Reviewer - 1

"I thank the authors for addressing my comments. Only a further minor comment: In Fig. 4, the center of gravity, CG, is mentioned in the caption but not shown in the figure. Please revise Fig. 4 accordingly."

Dear reviewer,

Thank you for the great comments and for noticing the misplaced CG. It is now included.
In comparison to the prior version, we also made some stylistic and textual updates, which are all visible in the tracked changes file.

We look forward to publishing this paper, which has greatly improved with your feedback.
Thanks again for your time!

Best,

Reviewer - 2

"Dear authors,

Thanks for making many of the suggested changes - the paper is looking much better now!

However, there are some comments that you answered in the response, but I don't think you adapted the paper accordingly (at least you didn't say you did, and it's difficult to track).

I didn't ask you these questions because I want to know the answer, but because I think readers should know the answer. So could I kindly ask you to look at the following open points and check if you have adjusted the paper accordingly? If not, could you please try to do so?"

Dear reviewer,

Thank you for the great comments and for requesting that we include our answers to the review round in the manuscript text instead.
Now that these remarks have made their way into the paper, the story is stronger indeed!

Find our in-line response below this message.

In comparison to the prior version, we also made some stylistic and textual updates, which are all visible in the tracked changes file.

We look forward to publishing this paper, which has greatly improved with your feedback. Thanks again for your time!

Best,
Jelle

In-line responses to Reviewer 2

Question: [Line 10.] Does that mean that the stitching was not present in the scale model, or why was the tape needed?

Answer 1)

Indeed, the stichting seam was not present on the scale model. The tape was applied to analyze the effect of a tripped boundary layer, which the stichting seam in reality may cause.

Answer 2)

Clarified in paper, in abstract and section 2.5.

Question: [Line 25.] in the range of? (context is: "wing pitched to a high angle of attack.")

Answer 1)

This is very system-dependent, but for the V3 kite, it is roughly 8deg. As stated by https://wes.copernicus.org/preprints/wes-2024-182/ and cited later in the text on line 336.

Answer 2)

The range is now stated in the beginning of section 2.4: Measurement matrix.

Question:[Line 33.] A close-up might be useful (context is: The tubular frame of the wing consists of an inflatable leading edge tube and several connected inflatable strut tubes.)

Answer 1)

The wing with leading-edge tube and connected inflatable struts is illustrated in Figures 1a and b, and an even closer view is provided in Figure 3, both figures clearly showing the leading-edge tube and struts.

Answer 2)

Nothing has changed; the tubular frame is already considered clearly visible from the figures.

Question:[Line 42.] Not sure exactly what you mean by that. Do you mean the design? Could you explain briefly? (context: "aerodynamic system identification")

Answer 1)

Aerodynamic system identification refers to figuring out what aerodynamic properties a given system has. In this context, once a kite has been built and is flown, the question often arises what the aerodynamic properties actually are, e.g., what is the lift-to-drag ratio of the deformed kite in flight?

Answer 2)

Clarified in paper, removed “aerodynamic system identification” and instead stated “determining the aerodynamic properties of a given system.”

Question:[Line 49.] How is it more scalable than field measurements? Because the industrial-scale kites mentioned above are still not "full" scale?

Answer 1)

The field experiments referenced above were conducted at full scale. However, experimental characterization of aerodynamic properties faces fundamental scalability constraints as system size increases—larger operational AWE systems require increasingly complex and costly flight tests due to expanding demands for measurement equipment, safety parameters, insurance, permitting, and so on. In contrast, once validated computational models are established, determining the aerodynamic characteristics of a 10MW system requires only marginally more computational resources than a 1MW system, while equivalent experimental characterization would demand orders of magnitude more instrumentation and operational complexity. This computational advantage extends beyond cost to encompass time and feasibility, enabling evaluation of aerodynamic performance across different operating conditions and system configurations that would be prohibitively expensive or logistically impossible to measure experimentally.

Answer 2)

Clarified further in the paper by adding: “As system size increases, full-scale experimental characterization demands substantially more complex instrumentation, safety margins, and operational resources. In contrast, a validated computational model permits aerodynamic analysis of successively larger AWE systems at only modestly increasing computational cost, thereby enabling design-space exploration that would be impractical to achieve experimentally.”

Question: [Line 109.] How high was the blockage and why did you choose that amount?

