COMPARISON OF VISCOUS AND INVISCID SOLUTIONS FOR SHOCK WAVE/TARGET INTERACTION

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As part of a cooperative effort with the Centre d'Etudes de Gramat (CEG), the U.S. Army Research Laboratory (ARL) has conducted a series of numerical simulations of blast wave/target interaction experiments conducted at CEG. The experiments which were modeled involved a square, two-dimensional
block target positioned in the vertical center of a shock tube test section and subjected to non-decaying blast waves of various amplitudes. The computational investigations were performed with two different hydrodynamic computer codes. The first computations were conducted with the SHARC code, a 2-D/3-D, explicit Euler solver which can employ either a first-order accurate or second-order accurate solution algorithm. SHARC also has available a k - c turbulence model and an artificial viscosity model to provide enhanced mixing of the flow and artificial dissipation where necessary. Additional calculations were performed with the Rockwell Universal Solution Algorithms Real Gas 2-1) (USARG2D) code. The USARG21) code is a multi-zone, 2-D/3-D, implicit, Navier-Stokes solver supporting first-order accurate or second-order accurate solution algorithms and three available turbulence models. The results of the inviscid SHARC code and the viscous USARG21) code runs are compared to experimentally measured pressure histories. Particular emphasis is placed on the accurate modeling of vortex formation and evolution which influences the aerodynamic loading of the target. The viscous and inviscid results are directly compared to determine the most accurate method of modeling both diffraction and drag phase blast loading of targets.