SUPERSONIC FLOW OVER A DIAMOND AIRFOIL

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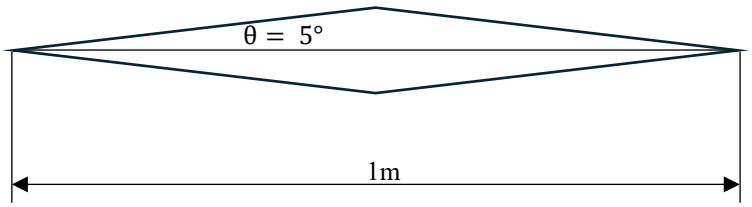
ABSTRACT

This study describes the aerodynamic characteristics of a “Double-Wedge” airfoil at supersonic speeds using the OpenFOAM solver “SonicFoam”. A series of simulation are conducted to capture and analyze the shock and expansion fan generated over the airfoil for Mach number 1.4, 2.4 & 3.4 at various Angle of Attack (AOA) ranging from 0° to 15°. The study is divided into two parts: (1) Analytical Solution and (2) CFD simulations using OpenFOAM. It involves obtaining Mach number, pressure, temperature and density and along with Co-efficient of Drag and Lift. Additionally, contours are captured to visualize the flow behavior. This results are then compared with each other to see differences in obtained values from the analytical and SonicFoam simulation. Before moving on to final simulation process a “Grid Independence Study” was thoroughly conducted to see the difference of mesh results. The geometry of the airfoil is symmetry in shape with the length of 1m and half wedge angle is of 5°.



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Reference :

Md. Zulkarna-En, Md. Ashraful Islam, Abdullah Al-Faruk, Islam, R. and Islam, M. (2023). Numerical Analysis of Aerodynamic and Shock Wave Characteristics of Biconvex and Double-Wedge Shape Airfoils for Supersonic Flow. *International Journal of Automotive and Mechanical Engineering*, 20(4), pp.10821–10837.