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Feedback Control of Bistability in the Turbulent Wake of an Ahmed Body ROWAN BRACKSTON, ANDREW WYNN, JUAN MARCOS GARCIA DE LA CRUZ, Imperial College London, GEORGIOS RIGAS, University of Cambridge, JONATHAN MORRISON, Imperial College London — Three-dimensional bluff body wakes have seen considerable interest in recent years, not least because of their relevance to road vehicles. A key feature of these wakes is spatial symmetry breaking, reminiscent of the large scale structures observed during the laminar and transitional regimes. For the flat backed Ahmed body, this feature manifests itself as a bistability of the wake in which the flow switches randomly between two asymmetric states. This feature is associated with instantaneous lateral forces on the body as well as increased pressure drag. Starting from the modelling approach of Rigas *et al.* (J. Fluid Mech. **778**, R2, 2015)we identify a linearised model for this mode of the flow, obtaining parameters via a system identification. The identified model is then used to design a linear feedback controller with the aim of restoring the flow to the unstable, symmetric state. The controller is implemented experimentally at $\mathrm{Re} \sim 3 \times 10^5$ and is found to both suppress the bistability of the flow and reduce the drag on the body. Furthermore, the control system is found to have a positive energy balance, providing a key demonstration of efficient feedback control applied to a 3D bluff body at Reynolds numbers representative of road vehicle wakes.

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