

# How to Design Aerodynamic Cars

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Aerodynamic design in automobiles has been an intense field of study ever since Buckminster Fuller built his three-wheeled, teardrop-shaped Dymaxion in 1933. Since aerodynamic drag goes up with the square of speed (in other words, you need four times as much power to go twice as fast), reducing drag has been a priority in all areas of performance from land-speed-record seekers to road-going fuel sippers like the Toyota Prius and Honda Insight. Aerodynamics, however, is a complicated science. Consider contacting your local university and enrolling in an introductory course on the subject. Short of that, pick up a copy of racer Paul Van Valkenburgh's seminal book "Race Car Engineering and Mechanics."

## Basic Design

1. Reduce the front cross-section (vehicle size when viewed from the front). No matter what else you do to a car, its aerodynamic drag is determined by how much air it has to push out of the way. You can achieve a minimal frontal cross-section by bringing the car as low to the ground as possible, keeping the hood low and making the roof no higher than it needs to be to accommodate the driver's head.
2. Shape the sheet metal of the car to be as close as possible around the mechanical parts and driver. Treat the driver's head, the engine and the tires like a skeleton around which you can shape the car's skin.
3. Make it sleek. If you were to cut a football in half (lengthwise), you'd wind up with a shape with a flat bottom and a bulge in the center that tapers to a point at both ends. Now, imagine this shape is your car when viewed from the side. In the world of car aerodynamics, this "half-football" is the ideal shape; the long front taper helps to speed air over the car and the rear taper keeps that air from whipping around behind the car and creating drag.
4. Make it smooth. Aside from a small front cross-section, smoothness is the most crucial factor when designing an aero-efficient car. Surface irregularities like mirrors, door handles, trim pieces, rear wings and even small gaps between body panels will all create drag. Although no one protrusion will contribute much to drag, added together these minor inefficiencies can create quite a lot.