

Analysis of the performance of Airfoils in Ground Effect

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Abstract:

Ground effect is a phenomenon caused by the presence of a fixed boundary layer below the wing when it moves close to a fixed surface. This results in an effective increase in lift to drag ratio of the airfoil. In this paper, the performance of three airfoils used in general aviation is analysed experiencing ground effect using Openfoam at different operating conditions namely, the angle of attack and the height above the fixed surface. The main objectives is to evaluate the performance of these airfoils experiencing ground effect at different ground clearances and angles of attack and to find the most suitable airfoil which can be used to exploit the advantages of ground effect. It was found that all the airfoils experienced an increase in lift and decrease in drag as distance from the ground reduced thus validating ground effect. The aerodynamic efficiency increases, reaches a maximum, and then decreases as the angle of attack increases due to the onset of flow separation at the top surface of the airfoil. It was also noted that the symmetric airfoil experienced negative lift at very low ground clearances which was attributed to the formation of a venturi effect between the airfoil and ground

References:

- 1) CFD analysis of the performance of different airfoils in ground effect by Zubin Zaheer , Dr. K E Reby Roy , Gopakumar S Nair, Vineeth Ragipathi , Niranjan U V.
- 2) Analysis and Design of Flight Vehicle Structures by E.F. Bruhn