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Simulation, Modeling and Feedback Control of the flow around a Square-Back Bluff Body LAURENT DALLA LONGA, AIMEE MORGANS, Imperial College London, IMPERIAL COLLEGE LONDON - FLOW CONTROL TEAM — Because of capacity, aesthetic and comfort requirements, most road vehicles are not streamlined but blunt bluff bodies. The flow exhibits a large wake recirculation area leading to high pressure drag, which at highway speeds, represents the main source of energy loss. In this work, Large Eddy Simulations of the flow past a square-back bluff body with interacting shear layers are performed with the aim of reducing aerodynamic drag. A linear feedback control strategy is applied to increase the back face pressure and therefore obtain drag reduction. Synthetic jets located along the perimeter of the back face are used for actuation while body mounted sensors record the base pressure. System identification, via harmonic actuator forcing, is used to characterize the flow response to actuation, which is assumed to be dynamically linear. Based on the identified frequency response, a feedback controller is designed in the frequency domain which aims to either attenuate or amplify base pressure fluctuations by shaping of the sensitivity transfer function. This is first done for a D-shaped body. Current work extends this strategy to a simplified lorry geometry on which experiments were carried out recently.

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