

EXPERIMENTAL AERODYNAMIC STUDY OF A CAR-TYPE BLUFF BODY

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The purpose of the project was to realize reference tests in VKI-L1 wind tunnel in order to qualify the facility for aerodynamic applications. In addition to classical measurement techniques, the project was the occasion for a first implementation of PIV in the tunnel for aerodynamic study.

As reference, a car-shape model, called Ahmed body, was built at the VKI. It is a classical model used as a reference in the literature for both wind tunnel testing and numerical simulation. In order to compare results with existing data, five rear parts (10° , 20° , 25° , 30° and 40°) were built to study the influence of the rear angle on drag.

To ensure a good reproduction of reference conditions, VKI-L1 ground vehicle facilities were improved in open and closed test sections. (Figure 2)

Two test campaigns were carried out in which the evolution of drag coefficient with the rear angle has been established. Corrected results were compared with literature data. The physical interpretation of the evolution of the drag coefficient was supported by oil visualization and by PIV results.

Corrected results from the two test sections give a very similar result at less than 1% difference. Drag coefficient results follow the same evolution in comparison to the original data. In general, results agree within 5 to 6 % with the result published in the literature.

During the project, PIV was performed for the first time in the closed test section with the 30° rear slant. The test was satisfactory, it confirms the flow behaviour at high rear angle, validate the suitability of L-1 for PIV purpose and brought first information on the instantaneous velocity field.

The Ahmed body was used for the first time at VKI, this simple and flexible model can be used for many applications like unsteady wake investigation, upstream condition parametric study or development of flow control. The model shape is also suitable for implementation of measurement techniques or numerical code validation.

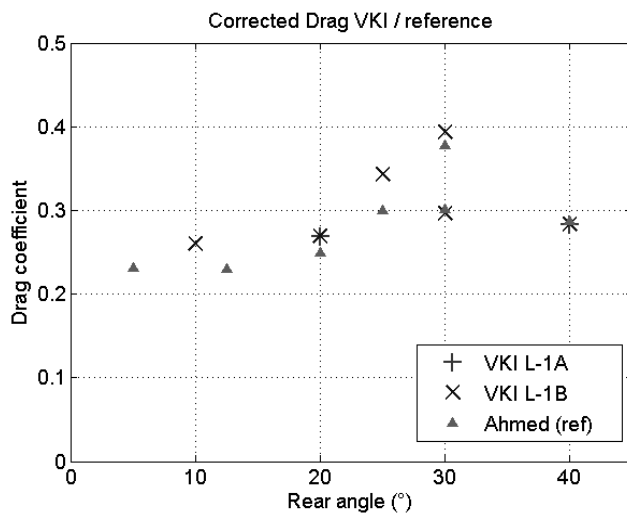


Figure 1: Final drag measurement results

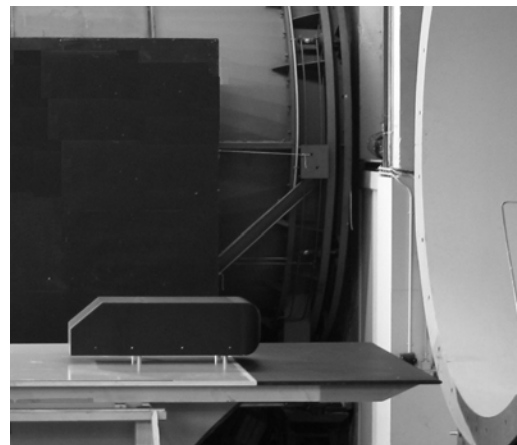


Figure 2: The model in the tunnel