# Evolution of the Favorable Pressure Gradient Turbulent Boundary Layer Towards a to Pseudo-Laminar State

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**Abstract**

The development of a favorable pressure gradient (FPG) turbulent boundary layer that undergoes pseudo-laminarization is studied through an experiment design via Laser-Doppler Anemometry (LDA) to measure the velocity field and oil film interferometry to measure the skin friction. The equilibrium similarity analysis proposed by Castillo and George [1] for pressure gradient turbulent boundary layers will be used to analyze the data and the development towards pseudo-laminarization. Traditionally, favorable pressure gradients have been characterized using the acceleration parameter, K. It was shown by Cal et al. that this is not a sufficient condition for analyzing this phenomenon. Furthermore, it was found that the Reynolds stresses diminish drastically due to the imposed pressure gradient. It was also seen that the Reynolds shear stress and the Reynolds normal stress in the wall-normal direction almost disappear; while the streamwise component still remains. More importantly, the skin friction coefficient is desirable and obtainable using several distinct techniques such as using the momentum integral equation as well as the slope at the wall. This experiment is compared with the data from Warnack and Fernholz [2] on a turbulent boundary layer subjected to a strong pressure gradient. The turbulent boundary layer subjected to FPG is found to reach a pseudo-laminar state when subjected to strong pressure gradients.