in the stratosphere is seven years.

4. Each sampling period is of one month's duration, for a total period of three years for the program.

B. To estimate the ratio between the amount (activity or mass) in the stratosphere versus the amount collected at the earth's surface per month:

1. With T_{Mean} = 7 years,

   1.2% is removed from the stratosphere per month

2. With 1.4×10^{15} ft^2 = one-quarter of the earth's surface,

$$\frac{0.012}{1.4 \times 10^{15}} = 8.56 \times 10^{-18} \text{ fraction of}$$

material in stratosphere that reaches one square foot of the earth's surface per month.

C. To determine amount originally needed to be produced or placed near the bomb:

1. Assuming a three year collection period, then

the amount originally needed in the stratosphere to have a given amount remaining there after three years is

$$A_3 = A_o e^{-\lambda t}$$

$$A_3 = A_o e^{-(0.012)(3)}$$

$$A_3 = 0.65 A_o$$

$$A_o = 1.54 A_3$$

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D. To determine the total amount of material needed near bomb to yield an acceptable (detectable) limit per sample (one month's collection at the end of three years):

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