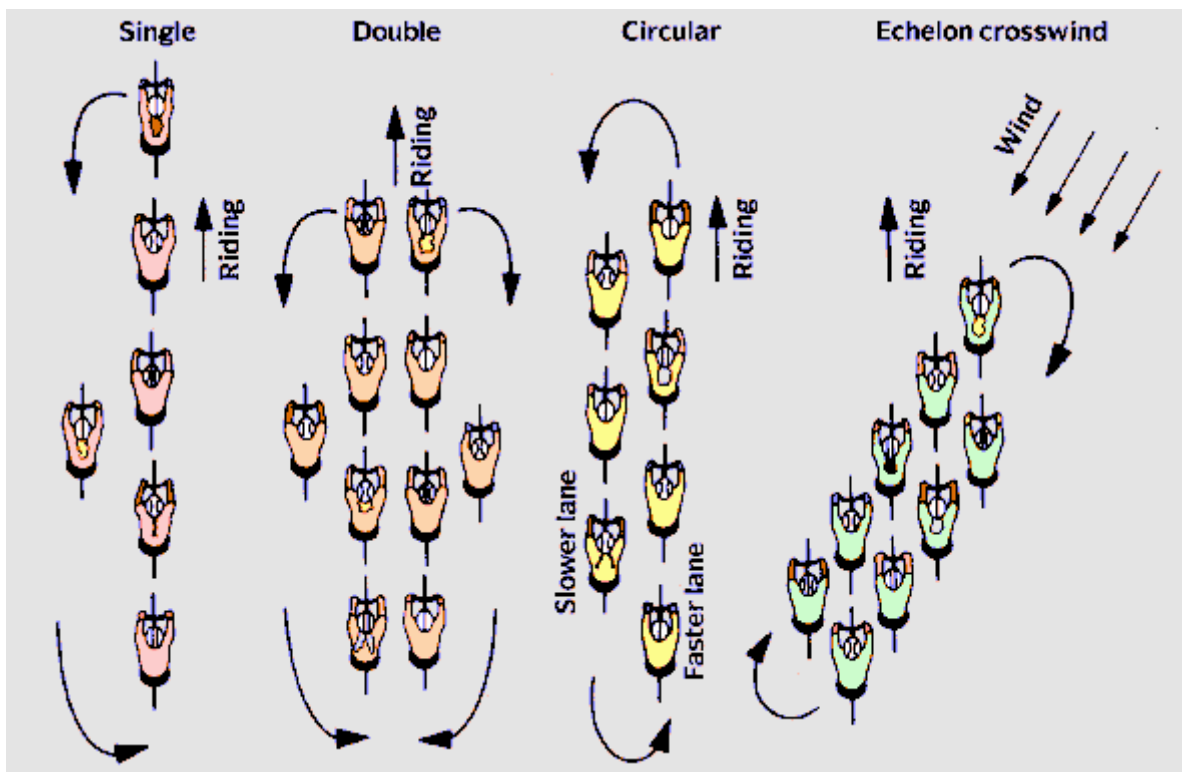


# Paceline Riding

The primary purpose of riding in pacelines is to allow a group of cyclists to go faster than they could by themselves, with less effort for a given speed. Pacelines are about **aerodynamics, efficiency and cooperation**, and the right combination of these factors will allow you to gobble up the miles at a rate that would be otherwise impossible. For this reason, they are useful in many aspects of the sport. Whether you're in a breakaway in a race, trying to pull a break back, shooting for a PR in a century or just rolling out the miles with your friends, pacelines are an essential and highly effective tool.

In competition, they're often the reason that non-sprinters win flat races, or sprinters win hilly ones. Racing pacelines are most often temporary coalitions of riders from opposing teams who would usually be protagonists to each other, but are cooperating for the good of the group at hand. Once the group's temporary goal is achieved, the coalition breaks down and new arrangements ensue. And of course there are times in races when you want to disrupt pacelines for tactical advantage, but that's for another subject; **racing tactics**. For now let's focus on paceline techniques, as they are a fundamental skill for every level of road racing from local crits to the Tour de France. Pacelines are **not** just for racers, though; any group of cyclists interested in covering a distance quicker and with less effort would do well to make use of pacelines, and most of the same techniques apply.

