Abstract

The present work has dealt with the effect of longitudinal riblet upstream the wing-wall junction. The flow field investigated numerically and experimentally in the junction at six planes (x/c= 6.5%, 32.8%, 50%, 100%, 133%, 166%) at fixed Reynold's number of (6.8*105) based on chord length. The wing-wall junction set at zero ngle of attack.Numerical investigation involve examining the flow behavior and drag reduction by using the well-known package FLUENT version (12.1). The Governing equation were solved in three dimensions turbulent regime with appropriate turbulent model (k-ω,SST). The numerical solution was carried out using airfoil type (NACA 23015) for eleven riblet models (nine models type of (V) and two models type of (U and semi-circular riblet model) of same of space (s) and height (h)).

The effect of space and geometry of riblet were also studied. Drag reduction, pressure contour, streamwis velocity contour, secondary flow vector, average shear stress contour, and streanwise vorticity contours are found as output results.The experimental tests carried out in an open-type wind tunnel. Five-hole probe is used to measure airflow velocity vector in space .In the numerical investigation, V-riblet was found the most effective riblet, in which the drag reduction (5.86%) when comparing with smooth surface. Therefor it was selected as the model of the experimental work.The results show that the location of separation point has moved to a location closer to the wing junction. The computational and experimental results gave a fair agreement for (streamwise velocity, secondary flow, average shear stress and streamwis vorticity). It was found that the vortex strength, the secondary flow, and the average shear stress were reduced in the junction planes.

The vortex displaced further away from junction base wall toward the corner.The main conclusion that can be made, the riblet surface models are regarded as the key parameters to control the junction flow characteristics. The ribet surface technique is able to alter the flow properties and thus improve the junction flow structure.