

Estimation of Pressure Profile and Boundary Layer Characteristics over NACA 4412 Airfoil

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Abstract : Pressure distribution data of the standard airfoils is usually used for the calibration purposes in subsonic wind tunnels. Results of such experiments are quite old and obtained by using the model in the spanwise direction. In this manuscript, pressure distribution over NACA 4412 airfoil model was presented by placing the 3D model in the lateral direction. The model is made of metal with pressure ports distributed longitudinally as well as in the lateral direction. The pressure model was attached to the floor of the tunnel with the help of the base plate to give the specified angle of attack to the model. Before the start of the experiments, the pressure tubes of the respective ports of the 128 ports pressure scanner are checked for leakage, and the losses due to the length of the pipes were also incorporated in the results for the specified pressure range. Growth rate maps of the boundary layer thickness were also plotted. It was found that with the increase in the velocity, the dynamic pressure distribution was also increased for the alpha seep. Plots of pressure distribution so obtained were overlapped with those obtained by using XFLR software, a low fidelity tool. It was found that at moderate and high angles of attack, the distribution of the pressure coefficients obtained from the experiments is high when compared with the XFLR ® results obtained along with the span of the wing. This under-prediction by XFLR ® is more obvious on the windward than on the leeward side.

Keywords : subsonic flow, boundary layer, wind tunnel, pressure testing

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