BLAST WAVE MODIFICATION DURING COMBINED THERMAL/BLAST SIMULATION TESTING,

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There is considerable interest within the U.S. Army in simulating combined thermal and blast effects from nuclear weapons because of possible enhanced equipment vulnerability caused by thermal/blast synergism. Recently, two experimental techniques have been developed for simulating combined thermal/blast effects: (1) the BRL thermal/blast simulator which integrates an A1/02 thermal source into an existing 2.4 m diameter shock tube, and (2) the placement of an Al/02 thermal source in the test bed of a high explosive field test, such as Misers Bluff. In both simulation techniques the blast wave must pass through hot remnants of the thermal source combustion products. The resulting interaction significantly modifies the "free field" wave form, causing an attenuation of the peak overpressure of as much as 30%. This paper will describe the difficulties that have been experienced to date with blast wave modification during combined thermal/blast testing and will present an analysis that explains the observed effects.

The analysis developed here models the unsteady interaction between the blast wave and the hot combustion products. One-dimensional assumptions are used to simplify the problem treatment, while still retaining the essential features of the interaction process. The governing equations are solved numerically by Glimm's method, which maintains shock wave and contact surface discontinuities throughout the computed flow field. This allows quantitative predictions to be made for the overpressure attenuation to be expected under various conditions of thermal source and target placement. This analysis has also been used to predict the alteration of the static and dynamic pressure waveforms that can be expected. The results of this analysis will be described and the implications for future thermal/blast simulation testing discussed.