DENSITY FIELD OF NONSTATIONARY OBLIQUE-SHOCK-WAVE REFLECTIONS: COMPARISON BETWEEN ACTUAL AND NUMERICAL EXPERIMENTS

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The interaction of blast waves with the ground usually results in regular (RR) and single-Mach reflections (SMR) depending on the strength of the blast wave and its angle of incidence, with the ground. The front of a detonation wave consists of a multiplicity of regular and single-Mach reflections. Consequently, shock-wave reflections become the building blocks of blast-wave ground-surface interactions and detonation-wave propagation.
Therefore, it is essential to accurately predict (numerically or analytically) the flow fields associated with the relatively simple two-dimensional, pseudo-stationary regular and single-Mach reflections, before proceeding to the more complex three-dimensional, nonstationary reflections of blast waves.

Schneyer (1975) and Kutler & Shankar (1976) have recently published their results for RR and SMR which are based on different computer codes. Unfortunately, their results even for the same initial conditions did not agree. Furthermore, the results of Schneyer for the same SMR using two different computer codes (two-dimensional Eulerian and two-dimensional Lagrangian) disagreed. Consequently it is apparent that it is important to have a comparison of actual measurements with numerical predictions.

Oblique-shock-wave reflections with the same initial conditions as chosen by Schneyer and Kutler & Shankar were produced in the 10 x 18 cm UTIAS Hypervelocity Shock Tube. The phenomena were recorded using a 23-cm dia. Mach- Zehnder interferometer. The interferograms were evaluated and comparisons were made with the available numerical experiments. It is found that the available numerical techniques will have to be modified or new approaches developed before acceptable agreement can be obtained between actual and numerical experiments. The very accurate interferometric data will provide a basis for comparison with future numerical methods, which should also include the two remaining cases of complex (CMR) and double-Mach reflections (DMR), as a test of their accuracy and applicability.