USE OF AN EXPLOSIVELY DRIVEN SHOCK TUBE TO SIMULATE NONIDEAL AIRBLAST LOADS

SANAI,M.;COLTON,J.D.

To simulate the loads produced in a nonideal airblast environment, we de-veloped a 1-D approach that is based on matching the time histories of the static and dynamic pressures of the flow averaged over the height of the target. Through simple shock tube experiments and hydrocode calculations, we evaluated many schemes for simultaneously matching the static and dynamic pressure time histories of a nonideal environment, even when the peaks of the static and dynamic pressure are not in phase. The schemes
evaluated include combinations of explosive charge distribution, expansion or contraction of the shock tube or use of a perforated tube over the test section, and use of multiple gases, both lighter and heavier than air, in the tube. For a specified environment a suitable combination of these parameter is selected that matches the static and dynamic pressures averaged over the height of the target. We then validated the 1-D approach with the comparing the pressures applied to a semicylindrical rigid model using our 1-D approach with corresponding pressures applied to a similar model in a 2-D simulation experiment. For a fixed model size, the ration of the required 2-D to 1-D tube diameters was about 6.3 and the ration of required tube lengths was about 1.3. These ratios give a tube/volume ratio of about 50, indicating the substantial savings afforded by the 1-D approach.
As an alternative to the use of dense gases in 1-D simulators, dust can be suspended in the air over a long section of the shock tube. Another important use.