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 RESEARCH AND DEVELOPMENT BOARD  
 WASHINGTON 25, D. C.

DECLASSIFIED  
 Authority NND 8130  
 Co By G NARA Date 38

1 July 1951

AE 207/1

MEMORANDUM FOR CHAIRMAN, RDB COMMITTEE ON ATOMIC ENERGY  
 CHAIRMAN, RDB COMMITTEE ON GEOPHYSICS AND GEOGRAPHY

SUBJECT: Review of DOD Program for Long Range Detection of Atomic Operations

1. The Joint Panel on Technical Objective IO-7 on 11 June 1951 reviewed the FY 1952 research and development program on long range detection of atomic operations for which the Department of the Air Force has primary responsibility. During this review the Panel considered the technical accomplishments to date and the results achieved during Operation GREENHOUSE.
2. The Panel considers that substantial progress has been made during the past year in the development and improvement of techniques for long range detection of atomic explosions of both fusion and fission types, and for determining the rate of plutonium production by the USSR.
3. As the result of experiments conducted during Operation GREENHOUSE there is increased optimism concerning the capability of acoustic techniques to detect and fix the location of atomic explosions occurring at considerable ranges. While useable seismic signals were recorded during GREENHOUSE, the underground explosions scheduled for the fall of 1951 will provide a more realistic test of seismic detection.
4. The FY 1952 research and development program in the field of IO-7 indicates a proper division of effort among the several objectives of the long range detection program. This division of effort is in accord with the Joint Chiefs of Staff current guidance which emphasizes the importance of developing capabilities for determining Russian plutonium production and for detecting a thermonuclear explosion occurring in the USSR. Including the AEC contribution, it is estimated that over two thirds of the overall research effort on long range detection is in support of these two objectives.
5. The Panel recommends that the Committees on Atomic Energy and Geophysics and Geography endorse the Air Force technical program for FY 1952 on long range detection of atomic operations outlined in Attachment B. More detailed comments and recommendations by the Panel relative to this program are included in Attachment A.

Attachments  
 AE 207/1.1  
 AE 207/1.2

*Charles P. Boneh*  
 CHARLES P. BONEH  
 Chairman  
 Joint Panel on IO-7

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1. Nuclear Bomb Debris IO

a. Radiochemical studies of nuclear bomb debris and the analysis of debris from foreign and domestic atomic explosions are extremely important in developing a capability for detection of foreign explosions of both fission and fusion weapons. At present these studies are concentrated in a single facility.

Recommendation: It is recommended that additional competence for independent measurements of this type be gradually acquired through further contractual arrangements.

b. Radiological contamination of the atmosphere during the Nevada tests temporarily impaired long range detection capabilities based on the analysis of nuclear bomb debris. The seriousness of this occurrence is correctly reflected in the provision for new projects in the Air Force FY 1952 program which are aimed at development of techniques for identifying foreign bomb debris in the presence of debris from U. S. tests.

Recommendation: The Panel recommends that in planning future atomic tests the AEC give due consideration to scheduling the shots so as to minimize adverse effects on our long range detection capabilities.

2. Atomic Energy Production Operations IO-7.3

a. Determination of the krypton-85 distribution in the atmosphere and the krypton-85 fission yield have not yet been accomplished with sufficient accuracy to assign definite limits to the Russian radiokrypton contribution. The Panel believes that by mid-1952 quantitative measurement of Russian krypton-85 generation with a precision equal to ten percent of U. S. generation may be possible, assuming no suppression of radiokrypton by the USSR.

b. The Panel notes with satisfaction that the AEC plans for the new Savannah River reactors include provisions for krypton suppression.

c. The Air Force FY 1952 long range detection program includes three projects on atomic energy plant surveillance which are designed to provide a capability for locating Russian atomic production facilities and for identifying the nature of their operations.

Recommendation: It is recommended that studies on atomic energy plant surveillance proceed as a matter of priority. These projects were approved previously by the CAE but funds were not made available for this purpose during FY 1951.

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### 3. Seismic and Acoustic Detection IO-7.1

a. Acoustic techniques for long range detection show considerable promise for detecting and locating a foreign atomic airburst. Preliminary reports on Operation GREENHOUSE indicate positive results in the detection of the first three shots out to ranges of twenty-four hundred nautical miles. Additional research will be conducted during FY 1952 to determine further the nature of acoustic propagation and the diurnal, seasonal, and terrain effects on acoustic detection.

Recommendation: A number of acoustic techniques have been under development and were tested during Operation GREENHOUSE. It is recommended that steps be taken in the very near future to select for final development the most promising technique and instrumentation.

b. Transfer of the seismic long range detection experiments from Anchitka to the underground and surface tests at a continental site will provide better geological conditions for these experiments. The reliability of the seismic technique as an aid to early detection should be definitely established during the fall underground tests, although the scaling factors are questionable.

Recommendation: Every effort should be made to develop an array as well as a tripartite station at the Wyoming site for the most effective test of the seismic technique.

c. Acoustic and seismic detection techniques may provide the most reliable means available for detecting and locating an atomic explosion and determining the approximate energy yield. Reliance on geophysical means for initial detection may be quite important at such times when radiological detection of a foreign atomic burst is impaired by the conduct of U. S. atomic tests.

d. Interesting SOFAR signals were observed at considerable distance from Eniwetok during Operation GREENHOUSE. There is some evidence that a minimum velocity channel exists in the earth's solid crust, and if that channel were to connect with the comparable SOFAR channel in water there might be a good possibility of transfer of energy from ground to water.

### 4. Optical Detection IO-7.1.3

a. The development of a light intensity meter for long range measurement of nuclear bomb light is recognized as a borderline investigation, but it has the potentiality of providing information on energy yield which is difficult to obtain by radiochemical means.

