Abstract Submitted
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Influence of the obstacle after-body on actuation effectiveness for wake control.[1] ROBERT MARTINUZZI, ALEX LI, University of Calgary — The dynamic response of the turbulent wake to leading-edge synthetic jet actuation was investigated experimentally for a two-dimensional normal flat plate and square cylinder. The obstacles are immersed in a uniform stream of turbulent intensity less than 0.5%. The actuators are placed directly behind one of the obstacle leading edges. The leeward surface pressure and wake velocity (PIV) measurements are synchronized. For actuation frequencies approaching those of the Kelvin-=Helmholtz shear layer instability, mean drag and wake velocity fluctuation levels can be reduced for both geometries. The flat plate wake is generally insensitive to lower frequency actuation. In sharp contrast, for the square cylinder the vortex shedding frequency can lock-on to subharmonics of the actuation frequency. Most striking is that the wake can be manipulated to increase or decrease drag. It will be shown that two different mechanisms underlie the low-frequency response. First, actuation results in a pulsed vortex pair which can interfere with the shear layer to trigger shedding. Second, the after-body can act to alter the vorticity flux along the shear layers and thus modify the strength of the shed vortices. These mechanisms are mitigated when the after body is removed, such as for the flat plate.

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