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Active flow control for a NACA-0012 profile H. OUALLI, M. MEKADEM, M. BOUKRIF, S. SAAD, Ecole Militaire Polytechnique, Algiers, Algeria, A. BOUABDALLAH, Universite des Sciences et de la Technologie Houari Boumediene, Algiers, Algeria, M. GAD-EL-HAK, Virginia Commonwealth University, Richmond, Virginia, USA — Active flow control is applied on a NACA-0012 profile. The experiments are carried out in a wind tunnel, and flow visualizations are conducted using high-resolution visible-light and infrared cameras. Numerical LES finite-volume code is used to complement the physical experiments. The symmetric wing is clipped into two parts, and those parts extend and retract along the chord according to the same sinusoidal law we optimized last year for a circular/elliptical cylinder (B. Am. Phys. Soc., vol. 59, no. 20, p. 319, 2014). The Reynolds number varies in the range of 500–100,000, which is typical of UAVs and micro-UAVs. The nascent cavity resulting from the oscillatory motion of the profile segments is kept open allowing the passage of fluid between the intrados and extrados. The pulsatile motion is characterized by an amplitude and frequency, and the airfoil's angle of attack is changed in the range of 0–30 deg. For certain amplitude and frequency, the drag coefficient is increased over the uncontrolled case by a factor of 300. But when the cavity is covered to prevent the flow from passing through the cavity, the drag coefficient becomes negative, and significant thrust is produced. The results are promising to achieve rapid deceleration and acceleration of UAVs.

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