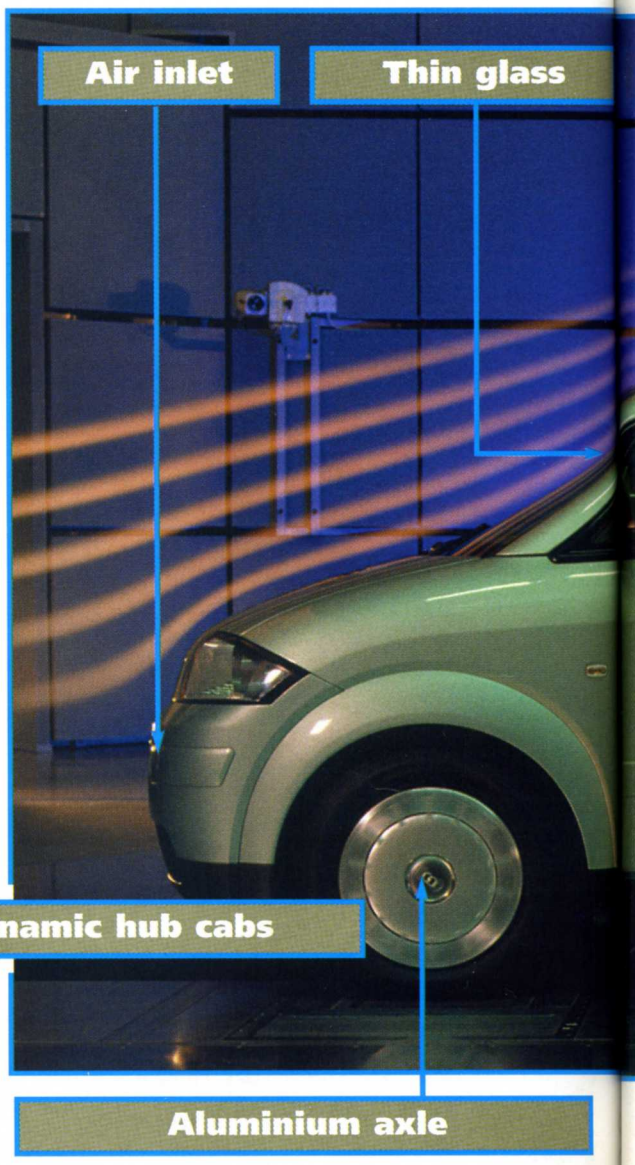
Lightw

If there is one overriding aspect to the A2 it is the fanatical attention to detail that been lavished on the car by its engineers and designers. Nowhere is this more apparent than in the so-called '3 litre' version which sips only three litres of fuel for every 100km covered. James Brewer highlights some of the more intriguing technologies that have been employed by Audi to trim the 1.2TDI's weight down to 825kg—an impressive 165kg less than the standard A2 1.4 TDI—and hone its Cd statistic to a class-leading 0.25



Aerodynamics

The already slippery standard A2's Cd of 0.28 has been optimised even further to a class-record 0.25. According to Thomas Knott, head of Audi's A2 technical release department, the 10 per cent improvement in aerodynamic drag results in a two per cent reduction in fuel consumption over the latest European driving cycle.

The savings are in the detail.

The lower Cd was achieved by marginally reducing the width of the wheel arches. The barely perceptible 'valley' where the wheel arch meets the body, is common to all models and has the effect of smoothing the airflow while making the wheel arches look as if they flare out a little more than they actually do.

Narrow—145/80R 14—tyres were specially developed by Dunlop and wind tunnel tested. Small 'wings' were developed for the inner walls that smooth the air flow round the tyres. The 'Aero fan' wheel trims also help to reduce drag.

Because the 1.2-litre, three-cylinder engine requires less cooling and a lower volumetric flow of air than the 1.4 TDI A2, Audi was able to blank off frontal air intakes and sheath the underside of the engine with a removable moulding that reduces underbody drag.

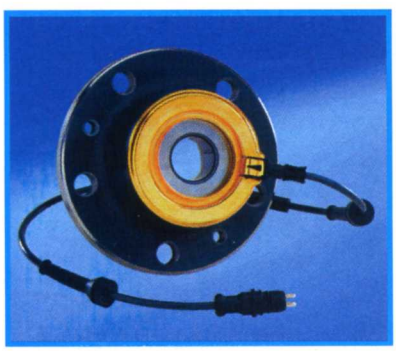
Weight watchers

At 990kg the standard A2 1.4 TDI weighs some 230kg less than its nearest, conventionally-built steel rival. But to achieve the holy grail of 3 litres/100km, even more weight had to be taken out of the car.

Knott calculates that in the weight range of the A2 fuel efficiency improves five per cent for every 10 per cent of weight saved. The task is difficult enough in a big vehicle but a massive challenge in one that already weighs less than a 1000kg, where it is still necessary to retain the same level of refinement and standard equipment.

The biggest savings—totalling 81kg—resulted from replacing steel suspension components with aluminium designs, while Lear Corporation developed lighter seats, saving a further 19kg. Replacing the steel brakes with alloy systems shaved further weight off the car.