There are basically two types of pacelines. The **single**, where all the riders are in single file and each rider takes a turn at the front and then rotates around to the back; and the **double**, where there are two parallel lines of riders. Single pacelines are usually reserved for smaller groups and/or maximum speed over shorter distances. Double pacelines work best with larger groups and more open terrain. Doubles themselves can be separated into three types; **mirror-image, circular and echelon**. Mirror-image doubles are generally used at lower speeds (and on wide roads), and work like two mirror-image single lines, with the two central lines advancing in unison and riders peeling off and falling back on both sides. The most common form of double paceline is the circular one, which rotates in one direction and functions like smoothly meshing gears, with riders rotating from one line to the other as they reach either end. The echelon is a variation of the circular that's used in strong crosswind situations, especially in racing. Like the mirror-image, echelons take up a lot of road and are thus impractical in most non-closed-road situations. Below are graphic examples of the different types of formations, with the three on the right being variations of the double paceline.



## Double Pacelines:

Since singles are pretty easy to grasp and require less coordination, let's take a closer look at the circular double paceline should work:

The image at right shows a typical situation, with six riders rotating counterclockwise. This tends to be the default mode for non-competitive pacelines where maximum speed is not essential, as it offers plenty of room to maneuver when you're moving backwards in the group. But as speeds increase, and *always* in competition, **wind direction should dictate the direction of rotation**. This is because while both lines offer shelter from a direct wind, in crosswinds the proximity of the two lines allows one line to shelter the other from the **side** as well. By offering the advancing line more shelter, the group can go faster. Riders rotate off the front towards the side that the wind is coming from. So counterclockwise rotation is particularly effective when the wind is coming from the left, and clockwise is the best choice if the wind is coming from the right. But whichever way you're rotating, the group's speed should be **constant**, and rotation very **smooth** and **even**. Riders should ease off very slightly as they rotate from the front of the advancing line to the receding one, and then reaccelerate similarly as they reach the back and slide over to rejoin the advancing line. The advancing line sets the pace for the group, and riders should try to maintain that same pace when they hit the front. The group must stay in tight formation to maintain good aerodynamics, which means **no big accelerations**, jamming it up hills or out of corners. It also puts a premium on riding in a straight line and not making any abrupt moves. This is a constantly rotating line, so no one should be taking long individual pulls; *remember the idea of interlocking gears*. This may require some restraint on the part of the stronger riders in the group, but by matching their efforts to the group's, they will end up going faster than they could on their own. The **only** way a stronger individual can ride away from a weaker group is if the group fails to cooperate effectively.

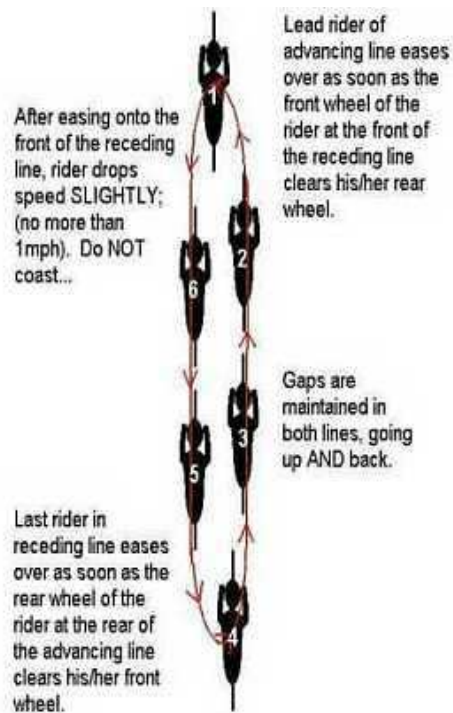
In a double paceline, you will need to keep an increased awareness about where the other riders are and how the group is rotating. Ideally, you will **hold your spot** in the rotation and follow the same rider every turn. However hills, corners, riders sitting up or taking a rest, etc. will often break the formation temporarily. So you should pay special attention at these times and **be willing change positions** in the rotation to **keep gaps from forming**. Gaps ruin the fluidity and aerodynamics of the group, and the sooner you can close them the sooner you will be back up to speed..

