Bachelor thesis, research internship, advanced seminar or master thesis

Finite Element Analysis (FEM) for a "Drag Power" Kite

Contact/Applications to:

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Motivation

Power generating kites have the potential to generate clean energy at a low cost competitive with coal power plants or cheaper without subsidies (see e.g. [1, 2, 3] and references therein). "Drag power" kites generate power with onboard wind turbines and generators by flying fast crosswind motions, see Fig. 1. Electrical power is transmitted to the ground at a medium voltage level via electric cables in the tether.

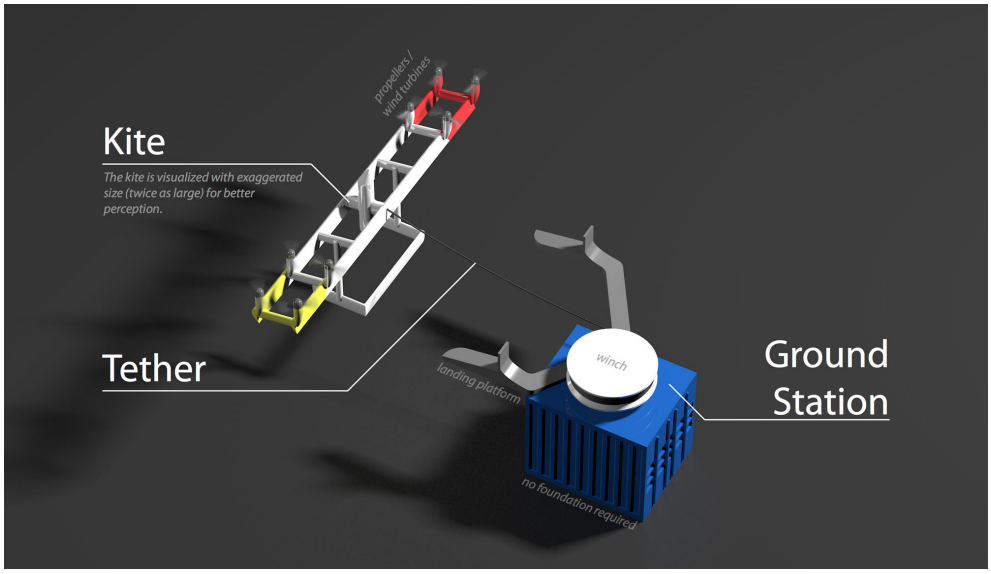

Figure 1: 20 kW "drag power" kite visualization of kiteKRAFT (image source: http://kitekraft.de/Images/20kWProduct.png, accessed: Aug 11, 2019).

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Tasks, Suggested Solution Approach, Expected Results

In this student work, a FEM model of the kite is to set up, based on its CAD model. Static load scenarios based on expected loads from simulations as well as dynamic load scenarios for fatigue analyses are to be designed and set up. The FEM model is to be simplified such that the computational burden can be handled. Based on the results, improvements to the CAD design are to be made and re-evaluated in FEM simulations as well as static load tests on a build kite.

Starting Point

This announcement, the literature list below, and additionally provided internal documents upon start.

Report and Presentation Guidelines

One report (or thesis) and at least one presentation of the results are required. Guidelines and templates can be downloaded from https://github.com/floba/StudentGuidelines.

Your Profile

This student work will be jointly supervised by the Institute for Electrical Drive Systems and Power Electronics, the Chair of Wind Energy, and the TUM startup kiteKRAFT. The ideal candidate

- is a student in mechanical engineering or related fields,
- has good skills/background knowledge in FEM, FEM-software(s), CAD, MATLAB, Office, LaTeX,
- is motivated in the respective field of science and engineering,
- has good English and German language skills.

References

[1] M. Loyd, "Crosswind kite power," Journal of Energy, vol. 4, no. 3, pp. 106–111, 1980.

[2] U. Ahrens, M. Diehl, and R. Schmehl, Eds., Airborne Wind Energy, ser. Green Energy and Technology. Springer Berlin Heidelberg, 2013.

[3] kiteKRAFT: Website, https://www.kitekraft.de, accessed: Aug 11, 2019.