Study of boundary layer separation over NACA 66_2-015 symmetric and cambered airfoil through numerical method

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Abstract

This case study aims to understand the flow over a symmetric and cambered airfoil in an incompressible flow condition. The primary objective of this case study is to study the boundary layer separation by varying the angle of attack. Further, the boundary layer separation is justified with the variation of coefficient of lift and drag values, as there will be sudden drop of coefficient of lift and rapid increase in coefficient of drag due to stalling phenomena.

Problem statement

CFD study on symmetric and cambered airfoils. The particular airfoil used for this case study is NACA 66_2-015. The cambered model used for this case study is NACA $66_2$015 + Camber line Cl1 =1.0 at α = 4.56°. Angle of attack will be varied from 0° to 16° with 2 degrees increment. C_L and C_D values will be determined. A C-domain shape mesh will be utilised for this analysis. SimpleFoam solver will be used for all the cases. Pressure distribution and velocity contour will be determined.

Initial Data

Airfoil type: NACA 66_2-015
Solver type: SimpleFoam
Inlet velocity: 50m/s
Mach number: 0.15 (incompressible condition)
Chord length: 150 mm
Density of air: $1.225 kg/m^3$