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**Delaying Leading-Edge Vortex Detachment on a Pitching and Plunging Flat Plate using a DBD Plasma Actuator** JOHANNES KISSING, BASTIAN STUMPF, Technische Universität Darmstadt, Fluid Mechanics and Aerodynamics (SLA), JOCHEN KRIEGSEIS, Karlsruhe Institute of Technology (KIT), Institute of Fluid Mechanics (ISTM), CAMERON TROPEA, Technische Universität Darmstadt, Fluid Mechanics and Aerodynamics (SLA) — In order to achieve higher manoeuvrability, novel micro-air vehicle designs adapt flapping wings from biological flight to realize hovering and forward flight. The increased lift of flapping wings is mainly due to the circulatory lift of the leading-edge vortex (LEV), which forms on the wing and induces transient lift as it grows. Subsequently, the unsteady lift drops when the vortex detaches from the airfoil. In order to attain higher overall lift, the current project aims to delay the detachment of the LEV by manipulating the flow field at topologically critical locations with a dielectric barrier discharge plasma actuator (DBD-PA). Time-resolved particle-image velocimetry measurements are used to characterize the flow field around a flat plate, which executes a combined pitching and plunging motion at a Reynolds number of 24,000, a reduced frequency of 0.48 and a Strouhal number of 0.1. A prolongation of the growth phase of the LEV, marked by a longer circulation-accumulation phase and a decreased convection of the LEV, is achieved by compressing secondary structures ahead of the main vortex. Temporal variations of the excitation onset are found to be the key factor between spatial control authority of the DBD-PA and the determined effectiveness of flow control.

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