Answer 1)

The blockage amount is detailed in Appendix A, in the discussion of the wind tunnel corrections. With the kite set at the maximum tested angle of attack of 24 degrees, the projected frontal area (Af) at alpha = 24 degrees is approximately 0.2m2. The octagonal wind tunnel opening has an area 7.47m2, resulting in a blockage factor of 3%.

We chose a 1:6.5 scaling as it was a compromise between having a large model, good for achieving higher Re, and having a small model, good for limiting blockage effects and low manufacturing costs.

Answer 2)

Added a pointer to the appendix, which is now Appendix B.

Question: [Line 128.] How were these particular values chosen? (context is the measurement matrix in table 2)

Answer 1)

We chose a range of values representative of kite operations when harvesting energy.

For the angle of attack, different values were selected prior to the experiment. But the values have changed as the 6.3deg correction to the angle of attack was adjusted post-experiment upon re-re-re-measuring the experimental setup. Furthermore, the reported angles of attack include the wind tunnel correction, which was also determined post experiment.

For the side slip (and in fact also for the angle of attack range), the angles chosen were first of all chosen to be representative of real flight. Secondly based on the available CFD data range, which is from 0 to 12deg, and thirdly it was decided to measure a larger range to provide validation data that could be used to analyze the extreme cases of up to 20deg.

The inflow velocity was determined to match Reynolds numbers encountered in flight. Witht the kite flying at approximately 30m/s during flight, and a chord length of 2.6m, we find a Reynolds number of approximately 5e6. This is not achievable within the current wind tunnel setup, due to inflow velocity limitations (but also due to the structural vibration limitations). Therefore inflow velocities were selected that were as high as possible, to get as close as possible to this Reynolds number. The Re =5e5, was furthermore selected as CFD data was available at that Reynolds number

Answer 2)

Added explanation in the first paragraph of section 2.4: Measurement matrix.

Question: [Line 136.] Because? (context: interference effect of kite and support-structure)

Answer 1)

Because of their distance, and it not being measurable within the current campaign. One can only measure the support structure's own aerodynamics, and subtract this from the kite and support structure aerodynamics. But the effects of the interaction between the two cannot be captured using the presented setup.

Answer 2)

Added an explanation in section 2.4: Measurement matrix.

“As the load measurement setup does not allow measuring the interference effects between the support structure and the kite, they are assumed to be negligible.”

Question: [Line 138.] And corrected for? (context: sensor drift was analyzed)

Answer 1)

The sensor drift is accounted for as a ‘zero-run’, a run without wind was conducted before every new measurement set. The sensor-drift present, and captured by measuring the static load, is, in this way, inherently counted for.

Answer 2)

Added an explanation to section 2.4: Measurement matrix.

“A zero-wind measurement was performed before each measurement set, and by using this as a baseline, any sensor drift present in the system was inherently accounted for in the subsequent data.” "A zero-wind measurement was performed before each measurement set. By using this as a baseline, any sensor drift in the system was inherently accounted for in the subsequent data."

Question: [Line 190.] Did you check how good this fit was? (context: Missing data points were determined by interpolation, which was carried out by fitting two linear segments from the minimum to the mean and from the mean to the maximum, respectively)

Answer 1)

This was done, yes. We checked the respective fit with either a single linear line, two linear lines or a parabola. A single linear line clearly did not capture the measured trends, e.g., lowest drag a a medium angle of attack and an increase with large negative and large positive. The parabola seemed to cause problems towards the ends of the measured range; hence, we decided upon using two linear lines.

Answer 2)

Added to step (5) of Data processing:

“A two-segment linear fit was selected as it captured the measured trends, whereas a single linear fit failed to do so and parabolic fits overfitted near the bounds.”

Question: [Line 234.] Why did you choose this condition? (context: beta = 0, alpha = 9.4, for zigzag measurements)

Answer 1)

The beta = 0 is the design condition and was chosen for that reason. The alpha =9.4 was not chosen. Similar to the answer to the question on the measurement matrix (“How were these particular values chosen?”), it comes down to that the angles of attack were corrected post-experiment, both for the offset with steel supporting rods and the wind tunnel corrections. The intended design value was closer to 8deg, the nominal operating condition during reel-out (power production) flight.

Answer 2)

Added to ‘Effect of forced boundary layer transition’ section: “.., selected for its proximity to the nominal reel-out angle of $\alpha = 8\unit{\degree}$~\citep{Cayon2025a}”