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Boundary Layer Separation Induced by Successive Favorable and Adverse Pressure Gradients

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Fig. 1. Flow visualization with smoke.

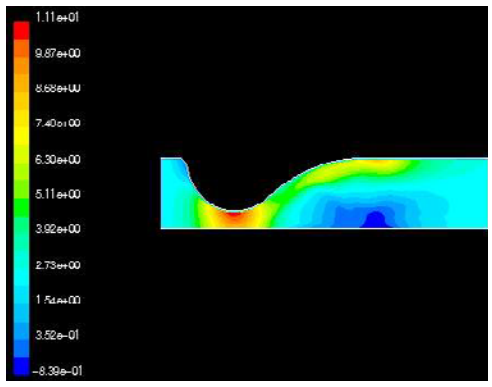

Fig. 2. Mean velocity contours [k-e model].

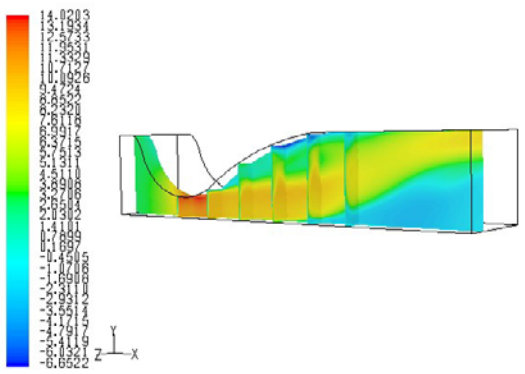

Fig. 3. X direction velocity contours [LES model].

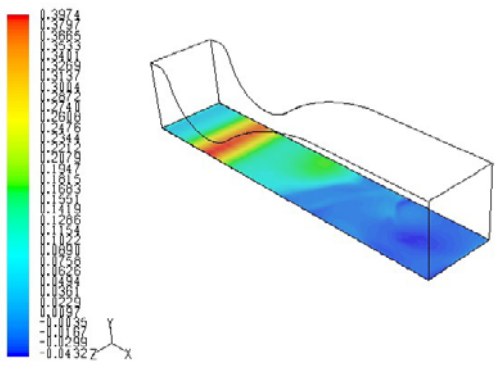

Fig. 4. Bottom wall shear stress [LES model].

These figures show the results of flow visualization obtained experimentally in a low speed wind tunnel of cross-sectional area of 1.2m x 1.2m and the results of numerical simulations carried out by using traditional turbulence models based on k-ε (Fig. 2) and the results of Large Eddy Simulation (Figs. 3 & 4). The onset of three dimensionality starts at the corners of the wind tunnel. The flow seems to have a flapping motion upwards and downwards causing a massive separation on the flat wall of the wind tunnel followed by separation on the upper shaped wall that is inducing the pressure gradients. Efforts are underway to control the flow separation by introducing free stream turbulence into the flow.