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Wake Control of a Blunt Trailing Edge Profiled Body Using Dielectric Barrier Discharge Plasma Actuators[1] ARASH NAGHIB-LAHOUTI, PHILIPPE LAVOIE, University of Toronto Institute for Aerospace Studies — The periodic shedding of von Karman vortices is the source of cyclic aerodynamic forces on nominally 2D bluff bodies. Beyond a threshold Reynolds number, which can be as high as 700 depending on profile geometry, secondary instabilities, appearing as undulations in the von Karman vortices and pairs of counter-rotating streamwise vortices, emerge in the wake. The secondary instabilities are found to persist at Reynolds numbers in the order of 10^4. It has been shown that amplification of the secondary instabilities can lead to disorganization of the von Karman vortices, and attenuation of the cyclic forces. In the present study, this relationship is used as the basis of a wake flow control approach for a blunt trailing edge profiled body, comprised of an elliptical leading edge and a rectangular trailing edge. An array of dielectric barrier discharge plasma actuators placed at the trailing edge is used for control actuation, with a spanwise spacing based on the wavelength of the secondary instabilities, to achieve maximum amplification of the instabilities. PIV and hot-wire measurements have been conducted at Reynolds numbers between 2,000 and 24,000 to determine the effect of flow control on the wake characteristics, and the total drag.

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