

Abstract

The aim of this project is to simulate a flow across a forward facing step using OpenFOAM. The phenomenon of Mach reflection is studied by investigating the properties of the flow across the forward facing step. It is a classical two-dimensional test case introduced for the first time by Emery [1], and later studied by Woodward and Colella [2].

Problem Statement

This case involves steady, inviscid, non-heat-conducting supersonic flow of air ($\gamma = 1.4$) over a forward facing wedge.

The geometry used is shown in fig. 1.

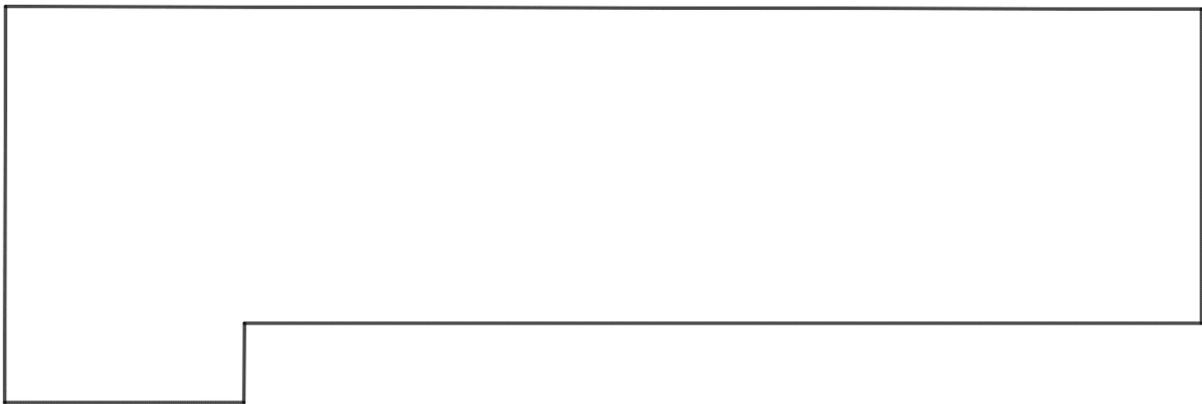


Figure 1. The configuration of flow across a forward facing step.

The inlet (left face) Mach for the simulation is $M = 3$ is the same as the test case in [2]. The phenomenon of Mach reflection and the strength of the incident and the reflected shocks is analysed.

References

1. A. F. Emery. An evaluation of several differencing methods for inviscid fluid flow problems. *Journal of Computational Physics*, 2(3):306–331, 1968.
2. P. Woodward and P. Colella. The numerical simulation of two-dimensional fluid flow with strong shocks. *Journal of computational physics*, 54(1):115–173, 1984.