

In this paper the effect of the two key parameters on the transition process from laminar to turbulent state has been investigated. i.e. intensity of free stream turbulence and pressure gradient along the stream are numerically analyzed. For capture turbulence characteristics and transition flow the equations of Non-Equilibrium Turbulence Model developed by Mr. Perot which is based on turbulence body force potentials for computation of flow oscillatory and turbulent quantities have been employed. This model has suitable structure for analysis transition flow. For this research The equations of turbulence model have been applied profiting from UDF functions' programming capability add to joinery fluent software. The numerical analyses for the five different flow types have been conducted under variable pressure gradient and within a wide range of input free flow turbulence intensity. The result show that Increment of intensity free entry flow and also reverse pressure gradient lead to a transitional start position region and the length of transition region also becomes smaller and inverse. Another important consequence is that in the streams with turbulence intensities above 5 percent the effect of pressure gradient on transition starting point is insignificant.

Today one of the most important challenges in fluid mechanic is prediction of the position of transition flow from laminar to turbulence. Factors affecting the transition process are still unknown. Heat transfer rate and shear stresses on the wall during the transition process and along the stream increases steadily. So a proper design based on thermal loads and shear forces can be done which characteristics of the transition process are known. Analysis of thermal transfer problem in rocket nose cones and more detailed aerodynamic analysis of aerial vehicles, design and analysis of thermal transfer airfoils and gas turbine blades and issues related to drag reduction for moving bodies is just some of the issues that directly require the recognition of the flow transition process. The historic experiment in 1883 is marks the beginning of the empirical research of transition process at boundary layer. For nonlinear flow, Lord Rayleigh's linear stability analysis have been the first methods of studying the theory of the transition process. Subsequently, Orr and Summerfield independently examined the effect of viscosity on the flow stability of the flat plate. which the well-known equation Orr- Summerfield is the result of their research work. in Blasius boundary layer Tollmien and Schlichting analyzed the Orr- Summerfield equation for two-dimensional unstable perturbation waves Which later this two-dimensional wave-type turbulence in the name of these two researchers named the T-S waves. Exact experimental experiments Stubbier and Skramstad confirmed the T-S wave, with the help of theoretical analysis, they were able to calculate the neutral stability curve for the transition process. Based on the above studies, the first scenario for the stages of the transition process is raised.