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Turbulent Wake behind a Single Element Wing in Ground Effect

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ABSTRACT

A study was performed in order to investigate the flowfield characteristics of a wing in ground effect. A highly cambered single element wing, with the suction surface nearest to the ground, was used to research the effect of changing the operating height from the ground at a single incidence. The results are of direct relevance to both aeronautical and racing car applications. A Laser Doppler Anemometry survey has been used to investigate the ground effect on the mean flow characteristics of the wake of the wing. The size of the wake was found to increase with proximity to the ground. A downward shift of the path of the wake was also observed. Instantaneous Particle Image Velocimetry elucidates the unsteady flow features. Discrete vortex shedding was seen to occur behind the finite trailing edge of the wing (Figure 1). As the ground height is reduced, separation occurs on the suction surface of the wing and the vortex shedding is coupled with a flapping motion of the wake in the transverse direction.

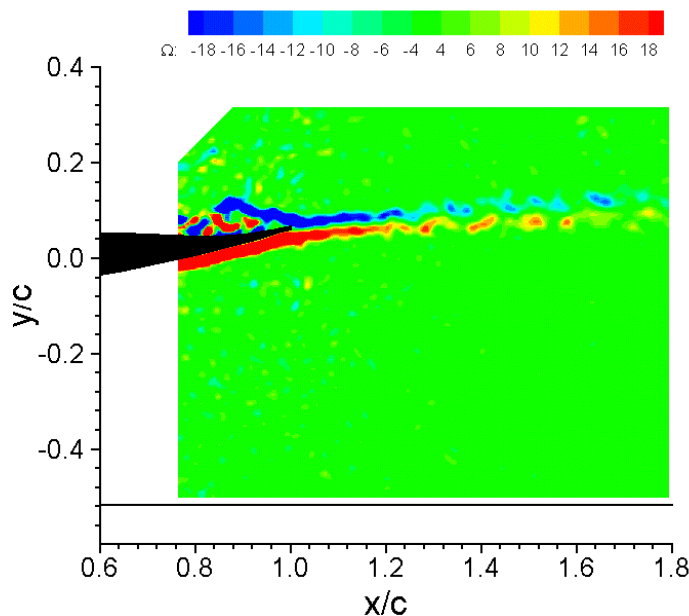


Fig. 1. Instantaneous vorticity contours behind wing with finite trailing edge