AN EXPERIMENTAL AND COMPUTATIONAL STUDY OF FLOW SEPARATION AT LOW REYNOLDS. APPLICATIONS FOR MAVs

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An experimental and computational study over a NACA 0012 airfoil was conducted at fixed angles of attack at a Reynolds number of 5000, using different simulation approaches and turbulence models such as LES and the SST k-ω model, realizing qualitative comparisons with results obtained from PIV measurements at the VKI Water Tunnel facility.

The purpose of this investigation is to set the basic foundations in VKI for aerodynamic research in low Reynolds aerodynamics for MAV (Micro Aerial Vehicle) applications.

It was found that the simulations provided good results compared to published works without paying a high prize computationally while the experiments provided a reasonable comparison of statistical quantities from the flow field despite the high freestream turbulence level. The unsteady flow behaviour with its correspondent separation and transition phenomena was observed clearly from both simulations and the experiments, no reattachment was found.

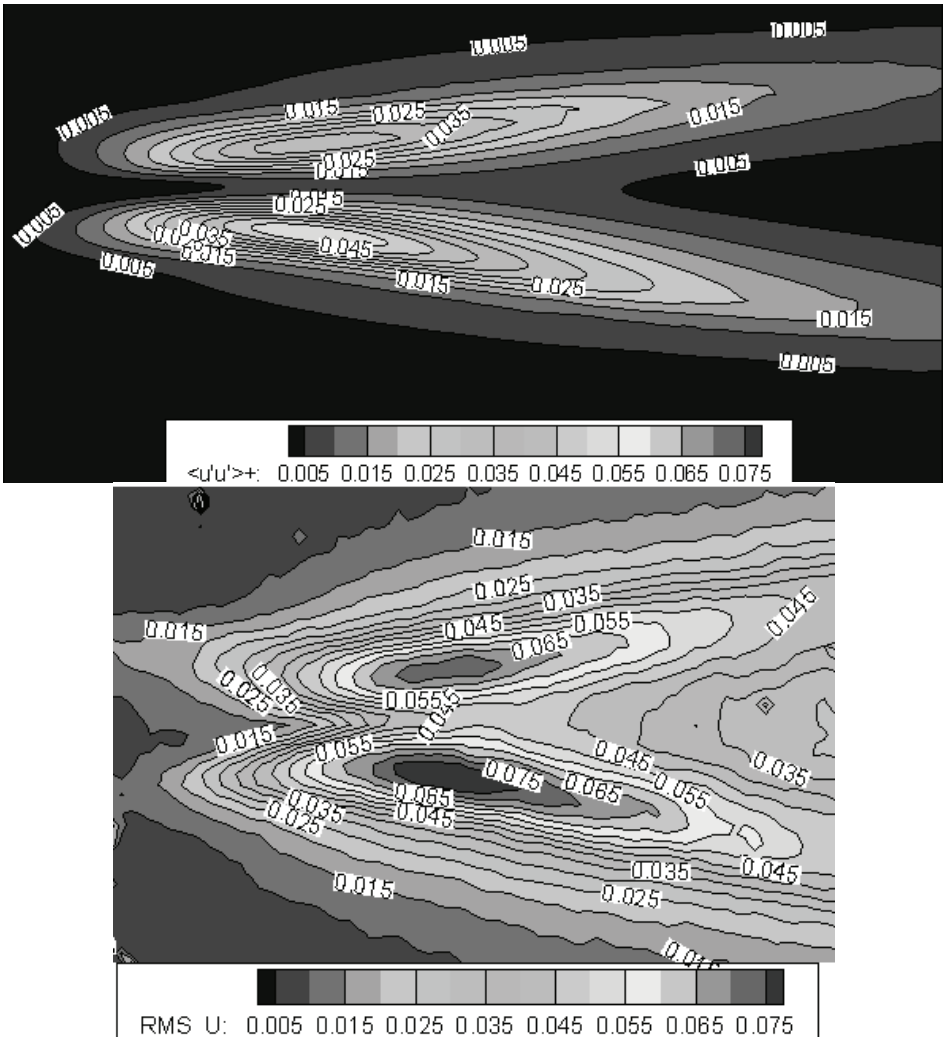

Figure 1: Comparison between RMS U velocity plots between Morpheus simulations (up) and PIV measurements (bottom). AOA=4°