**Echelons**, seen at far right in the first graphic, are just a variation of the circular double paceline that comes into play in **extreme crosswind** situations. They are not often seen outside of competition as with riders angled across the road, they aren't suitable for high-traffic areas. The primary jump in complexity from the circular double is figuring out the **optimum angle** and **number of riders** that an echelon can accommodate, which can only be learned from experience. Many of us have had the experience of being strung out in a typical, inline paceline when heavy crosswinds made shelter very hard to come by, even ten or more places back from the front. In situations like this, it's often better to **break** the main group into **smaller** ones that have room to angle themselves most efficiently for the wind conditions. In races, echelons appear spontaneously as riders well back in a normal paceline find themselves fighting the wind and react. The front part of the paceline seeks the **optimum angle** for wind protection, and at some point the group **runs out of road**. Just behind that point, a **smart rider** will just **move across the road** to a position matching the lead rider of the front echelon and a second echelon forms. And so on. The echelons function separately but within a close distance of each other, and when the course changes direction the groups can rejoin.

By extreme example, echelons illustrate how **all** pacelines should orient themselves. If the wind is head-on or still, it's OK for the lines of riders to be straight ahead. But whenever there is a crosswind, the **front** of the line (or lines) should point **into** the wind, with the **rear** of the group being angled **away** from it; in effect an *almost-echelon*. So for a wind coming from the left, the front of the group should slide towards the center of the lane to give the riders in back more shelter, and vice versa. Just remember to keep traffic in mind and don't take up a whole lane unless you have the road to yourselves.

### Single Pacelines:

Sometimes double pacelines are not the best solution. If there are 5 or fewer riders in a group, the constantly rotating double line becomes less effective as time spent transitioning between lines grows near or equal to the time in-line. In this case a single paceline, with riders taking pulls and rotating to the back one at a time will work better. Singles are **simpler** and allow **more variation in pace** and **rotation timing**. Some riders can pull longer and/or harder than others without hurting the group's cause, so long as the variations aren't *too* great. When the ultimate goal is speed, each rider should make their best effort at the front, but should **never sacrifice speed** to do a long turn on the front. **Shorter, harder pulls** that maintain a **high, but constant** pace will work better and avoid causing everyone in the group to slow down and then reaccelerate over and over to accommodate the lead rider. That **endless** cycle of **intervals** will doom a group in no time. You should never stay on the front too long anyway, since the inevitable variations in speed may see you getting shelled off the back when you try to tag back on the end of the line after your pull. This is especially true in racing situations, where **opposing team** riders may want to **dump you** after you take a hard pull. So do your turn and go to the back **before** you start to suffer, and **always keep something in reserve**. In crits, due to the shorter straights and tight corners, a single paceline where individuals typically pull sections is the norm. In this situation, you will often find yourself pulling to a corner, or over a hill; basically, picking points on the course that are good positions for changes of the lead rider. Every course and event will be unique and you'll just have to let the circumstances be your guide.



### Now that we're up to speed on the basics, let's finish off with a few double paceline Do's and Don'ts:

**Do rotate.** The speed advantage of riding in a paceline is 100% due to aerodynamics. It's all about staying out of the wind; the less time each rider in a group is exposed to the wind, the quicker it's possible for the group to go. So don't be a hero; a proper double paceline rotates like a set of meshing gears, and staying on the front just unmeshes the gears of the machine. It also hangs whoever who just did a turn on the front out in the wind to dry as they rotate back, wasting their energy as well as your own. Ease over into the receding line as soon as possible without interfering with the riders behind you. This gets more important the faster you're going. At 30mph +, you're going to need shelter as soon as you can get it.

