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Transient deployment of flat winglets inside a turbulent boundary layer[1] ALEXIS PIERIDES, YIANNIS ANDREOPOULOS, City College of CUNY — An experiment has been designed to investigate the flow mechanisms responsible for the augmented force generation during the transient flapping of winglets. Square and triangular flaps hinged at the wall beneath the flow have been used which were rotated with angular velocities between 10 and 100 rad/s. Strouhal numbers between 0.05 and 0.4 and Stokes numbers between 3800 and 38,000 were achieved. Experiments with two different boundary layers were also carried out. In the first one, the boundary layer thickness to the winglet's height ratio was 1.3 and in the second 0.6. Particle Image Velocimetry was used to provide qualitative and quantitative information of the flow field. The dynamic lift and drag force coefficients during the transient deployment are different than the corresponding coefficients under stationary conditions at the same deployment angle after adjusting for inertial effects. These effects are enhanced with increasing Strouhal number and decrease with increasing boundary layer thickness.

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