

TESTING TO COMBINED BLAST & THERMAL EFFECTS AT THE BRL

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The army has a need to test critical items of its equipment to the effects resulting from detonation of nuclear weapons. The end result of this tremendous release of energy is neutrons, gamma rays, electromagnetic and thermal radiation, and blast from which certain equipment must be protected. At the Ballistic Research Laboratory, we have been developing techniques for simulating the combined blast and thermal effects of tactical nuclear weapons. We have done this by incorporating in our 2.4 meter diameter shock tube a thermo-chemical source. When a nuclear weapon detonates, the intense thermal radiation emitted heats the target before the blast wave arrives. The initial radiant energy spike can be neglected; it contributes only about one percent to the total heat load delivered to the target.

We have attempted to simulate a typical situation using the techniques described in the proposed paper. The thermal source is achieved by burning finely powdered Aluminum in an oxygenrich atmosphere contained by the shock tube walls and two polyethylene diaphragms. The target is exposed to the thermal radiation from the source. When the thermal source is expended, the target is turned, by means of a pneumatically-operated rotator, in a matter of seconds, to face upstream, the direction from which the shock wave approaches.

In the BRL concept of using a rotator, the expended combustion products were to remain downstream so that they would neither cause distortion of the shock wave nor, more importantly, cause damage to the target as they flow over it. Our efforts were only partially successful. Pressure traces of the incident shock wave ahead of the center of the rotator showed that it was distorted. The effect of this distortion and the reasons for it will be discussed in the paper.

Results of current experimentation done to achieve a combined blast and thermal test capability, the types of experiments done using this capability, and our plans for further development of this testing technique will be discussed in the paper.