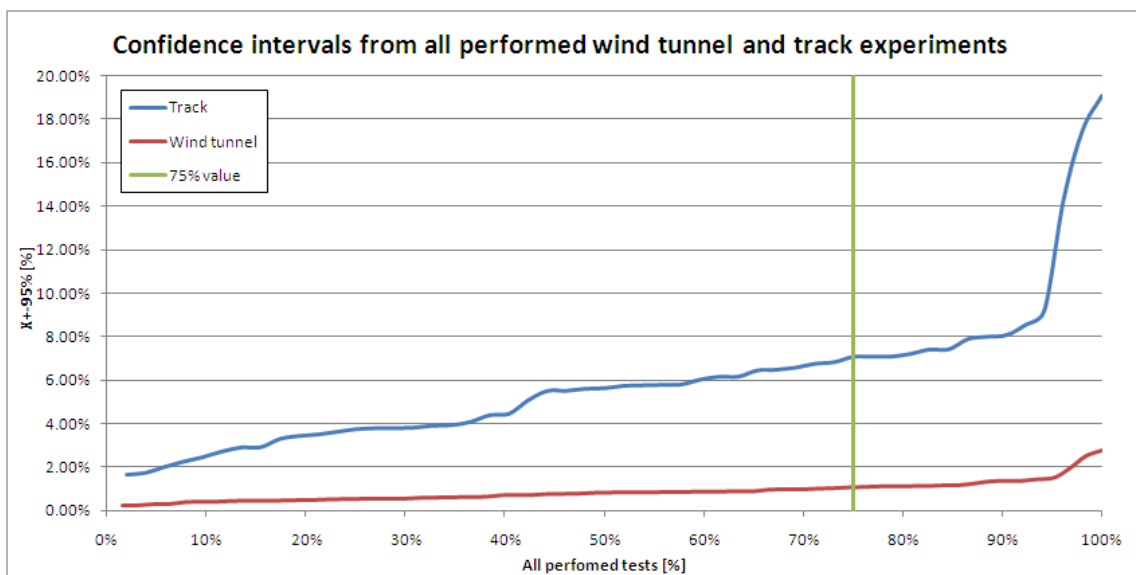


## Summary

This report is the result of my, Sander Oostlander, research. The research has been performed as part of my Master of Science education at the Technical University of Delft. The research has been performed in the fall of 2010 until the spring of 2011. The research consists of a comparative research between aerodynamic testing of cyclists inside the brand new Open Jet Facility at the TU-Delft and on the wooden 250m track in Büttgen, Germany. Both experiments have been carried out with 6 cyclists, from which 5 from the Rabobank Cycling Team. The goal of the research is to create an objective image of both experiments and to compare these images.

Inside the wind tunnel 63 experiments have been performed. During the experiments the drag force of the cyclist and his bicycle was measured 5x 30 seconds and the  $C_dA$  of each position was determined 5 times. Using linear regression a final  $C_{dA_{average}}$  was determined for each position. On the track 52 experiments have been performed, from which 36 were identical to the wind tunnel experiment. A SRM power meter has been used on the track to determine the power needed for the cyclist to cover 18 laps with 6 different speeds. Six intervals of 20 to 40 seconds were manually selected out of the SRM file. These 6 intervals resulted in 6  $C_dA$  values and using linear regression a final  $C_{dA_{average}}$  was determined. For both experiments the 95% confidence level has been determined using the studentized method. The figure below shows the resulting confidence intervals of all experiments with  $C_{dA_{average}}=100\%$ .



With the wind tunnel experiment it is in 75% of all experiments possible to distinguish a difference between two positions of 2.14% with a certainty of at least 95%. Compared to the 14.1% of the track experiment one can only conclude that, in this research, the wind tunnel experiment is far more accurate than the track experiment.

When looking at the comparison on equal positions almost all confidence intervals of the track results overlap. But also a lot of confidence intervals of the wind tunnel experiment overlap. When comparing the trends of some wind tunnel and track results one could state that there is some equality. So the track experiment could very well be suitable for a test to create an initial (basic) position for a cyclist. The track experiment also provides a more realistic feel for the cyclists. But for really fine-tuning a position and to get a close look of the position and the airflow the wind tunnel is the better option.

The wind tunnel experiment as performed may have the better confidence interval, it's still not good enough though. Small differences between multiple 'good' positions cannot be measured accurately. So the used experimental setup should be modified to enhance the accuracy. The accuracy of the track experiment should be improved, most likely by changing the method used to determine the  $C_dA$  out of the cyclists' power.