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WAKE EQUILIBRIUM PARAMETERS ON A SYMMETRIC AIRFOIL FROM NUMERICAL SIMULATIONS

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In this work, a detailed computational study of the mean wake equilibrium parameters on a symmetric airfoil (NACA0012) is presented. Steady state computational simulations at Reynolds number $Re = 10^6$ have been carried out using Reynolds Averaged Navier-Stokes (RANS) equations and have been compared with the experimental data obtained by Hebbar [1] and the analytical model presented in Sreenivasan *et al.* [2]. The purpose of this work is to study the manner in which computational simulations on a symmetric airfoil at hight Reynolds number reproduce the wake development behind a NACA0012.

1 Approach

The flow in the near wake of an airfoil significantly affects the airfoil pressure distribution and hence is of considerable interest as noted in Meng *et al.* [3]. According to George [4], a self-preserving state on a flow exists when in the evolution of the wake, see figure 1(a). Further, Fernández-Gamiz *et al.* [5] investigated how well the simulations can mimic the physics of the flow behind a twin plate. All dynamical parameters have the same relative value at the same relative position. These parameters are sketched in figure 1(b).

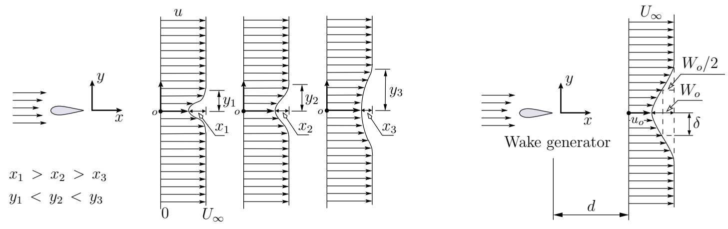

Figure 1: Wake development parameters behind a symmetric airfoil.

Figure 2 represents a comparison between experimental data (■) and computational results (X) at the stations $x = 2$, $x = 56$, $x = 530$, $x = 1770$mm downstream of the trailing edge of the NACA0012 airfoil. In each plot, the half-wake velocity profile at a particular plane position downstream of the airfoil is represented and compared with experimental data obtained from Hebbar [1].

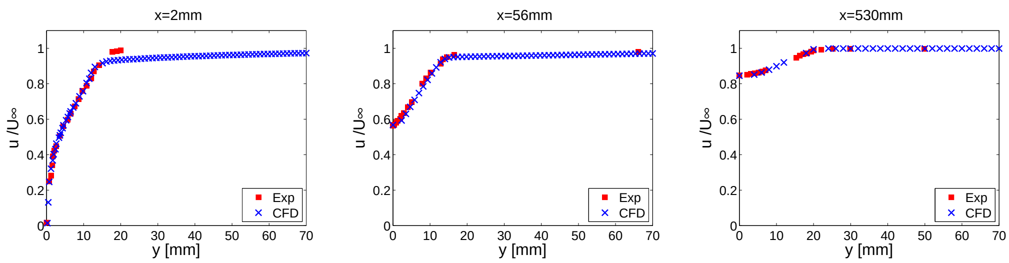

Figure 2: Comparison between experimental data (■) from Hebbar [1] and computational results (X) at the plane positions $x = 2$, $x = 56$, $x = 530$, $x = 1770$mm downstream of the trailing edge.

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