REVIEWS ON THE MANUSCRIPT [31]

Reviewer 1:

I will mainly focus on the presentational side of the article, because I guess there are little feasible changes to the physical part of the manuscript.

In my opinion, the presentaion of the work could be made far more successful.

Firstly, the amount of plain text can be reduced. Now it hinders the understanding.

Secondly, some of graphs are not suitable for the printing, the labes of axes will not be visible on a hard copy.

Description under the Fig. 4 seems to be a little awkward, there is lot of text concerning three different graphs.

Thirdly, more attention should have been paid to the theoretical part of work.

It concerns all data on the Fig. 4: how these data were obtained and how can they be explained.

Conclusion: the article needs major changes before publishing.

Reviewer 2:

This paper discusses the descent of a paper-made device with the longest possible time to fall to the ground from a specific height.

The theoretical model is based on determination of aerodynamic drag and lift forces applied to the chosen paper-made devise of a specific shape. At the same time, there is no previous work cited.

The work is well structured and ensures a smooth reading. The argumentation is clear.

There are some requests:

1. There is no information at all about the time of falling of non-rotating devices.

I recommend mentioning the average time of fall, just to compare it with a rotating device.

2. Important (!). Compare Figure 4 (Time of fall vs. length of blades) for paper-helicopter devices and Figure 8 (Predicted time of fall vs. length of the blades) for a helicopter, too.

These graphs should be similar (values predicted by the theory), shouldn’t they?

If they should, please, find out and correct the mistake. If not – what is the difference among them and how it can be explained? Were different paper-made devices used? Please check.

The article is recommended to be accepted for publishing, if the suggested details are clarified.

Reviewer 3:

Comments & suggestions:

The article focuses on the experimental part of designing a slowest-falling object.

The number of conducted experiments is high.

However, the theoretical part is not sufficiently well described (we see for example a curve for the predicted theoretical velocity in Fig. 7, but there is no exact equation in the text for that velocity. Maybe this curve is a result of a simulation? It is so far unclear.)

- Please, clarify the theoretical part. What are your assumptions, what equations and dependencies you finally derive, and what do you take as the input values for the simulation. I am under an impression that you mix or confuse the simulation with the theory.
- Provide “color” scale bar for the Figure 6.
- There is a number of spelling mistakes (for example, in the caption for the Fig. 4a – “)” missing). Please, check the spelling once again
- It is unclear what the theoretical curves on the graphs are (Figs 4, 7, 8). It should be explained properly.

Style & structure:

The text has rather well understandable structure. The language is sometimes unclear, unspecific in particular, but the style is well chosen for the scientific article.

Literature:

The authors do not refer to any additional literature or external sources, which is a drawback of the article.

Many places in the text clearly require referencing (e.g.: about FLUENT simulations, or drag coefficients etc.) All these need a reference to an external source of information, for an interested reader at least. Provide those references and others alike, if possible.

Recommendations:

The manuscript is recommended for publication only after revision (see the comments part).

Editorial request

80 gr per square meter: 80 g/m^2

Figures 1, 2: consider adding a scale bar

CFD: computational fluid dynamics

FLUENT: provide a reference and a minimum information about the solver

Figure 7: a direct calculation or a fit with several tuneable parameters? If slighly different input parameters are used, can the curve provide a better fit for experimental data?

Video analysis: consider adding one or several snapshots of the video with a descending device. Consider sharing some of the videos as online supporting material.

References: Has there been any previous research on the hydrodynamic properties of a descending helicopter-shaped spinner? If yes, this deserves a reference. If no, it brings a noticeable novelty to the project and may be mentioned.

At the moment, the Editor is aware of a large number of publications on descending single-winged spinners (maples seeds, samaras, etc.) and double-winged spinners, but cannot immediately cite a work on a four-winged helicopter.

Figure 6 and related calculations: if air density and viscosity are used in the calculations, a length scale bar would be an appropriate (and necessary) addition to the figure.

What were the order of magnitudes for the Reynolds' number of such a system?

A paper device with such a complex shape, protruding wings with a length of ca. 30 cm, translating at ca. 1 m/s and revolving at an unreported angular speed, is quite likely to generate a turbulent flow pattern, one may suggest. Consider adding a commentary.

Is it correct that the flow is purely laminar on Fig. 6?

Report all input parameters used in the simulation.

Experimental angular speeds of the descending devide: please report them if they were measured. If not, consider providing an estimate of their order of magnitude.