EFFECTS OF DRIVER CONFIGURATION ON SIMULATED BLAST WAVES IN AIR-BLAST SIMULATORS

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Large air-driven blast-wave simulators normally have multiple, independent drivers of different lengths which are joined together at the entrance to a single, long, constant-area channel containing a test section larger than 60 m2 in cross-section and ending shortly thereafter with an active reflection eliminator. Large or full-scale military test objects are placed in this test section and subjected to simulated blast waves to check design criteria and assess survivability. Previous numerical analyses for predicting the unsteady blast-wave flows in these blast simulators have always been done by artificially combining the multiple, independent drivers into a single, supposedly equivalent, composite driver having an area variation with distance based on the sum of the areas of the overlapping parts of the multiple, independent drivers. This numerical study presents computational results for the first time for the case when the unsteady blast-wave flows in these multiple drivers are treated separately, as they occur in practice, and then all joined together with a specially developed junction cell to continue the unsteady flow solution into and throughout the simulator channels. These numerical results are compared to numerical solutions obtained for the supposedly equivalent blast simulator featuring a single composite driver, in order to identify and illustrate important differences in the two types of solutions, to explain the origin and behavior of may secondary and tertiary shock and rarefaction waves superposed on the simulated blast wave, and to assess the advantages of obtaining solutions for the actual case of multiple, independent drivers with the correct secondary and tertiary flow features. Because the computational effort of obtaining the full solution for blast simulators with multiple drivers is not substantially greater than that for the case of an artificial composite driver, and since the solution for the multiple drivers is more realistic and has some important advantages, it is recommended that the more realistic solutions be obtained in the future.