

**Foreword from a Western Wheelers email:**

The season is in full swing, and there are lots of rides going. Group riding is a shared safety exercise - There is safety and speed in numbers.

Riding in a group is also a responsibility - the riders behind you have a harder time seeing road debris and obstacles. Club rides often bunch up at intersections or coming into re- groups. There are a few simple things you can do to keep the whole group safe:

1. **Point out obstacles in the roadway. As you go around the obstacle, point at it and call it out - "Hole!"**
2. **Avoid sudden braking. When you are at the front of a group, or even in the middle, the riders rely upon your consistent pace and steady line to be safe. Quick changes in speed lead to crashes. If you must brake, call out "Braking" to warn other riders.**
3. **When riding behind other cyclists who may not be paying attention to rules one and two, choose a bike position such that you can see the roadway ahead of them and be prepared for the unexpected.**

These rules apply to all rides! As cyclists, we tend to focus on the road ahead. On club rides, there are other people around and you can be the lead rider at any moment.

The following article composed by Andy Sass is a bit more technical. The first part is oriented a bit more toward higher performance riders, however I recommend everyone read the last few sections starting with the one labelled "Don't Stare". These apply to everyone who's riding in one of our group rides.

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**PACELINE RIDING 101**

**Andy Sass**

These are some tips for effective paceline riding.

The essence of group riding is riding in the paceline. It allows cyclists to travel faster with less effort and provides a better social experience. (It is also a foundation of racing.) Pacelines do have some inherent danger and require communication among the riders. But a good paceline is a wonderful thing. It enables cyclists to share the work of pushing through the wind. Depending on speed, 70% of the cycling effort is overcoming wind resistance. The faster you are going, the more important that is, as wind resistance is proportional to velocity squared. If you can keep a pace on the level of 16 to 18 mph, then riding in a paceline of 22 to 23 mph should not be an issue. A ride of 2 and a half hours will take less than 2 hours resulting in 30 minutes less in the saddle and time for a second cup of coffee.

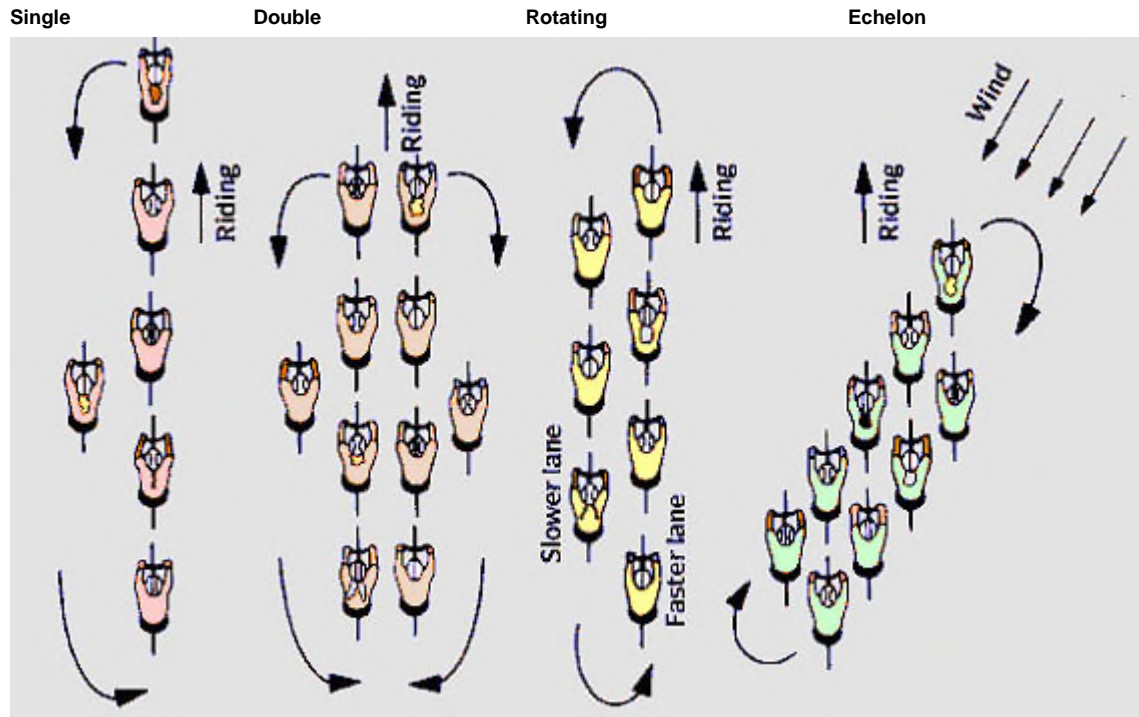
On most club rides, and most centuries, a single paceline is the norm.

