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Investigation of Flow Structures Downstream of a Bileaflet Mechanical Heart Valve using Particle Image Velocimetry JUAN MEJIA, PETER OSHKAI — Turbulent flow downstream of a bileaflet mechanical heart valve mounted in a non-compliant cylindrical duct is investigated using digital particle image velocimetry. The study focuses on the forward and back flow phases of a cardiac cycle, represented by a unidirectional inflow of constant flow rate. Global quantitative images corresponding to multiple planes of data acquisition provide insight into the three-dimensional nature of the flow. Turbulent flow structures including jet-like regions, shed vortices, and recirculation regions are characterized in terms of patterns of instantaneous and time-averaged velocity, vorticity, and streamline topology. The flow downstream of the valve, during the forward flow phase, features four separated shear layers that form at the leading and trailing edges of the valve leaflets. It is shown that the large-scale transverse oscillations of these shear layers dominate the near-wake of the valve. During the back flow phase, the flow field is dominated by the jets that form at the hinges and between the closed leaflets.

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