SIMULATION OF NUCLEAR BLASTS WITH LARGE-SCALE SHOCK TUBES

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Because of escalating costs associated with high explosvie simulations ofnuclear devices, large-scale shock tubes are being considered as analternative for generating blast waves of the type necessary to qualifymilitary equipment as "nuclear survivable". Such shock tubes, or blastsimulators, attempt to mimic the general features of the flow associatedwith a free-air burst.

Usually, the exponential decay in static and dynamic pressure is used as ameasure of the success achieved in such a simulation. This paper describest he flow regimes of a proposed U.S. version of a Large Blast/ThermalSimulator. The simulator is computationally modeled in a quasi-one-dimensional sense by numerical integration of the Euler equation of motion.

In order to establish validity for the model, comparisons between computedresults and experiments carried out at the Centre d'Etude de Gramat, Franceare presented.
These comparisons indicate good agreement for overpressure-time histories and show very well the influence of the rarefaction wave eliminator (RWE).

Optimization studies are carried out on simulator configurations without RWE's, with passive (static) RWE's, and active RWE's. The computational RWE model was also applied to the BRL 2.44 m shock tube facility to design a static RWE. Comparison of experimental pressure-time histories with computations agree well and the results indicate that the operational envelope of the shock tube has been considerably enhanced for drag sensitive targets.

Finally, combined thermal/blast experiments in the field sometimes force the blast wave to travel through hot products. The computations show how the blast wave is altered under these circumstances and point to the necessity for venting these hot products if the shock tube is to be used for combined thermal/blast testing of Army equipment.