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Effect of Fin Porosity on Wake Geometry for Flapping Fins at Intermediate Reynolds Number[1] J. CHEN, B. XIA, P.S. KRUEGER, SMU — Low aspect ratio flapping fins generate interesting 3-dimensional flow structures as has been observed, for example, in studies of fish swimming. As the Reynolds number is reduced, the exact geometry of the fin is less important and even certain amounts of porosity might be allowed without significantly affecting propulsive performance. These effects are investigated experimentally using flapping rectangular fins of aspect ratio 2 at Reynolds numbers in the range 100 – 1000. The experiments were conducted using a water tunnel to supply the free stream flow and the fin flapping parameters were set to provide a Strouhal number (based on amplitude of the fin tip motion) in the range 0.15 – 0.35. Phase-averaged measurements were made of the 3-dimensional, volumetric flow field, allowing visualization of the typical shed vortex structure behind the fin and calculation of time averaged thrust and propulsive efficiency. Results comparing the flow structure in the fin wake and the resulting propulsive performance will be presented for several fins with different planform porosities where the porosities are set using arrays of holes in the fins.

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