Universität Stuttgart
INSTITUT FÜR LUFTFAHRTANTRIEBE
UNIVERSITÄT STUTTGART
Prof. Dr.-Ing Stephan Staudacher

Bachelorarbeit

Flow control on a circular cylinder due to a moving wall actuator and its effect on vortex shedding

Background

The occurrence of flow separation over a cylinder in cross flow and hence the downstream vortex shedding cause significant aerodynamic loss. The topic is very old and constitutes a huge body of interesting literature on flow separation and vortex shedding control. Active and passive techniques have been considered for the purpose. Recently, the active flow control techniques such as the plasma actuators are commonly used for reduce aerodynamic losses. The current study considers a moving wall actuator to investigate its performance in controlling the flow separation and vortex shedding.

Goals of the work

The goal of this study is to evaluate the performance of moving wall actuator in delaying or completely avoiding the flow separation over a circular cylinder in cross-flow and on the downstream vortex shedding. The purpose is to understand the mechanism of separation delaying, boundary layer actuation, and the effect on downstream vortex shedding. The proposed flow situation is shown schematically in the following figure.

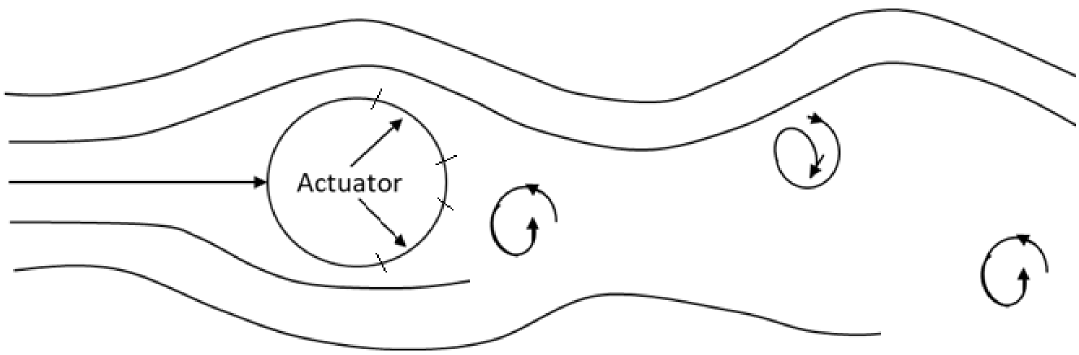

Figure: Schematic of the proposed scenario.

Working points

- Literature survey regarding the state-of-the-art of active/passive flow control techniques
- State-of-the-art of the applications of moving surface actuators
- Setting up the CFD (OpenFOAM) computations
- Implementation of the actuator boundary conditions
- Synchronize different placements of the actuator and sort out the most impacting one
- Summarize the outcomes
- Write the thesis

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Skills development within the context of work

- State-of-the-art of flow control techniques
- CFD OpenFOAM computations
- Post processing
- Flow and aerodynamic analysis
- Understanding the physics of flow

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