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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON 25, D. C.

LRD

AFM47-1

21 MAR 1951

MEMORANDUM FOR MR. ROBERT LEBARON, DEPUTY TO THE SECRETARY OF DEFENSE
FOR ATOMIC ENERGY

SUBJECT: Notes on Technical Cooperation With British and Canadians in
the Field of Atomic Energy Intelligence

1. PROBLEM. To determine the rate and aggregate amount of Russian
plutonium production.

2. FACTS BEARING ON THE PROBLEM.

a. The number of grams of plutonium produced in a natural
uranium pile is directly proportional to the number of grams of krypton-85
produced by fission of uranium-235 in the pile.

b. In the process of dissolving the uranium to recover the
plutonium, the chemically inert krypton is released into the atmosphere
with the dissolver gases in an amount proportional to the number of grams
of plutonium recovered.

c. A measurement of the total number of grams of krypton-85 in
the earth's atmosphere is therefore a measure of the total number of
grams of plutonium processed.

d. It has been determined that the atmosphere contained no
krypton-85 previous to 1944.

e. The number of grams of krypton-85 released into the atmo-
sphere by Hanford operations can be calculated for any time between 1945 and the present date. (b)(3)

f. The amount of krypton-85 released into the atmosphere at
Chalk River, Canada, is reasonably well known.

g. No krypton-85 has been released into the atmosphere by the
British to date as far as we know. However, it is understood that the
British will be processing plutonium in considerable quantities by the
fall of 1951.

Bockroft said they would trap.

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h. A method of measuring the number of grams of krypton-85 in the earth's atmosphere has been developed jointly by the Atomic Energy Commission and USAF (AFOAT-1). Accuracy limits of approximately 5% in this measurement should be attainable within six to eight months.

i. In order to determine the number of grams of krypton-85 resulting from Russian production of plutonium, it is necessary to subtract the amounts produced by the United States, the United Kingdom and Canada from the total amount measured.

j. There is considerable promise that the experimental program of the United States for the next six to eight months will be capable of reducing existing errors of measurement of the number of grams of krypton-85 in the atmosphere as indicated below.

<u>Measurement</u>	<u>Present Limits of Accuracy</u>	<u>Expected Limits of Accuracy</u>
Vertical Distribution of Kr-85	Estimated plus or minus 3%	Plus or minus 0.5%
Horizontal Distribution of Kr-85	Plus or minus 5%	Plus or minus 1.5%
Grams of atmospheric Kr-85 per gram of plutonium	Plus 4% minus 10%	Plus or minus 1.5%
Hanford production		

(b)(3)

k. All previous atomic bomb tests have contributed known but relatively small amounts of krypton-85 to the atmosphere.

3. CONCLUSIONS.

a. It can be concluded from the above facts that from within six to eight months the capability of determining the number of grams of plutonium produced by the Russians will depend upon two factors, i.e., measurement of atmospheric krypton-85 to accuracy limits of 5% and a knowledge of the amount of atmospheric krypton-85 produced by the British and Canadians.

b. The introduction of krypton-85 into the atmosphere by countries other than the U.S. and USSR will necessitate a continuing knowledge of the krypton-85 production of these other countries in order to determine the number of grams of krypton released by the USSR. Reasonable estimates might be made concerning the United Kingdom and

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Canadian initial rates of release of krypton-85 but if the aggregate production of krypton-85 in these countries increased beyond 5% of the U.S. production, an accurate knowledge of the number of grams of krypton-85 introduced into the atmosphere by the United Kingdom and Canada becomes essential.

4. RECOMMENDATIONS. It is recommended that the American members of the Combined Policy Committee advise the Joint Congressional Committee of the problem and recommend the necessary changes in legislation to permit the exchange of information on production rates of krypton-85.

5. The above study and recommendation was prepared jointly by the Director of Research, Atomic Energy Commission, and USAF (AFOAT-1), and is considered by both organizations to meet the requirements of the problem.

Remaude

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