THREE-DIMENSIONAL CALCULATIONS FOR A NON IDEAL AIR BLAST SIMULATOR

FRY,M.A.;EIDELMAN,S.

Predictive calculations have been performed to study the feasibility of construction a large shock tube (tens of feet in diameter) to model non-ideal air blast. In the past smaller shock tubes with and without thermal layers have been used to study the interactions of shocks with heated layers. Insertion of a thermal layer changes the geometry from one to 2 dimensions. Adding a rigid structure introduces a third dimension.
We have used FAST3D, a code which solves the three-dimensional hydrodynamic equations for the conservation of mass, momentum and energy of an ideal fluid using the new Flux Corrected Transport (FCT) algorithm. The thermal layer has been modeled by use of a helium gas layer along the bottom of the tube. When the shock wave encounters the helium layer it begins to propagate faster and creates an additional contact surface (discontinuity in density but not pressure). 3D graphics are shown as well as density and pressure contours in the plane of symmetry (z-x axis).

These calculations allows one to optimize the geometry of the simulator and to evaluate the interference of reflected waves from the walls with the interaction of the shock and rigid structure. Such computations are
increasingly important in the verification and construction of simulators.