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SWPRA 927

DEC 11 1958

MEMORANDUM FOR: THE CHAIRMAN, JOINT CHIEFS OF STAFF

SUBJECT: Status Report on Fallout

1. Reference SM 861-54, 29 September 1954, Inclosure "A" to JCS 1716/12 as modified by SM 865-54, 30 September 1954, in which the Chief of Staff, U.S. Army, the Chief of Naval Operations, and the Chief of Staff, U.S. Air Force expressed interest in a continuing report by the Armed Forces Special Weapons Project to the JCS that would analyze and evaluate the radiation hazards resulting from atomic detonations. AFSWP should investigate and appraise the radiological threat to life under varying conditions of weather, time, distance and circumstances of detonation.

2. This report is submitted as the third status report of the series of reports requested above. The previous reports were:

a. JCS 1716/21, 27 September 1955 and decision on 1716/21, 21 October 1955.

b. Memorandum, SWPDR 927, this headquarters, 15 October 1957, subject as above.

3. The nature of the state-of-the-art of fallout is such that this report, as were previous reports, must be qualified as being interim in nature. Fallout reports from Operation REDWING (1956), PLUMBBOB (1957), and HARDTACK (1958) are currently under preparation. After completion, they will be under continuous review and analysis and subject to revision based upon more comprehensive or accurate data from subsequent tests.

4. The hazards of LOCAL CONTAMINATION from nuclear weapon detonations have been fairly well delineated. However, the difficulty in accurately predicting the rapidly varying atmospheric conditions results in uncertainties as to the area of deposition of fallout. Prediction of local fallout contours from enemy bombs must be based on a large number of assumptions, such as the type of weapon, height of burst, and yield. These unknowns do not allow accurate prediction of fallout from enemy bursts during wartime. Delineation of contaminated areas by air-borne radiac instruments

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after deposition of the fallout is presently practicable, and would be of considerable military and civil value during wartime. Underwater bursts do not produce any fallout; however, they do create what is called a base surge that is radioactively very hot for short periods after formation. Good base surge measurements were taken for the first time during Operation HARDTACK; however, there is still insufficient data to scale its behavior with respect to yield and depth of burst. The many air bursts fired to date continually reaffirm the fact that no local fallout results from air bursts.

5. The deposition of WORLD-WIDE fallout or world-wide surface contamination is now beginning to be accurately measured. The AFSWP High Altitude Sampling Program (HASP) has been securing data on the stratospheric burden and drip-out rate of the radioactive debris. Recent indications are that the radioactivity in the stratosphere has a residence half-life of two years (in contrast to the previously assumed value of about seven years) and the present amount of Sr^{90} in the stratosphere would be maintained by the injection of about 6 megatons of fission products per year. The concentration of the Sr^{90} on the surface of the earth is greater in the United States than in any other area of the world. The danger of $Carbon^{14}$ and $Cesium^{137}$ has been examined and the immediate probability of any one individual being affected is about 1 in 500,000. The radiation effects of world-wide fallout from the testing of weapons do not compare with the risks commonly accepted; i.e., X-rays, automobiles, chemical contaminants, and the threat of nuclear war. However, the probable casualties attributable to radio-isotopes from weapons testing, when summed over the populations of thousands of years, create a moral issue that can be of considerable propaganda importance.

6. There is a need for more information in the following areas of the effects and behavior of fallout from nuclear weapons:

a. Correlation of low heights of burst with the amount of fallout that is deposited locally, and specifically, the accurate determination of the lowest height at which no fallout will occur.

b. The more accurate determination of the drip-out rate of radioactive particles from the stratosphere to assist in estimating the Sr^{90} hazard.

c. The theoretical estimate of the amount of radioactivity formed per KT of fission yield is at present very uncertain, and refined work is a fundamental requirement.

d. The refinement of measuring techniques to enable test and research personnel to account for all radioactivity produced from a nuclear yield.

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e. The methods of predicting fallout patterns are undergoing continuous improvement; however, the lack of high quality fallout measurements seriously restricts the limits of accuracy to which this effort can go. Therefore, it would be desirable to have the necessary land surface nuclear explosions to properly document fallout with the latest scientific equipment.

f. Advancements in the knowledge of fireball chemistry, physics, and particle behavior are essential to the thorough understanding of the fallout phenomenon, and are necessary before predictions of the behavior of very large yield weapons can be attempted. Joint AEC-DOD attempts to obtain information on radioactive particle distribution in the cloud have not been successful to date.

g. Behavior of the radioactive isotopes in the biosphere and the selectivity of biological systems for particular isotopes.

h. Response of biological systems to radiation and the correlation of the data to effects on large populations.

i. The dominant role of genetic danger in humans.

7. The attached inclosure, "Report on The Current Status of Fallout," presents information amplifying the above conclusions.

1 Incl
Cys 1A&2A of "Report on The Current Status of Fallout," w/cys 1A&2A of Appendix A