HYDRODYNAMIC CALCULATIONS OF DOUBLE MACH STEM FORMATION FROM SPHERICAL CHARGES

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Hydrodynamic calculations have been completed which model the formation of double Mach reflected shocks. The calculations have been carried out in two dimensions using the second-order S-CUBED SHARC code. The incident shock was generated by the detonation of an 8-pound high explosive charge
at a height-of-burst of 1.16 meters. Numerical gages were placed to coincide with and to complement the experimental gage positions. The calculations were continued in three-dimensions using the S-CUBED SHARC code. The shocks were generated by the simultaneous detonation of three 8-pound high explosive charges at height-of-burst of 1.16 meters. The charges were placed at the vertices of an equilateral triangle with 4-meter sides.

The results of the calculation show the details of the Mach stem formation and the complex flow following the initial reflection. Details of the flow are clearly defined including the slip stream and vortex behind the leading Mach shock. In the three-dimensional case, at least three shock fronts have been identified arriving at the ground surface at the bisecting plane, and the cause for each has been identified.

Experimental data is compared with the calculated results for the incident free air shocks as well as for the reflected shock region. Several sets of experimental data are available, thus providing good statistics for variability and uncertainty. the calculational results are available for experiment design, gage calibration, gage placement and data interpretation.