RC1 Feedback: Anonymous Referee 1, 30 Nov 2025

Jelle Agatho Wilhelm Poland, Erik Fritz, and Roland Schmehl

1 General comments

> **The manuscript presents a high-quality experimental study on a 1:6.5 scale LEI kite using stereoscopic PIV, providing a benchmark dataset for validating CFD and Vortex-Step Method models. The work is scientifically significant, as it elucidates local 3D aerodynamic phenomena, including strut-induced flow effects, and directly confirms stall onset at high angles of attack. Methodology and analysis are rigorous, and results are clearly presented. Minor technical revisions are suggested to improve clarity, including sentence refinements, explicit description of pseudo-2D assumptions in force calculations, and clarification of some PIV limitations. Overall, the manuscript represents a valuable contribution to the field of kite aerodynamics and is recommended for acceptance after technical corrections.**

Dear reviewer,

Thank you for your constructive assessment and for recommending the manuscript for publication after technical corrections. We appreciate your positive evaluation of the experimental methodology, the clarity of the presentation, and the value of the dataset for validating CFD and vortex-step-method models.

We have implemented the suggested revisions to improve clarity and transparency. Specifically, we refined a number of long sentences for readability, added an explicit description of the pseudo-two-dimensional assumptions underlying the sectional force estimates, and clarified the principal PIV limitations and their implications for interpreting gradient-based and drag-related quantities. Answers to the technical corrections are shown below in Sect. 2. All changes are documented in the attached tracked-changes manuscript.

We look forward to publishing this paper, which has greatly improved with your feedback.

Best regards,

J.A.W. Poland, on behalf of the authors

2 Technical corrections

Split long sentences in Discussion and Conclusion for readability for example:

- **“Characterizing the aerodynamics of LEI kites with numerical prediction and experimental measurement poses several challenges, owing to the highly flexible nature, pronounced anhedral and sweep, and unconventional airfoil geometries.”**
- **"The combination of increased downward, sideways, and upstream flow near the strut suggests the presence of a tilted or angled vortex structure.”**
- **“Measurement quality could be further improved by employing a narrower laser light sheet to concentrate laser power, potentially reducing reflection intensity.”**

We agree, and we have addressed this throughout the manuscript. Several long sentences (including the three examples highlighted by the reviewer) were split into shorter, clearer sentences to improve readability and reduce syntactic complexity. These edits are best reviewed in the tracked-changes file.

"explicit description of pseudo-2D assumptions in force calculations"

The manuscript has been revised to incorporate this description. In particular, we now state explicitly that the force estimates are *sectional, pseudo-two-dimensional loads per unit span* obtained from a single measurement plane, and that the momentum balance neglects out-of-plane fluxes. As a consequence, spanwise force transport and three-dimensional coupling effects are excluded by construction, reducing accuracy where out-of-plane components become significant (notably near the wing tip and strut junctions). This clarification has been added to Sect. 2.7 and is reflected consistently in the surrounding text.

"and clarification of some PIV limitations"

We have clarified the PIV limitations more explicitly in the revised manuscript by (i) expanding the uncertainty analysis, (ii) identifying the dominant limitation mechanisms, and (iii) stating how these limitations constrain the interpretation of derived quantities.

First, the uncertainty section was expanded to distinguish Type-A (statistical) from Type-B (systematic and modelling-related) contributions following common PIV uncertainty practice (Sciacchitano and Wieneke, 2016). The reported uncertainties of the mean velocity are now presented strictly as Type-A convergence metrics, whereas systematic effects are discussed separately and are not conflated with statistical confidence intervals. This reduces the risk of using precision metrics as a proxy for overall measurement fidelity.

Second, the revised manuscript identifies the dominant experiment-specific limitations and their consequences for the resolved flow field. In particular, reflection-induced correlation loss and the progressive increase in measurement-plane misalignment towards the wing tip are stated explicitly as the primary constraints on interpretability. Their impact is quantified through planewise data-quality metrics (fraction of rejected and additionally masked vectors) and is linked directly to regions where near-wall information and velocity gradients become unreliable.

Third, the revised manuscript clarifies the implications for downstream analysis. At the start of the Discussion, a framing statement has been added noting that interpretation is primarily constrained by reflection-driven data loss and increasing plane–surface misalignment, which disproportionately degrade near-wall gradients and, consequently, gradient-sensitive and momentum-based sectional quantities. The detailed mechanisms, quantitative breakdowns, and their influence on circulation and pseudo-two-dimensional force estimates are then discussed in the dedicated uncertainty and Discussion subsections, with supporting material provided in the relevant appendices.

References

Sciacchitano, A. and Wieneke, B.: PIV uncertainty propagation, Measurement Science and Technology, 27, 084 006, https://doi.org/10.1088/0957-0233/27/8/084006, 2016.