Flow over an inclined flat plate

Rohin K Rajeev

Abstract

The objective of this project is to numerically model incompressible turbulent flow over an inclined flat-plate structure of chord length 1 m and 3% thickness using OpenFOAM, and to study the aerodynamic effects. The angle of attack of the plate with respect to the flow is 30 degrees, and the corresponding Reynolds number of the flow based on the chord length is 150000. The computational domain is shown Figure 1. Numerical modelling is performed using pisoFoam solver and k-ω SST turbulence model in OpenFOAM. The primary aim is to investigate the influence of the flat plate's height above the ground on the flow characteristics and the aerodynamic forces acting on the plate. Furthermore, the effect of varying Reynolds number on the vortex shedding frequency is examined. The obtained results were compared with experimental data from Fage and Johansen (1927). Details regarding geometry and flow has been listed in Table 1.

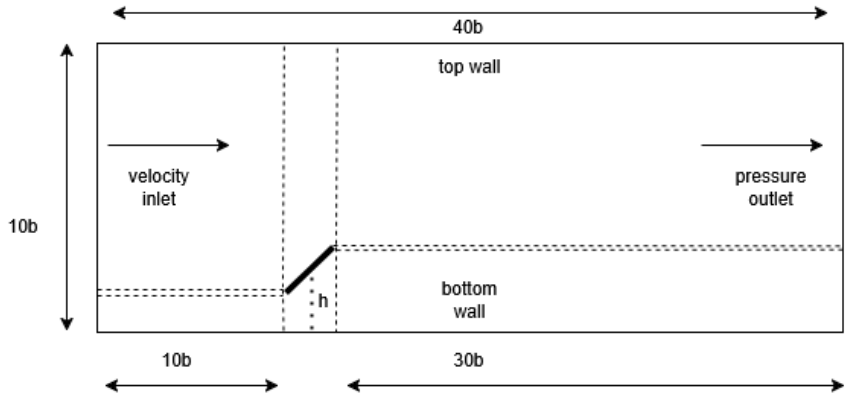

Figure 1: Computational domain diagram

Geometry details	Length of the domain = 40b Height of the domain = 10b Chord length of plate (b) = 1m Height of plate (h) = 1m
Fluid Property	Kinematic viscosity = 1.51e-05 m^2/s
Reynolds number based on chord length	Re = 150000
Turbulence model	k-ω SST
Solver	pisoFoam

Table 1: Details of geometry and flow conditions