Abstract Submitted
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Volumetric Velocimetry in the Rotating Frame of Reference using a Plenoptic Camera[1] ABBISHEK GURURAJ, MAHYAR MOAVEN, ZU PUAYEN TAN, BRIAN THUROW, VRISHANK RAGHAV, Department of Aerospace Engineering, Auburn University — Understanding the spatio-temporal behavior of flow separation on rotating surfaces is essential to characterize the performance of wind turbines, helicopters and more recently for drones. These require time-resolved measurements to quantify the unsteady flow fields during flow separation over rotor blades. Shortcomings in the use of conventional velocimetry techniques have limited researchers to comprehensively understand the flow over rotating wings. This study presented a novel concept for the development of a rotating frame of reference flow field measurement technique. A single plenoptic camera mounted coaxially above a hub mounted mirror that rotates with the rotor enables instantaneous and three-dimensional flow field measurements over a wide range of azimuth angles. The design and implementation of this concept as an experimental test facility to conduct flow field and force measurements over a rotating wing is discussed. In the presentation, an overview of the methodology along with the challenges, details of the test facilities and some preliminary flow field and force measurement results will be discussed.

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