

Slipstreaming and Drafting for Road Riding Efficiency

Slipstreaming is riding behind another moving object, usually a fellow rider, to save energy. It's a great technique to learn, allows you to keep up with far faster riders, and allows groups who take turns to travel at impressive average speeds.

Paul Doherty explains, "The bicyclist, as he moves through the air, produces a turbulent wake behind himself. It makes vortices. The vortices actually make a low pressure area behind the bicyclist and an area of wind that moves along with the bicyclist. If you're a following a bicyclist and can move into the wind behind the front bicyclist, you can gain an advantage. The low pressure moves you forward and the eddies push you forward."

How Much Energy Does it Save?

Drafting typically saves about a third of a following rider's energy. If three or more riders are in single file, the riding gets easier the farther you go back. What is less known is that the lead rider, or pacemaker, saves about 5% of his effort by having someone behind him because of the way air closes in from behind.

On hills, however, you may have trouble keeping up with riders going even a single km/h faster. Formations often separate on hills and recombine at the top.

How Close Do I Need to Be?

The closer you draft, the better the wind shadow. While theoreticly there is a good windbreak several bike lengths back, crosswinds on even calm days move it around too much to find it unless you are close.

You shouldn't try to draft closer than is safe for the skill level of both you and your companions, but stay as close as is safe and no farther. Novices should leave about three feet, and good riders like to take it in to 12 to 18 inches. When I ride competitively with a bunch of expert roadies at the local cycling club, I tend to stick between 6 to 12 inches over flat, uneventful pavement, and we temporarily stretch out when cornering to about two feet.

The distance to keep is determined by how stably you can ride. When riding at the front and looking well ahead, it's pretty easy to make your course very stable. When using aerobars, riding with your head tucked down, and staring at someone's rear wheel instead of well up the road, it is considerably harder to stay put. The idea is to get as close as you can without the chance of touching wheels.

Touching Wheels

This is really bad news. If you're the one in front, all you'll notice is a dull thud on your back tire and maybe a short buzzing sound, and you'll probably be safe. If you're in behind, you'll probably crash. Your front wheel will be pushed out from underneath you

faster than you can react. Try to dodge and ride with your wheels side by side if you are about to touch wheels, and slowly move back into position directly behind.

Pay Attention

Paying attention to your surroundings is doubly important when slipstreaming. A mistake on your part can cause a big pileup, injuring many others. Inattention can let the gap between bikes grow (or shrink!), and you may end up spending a quarter mile sprinting at top effort to get back on.

And further, you have to pay attention to more than the back wheel of the rider in front to notice stop signs, approaching hills, traffic, a busy intersection, or on the other hand a smooth downhill, upshifting derailleur, the leader ankleing heavily or riding out of the saddle, will all impact the speed and distance you should be maintaining.

Downhilling

When slipstreaming down a hill, you'll probably have to pedal very little to keep formation, if at all. It is thus a good chance to rest, and if you are applying only a little force on your pedals, shift into a higher gear. You'll still have only a little force to apply, and you'll waste less energy moving your leg mass around.

Cross Winds

If the wind is coming from the side, the low pressure region is shifted to the other side and you have to adjust your riding position accordingly. The echelon formation, or a diagonal paceline, is best for crosswinds, but its size is limited by the width of the road. When the lead rider tires, he slows and moves behind the other riders to the end of the paceline.

Also, it is tempting to get too close to someone when riding diagonally behind them, with your front wheel nearly grazing their rear axle. Given the greater importance of dodging than deceleration in pack riding, it's good to leave at least as much margin to each side as you do when riding directly behind.

Drafting in Mountain Biking

Given the irregular turns, climbs, and abrupt speed changes of trails, the minimum reasonable distance is too much to be very useful for aerodynamics. U.S. cross-country champion Ruthie Matthes adds, "In mountain biking, drafting doesn't tend to be a factor. The speeds are slower (than on road bikes) and the rolling resistance is greater. It helps to draft for the mental aspect, for keeping pace with someone ahead of you. But as far as using less energy, it's not really a big factor."

Slipstreaming Motor Vehicles

While cars and busses are very effective wind blocks, keep in mind that cars have better brakes than you do. While it is unusual for a driver to apply full brakes, if you are behind him, it's hard to anticipate when they will. If they do, expect a nasty spill, and at higher speeds than a bike can typically cruise at.

Some ride in the slipstream of school busses, which works better than with cars if you know the route, as busses can't stop as quickly. Listen for the sound of the engine cutting to idle; that would be a good time to back off. But don't try it on roads with frequent stop lights or crossings!