Abstract

The simulation is based on analyzing the transition of Regular reflection to a Mach reflection in an inviscid dual-solution domain using the software OpenFOAM and the in-built Paraview for post-processing. It also aims to compare the different results obtained using different wedge angles and pressure variations. The theoretical understanding of the gas dynamics behind the transition region and the origin of Mach stem is well understood but this project aims to computationally verify the theoretical and experimental studies using OpenFOAM. The gas with gamma value of 7/5 is taken (Polytropic) and the values of wedge angles, pressure and the speed of flow is slowly varied to get contour plots and other necessary details in the Paraview software.

When a shock wave propagates over a solid wedge, the flow generated by the shock strikes the wedge thus generating a second reflected shock, which ensures that the velocity of the flow is parallel to the wedge surface. When the angle between the wedge and the primary shock is made sufficiently large, a single reflected shock is not able to turn the flow to a direction parallel to the wall and transition to Mach reflection occurs. The simulation is based on verifying this aspect.