Karlsruhe Institute of Technology

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Bachelor thesis – experimental

Measure skin-friction accurately in a new wind-tunnel facility

Background

Flow control is a broad and active research field in fluid mechanics which investigates how the natural behaviour of flows can be favourably modified in view of particular technological goals. For instance, the flow in a cyclonic vacuum cleaner can be tuned to make the device more silent or the surface of a car improved in such a way that the aerodynamic drag decreases. Flow control aimed at reducing the drag due to skin-friction is a very enticing field, thanks to the large potential economical savings for the transport industry. In our institute we experimentally assess novel technologies for skin-friction drag reduction, for which accurate measurements of the friction drag are required. Such measurements are very challenging, since small variations of usually small quantities must be detected. A new wind-tunnel has been recently built with the explicit purpose of enabling extremely accurate friction measurements..

Content of the Thesis

This project aims at characterizing the flow in the wind-tunnel by systematically measuring the skin-friction along the 4 meters long duct flow through accurate pressure-drop measurements. The reproducibility and uncertainty must be carefully addressed and the influence of the ambient quantities such as temperature changes must be taken into account. Different pressure-based flow-rate measurement devices, several orifice flow meters and nozzles, are to be tested in different Reynolds number ranges. The consistency of the result must be proved. If no problems in the measurements is evidenced, further experiments could be planned.

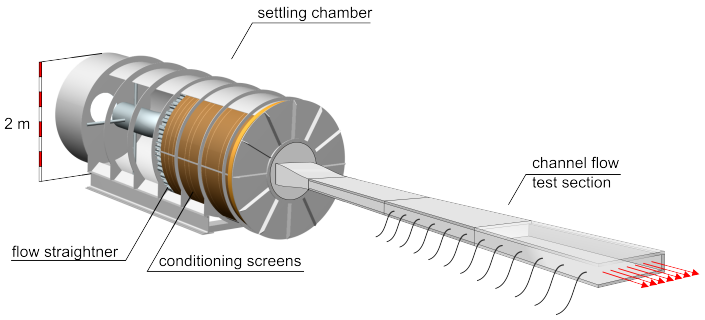

Abb.: Sketch of the wind tunnel.

Requirements

basic knowledge in fluid mechanics

Start: immediately

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