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Modeling the dynamics of four-vortex bluff body wakes SAIKAT BASU, MARK STREMLER, Virginia Tech, TEIS SCHNIPPER, ANDERS ANDERSEN, Technical University of Denmark — Vortex-shedding bluff bodies frequently generate wakes consisting of regular groupings of four vortices. We model such wakes as an integrable two-dimensional Hamiltonian system of point vortices by assuming spatial symmetries based on the vortex arrangements observed in experiments. The model demonstrates a number of dynamic modes that we classify using a bifurcation analysis of the phase space topology. In contrast to the standard von Karman street, very few initial conditions lead to relative equilibria in which the vortex configuration moves with invariant size and shape. Scaled comparisons of the model with experiments conducted in a flowing soap film support the model results. The richness of the results reveals a variety of patterns that can occur within the class of '2P' wakes. Following the approach of von Karman, we estimate the drag and lift forces exerted by such wakes on a bluff body.

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