FLOW AND WAVE PHENOMENA IN THE TEST SECTION OF A SHOCK AND BLAST SIMULATOR

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In modern shock- and blast simulators of large diameter frequently objects in original size are tested. The cross section area of the test section is reduced depending on the size of the test object. In order to interpret the obtained results an exact knowledge of the occurring flow- and wave phenomena is necessary, because strong constrictions produce modified flow- and wave situations.
Thus multiple shock reflections between the test object and simulator surface take place. If the cross section of the test section is strongly reduced by the model, highly accelerated and retarded subsonic and supersonic flow fields around the model can arise, whereas in the supersonic case secondary shocks additionally can be formed. Furthermore boundary layers, vortices and detached flows (even shock induced ones) influence the flow field around the test object. All these phenomena are dependent on the ratio of test cross section area by model cross section area and they also influence the force effects on the model.
These phenomena are shown and discussed by pressure-time-diagrams and shadowgraphs, taken in a shock tube section for several cross section area ratios. Furthermore it is tried to estimate the maximum object size which is just still allowable for a given cross section area of the simulator and to give some information about the deviation of the results compared with free field experiments.