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Characterization of Fluid Flow through a Simplified Heart Valve Model KAKANI KATIJA, MORTEZA GHARIB, JOHN DABIRI, Graduate Aeronautical Laboratories and Bioengineering, California Institute of Technology — Research has shown that the leading vortex of a starting jet makes a larger contribution to mass transport than a straight jet. Physical processes terminate growth of the leading vortex ring at a stroke ratio (L/D) between 3.5 and 4.5. This has enhanced the idea that biological systems optimize vortex formation for fluid transport. Of present interest is how fluid transport through a heart valve induces flutter of the valve leaflets. An attempt to characterize the fluid flow through a heart valve was made using a simplified cylinder-string system. Experiments were conducted in a water tank where a piston pushed fluid out of a cylinder (of diameter D) into surrounding fluid. A latex string was attached to the end of the cylinder to simulate a heart valve leaflet. The FFT of the string motion was computed to quantify the flutter behavior observed in the cylinder-string system. By increasing the stroke ratio, the amplitude of transverse oscillations for all string lengths increases. For the string length D/2, the occurrence of flutter coincides with the formation of the vortex ring trailing jet.

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