The basic SINGLE paceline is simple. The riders align behind one another to take maximum advantage of the "drag" effect of the cyclists to the front. The cyclist in the front will set the group's pace, when the lead rider decides it is time to change, that rider pulls off to one side and drifts back to the end of the paceline.

The new lead cyclist increases effort SLIGHTLY (just increases the amount of pressure on his pedals) to maintain the group pace. A good paceline is smooth. A good paceline is built on trust.

The riders have to be confident that the others in the group will communicate well and ride safely.

## TYPES OF PACELINES



Which direction should the lead rider pull off? The **SINGLE** paceline picture above shows the rider pulling off to the left. But there are various reasons to pull off either direction. If there is a cross wind the lead rider will pull off whichever direction the wind is coming from. This is because the riders in the single paceline will naturally line up as shown in the "echelon" picture to hide themselves from the wind. Usually, people will pull off to the left. Some believe that the rider coming off the front and going backwards should not be in the lane of car traffic and should, pull off to the right. Basically, whichever direction the group is using, all riders should do the same thing.

The **DOUBLE** paceline is a minor modification of the single paceline. In this setting there are just two single pacelines side by side. The riders on the front of each paceline pull off in opposite directions. As a general rule, the pacelines are far smoother if the two front riders agree and pull off simultaneously. Otherwise, one of the lines has to surge to get the front riders side by side.

A **ROTATING** paceline requires more focus and greater skills but is very satisfying to be part of. In a rotating paceline there is an advancing (faster) line of riders and a retreating (slower) line of riders.

The retreating line is on whichever side the wind is coming from. If it is a headwind a tailwind or no wind, usually the retreating line will be on the right side and the advancing line will be on the left (the opposite of the picture above). Again, whichever way it starts, just go with the flow.

The key to a rotating paceline is that when the rider at the front of the advancing line clears the rider who is on the front of the retreating line, the advancing rider moves into the retreating line and softens up his pace. The rider who was behind him continues the pace of the advancing line until that rider switches over. The rider in the advancing line should NEVER surge. The idea is that you *ride to the front* and float to the back in a constant rotation. You change your speed by "soft-pedaling" as you switch to the retreating line and increasing your pedal pressure as you switch from the retreating line to the advancing line.

Smooth switches and keeping the distance between the riders in the paceline as small as possible will keep the paceline smooth.

An **ECHELON** is a paceline ridden in a crosswind. The riders will naturally find cover at an angle as shown above. An Echelon can refer to either a single paceline or a rotating paceline. In either case, the lead rider will pull off INTO the wind

Echelons are used extensively in team time trials and you may have unconsciously used them in your daily riding. Usually the wind is not head on to the riders in the pace line and may come from one side or the other to the direction of the pace line. In this case you will see the riders following to the side of the rider in front of them. The technical explanation is termed "relative wind" but is best explained by experimenting with a friend the next time you are in a crosswind. If you notice you are still feeling a headwind when following another rider pull off slightly to

## RIDING IN THE LINE

Before discussing leading a paceline, it is important to know how to ride in a line.

First, there should be no sudden moves. What you want is to keep a steady pace at a steady gap in a steady line. Everyone else is dependent on everyone else to keep a steady pace.

### Maintaining a Gap

Generally, the closer you are to the back wheel in front of you, the less resistance from the wind.

### Effect of Drafting

Wheel Gap in Feet	decrease in resistance
.5	44%
1.0	42%
2.0	38%
3.0	34%

If you get a bike length behind, the benefit goes away. A foot or so is comfortable. The steadier the people around you are, the more comfortable you will be at a small gap.

