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Castle file

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407.1

Operation Castle

5110 (1-2) RECEIVED

Colonel G. A. Lutka
Weapons Effects Division
Atomic Headquarters
P.O. Box 2610
Washington, D.C.

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January 6, 1953

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For: Lt. Colonel G. A. Lutka, Weapons Test Division

135094

Re: Sandia Corporation Participation in the weapons Effects program of Operation Castle

As requested by Lt. Colonel Lutka in a conversation with Dr. B. F. Turvey at AWP Headquarters on 30 January, the staff of the Weapons Effects Department (511) of Sandia Corporation has formulated some recommendations, both pro and con, for subject program. Further, we have contacted the manager of the Proving Ground Department, Field Testing Organization of Sandia Corporation, and have his concurrence in our statement of Sandia Corporation capabilities for subject operation. Our collective thoughts are outlined in the following paragraphs.

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1. Pressure-time vs distance:

- a. A few pressure measurements at ground level should be carried out for each thermo-nuclear test in order to obtain statistics on blast efficiency. The primary project for this determination would, of course, be the free-air data from rocket trails; but it is suggested that perhaps five pressure-time measurements along the ground for each shot would be useful.
- b. Data obtained for Mike shot should be checked by a similar pressure versus distance blast line, with measurements from about 200 feet out to 3 psi. The Mike shot data collection was successful up to pressures as high as 20 psi. The attempt to obtain higher pressure data should be repeated, principally in connection with establishing shock wave forms.
- c. In the event that there is a surface burst on land which would permit a moderately good blast line over land, pressures should be measured over the range of about 200 psi to as low a value as the land mass will allow, but not less than 5 psi, for a yield of approximately the size of King shot. It is because of the present indeterminacy of the efficacy of a surface burst that this is suggested. The purpose is to establish better the pressures that can be expected from a surface burst, and to determine that the shock wave is unaffected by precursor formation (or is affected, as the case may be).

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- d. Just as the air blast for surface bursts over land needs more precise determination, so also is it necessary to determine the blast accurately for a surface burst on water. However, this might be regarded as a check, assuming that the air blast ought to be nearly the same as that for a surface burst on land. It is suggested that the pressures be measured along the edge of the lagoon for a surface burst over water, in which the burst should be close enough to shore so that measurements could be made over the range of 20 or more psi down to about 5 psi.
2. Winds and afterwinds:
 - a. Since the maximum winds following the positive phase observed on Mike Shot were those associated with the negative pressure peak, it is felt that it is not necessary to repeat the afterwind measurements. The only possible exception to this is the question as to whether the data at hand are sufficient for the Forest Service group working on the forest fire problem. Whether or not the information is sufficient can be determined by March, 1953. In any event only a few measurements on a large yield (of the order of the Mike Shot) would be required.
 - b. $1/2 \rho v^2$ in the positive phase. It is presently indicated by data from surface bursts that good shock waves are observed at ground level. If this is invariably so, there is no need to measure winds as they are computable from pressure. However, if there should be a precursor effect, then it would be useful to measure the winds since we cannot presently calculate them in the precursor region. This would be regarded as an insurance measurement and would consist only of a couple of points near the 20 psi level.
3. Accelerations and earth pressure:
 - a. Under-earth pressures from air or surface bursts appear to be mainly those arising from passage of the air shock-wave. The coupling factor of about unity is being established at the Nevada Test Site. There appears to be no reason for measuring earth pressures in coral.
 - b. The same remarks should apply to acceleration. However, the question of earth acceleration magnitudes is so often raised in connection with surface bursts that it might be well to make a very few additional measurements at close distances, perhaps in the region of 100 to 20 psi.

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4. Underwater pressures should be measured in connection with the surface bursts on water in order to provide a value to tie in with high explosives experiments. Presumably one of the Naval Laboratories would be interested in conducting such measurements.
5. Measurements of thermal yield should be carried out and emphasized on these tests to verify the low thermal yields obtained on Ivy. Thermal measurements should include data obtained from aircraft.
6. Parachute-supported-canister pressure measurements at relatively high altitudes have probably been carried out now to the point of diminishing returns. Scientists at the Air Force Cambridge Research Laboratory state that the Fuchs altitude correction, which is the relation being checked by the canister gauges, is at least as accurate as the gauges now available to check the theory. We therefore believe that an air-drop canister project can not be used to good scientific advantage on Operation Castle.
7. In a meeting called by Captain Kingsley on February 9th, Drs. Newark, Lempson and Kerritt recommended no structural tests be considered for Operation Castle with the possible exception of a small amount of pressure instrumentation on the OCEJ.1.1 structure now on Engibi in case the loading pressure or incident angle be substantially different from that of Greenhouse Easy or Ivy Mike. They also agreed that pressure loading studies should be made in the precursor regions but since Castle Shots as now planned are surface bursts, we believe the probability for precursor formation is very small.
8. We wish to call attention to Mr. Aronson's (et al) recommendation (c), paragraph 6.3, page 185 of WF-513, to the effect that smoke-puff experiments not be included in most future tests. We concur, and recommend that they be omitted from Castle.

There are no doubt many other worthy experiments which have been proposed, but upon which we venture no opinion.

As a result of Sandia Corporation participation in Operation Ivy we are excellently equipped to carry out items 1, 2 and 3. Although our attempts at measurements in the very high over-pressure regions on the Mike shot of Ivy were not highly successful, our experience should benefit us to the extent of assuring a higher degree of success should we try again.

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Our new recording systems procured for Operation Ivy are excellent with regard to large amounts of radioactive contamination. The Sandia Corporation is therefore prepared to carry out any or all of the ground level measurements involving pressures, winds, or accelerations, and could accommodate some in-lagoon underwater pressure or wave height measurements if desired.

E. F. Cox, Manager
Weapons Effects Department

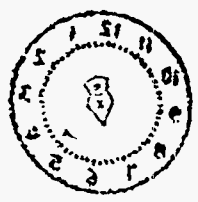
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