August 21, 1946

Major General L. R. Groves
P. O. Box 2610
Washington 25, D. C.

Dear General Groves:

In response to your request for my comments on the proposed third test of an atomic bomb against naval vessels, known as Test Charlie or the deep water test, I should like to make the following statements. You are welcome to make such use of them as you deem appropriate.

It is understood that the test as proposed contemplates the use of an atomic weapon submerged at a depth of approximately 1000 ft. in the vicinity of naval vessels of various types. Under these circumstances, it is believed that the pertinent circumstances will be approximately as follows:

(a) Since Test Baker has proved that an atomic bomb behaves normally in water, then Test Charlie becomes merely an experiment in which an atomic bomb is used to initiate a heavy water shock and the effect of this shock studied upon naval vessels. It is believed that the general excellence of the hydrodynamic predictions for Test Baker which were based upon scale experiments indicates that similar predictions may be made for Test Charlie with a high accuracy. In other words, the hydrodynamics of such a test may be predicted in advance as a function of distance. If it is then desired to know what the effect of a shock of a given character is upon a ship, this may be reasonably well determined by high explosive detonations at appropriate locations.

(b) It is believed that under these circumstances the lethal distance for a bomb at a given depth for a given type of ship may be predicted a priori with not much less accuracy than a single experiment using varied types of ships will give.

(c) Tests Able and Baker have indicated that an atomic bomb will destroy at least one capital ship no matter how delivered, within a radius of 500 yards. Test Charlie therefore becomes primarily a test of another and extremely difficult method of delivery under circumstances in which

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capital ships are seldom found close together. It is believed that Test Charlie may only be used to indicate the accuracy of delivery in radius which may be required of such a weapon, but it is believed that this distance may be predicted to at least 50% with present knowledge and some additional scaled experiments.

(d) Effects of contamination due to radioactive water and spray will certainly be no greater and will probably be less in Test Charlie than in Test Baker.

(e) The personnel required to instrument such a test and to assemble the bomb will not be available from civilian parts of the Manhattan Engineer District unless other tests of fundamental importance to the development and stockpiling of atomic weapons are delayed or abandoned. This does not preclude the training of other personnel, but it does indicate that the time scale for Test Charlie must be set up so as to permit such a personnel training program for which at least one year is required.

(f) The destruction of a third atomic weapon for such a test must be viewed with some concern in view of their cost, relative scarcity, and probable circumstances of use under offensive or defensive war strategy.

(g) The bubble hydrodynamics of Test Charlie are interesting but lacking military significance. Much of the publicized so-called "scientific" preference for such a test over Test Baker may arise from a lack of understanding of the depth at which Test Baker actually occurred. Wide misapprehension exists that this was a "surface" shot to which several legitimate objections would have existed.

I believe that members of the Los Alamos Laboratory concur in the general opinion, in which I share, that the value of Test Charlie is doubtful and its continuance should be the subject of careful reconsideration.

Yours truly,

N. E. Bradbury
Director

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