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Flow Through Deformable Orifice Diaphragms Used as Heart Valve Analogues[1] DEVESH AMATYA, Biomedical Engineering, University of Minnesota, ELLEN LONGMIRE, Aerospace Engineering and Mechanics, Univesity of Minnesota — Both hemodynamic and structural performance are important considerations in designing replacement heart valves. In this study, compression-molded silicone diaphragms of varying orifice and modulus are used as simplified heart valve analogues. Structural quantities such as diaphragm orifice area and deformation are quantified simultaneously with hemodynamic quantities (flow characteristics). Diaphragms are positioned downstream of a steady fully-developed pipe flow, and velocity fields are quantified both upstream and downstream of each diaphragm using particle image velocimetry (PIV). Diaphragm deformation is obtained from each image, while pressure drop across the diaphragm and volumetric flow rate are measured independently. The combined flow and structural data can be used to validate fluid-structure interaction codes suitable for biomedical applications. The bulk flow results will be compared against the existing hydraulic performance formula for rigid orifice diaphragms, and details of instantaneous flow fields will be presented.

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