

Abstract Submitted
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Application of Multi-Plane Particle Shadow Velocimetry to Obtain Velocity Fields Through an Optically Clear Object .¹ STEVEN HINKLE, CHRISTINE TRUONG, KYLE SINDING, RHETT JEFFERIES, JEFF HARRIS, MICHAEL KRANE, Pennsylvania State Univ — Particle Shadow Velocimetry (PSV) is performed using an LED array to illuminate a volume of fluid rather than individual two-dimensional laser sheets as is done in Particle Image Velocimetry (PIV). Multi-plane PSV is a technique that is able to take advantage of the volumetric illumination of PSV to simultaneously take velocity field measurements in two different planes along the same optical axis within the fluid flow. This technique can be further extended to resolve flow fields around and through clear objects to obtain measurements along the optical axis both in front of and behind the object. A proof of concept application of taking images both in front of and behind cylindrical rods is presented. The rods, one made of clear acrylic and the other borosilicate glass, were chosen to have an index of refraction close to that of the surrounding fluid. Two different calibration targets are arranged on either side of the cylinder and simultaneous images are taken to show that velocity measurements in front of and behind the rod are possible to obtain utilizing multi-plane PSV. This methodology will be implemented in future measurements to obtain velocity fields for an airfoil on both the suction and pressure sides simultaneously in fully developed turbulent flow.

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