GENERALIZED BLAST MODEL FOR THE U.S. LARGE BLAST/THERMAL SIMULATOR

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The US Defense Special Weapons Agency (DSWA) LB/TS was designed to produce ideal (Taylor wave) blast histories. Specific blast conditions are determined by selection of values for the three parameters of driver tube total volume (all nine tubes), and driver gas pressure and temperature (same in each tube). Recent interest in using the facility for simulation of non-ideal blast has generated the requirement to shape the histories using all available control parameter. lt is possible to independently vary volume, throat area. gas pressure, gas temperature, and gas release time for each of the nine tubes. This introduces a Potential set of 45 parameters for tailoring non-ideal blast histories.

Modeling of LB/TS blast environments has traditionally been done using two-dimensional (2D), axisymmetric finite difference hydrocodes, with the nine drivers lumped into a single tube. The technique can be extended to model driver tubes with differing gas conditions and release times, but at a substantial increase in computational time. Three-dimensional hydrocodes are also effective, but at even higher computational cost.

This paper describes a novel approach which takes advantage of the facts that, for the most part, the driver tube outflow is choked, and the blast is one-dimensional (1 D) in the tunnel test section. lt uses analytical solutions for certain aspects of the flow phenomenology to determine a time-dependent boundary condition which is coupled to a 1D lagrangian hydrocode to calculate blast histories at all points downstream of the input boundary. The model is implemented on a 75 MHZ Pentium PC which completes a full non-ideal blast calculation in four minutes of run time (compared to two days for the 2D hydrocode). Calculated results are compared to data from LB/TS non-ideal blast tests.