Without getting into a long discussion of vortexes and fluid dynamics, the person in front of you gets a little benefit from your close drafting. As the second in line gets a benefit from the wind,

the third person gets more, and the fourth person even more. If you open a gap, the person behind you has to work harder.

If a gap starts to open up, close the gap slowly and smoothly. Opening a gap then closing it with a quick acceleration to close it then slowing will cause a yo-yo or Slinky effect behind you. Smooth and steady is the key.

The only time to open a gap is to let someone in. If the road is narrowing and the previous leader has not worked their way to the back, let them in. If you feel tired, sit out a few turns until you're ready to take another pull. Simply open a spot for riders to rejoin the line in front of you, or come to the front and immediately pull off and drift to the back. You'll do the pack a favor by staying with them rather than working yourself into the red zone and falling off the back, which makes the group slow down to let you catch up. If you are near the front, don't open that gap; just take a very short pull. Opening a gap, or moving to the back when you are near the front makes it hard for everyone else.

One caveat, it is OK to have a bit larger gap on the uphill if things are slowing. People may stand, which is discussed later.

Think of it like driving: You don't slam on the brakes, then hit the gas; you moderate your speed

### **Don't Stare**

Focusing on the wheel directly in front of you is a natural instinct when riding in a line, but it gives you zero time to react should something go awry. "Keep your head up and check about 10 meters down the road," says Ignosh. "Look through holes in the leading rider—over his shoulder, under his arm or through his legs—and ride proactively instead of reactively. This will help keep the line moving smoothly."

### **Pedaling**

Don't stop pedaling if the speed of the pace line slows just pedal around slower ("soft pedaling" - pedaling without applying a lot of force to the pedals), this keeps your pedaling motion going and prevents you from unintended acceleration when you go from motionless to pedaling again. It also prevents the person behind you from being startled.

### **Braking**

Basically, DO NOT

Air brake: An easy (and safe) way to trim speed is to sit up and catch some wind. It'll slow you down a notch without disrupting the rhythm of the line. You can reduce your speed without braking by raising your body to create more air resistance or moving over slightly out of the draft of the person ahead of you, but don't raise up off the saddle! The technique that riders use to slow by moving out of line is why, except in a defined echelon, it is dangerous to have your front wheel overlap the back wheel in front of you. This called covering a wheel, and is to be avoided.

If you must use the brakes, just feather them lightly. Gently squeeze the brakes while continuing to pedal. You can scrub speed while shifting up or down as needed to alter your pace.

### **Keep Others Informed**

The person ahead of you must let you know about upcoming obstacles and if you are at the front you should give plenty of warning if you are going to stop for a signal. If you have a problem (flat, chain came off, etc.) just yell "chain, flat, stopping, etc." and pull out of the pace line and coast until you are clear and can stop without endangering other riders. If the line is slowing, yell slowing. It is much better than tire tracks on your spine.

Let the previous leader know if you are the last in line so they can move into line effectively.

### **Gear Changing**

Try and stay in a gear that you can spin around at 80-100 RPM. You want to be in a gear you can accelerate in to cope with a change in pace or grade. Also at a comfortably high RPM, it is easier to control that pressure on the pedals.

### **Standing**

Again, basically don't. When you stand, the bike moves backwards 6 to 12 inches, and into the person behind you.

Standing on hills is OK, but just in case, say "standing" before you do. Generally, pace line and hill should not be used in the same sentence. Everyone has a different climbing style and unless you are familiar with the rider ahead of you may end up in a ditch from an overlapped wheel. Gradual hills are fine, just increase the distance between you and the bike in front of you and try not to accelerate up the grade (it's OK for your pace line speed to drop 2-3 MPH or more on an uphill drag).

If you must stand up to make it up the hill and someone is close behind you, an advanced technique is to push down hard on the pedal as you raise up off the saddle. This compensates for the tendency of the bike to move back as you raise up. Practice this riding alongside someone going uphill before trying it out in a pace line. Likewise, give an extra hard stroke as you sit down to avoid slowing during the transition to seated climbing.

