

Abstract Submitted
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Wake dynamics of streamwise oscillating cylinders with one and two degrees of freedom STAVROULA BALABANI¹, NEIL CAGNEY², University College London — The effect of a second degree of freedom on the structural response and wake modes of a cylinder undergoing streamwise Vortex-Induced Vibrations (VIV) was studied using DPIV. The 2-DOF oscillating cylinder was found to exhibit similar amplitude response to a cylinder allowed to oscillate only in the streamwise direction, i.e. containing two response branches separated by a low amplitude region, as reported in the literature. The first branch was characterised by negligible transverse motion and the appearance of both alternate (A-II) and symmetric (S-I) vortex-shedding which competed in an unsteady manner. However, this mode competition did not appear to have a significant effect on either the streamwise or transverse motion. The additional DOF was found to simplify the overall dynamics of the system in the second response branch by reducing the number of states that the wake can exhibit: while the 1-DOF oscillating cylinder was found to exhibit 3 different wake states and hysteresis in the second branch, the 2-DOF one was found to exhibit only one wake mode in the second branch (the SA mode) and the cylinder response was no longer hysteretic. Figure-of-eight motion trajectories were observed throughout the lock in range and the phase angle between the streamwise and transverse motion was found to decrease in a linear manner with reduced velocity, with a sudden jump when the wake changed from the A-II to the SA mode.

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