

Response to Reviewer #1

The reviewer is correct that the asymptotic behavior of generalized momentum theory at high tip-speed ratio has been examined previously, including by Schmitz (1955). In the revised manuscript, the discussion of the limit $\lambda \rightarrow \infty$ has been rewritten to explicitly state that the generalized momentum formulation asymptotically reduces to classical axial momentum theory. The revised text now clearly indicates that the power and thrust coefficients converge to the axial-momentum limits $CP = 16/27$ and $CT = 8/9$. The wording has also been clarified to emphasize that it is the *swirl-related contribution* to torque and power that vanishes in this limit, not the total power predicted by the theory. This revision removes any implication of inconsistency with established results and aligns the discussion with prior analyses, including Schmitz (1955).

Response to Reviewer #2

The reviewer correctly identified a difference in interpretation regarding the high- λ limit in the previous version of the comment. To address this point, the relevant paragraph has been rephrased to explicitly acknowledge that Glauert's generalized momentum theory converges to axial momentum theory as $\lambda \rightarrow \infty$. The revised text clarifies that while the swirl-related contribution to torque vanishes in this limit, the theory remains internally consistent and recovers the classical axial-momentum results for CP and CT . All wording implying that generalized momentum theory predicts zero total power or is internally inconsistent has been removed.

Response to Reviewer #3

The author thanks the reviewer for the constructive comments. The wording describing low- λ behavior has been softened as suggested, so that the limiting values are described as *unlikely to fully represent* the behavior of a physical rotor under such conditions. In addition, the discussion of symbolic manipulation has been revised to focus solely on reproducibility and the verification of intermediate algebraic steps. Any implication that this discussion concerns journal policy or non-scientific matters has been removed. The revised manuscript now focuses exclusively on the physical interpretation and limitations of the one-dimensional momentum model.

Reviewer #1

General comment

The revised manuscript represents a substantial improvement. However, some statements appear to be in tension with established results in the general momentum theory of rotors.

Specific comment (Lines 14–20, $\lambda \rightarrow \infty$)

The asymptotic behavior of the power coefficient $CP(\lambda)$ as the tip-speed ratio $\lambda \rightarrow \infty$ has been studied previously, including analyses extending to fourth order in inverse tip-speed ratio (e.g., Schmitz, 1955). This prior work appears to contradict the statement in the manuscript that “*any expression predicting nonzero power in this limit is inconsistent with the angular momentum balance on which the model is based.*”

The author is requested to either:

- provide a more detailed justification for this statement, or
- revise the wording to account for established results in the literature and cite appropriate references.

Reference

Schmitz, G., *Theorie und Entwurf von Windrädern optimaler Leistung* (Theory and Design of Wind Wheels with Optimum Power), *Wiss. Z. d. Univ. Rostock*, pp. 379–391, 1955.

Reviewer #2

The author has addressed most of the issues raised in the previous review. One remaining point, however, requires attention.

The third paragraph of the revised comment asserts that the generalized momentum model yields a zero circumferential induction factor as $\lambda \rightarrow \infty$, and that this would imply zero predicted power, with any nonzero value being inconsistent. The reviewer disagrees with this interpretation.

From the reviewer’s perspective:

- The original paper by Tyagi and Schmitz is based entirely on Glauert’s generalized momentum theory, without modification of its assumptions.
- In this framework, as $\lambda \rightarrow \infty$, the generalized momentum solution converges to the axial momentum limit.
- The theory does not imply that swirl velocity vanishes identically, but rather that the integrated effect of swirl leads to power and thrust coefficients consistent with axial momentum theory ($CP=16/27$, $CT=8/9$).
- The results presented in the original paper are therefore internally consistent and theoretically expected.
- The additional contribution of the paper lies in deriving a limiting value for the bending-moment coefficient, which is not accessible through simple axial momentum theory.

The reviewer suggests rephrasing the disputed paragraph to reflect this interpretation and to acknowledge that the generalized momentum theory converges to axial momentum results at high tip-speed ratio, rather than implying an inconsistency in the theory itself.

Reviewer #3

The revised comment is now more clearly focused on the physical assumptions and conclusions of the original paper, rather than on external media coverage. This shift is viewed positively.

Specific line comments

- **Lines 14–20:** The discussion of physical consistency is reasonable.
- **Line 27:** The statement “*but do not represent the behavior of a rotor operating under such conditions*” is considered overly strong. The reviewer recommends softening the wording to indicate that such results are unlikely to fully represent physical rotor behavior.
- **Lines 36–48:** The suggestion that the authors should disclose the use of language-based mathematical tools may fall outside the scope of a technical comment and could be more appropriately addressed as a journal policy matter rather than as a scientific critique.

Overall, the reviewer requests a revision of the third paragraph to better reflect the above points.