

Universität Stuttgart

INSTITUT FÜR AERODYNAMIK  
UND GASDYNAMIK

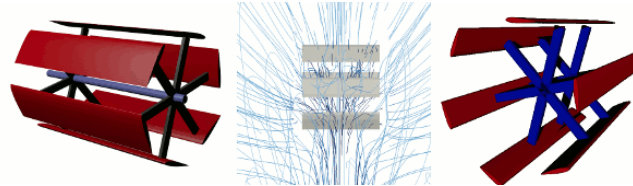
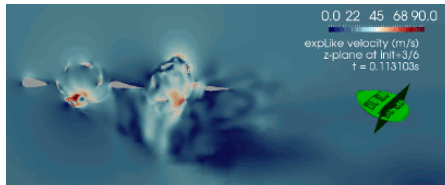
IAG

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## Master or Bachelor Thesis Topic

### Report on the Current State of the Art for Cycloidal Rotors



Cycloidal rotors have the advantages of providing  $360^\circ$  thrust forces and having constant flow velocities on their blades. However, the deformation of their blades reduces efficiency and is not well understood. Also, while air enters and exits the rotor, it encounters the blade twice and this favors dynamic stall and blade-vortex interaction. The given advantages over conventional helicopter rotors and consequent challenges make cycloidal rotors ideal for research. The aerodynamic phenomena they produce are investigated by means of numerical fluid simulation.

Although research covering their aerodynamics is far from being as thorough as more conventional rotors, a considerable amount of data is available in the literature. It is, however, difficult to quickly find all available data for any cycloidal rotor having specific geometrical and operational properties.

The theme of the proposed thesis is thus to conduct a literature review of the research done on cycloidal rotors. The objective is to systematically retrieve the aerodynamic properties such as power, thrust, figure of merit, dynamic stall, and wake behavior reported in the literature. Rotors alone and cycloidyros in both experimental and simulated setups should be considered.

#### Tentative milestones:

- gather literature available for cycloidal rotors
- categorize the accumulated documents and gain an overview of what is at hand
- systematically retrieve all relevant information from the gathered literature
- assess the influence of the Reynolds number on their performance
- briefly cover their aquatic and wind turbine counterparts
- present the results in the form of a literature review paper

#### Prerequisites:

- interest for fluid mechanics, rotors, and scientific research in general
- patience, attention to detail, and good sense of organization
- willingness to learn concepts required to understand what is reported in the literature

#### Language:

The supervision can be conducted in German, English, French, or Italian according to the preference of the student.

The thesis should be in German or English.

#### Interested?

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