



Aerodynamics

As soon as a car is driven at a speed of over 80 kph and does not encounter any type of gradient, **most of the energy that its engine delivers is devoted to overcoming air resistance.** This force, which opposes the progress of the vehicle, is directly linked to the vehicle's Cd or drag coefficient – the coefficient of its air penetration along the axis of its motion. The lower the Cd, the less friction there is from the air and therefore the power the engine must deliver just to maintain speed will be reduced in consequence. It follows that the Cd of a vehicle has a considerable impact on fuel consumption.



RENAULT COMMUNICATION

BASIC FACTS

Mastering the aerodynamics of a car is a particularly complex task. To begin with, shapes such as a teardrop that have an optimal Cd, are not necessarily applicable to car body design. Furthermore, the slightest protuberance, however minimal, such as a windscreen seal, is capable of upsetting the airflow and degrading the Cd. The drag coefficient of a car is proportional to the square of its speed. This means that when the vehicle doubles its speed, the force of the air resistance is quadrupled. Clearly, it is at high speeds that poor aerodynamic performance can have a rapid impact on fuel consumption.

IN SHORT

Aerodynamic design of the car makes it possible to bring down its resistance to air at high speeds. The better the car penetrates the air, the less the call on the engine to maintain speed, and therefore the lower its fuel consumption.



HOW DOES IT WORK?

1 A QUESTION OF CD

Although the shape of the front end of a car is important, helping it carve a passage through the air molecules, aerodynamic performance depends largely upon the rear of the vehicle. Low-pressure zones that arise in the wake structure of the vehicle tend to exercise drag. This drag accounts for 70% of the aerodynamic force. Any elements such as driving mirrors, air intakes, wings or even the car underbody will impact the global Cd. Occasionally the most minute modifications, almost invisible to the eye, deliver considerable improvements. This, for example, was the case with the rear quarter-light deflectors visible on the Mégane Scenic. These small plastic components play a major role in the vehicle's aerodynamics. They control the spot where airflows peel off the rear of the car, so by helping the air flow better at the rear of the car they contribute to lowering the vehicle's Cd. To optimise the aerody-

namics of its cars, Renault makes considerable use of digital computer models. These are used to "strip down" a car body to try and achieve the ideal trade-off between aerodynamics and technical constraints and considerations of appearance. Frequently, the differences between two solutions are to be found only in the details.

Digital modelling does not yet offer a sufficiently detailed analysis to quantify all possible effects accurately. For the purposes of refining its studies and conducting extremely detailed analysis of the aerodynamic behaviour of all its new models, Renault uses a brand-new next-generation windtunnel known as the S2A that can test 1:1 scale models of cars. In addition, it has ultra-silent functioning which makes it possible to take acoustic measurements. These are used to detect sources of air noise arising from the body and eliminate them.

2 DID YOU KNOW?

The laws of aerodynamics seem to defy those of common sense. For example, a relatively short vehicle rear delivers better Cd than a car with a curved, semicircular rear design.

