

# Cycling and Aerodynamic

Christian Rossi

## Abstract

The importance of aerodynamic resistance has been always recognized by cyclists and engineers, who over many years have been trying to find ways to reduce the aerodynamic drag.

It was found that after reaching the speed higher than 50 km/h, the aerodynamics influences the drag by 90% (Lukes 2005). Therefore, the aerodynamics plays an important role and it could influence the result of a race. While most of the aerodynamic studies of cycling are focused on the aerodynamic drag of a single cyclist, several efforts have also been made to evaluate the effects of drafting techniques. The drafting is a technique which can be explained as two or more cyclists ride close behind each other to reduce aerodynamic drag. Bert Blocken and his research team from the Eindhoven University of Technology simulated the aerodynamic drag of two drafting cyclists. Three different CFD simulations in terms of the rider position for different separation distance were made: upper position, dropped position and time trial position and distance from 0.01 m to 1m. All the simulations were supported by wind tunnel measurement. The results say that drag reduction decreases with increasing separation distance between cyclists. Simulations for a single cyclist have been made and compared with drafting simulations: the drag reduction of the trailing cyclist is 27.1%, 23.1% and 13.8% for each different position. The study confirms a drag reduction also for the leading cyclist for a value of 1.3% for a distance separation of 0.15 m. The study implies that the strategy for team time trials should not be determined only by the power performance but also by the body geometry, rider sequence and the resulting aerodynamic drag of each team member.