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Dr. Walter D. Claus, Chief April 6, 1951
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DATA TO BE SOUGHT AT PRELIMINARY WINDSTORM TEST [redacted]

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[redacted] to an unauthorized person is prohibited.

<u>Part 1. Area and distribution of fall-out radioactivity.</u> From Bikini test Baker, the integrated gamma dose due to base surge and fall-out was 100 r or greater for a distance of at least 3½ miles downwind from point zero. Due to run-off from ships decks, etc., this 100 r may represent a substantial underestimate of dosage at this 3½ mile distance. The integrated beta dosage in reps associated with this gamma dosage due to fall-out on a plane impervious surface would be for skin in contact with such a surface the order of 100 times greater than the gamma dose.

Assuming that the Baker test shot was 20 KT equivalent, the radiation from a proposed test of a 1 KT bomb would be lower by a factor of twenty assuming otherwise equivalent conditions. On the other hand, it appears conceivable that dust from an underground explosion might be much slower in aggregating and settling out than water bearing fission products from a similar underwater burst. This would result in lower radiation intensities near the blast site, but higher intensities at more remote distances. In particular in a mountainous country (where a second test is contemplated under conditions that will produce more useful data concerning structural damages than will be produced in this first test) areas of fall-out may be very irregular. It is conceivable that fall-out in a nonuniform, mountainous country might assume serious proportions at points many miles distant from the detonation point. It is important therefore to obtain from this first test, data indicating any substantial differences that may exist between flocculation and fall-out behavior of material particles carrying fission products from an underground burst as compared with an underwater burst.

The test probably should be made under conditions of a constant low velocity wind in the 5—10 miles per hour range.

An obvious method of collecting fall-out is by means of flat, retentive paper panels (flypaper) placed horizontally in the open in unobstructed locations, and later observed <u>in situ</u> or collected and measured at a central station.

Another type of collection apparatus might be useful that would give radioactive dust concentration in the air as a function of

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time. Apparatus of the type used in monitoring stations at Brookhaven in which dust is collected on a moving strip of filter paper might be useful for this purpose. There may be one or two spare units of this type available at Brookhaven.

Use of AFOAT personnel and equipment and perhaps also of drone planes ought also to be explored.

If this preliminary test takes place under conditions where the principal fall-out is at sea the number and location of fixed monitoring stations that are feasible is likely to be an important factor limiting the extent to which comprehensive data can be collected.

Part 2. Size and specific radioactivity of individual fall-out particles. One hazard in connection with inhalation of material particles carrying radioactive fission products is that, because the radioactivity is concentrated and particulate in nature, it may constitute a substantially greater danger than the same amount of radioactivity in a molecular dispersion or diffused through inert material so that a low specific activity results. Present tolerance values for air-borne radioactivity are based on the assumption of relatively uniform distribution of retained radioactivity in lung tissue. It is conceivable that particulate material retained in the lung might radiate minute portions of the lung so heavily that malignant disease would be induced while the lungs as a whole would receive an average radiation dose considered insignificant by current concepts.

For example, calculations based upon measurements of radioactive particles damaging Eastman Kodak film following the first Alamogordo test in July, 1945 indicate that the average of such particles, if fixed at one spot in the human lung from a period of three hours following the A-bomb blast for a month or so would have produced an average radiation dose of some 35 rep to a millimeter diameter sphere of tissue surrounding the particle. Most of this dose would have been delivered in the first few hours. These particles were light enough to be carried by the wind from New Mexico to the Wabash river watershed north of Vincennes, Indiana. The size of these particles is not further known, or whether the process of preparing water for paper production was s[redacted] larger and more active particles could not reach the final paper product.

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Such considerations suggest that it is advisable to obtain data on size distribution and on specific radioactivity of fall-out particles as well as information on how these qualities vary as a function of distance from the test site.

Proper radioautographic studies of flypaper fall-out collectors (as well as the filter paper strips from the Brookhaven type of air-dust monitors, if they are used) will provide information as to the variation in total radioactivity of individual particles in one location and as a function of distance from the test site and ought to be carried out. Such tests will not differentiate between large particles of low specific activity and small particles of high specific activity. To make such studies possible, use of cascade impactors or other devices with similar functions to separate out air-borne particles of different sizes for individual study ought to be seriously considered. Such units could be equipped with shut-off devices to stop air-flow when an optimal sample of radioactive particles had been collected for future radioautographic and other studies.

The ability and feasibility of the AFOAT organization's making observations on particle size and specific radioactivity ought also to be thoroughly explored, as well as the possibility of their providing technical aid and advice to any other group engaged in this task.

Finally, it appears reasonable to expose experimental animals in appropriate fall-out areas so that by later serial sacrifice and lung studies by radioautographs and other means more direct information can be obtained as to the real hazards from radioactive particles from underground as well as other types of nuclear explosions.

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