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Performance and wake measurements for a cross-flow axis lift-driven turbine PETER BACHANT, MARTIN WOSNIK, University of New Hampshire — A 2.67 m wide, 3.67 m deep tow tank was used to measure performance and wake flow from a cross-flow axis (CFA) lift-driven turbine. A custom turbine test bed was designed that allows precise control of turbine tip speed ratio via servomotor, as well as measurements of power and overall drag on the turbine. Blade forces are measured with high spatio-temporal resolution via piezoelectric film sensors. The flow-field in the near wake is measured via high frame rate PIV and acoustic Doppler velocimetry. The size of the turbine model and a newly renovated tow tank mechanism allowed the blade chord Reynolds number to be roughly an order of magnitude higher than in previous studies. The overall goal of this study is to accurately measure fluid-blade interactions to observe effects of design parameter changes to performance and wake structure; also to help validate (or invalidate) numerical models. The higher Reynolds numbers of these results, especially those under dynamic stall conditions, make them more applicable to full scale commercial installations.

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