

White vans goes green: Novel spoiler design reduces fuel consumption

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As if the drivers of mini vans and utility vehicles needed any more encouragement to drive fast between jobs, US researchers have designed a new rear spoiler for bluff-backed vehicles that can reduce drag and lift significantly. Writing in the *International Journal of Vehicle Design*, the team describes how the new spoiler could improve fuel consumption as well as vehicle handling.

Inchul Kim of Metacomp Technologies, in Agoura Hills, California, working with Xin Geng and Hualei Chen of the University of Michigan-Dearborn, explain that a traveling vehicle experiences two main aerodynamic forces.

The first is drag, or air resistance, and is in the opposite direction to the movement. The second force is lift, which is perpendicular to the drag and to the road.

The greater the drag, the more energy is needed to propel the vehicle and so the more fuel that it uses to cover the same ground at a given speed. Lift reduces the amount of friction between the tires and the road and so lowers traction. This also reduces efficiency as well as deleteriously affecting handling.

Kim and colleagues have used the principles of fluid dynamics, which were first developed in the nineteenth century, to create a computer model of a moving mini-van, on which they could test a spoiler design for the twenty-first century.

"The scientific principle and geometry of the new rear-spoiler are completely different from those of conventional spoilers that have been used so far," the researchers explain. Conventional spoilers resemble an inverted plane wing and generally working by increasing the downward force on the back of the vehicle as well as improving the flow of air across the bluff rear. The new rear spoiler resembles a wave in profile rather than a wing and acts like a diffuser when it is attached to the back of a vehicle. The air pressure on the back of a vehicle with the new spoiler is higher than that on the back of a vehicle without it, the researchers explain.

The team's calculations suggest that the spoiler can reduce drag by 5% and switch lift from positive to negative at 67 mph. Given that more than two-thirds of a vehicle's power is consumed overcoming drag at highway driving speeds, this could translate into a significant fuel saving of up to several miles per gallon. This could amount to a saving of several hundred dollars a year depending on mileage as well as a concomitant reduction in carbon emissions.

Equally, however, the increase in vehicle power could be exploited by an unscrupulous driver to push the mini-van to the speed limit.

"The new rear spoiler can be applied to other minivans, vans, sports-utility-vehicles and buses," the team says, "With the new spoiler attached, the vehicles having a bluff back would have not only a higher mileage but also better stability." The researchers are currently optimizing the design for further performance improvements.

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