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Vortex-Induced Vibrations of a One-Degree-of-Freedom Cylinder Transitioning from the Inline to the Transverse Degree of Freedom BRIDGET BENNER, YAHYA MODARRES-SADEGHI, University of Massachusetts Amherst — Flow-induced oscillations of a cylinder with one degree of freedom in the purely inline direction, and at angles that deviate from the inline direction, are studied experimentally. Experiments are conducted in a recirculating water tunnel using a setup with a low mass-damping coefficient. Force and displacement measurements together with flow visualization of the wake are used to characterize the response of the cylinder over a range of reduced velocities as the single degree of freedom incrementally deviates from the inline direction. It is shown that the two non-zero amplitude regions that are observed at reduced velocities of 1.8 and 2.5 in a purely inline vortex-induced vibration (VIV) response of the cylinder slowly disappear as the angle is increased and the lock-in region, usually observed in a pure crossflow VIV response, appears at higher angles. It is also shown how the observed vortex shedding modes change as the degree of freedom deviates from a pure inline direction.

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