### **Drinking and Foreign Substances**

It's probably best to get a drink when you're at the back of the line, so you won't mess someone else up if you swerve while swigging your favorite tonic. The same goes for spitting; this is best done when you're the last rider. Projectile vomiting and expectoration in the pace line is discouraged.

### **LEADING**

The biggest mistake people make is pulling hard when they get to the front. **EASE OFF THE GAS** Rather than accelerating when you pull, try to ride in the line at a steady pace and decelerate as you pull off and drift to the back. Take a look at your speed before you have to pull and keep that speed.

The second mistake is trying to maintain the same speed on the uphill. You should be maintaining the same effort. The pace will slow, but the group will stay together.

When going downhill is when you should be peddling your hardest. The people behind can keep up easily. All they have to do is coast. Most people want to coast then they are in the front. That is really a disservice to everyone else. This is the time to go all out.

Take short pulls. Keep it to under a minute. Try limiting your pull to 100 pedal strokes. If you are way stronger than others, limit your pulls to a few minutes to stay fresh and give other riders a chance. Many times, the strong riders pull for too long, the pace drops, and then things speed up and slow down. Also, there is more work in the second position than down the line and long pulls wear out the second person in line.

The other thing to remember is to accelerate slowly after a stop light. Not everyone can clip in at the same rate and accelerate at the same rate. No need to split the group, only to have to wait for a regroup.

In a smooth running pace line riders do not have time to see and avoid obstacles, such as rocks, holes, cracks in the pavement, old muffler pipes, cans of Bud, etc. The riders depend on the lead rider to be the eyes of the pace line and to either point out or shout out a warning, (rock right, runner right, car up, etc.) These warnings should be passed down the pace line by each rider. If you don't feel comfortable taking your hands off the bars to point out a rock, just shout "rock right (left)".

The last thing to remember is the pull is not over until you are safely back in the line. While you are drifting slowly back in line is the time to get that sip of water that you can't get when you are near the front of the line.

## **PRACTICE**

This may sound obvious but it is the key to a good pace line. The best way to start out pace line riding is with a partner you trust who is a smooth rider (i.e. as smooth as or smoother than you). Start out following him or her with about 2 feet of space between your bikes (or greater if you're not comfortable that close). Gradually close the distance to whatever your nerves can stand. Ideally you want to be 6"-12" away, although as you can see from the table that, you can get a good draft a wheel's length away, so getting too close is not absolutely essential. It is also important that you do not ride up along the side the rear wheel of the person in the pace line ahead of you. This is called "overlapping wheels" and can cause a fall if the person ahead of you swerves to avoid an object in the road.

Once you feel comfortable riding with another person in a pace line you can graduate to multiple riders. This gets a bit trickier since you are dealing with more than just two people. Everyone has a different comfort speed and this really shows up in multiple rider pace lines. Again, watch your computer and try to keep with 1/2 MPH of the last leader's pace. If you find the pace too fast, take a shorter pull at the front, or better yet "pull through and off" which means when you get to the front just pull off without taking a pull at the front.

When pulling off the front of the pace line ease up on your pedaling but don't stop, the idea is to get to the back of the pace line as fast as possible in order to get a break from the wind. As you get toward the back of the pace line, gradually increase your pedaling speed to match the pace line speed and pull in behind the last rider. Be careful to make sure that the rider you pull in behind is the last rider, More than one crash has been caused by someone pulling into another rider thinking they were at the end. (Another reason to keep the gap between you and the next rider at 6-12"). Even good riders have trouble in multiple rider pace lines, the best remedy is practice.

## **RIDING WITH THE INEXPERIENCED**

Occasionally you may be troubled by other riders who don't hold their line, stop unexpectedly, swerve side to side, yo-yo the pace, etc. Don't ignore this, often it's just a matter of education. Please talk to the offending rider in a polite way, asking him or her to refrain from the problem behavior. They may feel more comfortable staying in the back where their actions will not be as bothersome. If you are reluctant to do this, ask one of the ride leaders to handle the problem. Safety is every one's concern!