**Don't be a "motor", be a "gear".** For double pacelines, it's important that everyone be aware of what speed the overall group is capable of sustaining. If, for example, the average speed is 25mph with all riders' efforts taken into account, you shouldn't dial it up to 30 when you hit the front, even if you can. The idea is for the group as a *whole* to go quicker, and all you'll do with repeated accelerations is ruin the cohesion of the group and eventually destroy the paceline. So stay in sync with the group and you'll all go quicker as a result. Watch your speedometer if you use one, and take your pulls at a speed matching the others. If you don't use a speedo, just maintain the same cadence that you had sitting in the line. Let the reduced pace of the receding line bring you to the front; you don't need to accelerate to get past them.

**Do remember the accordion effect.** It's the same as in your car at a traffic light; a minor acceleration at the front gets multiplied due to the effect of reaction times as you go back down the line. In a paceline, that means riders 5 or 6 places back will have to accelerate much harder to maintain close gaps in the line, and a rider who's transitioning from the receding to the advancing line will have to sprint to get back on every time. This is *very* taxing, the opposite of efficient and a guaranteed way to split up a group. Most riders who dislike pacelines and think they're really hard feel that way because of this. So make whatever pace changes you *do* make *gradual* ones. While your absolute speed might be very high, your speed changes relative to your fellow riders should be *slow-motion* ones.

**Don't stall the motor.** If the speed of the group is high enough, sometimes you can find yourself having trouble going fast enough to maintain the tempo of the advancing line. Admit it, we've *all* been there. In these situations, all you're going to accomplish by trying to maintain a set place in the rotation is stalling out the line when you hit the front. It's much better to sit on the back until you're fresh enough to do a proper turn. All you have to do is let the rider ahead in the receding line know to come on over, and leave them room to do it so they don't waste energy figuring out what you're doing. They'll appreciate it, and they'll be glad to have your *smooth* help at the front when you're able to get back up there.

**Do look after your mates.** If you're at the front, call out any road hazards or turns and give a hand signal so the others can pass the message back. And if you're in the line and see/hear such, make sure the message gets relayed back. One of the most annoying things that can happen in a tight bunch is to get run through a big pothole over some broken glass just because the riders ahead of you didn't bother to call it out or pass it back. Seriously poor form! Ditto for riders at the back letting the group know about traffic behind if it's not a rolling closure situation. It's never a good idea for passing cars to catch the riders at the front unaware, and often they can't see

behind the group. So let them know if there are cars behind the group, and make sure the message makes it to the front. In tight groups, everyone is dependent on each other not to cause a crash, so be smooth and predictable - don't be *that guy*.

**Don't get too close.** Close is aero, and aero is good; but if you're overlapping wheels, you're asking for trouble and endangering everyone behind you. You have less visibility from being close behind other riders and a reduced reaction time from the tight distance, so even a great bike handler is at a distinct disadvantage when it comes to reacting to the unexpected. This is a judgment call and depends on how well you know the habits of the other riders, but if you've watched the team time trial in the Tour de France you know even the best get into trouble sometimes when they get too close. And they do around 20,000 miles/year together; so be advised!

**Do pay attention.** Look around enough to get a feel for where everyone is in the group, and get a status update however often you need to. If you're planning to keep your group intact, make sure no one's gotten gapped when you go over hills, and if so, ease up briefly and get them back on before you really have to slow down a lot to regroup. Often those riders will be useful on the flats and waiting a moment will end up quicker than reducing the size of the group.

**Don't ride aerobars when you're in the rotation.** Ever. This won't be an issue in mass-start races as they're not allowed anyway, but it can occur outside of USCF-sanctioned events. It's fine to use them when you're at the very front of the group and in the wind, which is the only time they're really needed anyway. Not only is your bike handling impaired when you're on aerobars, but so is your ability to quickly get to the brakes if needed. You may be a great bike handler, but you *never know* what's going to happen in front of you. And if the best pros in the world have trouble running tight pacelines on aerobars, we shouldn't even try!