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CAB 126/250

RELATIONS WITH JAPAN

EFFECTS OF THE BOMBING OF JAPAN AND OTHER RELEVANT MATTERS
(i.e. Proposed Mission to Japan, Destruction of cyclotrons, etc.)

(N.B. The contents of this file read forward, as in a book.)

THE BRITISH SUPPLY COUNCIL IN NORTH AMERICA

TELEPHONE EXECUTIVE 2020

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BENJAMIN FRANKLIN STATION
WASHINGTON 4, D. C.

Seen
A. 28/7

TOP SECRET

July 23rd, 1945

Dear Sir John,

You will have received a brief message to tell you that the test of the 49 bomb has been completely successful but I think you will be interested to hear some details and impressions.

I enclose two accounts, one by Frisch which I think is probably the best single description of the event, and one by Tuck which is accompanied by sketches. I also enclose a photograph which was taken from the same spot as these observations.

I visited the site of the test on Thursday, July 12, to see the general lay-out and to inspect the numerous experiments which were set up, or in process of being set up, for measurement and observation. Only the simplest of these were actually ready and much remained to be done. However, in spite of the difficulties of working in the desert, practically everything was got ready in time. I had hoped to see the parts of the gadget, but these had not yet arrived. I was only able to see the preparations for the final tests on the 49 sphere and the initiator.

You already know the main details of the assembly. I will only repeat that the weight of 49 was just over 6 kg. This is 97 percent of the critical mass when the 49 is in the delta phase (density of rather less than 16, compared with normal density of about 19). This was just a little too much and consequently the chance of pre-detonation was somewhat higher than we liked. Moreover, there had been a little trouble in the manufacture of the two halves of the sphere, which necessitated the most careful assembly at base. These points, with the many other factors on which success depended, gave cause for a great deal of anxiety.

The test was scheduled for 4 a.m. on the morning of July 16. I decided not to go to the Base Camp, where Groves, Oppenheimer, etc. were located, but to go with the Coordinating Council to a point in the hills about 20 miles or so from the gadget, whence a better view was possible.

The weather was unfavourable and it seemed for some time that the test might have to be postponed, but it was finally decided to take a chance and at 5.15 we were told that the zero hour was 5.30.

The first grey light of dawn was appearing as we lay or sat on the ground. Except for the faint twitterings of a few early birds there was complete silence. Then a great blinding light lit up the sky and earth as if God himself had appeared among us. After a second or so I peeped round the dark glass with which I was shielding my eyes, but the light was still so intense that I was almost blinded. Then I saw some of the phenomena, but not all, which Frisch describes - the ball of flame, the blue and purple luminosities, etc. After about 100 seconds there came the report of the explosion, sudden and sharp as if the skies had cracked. Then the hills themselves took alarm and uttered rumbling protests for what seemed several minutes. Meanwhile, the column of gas had risen and it continued to rise in a fairly definite cylinder with a mushroom top. It rose with surprising speed. There was an inversion at about 17,000 feet, and here the cloud spread out to some extent, but the central portion pushed through this layer and continued to rise. After some minutes, the column had reached a height which I estimated, by rough measurement, to be about 40,000 feet.

My anxieties over the uncertainties of the test had made me somewhat nervous, and the awe-inspiring nature of the outcome quite overwhelmed me. Although everything happened almost exactly as I had imagined it, the reality was shattering. Even now, a week later, I am filled with awe when I look back on this moment. It was a vision from the Book of Revelation.

Now as to consequences and results. Although the explosion was observed over a very wide area, the explanation that it was due to an ammunition magazine seems to have been accepted and there has been no undue publicity or awkward enquiry. This has been helped by the fact that there were few habitations in the neighbourhood, and that no evacuation was found necessary. The bulk of the fission products and the remaining 49 appear to have ascended into the upper atmosphere, as I anticipated. There is of course strong contamination in the immediate vicinity of the gadget, extending to some hundreds of yards.

The steel tower (100 ft. high) on which the gadget was placed has completely disappeared, probably vapourised in the great heat. There is a crater of about 140 feet in diameter, surrounded by a green area of some 1100 feet diameter. This is probably a vitreous surface formed by the action of the heat on the sand, a kind of bottle glass.

Such measurements as were available when I left Y last Thursday, July 19, indicated that the blast of the explosion was equivalent to the explosion of about 10 to 12,000 tons of T.N.T. Many of the instruments cannot yet be recovered, owing to radioactive contamination, and it will be several days before any accurate results are available. It seems very likely that the pressure - distance curve will be rather different from that due to a T.N.T. charge, since our explosion takes place much more quickly. The effects are likely to die off more quickly with distance.

Some estimates have been made of the amount of energy released, but they are still very rough. I think it is reasonably certain that the amount of energy is equal to that released in the explosion of at least 20,000 tons; it may be considerably more. (We have always expected that the shock wave would be considerably less than would correspond to the energy release.)

If all the 49 in the gadget had been burned, the energy release would have been 100,000 tons of T.N.T. The explosion has therefore been more efficient than calculation led us to expect. This is partly due to the fact that the calculations were deliberately kept on the conservative side, partly because of the effect of radiation, which would increase the efficiency. There seems to be little doubt that the radiation from the gadget is quite strong.

The figures I have given you are rough, but I do not think they can be far wrong. I hope to get better data by the end of this week, but it will be some time before the final results are available.

More accurate figures can do no more than confirm the main facts, which are already perfectly clear. The nuclear reaction works, and, as far as can be judged from the first analysis of the observations, exactly as predicted. The implosion method of assembly, even in this first form, is successful. The efficiency of the nuclear reaction is high enough to give a weapon of military significance.

I wish to add here, for I think you will be glad to know it, that a substantial part of the success of this operation has been due to the contributions and efforts of our British group, small as this group is. We can be quite satisfied that we have borne our share, within the limitations imposed by present circumstances.

I should like now to be able to say "Nunc dimittis", but the end is not yet. The gadget used in the test was not exactly in a form which can be used in combat. A good deal of

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preparation towards combat use has been made already but much still remains to be done. This is recognised by some of our U.S. colleagues, but not by all. I think it is possible to get all the tests carried out and still to meet the expected schedule, but there is no time to spare.

Yours sincerely,

J. Chadwick.

The Right Honourable Sir John Anderson, M.P.,
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