Lightweight braking system shed vital kilograms



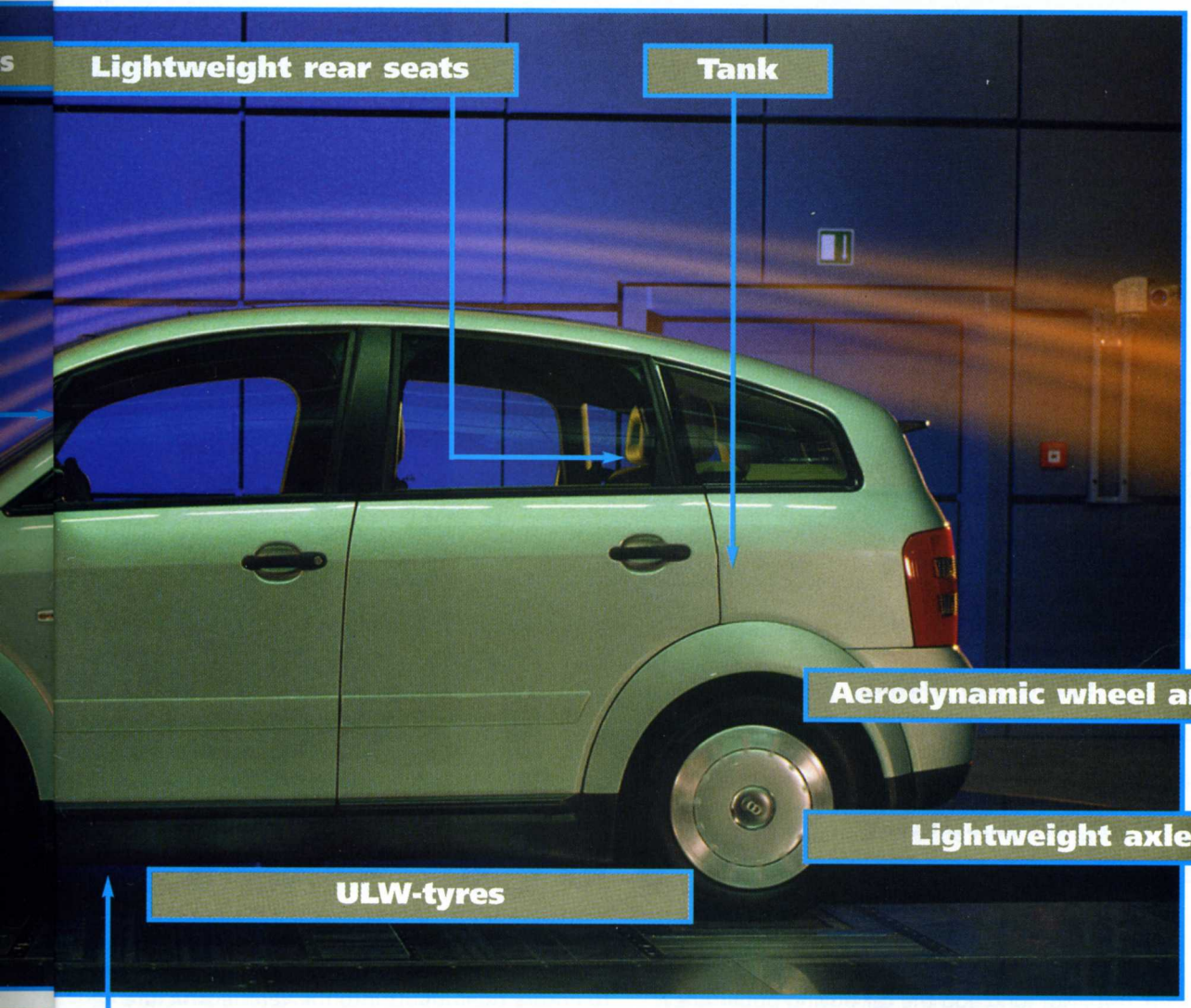
From within VW Group the all-aluminium three-cylinder direct injection engine, first used in the Lupo, was adopted. That lopped a further 17kg off the total weight.

Another 18kg was shaved from the body, equipment (7kg each) and exterior trim (4kg).

Further weight was saved by using thinner glass (3mm) for the front and rear screens and also reduced weight in the upper regions of the car.

The ultra light-weight two passenger rear seat from Lear is especially interesting. Specially developed for the 3 litre car, it is 50 per cent lighter than a conventional seating system using steel as the basic material.

eight superstar



An exhaustive engineering effort resulted in a design which comprises aluminium profiles glued and riveted to a Lear-developed aluminium sandwich sheet.

To reduce weight still further, finite element analysis techniques were used to determine which areas of the aluminium sheet could be eliminated without damaging the functionality of the seat system. Consequently, any 'heavy' and unnecessary use of metal could be neatly cut away while retaining the seating structure.

The same approach was taken to the use of foam which was removed from the seat design in areas where it is of no benefit to the occupant..

In addition, a space was created behind the aluminium seat back and the foam in order to provide further weight savings. Comfort was fully maintained.

Under floor tray reduced drag