# COLLOQUIUM ANNOUNCEMENT

Faculty of Engineering Technology

Department **Engineering Fluid Dynamics**
Master programme **Mechanical Engineering**

As part of his / her masterassignment

## JELLE BASTIAAN WILL

will hold a speech entitled:

## AERODYNAMIC NOISE OF THIN AIRFOILS IN TURBULENT FLOWS: A DETAILED EXPERIMENTAL VALIDATION OF SEMI-ANALYTICAL METHODS

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| Date | 27-01-2017 |
| Time | 14:00 |
| Room | HT 500B |


#### SUMMARY

In todays society noise pollution is an ever growing issue. According to new research by the Dutch CBS around 50% of the Dutch population experiences excessive noise on a regular basis. Research into the effects of noise on physical and psychological well-being shows ever increasing evidence that people are getting sick and experience stress due to excessive exposure. Noise pollution is stating to be the largest environmental issue of the coming decades as sources of noise pollution are ever encroaching on our living space. One of the main growing sources of noise pollution is aeroacoustic noise e.g. the usage of drones that is becoming more and more prevalent, or wind farms close to urban centers to meet our ever increasing demand for green energy.

Therefore predicting noise levels in the preliminary stages of design will become more important to meet ever stricter requirements. Current approaches are very time consuming and expensive. A solution can be the use of so called semi-analytical techniques which allow for quick approximations. One such model, based on the Amiet theory, for a turbulent inflow on thin structures, e.g. airfoils, is treated in this work. To validate this model experimental testing and validation is required. This is the main topic of this thesis.

To perform these types of measurements the wind tunnel has been modified to produce a turbulent inflow which matches theoretical turbulence models and is quiet enough to obtain adequate signal-to-noise ratio for acoustic measurements. The turbulence flow has been characterized using Constant Temperature Anemometry (CTA) and Particle Image Velocimetry (PIV), allowing for reconstruction of the turbulence spectrum for noise prediction purposes. Acoustic measurements of several airfoils in this turbulent flow have been performed. These results show a good match with prediction levels.

The experimental setups and techniques developed over the course of this thesis can accurately validate noise generation models for simple airfoil shapes. Variations in the measured sound pressure levels of the wings can accurately be observed. This is promising for further research since it allows for validation of more detailed models for more specific cases. In the long run the methods thus obtained will be important tools during product design and development.


#### ASSESSMENT COMMITTEE

chairman

| | |
|---|---|
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d.d.