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DEVELOPMENT OF A NON-IDEAL NUCLEAR WAVEFORM FOR THE LB/TS BASED ON CUBE ROOT SCALING

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Nuclear air blast data over desert surfaces are known to be non-ideal, meaning that the desert surface is far from an ideal. purely reflecting, surface. In general, the non-ideal effects include the precursor that outruns the main shock, the flow field just behind the main shock front, the cold airjet and the dusty flow that follows. For decades, the word 'non-ideal' is also presumed to mean that pressure-time records from this set of data will not admit conventionally accepted scaling laws for flow fields produced by explosions. Specifically, the waveform classification proposed by Bryant and Keefer (1 962) suggests that cube root scaling does not apply to non-ideal air blasts.

In this paper, the existence of a cube root-scaled regime in the set of non-ideal air blast data is demonstrated. It is found that this regime is bounded by the boundaries of Type III of the five waveform types proposed by Bryant and Keefer. Furthermore, detailed Analyze of a subset of the existing pressure data (yields ranging from 1 0 kT to 40 kT) in this particular regime reveal that there exists a similarity regime in both the static and dynamic pressure-time records. This similarity regime begins a short time after the arrival of the first shock, and ends at the end of the dynamic pressure pulse. It corresponds to the period in which the cold air jet sweeps across the gauge.

The scalability shown by this subset of data, for this particular cube root-scaled regime, adds credibility to the existing data. It suggest that there may be order (hence governing physics) in this set of highly chaotic waveforms. The end result of this effort produced a nuclear waveform which is successfully simulated in the LB/TS (Large Blast and Thermal Simulator). An Army personnel vehicle (an MI 1'» is subjected to this environment in the LB/TS. The final velocity of the vehicle is approximately 40 mph, a speed that guarantees overturning if the vehicle is traveling on a desert surface.