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Experimental investigation of the dynamics of a hybrid morphing wing: time resolved particle image velocimetry and force measures GURVAN JODIN, Laplace - IMFT, JOHANNES SCHELLER, IMFT - MIT, JEAN-FRANÇOIS ROUCHON, Laplace, MARIANNA BRAZA, IMFT, MIT COLLABORATION¹, IMFT COLLABORATION, LAPLACE COLLABORATION — A quantitative characterization of the effects obtained by high frequency-low amplitude trailing edge actuation is performed. Particle image velocimetry, as well as pressure and aerodynamic force measurements, are carried out on an airfoil model. This hybrid morphing wing model is equipped with both trailing edge piezoelectric-actuators and camber control shape memory alloy actuators. It will be shown that this actuation allows for an effective manipulation of the wake turbulent structures. Frequency domain analysis and proper orthogonal decomposition show that proper actuating reduces the energy dissipation by favoring more coherent vortical structures. This modification in the airflow dynamics eventually allows for a tapering of the wake thickness compared to the baseline configuration. Hence, drag reductions relative to the non-actuated trailing edge configuration are observed.

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