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In-plane travelling waves for turbulent skin friction drag reduction. JAMES BIRD, MATTHEW SANTER, JONATHAN MORRISON, Imperial College London — The control of turbulent boundary layers via spanwise wall forcing has long been the subject of investigation, where large reductions in skin friction drag have been observed in experimental and numerical studies. When the wall forcing takes the form of streamwise travelling waves of spanwise velocity, the same drag reductions occur, but also with the potential for net power saving, when the waveform has certain dimensionless qualities. The production of waveforms of this nature experimentally, and their influence on the flow, is the subject of the work presented. A flat surface, 3 m in length, was developed comprising of a compliant substructure, based on the Kagome lattice geometry, supporting a membrane skin. The substructure was designed such that when it was actuated, it produced in-plane waveforms of variable length and speed. Various waves were generated under a turbulent boundary layer, with $Re_\tau = 1125$, and, for certain forcing parameters, a large drag reduction of 20% was measured, in line with, and following the same trends as, existing numerical studies.

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