

10th July 2018

master's thesis – experimental

Modification of a wind tunnel test section for optical measurements

Background

The wind tunnel facility at the Institute of Fluid Mechanics (ISTM), Karlsruher Institute for Technology (KIT), allows to perform high-accuracy measurements of the skin-friction coefficient within a turbulent air-channel flow. Hence, passive and active flow control devices may be deployed to reduce friction drag in comparison to a smooth-wall reference case. The mechanisms that pertain to turbulent flow control require however a spatio-temporal resolution of the flow structures with particle image velocimetry (PIV) and Laser-Doppler-Anemometry (LDA). These measurement techniques are both based on the illumination of particles by a laser light source. Currently, the test section is optically isolated from the ambient and a system for seeding the channel with particles has to be developed.

Content of the Thesis

In this Master's thesis project, a particle supply system and a test section with optical access will be added to the existing wind tunnel facility. This includes an appropriate interface for the optical equipment (camera and laser) and the particle injection. First, some conceptual ideas have to be assessed. As a next step the chosen design will be elaborated on a CAD software tool. This work further comprises the construction of the eventually designed CAD model. The final aim of the thesis is to run a first experiment with a LDA system in the modified wind tunnel in order to evaluate the applicability of measurement systems based on the illumination of particles by a laser light.



Requirements

basic knowledge in fluid mechanics

Beneficial Skills

experimental experience with PIV/LDA
basic knowledge of optical
measurement systems
experience with Creo and Matlab

Start: immediately

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