

Review report #1

Dear Reviewer,

We sincerely appreciate your time and effort in reviewing our manuscript. While we respect your perspective, we want to address some of the concerns raised in your comments. We disagree with the concern that the paper lacks focus. The sections on flight control and optimization are not intended as separate topics but form part of the methodology necessary to enable the main contribution: the comparison of the three reel-out trajectories. Developing and describing the simulation environment, including control and optimization components, was essential to ensure that the trajectory comparisons are meaningful and reproducible.

Regarding the suggestion to instead perform a parametric study focused on common features (such as ground coverage or cycle time), we note that such an approach would provide similar insights to those already presented. In fact, we attempted constraining the airspace to the same area, but in this case figure-of-eight trajectories were generally unable to sustain converging pumping cycles in such small area widths. For these reasons, we believe the current structure, where methodology naturally leads into the trajectory comparison, best serves the goals of the study.

Sincerely,

Dylan Eijkelhof
On behalf of all authors

Review report #2

Dear Reviewer,

We sincerely appreciate your time and effort in reviewing our manuscript. We would like to clarify that the focus of this paper is not on optimization methodology itself, but on comparing different flight trajectories under realistic operating conditions. While we agree that a detailed sensitivity study on penalty functions and optimization parameters could be valuable in a broader optimization context, it lies beyond the intended scope of the present work.

To address the concern as far as it relates to our objectives, we have included results from an optimization without the PAPR constraint (the only constraint for which a sensitivity test is physically meaningful) as well as for a lower wind speed. These additional simulations illustrate that the overall conclusions are less sensitive to the optimization strategy than might be expected.

Finally, regarding the suggestion to report full numerical values of the objective function and penalty breakdowns, we believe this would shift the focus of the paper toward optimization aspects rather than the intended comparison of flight patterns. We also note that another reviewer has already suggested that the scope of the paper should be more focused on one thing rather than further split. For this reason, we prefer to keep the emphasis as it is now.

The responses to the detailed comments are attached below.

Sincerely,

Dylan Eijkelhof
On behalf of all authors

Response to detailed comments in review report #2

A new penalty term, p_α , is introduced in Equation 8, but it is not described anywhere in the text. Please provide an explanation.

#Response: The penalty term was actually not present in the revised manuscript, it was in the initial version only. However, the angle of attack is always limited to the maximum provided by the kite design and therefore, we removed the constraint from the paper as it is not used in the constraint handling. We also moved equation 8 and the constraint handling to the appendix, as we believe for the general reader, the actual values are not relevant to the study. The section now only mentions the applied constraints to avoid confusions.

Just before Equation 8, the manuscript states that only the PAPR-related penalty is always active. However, Figures 10 and 12 show kite speeds exceeding 100 m/s, implying that the corresponding constraint is also active. This is also mentioned elsewhere in the text. Please ensure consistency across the manuscript.

#Response: This is correct, in the section it is now better stated that the constraint is only applied to the

traction phase, this means the velocity could exceed the 100 m/s during the transition phase, but as stated in the paper, this phase is not modelled in proper detail and is considered a part of future studies.

The paragraph from lines 321 to 331 is difficult to follow. Consider rephrasing it to clearly identify the primary causes of the large turning radii. A bullet-point list could help make this more understandable. Again, a sensitivity analysis would be particularly helpful here. I suspect that the high PAPR values are a direct consequence of the large turning radii: a larger radius leads to greater altitude variation, which results in higher PAPR. If one of the penalty terms is effectively enforcing a lower limit on the turning radius, it could be distorting the solution space. A sensitivity study on the penalty functions (i.e., soft constraints) would clarify how the turning radius changes in response to each constraint. A simpler alternative might be to analyze simulations under lower wind speed conditions, where the constraints are not active, to see how the solutions differ.

#Response: The paragraph is rephrased, including a bullet list to explain the larger turn radii. The larger radii indeed also leads to larger PAPR values due to the altitude variation. This is also explained now in the last paragraph of the results section. However, as can be seen in the newly included results, the optimisation without the PAPR constraint, leads to approximately the same result. Aside from the simulations without the PAPR constraint, the same is performed at a lower wind speed for both with and without PAPR constraint. We further believe that a sensitivity analysis on the other imposed constraints would not be meaningful in this context. The constraints are not arbitrary model parameters but are instead chosen to reflect realistic operating conditions for the system. The purpose of the study is to compare different flight patterns within these feasible and practically relevant conditions. Investigating behaviour outside of these constraints would correspond to scenarios that are considered operationally unrealistic, and thus falls beyond the scope of this work. Nevertheless, such an analysis could be valuable in a different context.

Equations 9 and 10 should be introduced earlier in the manuscript, when PAPR and average power are first discussed.

#Response: We moved the entire section up in the order of the paper to accommodate this.