Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Three-dimensional study of the near wake of a small-scale coaxial rotor system using tomographic particle image velocimetry[1] LOKESH SILWAL, ZU PUAYEN TAN, VRISHANK RAGHAV, Auburn University — In recent years, the popularity of coaxial rotor has increased rapidly with its applications extending from small-scale UAVs and Mars rotor to concepts for the air taxi model. Thus, the comprehensive understanding of coaxial rotor flowfield under various operating conditions has become vital to ensure its smooth operation. Previous two-dimensional studies have demonstrated the complex nature of the coaxial rotor wake which is dominated by mutual interactions between the tip vortices. However, the three-dimensional evolution and interaction of helical vortices in the near wake is yet to be investigated. With the current study, we aim to employ tomographic PIV enabled by a single camera quadscope system to accomplish a three-dimensional and time-resolved study of a small-scale (0.2m span) coaxial rotor wake. The focus of the study will be to elucidate the effect of tip Reynolds number on the three-dimensional interaction of the upper and lower rotor helical vortex structures in the near wake at fixed rotor spacing. Here, the tip Reynolds number is varied between 19,000 to 40,000 which corresponds to the operational range of small-scale UAVs.

[1]Instrumentation acquisition was partially supported by DURIP through Army Research Office - Grant Number - W911NF-19-1-0124, monitored by Dr. Matthew Munson.

Lokesh Silwal
Auburn University

Date submitted: 10 Aug 2020 Electronic form version 1.4