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Objectives of Proposed Experiments for Bomb Tests

1. Radiochemical Analysis of Air and Ground Samples

   (a) Air samples - Determination of efficiency. This is the most reliable and accurate measurement of bomb efficiency.

   (b) Ground samples - Determination of efficiency radiochemically if collection of air samples fails. Determination of the isotopic constitution of the residual fissionable material necessary in order to calculate the efficiency accurately from air sample measurements. A plan to avoid the necessity for ground samples on the letter count will be tried in the forth coming tests, but until it has proved satisfactory the ground samples will be required.

2. Blast Measurements

   Determination of the TNT equivalent and efficiency of the bomb in the event of failure of the radiochemistry. Determination of peak pressures as a function of distance and pressures as a function of time and distances. (This may be of value to construction engineers as the shock wave properties of atomic bomb explosions cannot be reproduced by means of high explosives).

   Traditional necessity for recording blast and blast effects of all mighty explosions.

3. High-Speed Photography

   Determination of the efficiency of the bomb by the rate of growth of the ball of fire in case of failure of the radiochemical determination, and as a check on the blast measurements.

   Determination of the shock velocity near the bomb for both academic interest, direct check on one type of blast measurements, and to aid in determining scaling laws for use with high explosive charges.

   Recording of the formation and movement of the cloud for purposes associated with national defense and with meteorology.

   Determination of the velocity of high speed jets produced by the shock pressures. If sufficiently high speeds can be produced by nuclear explosions, there are two possible applications in bomb design.

   Traditional necessity for recording so spectacular an event as an atomic bomb explosion.

4. Initial Rate of Neutron Multiplication

It is possible to calclate in advance of a test a reasonable value of alpha. It is not possible at the present state of the art to calculate the efficiency from a value of alpha. Hence if we measure alpha and efficiency for a number of different bomb designs, we will supply an experimental method to partially offset this defect in theory. It is clear that efficiency will depend on other parameters than alpha so that this measurement is not a complete solution of the problem but is a help to the theory.

Determine if the particular bomb fired resulted in a partial fizzle or an accidental large explosion. Without this knowledge a serious error in judgement of the acceptability of a given model might result.

(a) The "Rossi" method. This is a method previously tried and believed to be trustworthy.

(b) The "Teller" method. This is an as yet untried method which should be compared with the Rossi method. If it is found to be satisfactory, it could be the only method used in subsequent tests. The instrumentation and techniques are appreciably simpler for the Teller method.

5. Transit Time

Determination of information complementary to that given by the neutron multiplication rate measurement for aid in deciding whether or not the particular bomb detonated was normal for that type.

6. Gamma-ray Spectrum

Determination of the spectral distribution and intensity of especially the very hard gamma rays for considerations of their lethal effects and to increase our understanding of the fundamental processes involved in the nuclear explosion. There is some question whether or not identical radiation can be produced in the laboratory.

7. High Energy Neutron Measurements

Determination of the high energy neutron spectral distribution at various distances from the bomb to aid in estimating the biological effects of atomic bombs.

Determination of the background intensity of very high energy neutrons as a control measurement for an experiment proposed for a future test, which experiment would be designed to determine the feasibility of an entirely new principle for atomic weapons.