Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Modelling and Feedback Control of Bistability in a Turbulent Bluff Body Wake ROWAN BRACKSTON, ANDREW WYNN, JUAN MARCOS GARCIA DE LA CRUZ, Imperial College London, GEORGIOS RIGAS, California Institute of Technology, JONATHAN MORRISON, Imperial College London —
The turbulent wake behind many three-dimensional bluff bodies exhibits a bistable behaviour, the properties of which has been the subject of significant recent interest. This feature of the wake is known to contribute to the pressure drag on the body and is relevant for geometries representative of many road vehicles. Furthermore, due to its high visibility from surface mounted pressure measurements, it is a feature that may be observed and controlled in real-time. In Brackston et al (*J. Fluid Mech.*, 2016) we have recently demonstrated such a feedback control strategy that aims to suppress the bistable feature of the wake. Starting from a stochastic modelling approach, 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 the feedback controller, with the aim of restoring the flow to the unstable, symmetric state. The controller is implemented experimentally at $Re \sim 2.3 \times 10^5$ 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 wake at turbulent Reynolds numbers.

Rowan Brackston
Imperial College London

Date submitted: 31 Jul 2016 Electronic form version 1.4