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Vibrating cantilever beam in a flowing soap film VEERA SAJJANAPU, THOMAS WARD, Iowa State University — We present an experimental study of the interaction between a flexible cantilever beam and a flowing fluid medium using a soap film. The vertically falling soap film is capable of attaining speeds ranging from 1.5 - 3 m/s with an operating test section width of 7.5 cm. Experiments were conducted for flexible cantilever beams of length L $\leq$ 10 mm yielding Reynolds number $5000 < Re < 10000$ and of cantilever beam thickness ranging from 0.03 - 0.08 mm were placed at angles of attack ranging from 10° - 50°. We visualize the beam displacements and wake with a high-speed camera. Assuming small vibrational amplitudes, we consider the Euler-Bernoulli beam theory to understand the dynamics. From the analysis we find that the normalized average displacement is linear with respect to the square of the free-stream velocity. The vibrational amplitude is also discussed using a similar scaling. Finally, visualization of the downstream vortex structure is related to a beams displacement and vibrational frequency using dimensional analysis.

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