

Interactive comment on “Flow angle measurement of a yawed turbine and comparison to models” by Tyler Gallant and David A. Johnson

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Thank you for the careful and detailed review of our experimental study.

The general subject of a wind turbine in yaw is significant and a state-of-the-art review would encompass more than what would be required to introduce these experimental measurements. The literature that has been reviewed is specific and of recent publication. Updates to the literature review are always possible if they address the specifics of the experiments detailed here. The authors are well-aware of IEA Task 29. IEA Task 29 is important although full results of the yawed cases are somewhat challenging to find in the peer reviewed literature. If angle of attack measurements in that Task have been missed by the authors they will certainly be welcomed and added to the background.

We have many potential rotor configurations (1-3 blades) and have undertaken many

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studies including single blades but more commonly with a conventional 3 bladed rotor when that was the focus. Since the blade was 3D printed and contained all the instrumentation in the one blade the remaining rods are used for balancing. This approach was considered acceptable given the magnitude of the testing wind velocity. The wake following the very slender weighted rods did not alter the measured results in side by side comparison. However, the single-bladed rotor does result in a significantly lower induction than a typically 3-bladed rotor. This is reflected in the low induction a values presented in Table 2.

The design of the wind facility is not that of a conventional wind tunnel. Turbulence intensity is intentionally high to attempt to replicate our field experience measurements. It is stated in the paper that the wind generation facility experiences a non-uniformity in the flow from the current fan configuration, as described by Best (2010). The non-uniformity was quantified by calculating the upstream flow velocity as a function of the azimuthal position using the Petersen (2015) method and measured five-hole probe data (see Fig. 12). This non-uniform flow field is reflected in the angle-of-attack as a cyclical variation. However, when the variation is accounted for, the theoretical and experimental values are considered to be in close agreement.

The periodic behaviour in the AoA during axial conditions is due to the consistent non-uniformity of the flow field. It is not related to the presence of an atmospheric boundary layer, as stated by the reviewer.

The uniqueness of the experimental design (3D printed blade with self-contained data acquisition) and the application in the wind facility do provide substantial contributions to the wind energy research community.

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