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Hysteresis and Bistable Behavior in Low Reynolds Number Flow Over a Cylinder With a Slanted Afterbody[1] FERNANDO ZIGUNOV, PRABU SELLAPPAN, FARRUKH ALVI, FAMU-FSU College of Engineering — A cylinder with a slanted afterbody is a bluff body that has a wake pattern similar to aircraft fuselage wakes. Recent work (Bulathsinghala et. al, 2017; Zigunov et. al, 2019) improved our understanding of the vortex-dominated regime of this wake, where a pair of counter-rotating vortices is formed. Steepening the slant angle above a critical value causes the vortex-dominated wake to transition to a fully-separated ("stalled") wake, with a subsequent increase in unsteadiness and a significant drop in form drag. The current investigation shows the full three-dimensional flow topology of the two wake states, reconstructed through stacked stereoscopic particle image velocimetry (S-SPIV). The wake state transition is found to be a function of Reynolds number for a fixed slant angle and the wake presents a hysteretical behavior when the Reynolds number is slowly varied. The hysteresis effect is further detailed in this investigation through fully time-resolved, high-speed PIV, and physical insight into the flow instability mechanisms that contribute to this effect is presented.

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