An Experimental Investigation of Lift and Roll Control Using Plasma Actuators

by

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This work describes an experimental investigation into the use of plasma actuators for lift and roll control. The use of plasma actuators for flow-control applications has been demonstrated extensively in recent years, for example, to postpone flow separation or eliminate Karman shedding behind bluff bodies. The current research describes a unique application of plasma actuators in which the actuators were placed near the trailing edge of a wing or airfoil in an effort to directly control circulation.

Experimental data are presented showing the effect that the actuators have on lift, pitch, roll-moment and pressure distribution as a function of angle of attack and wind speed. The experiments are performed in the range of Reynolds numbers $Re = 30,000$-$370,000$ and the angle-of-attack range $\alpha = -3^\circ$ to $+10^\circ$. The results indicate that the performance of the actuators is strongly influenced by Reynolds number effects. The implications of the results on the application of plasma actuators as lift and roll-control devices are discussed.