

Test Outline

Using Aero Optim 20J (W1 × H3 units) and bicycle measuring table, we performed the a comparison test with an academic paper by Blocken et al. (2018)* that verified the aerodynamics of downhill positions using CFD and wind tunnel experiments.

*Bert Blocken, Thijs van Druenen, Yasin Topalar and Thomas Andrianne (2018) , “Aerodynamic analysis of different cyclist hill descent positions” , Journal of Wind Engineering & Industrial Aerodynamics, 181, p27-45.

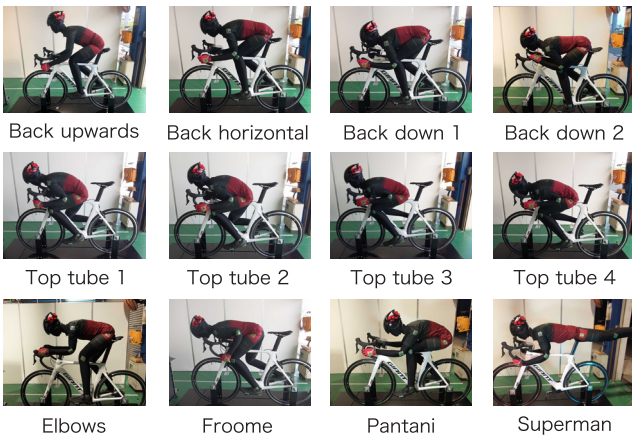
Test Conditions

	Our Test	Blocken et al. (2018)
Bicycle	GIANT PROPEL ADVANCED 1 SE (2020)	Simplified Model (no chains, sprockets or cables)
Riders	Mannequin : h=1.8m Human : h=1.75m, w=66kg	Simplified model of human, h=1.83m w=72kg
Wind Tunnel Conditions	Outlet W=0.67m H=2.01m, Eiffel-type, open-flow, Blockage = around 30% Fluctuation = less than 1%	Outlet W=2m H=1.5m, Göttingen-type, closed-loop, Blockage = around 3.5% Fluctuation = less than 0.2%
Scale	1/1	CFD : 1/1 Wind Tunnel : 1/4
Positions	12 (three positions were omitted due to equipments)	15 (four of them were tested in wind tunnel)
Model Surface	Outfitted with cycling wear, helmet and gloves	Smooth surface (no-slip surface in CFD)

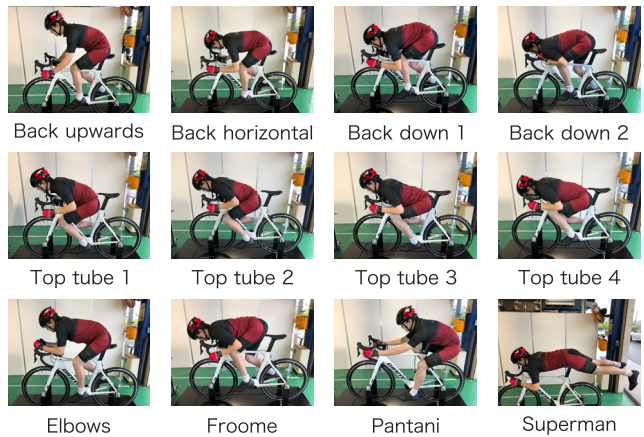
List of Positions

*Position name from Blocken et al. (2018)

Mannequin

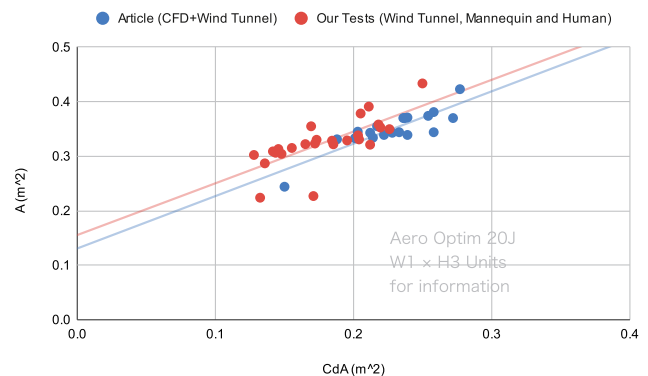


Human



Results and Discussions

Although our overall test results showed slightly lower drag area values, the trend was generally consistent. This suggests that the Aero Optim is suitable for applications where the aerodynamics of a cyclist's riding positions are compared against one another. The reason for the overall smaller aerodynamic drag may be due to differences in the body size, vehicle, support direction, clothing, and blockage of the test object.



Frontal area versus drag area, for 12 cyclist forms in Blocken et al. (2018) and our experiment

Remarks

The results of the wind tunnel test in the paper were corrected by the wind tunnel correction factor and blockage. The CFD in the paper was conducted under conditions where the effect of blockage could be ignored. In our experiment, only corrections for temperature, humidity, and air pressure were made.

The measurement table used in this experiment is still under development, and the evaluation of accuracy and error is insufficient. Therefore, the results of this experiment are presented as reference values for comparing riding positions.

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