Institut für Hydromechanik (IfH)
Leitung: Prof. Olivier Eiff, Prof. Markus Uhlmann,

- Research group: Building and Environmental Aerodynamics -

Final Year Thesis (BSc or MSc):

Wind Tunnel Study on Aerodynamic Performance of Velomobiles

Motivation

Velomobiles are fully-faired recumbent bikes also referred to as human powered vehicles (HPV). Due to their streamlined shape, velomobiles experience considerably lower drag than other bicycle types. Drag coefficients of velomobiles are typically less than one fifth of those of conventional cyclists. An intrinsic challenge of wind tunnel experiments with reduced-scale models involving streamlined shapes is the typically pronounced Reynolds number sensitivity of aerodynamic characteristics and connected to that their transferability to full-scale.

Figure: Velomobile on speed record run and scaled model velomobile in wind tunnel test.

Objective and Approach

The project seeks to investigate the Reynolds number sensitivity of the aerodynamics of a model velomobile in a reduced-scale wind tunnel setup. Particular focus is on the impact of surface roughness of the velomobile envelope on the Reynolds number sensitivity of aerodynamic loads. To this end, various surface roughnesses realized by sand grain layers of different packing density attached to the envelope will be tested.

Tasks

- Measurement of aerodynamic loads on a model velomobile for
  - sand grain layers of different packing density,
  - various wind velocities,
  - different angles of wind attack.
- Determination of aerodynamic coefficients and analysis of their Reynolds number sensitivity.
- Surface pressure measurements and analysis of their Reynolds number sensitivity.
- Measurement and analysis of the flow field around the model velomobile (MSc thesis only).
- Documentation of the work and results.

Duration: 3 / 6 months (BSc / MSc) **Availability:** with immediate effect

Daily supervisors:

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