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Switchable and Tunable Aerodynamic Drag on Cylinders MARK GUTTAG, PEDRO REIS, Massachusetts Institute of Technology — We report results on the performance of Smart Morphable Surfaces (Smporhs) that can be coated onto cylindrical structures to actively reduce their aerodynamic drag. Our system comprises of an elastomeric substrate that contains a series of optimally designed undersurface cavities that, once depressurized, lead to a dramatic deformation of the surface topography, on demand. Our design is inspired by the morphology of the giant cactus (*Carnegiea gigantea*) which possesses an array of axial grooves, which are thought to help reduce aerodynamic drag, thereby enhancing the structural robustness of the plant under wind loading. We perform systematic wind tunnel tests on cylinders covered with our Smorphs and characterize their aerodynamic performance. The switchable and tunable nature of our system offers substantial advantages for aerodynamic performance when compared to static topographies, due to their operation over a wider range of flow conditions.

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