EXPERIMENTAL PERFORMANCE OF A SMALL SCALE ACTIVE REFLECTION ELIMINATOR

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An active rarefaction wave eliminator (RWE) was designed with rotation louvers for a modest size BRL shock tube (diameter of 25.4 cm), with the open area versus time setting based on performance requirements dictated by free-jet theory and the random-choice method (RCM). This design yielded a hardware device which met the operational requirements of completely closing within 30 ms time duration of the positive overpressure phase of the simulated blast wave, and thereafter opened for the negative overpressure phase. The RWE was installed on the BRL shock tube and tested at three nominal blast wave overpressure of about 5, 8 and 15 psi. These results with the RWE are compared to those for both an open channel end and an extended channel on the shock tube, in order to provide a good basis for comparison and evaluate the RWE performance.

The experimental results showed that the preprogrammed theoretical area closing function was fairly accurate, especially at the lower overpressure levels. The predicted area setting it not accurate for the first few milliseconds after the shock arrives at the RWE, when the shock-induced out-flow is inherently unsteady prior to the establishment of a more-or-less quasi-steady jet outflow. For this short time the predicted area setting is too large for this type of RWE design, but the area setting can be reduced to improve RWE performance. This was demonstrated by experiment.

Details of the performance and effectiveness of the active RWE are presented along with comparisons to the shock tube calibration tests.