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Fluid force and static symmetry breaking modes of 3D bluff bodies. OLIVIER CADOT, ANTOINE EVRARD, ENSTA-ParisTech, DFA TEAM — A cavity at the base of the squareback Ahmed model at Re $=6.10^6$ is able to reduce the base suction by 18% and the drag coefficient by 9%, while the flow at the separation remains unaffected. Instantaneous pressure measurements at the body base, fluid force measurements and wake velocity measurements are investigated varying the cavity depth from 0 to 35% of the base height. Due to the reflectional symmetry of the rectangular base, there are two Reflectional Symmetry Breaking (RSB) mirror modes present in the natural wake that switch from one to the other randomly in accordance with the recent findings of Grandemange *et al.* (2013). It is shown that these modes exhibit an energetic 3D static vortex system close to the base of the body. A sufficiently deep cavity is able to stabilize the wake toward a symmetry preserved wake, thus suppressing the RSB modes and leading to a weaker elliptical toric recirculation. The stabilization can be modeled with a Langevin equation. The plausible mechanism for drag reduction with the base cavity is based on the interaction of the static 3D vortex system of the RSB modes with the base and their suppression by stabilization. There are some strong evidences that this mechanism may be generalized to axisymmetric bodies with base cavity..

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