

DISC DISCUSSION

Should touring bikes have disc brakes?

by Sheldon Brown

Disc brakes are increasingly taking over in the mountain bike world because they have some clear advantages over rim brakes. 1. With disc brakes, your rims will last virtually forever, because there's no wear on the sides from rim brakes. Rim wear is generally more of an issue for mountain bikers who ride in dirty conditions, but is also a real issue for high-mileage touring cyclists. 2. Disc brakes eliminate the risk of overheating your rims and blow-

ing tires on mountainous descents. This is a problem mainly associated with touring tandems.

3. Disc brakes allow the use of different-sized wheels on the same frame. You can run 26 x 2.2 knobbies for hard-core off-road touring, then swap them for 700 x 20 racing wheels for your local time trial, or anything in between.

4. Discs are pretty much weatherproof, so they work as well in the rain as they do in dry conditions. This is probably the most important reason for a touring cyclist to consider them.

Disc brakes, however, also suffer from some disadvantages, compared to good rim brakes:

1. Disc brake calipers get in the way of installation of fenders and luggage racks. This is generally not an insuperable problem, but may require some ingenuity, and will limit your options for these essential touring "accessories."

2. There's also a slight weight penalty, but with modern units, and considering that they permit the use of lighter rims, this is not a serious limitation.

3. Discs are generally more expensive than rim brakes, but not prohibitively so.

There are some issues specifically relating to front disc brakes that the touring cyclist should bear in mind.



Comfort

Traditionally, touring bikes have had fairly flexible fork blades to permit the fork to flex and thus provide a bit of cushion on bumpy roads. Because a disc brake mounts low on the fork blade, and is only on one side, forks designed for discs must be as close to totally rigid as possible, so you will lose this natural springiness. Of course, you can use disc brakes with most suspension forks, and that makes the issue moot, if you choose to use such a fork.

Weaker Wheel

Touring cyclists commonly have trouble with rear wheels, but rarely suffer any problems with front wheels. This is because conventional front wheels are built symmetrically, with equal spoke tension and equal spoke angles on both sides. Conventional front wheels are also free from torsional loads. Using a disc brake in front cancels out those advantages.

Front wheels with disc brakes are dished, with the left hub flange closer to the center line of the wheel than the right flange. Thus, the left-side spokes are forced to be at a higher tension and have a steeper angle to the axle. This is not as

severe as it is on the rear wheel of a derailleur-equipped bike, but it is not negligible.

Disc brakes, like other hub brakes, do create torsional loads on the spokes. For this reason, among others, it is probably not a wonderful idea to use front panniers on a bike with a front disc brake.

Ejection

There's another issue with front disc brakes that has created real concern lately, namely the possibility of the axle being ejected from the fork. There have been a few instances of this reported, mainly among hard-core mountain bikers. These accidents are rare but typically quite serious when they occur.

When Disc Brakes Are Used, Skewers Become Even More Important

Quick-release skewers:

When you close a skewer, your hand strength is accomplishing two things: It's applying a clamping force to the skewer, and it's overcoming the mechanical friction of the mechanism.

Quick-release skewers come in two distinct types:

Enclosed cam design:

The original type of quick-release skewer, invented by Tullio Campagnolo, features a steel cam, surrounded by a solid metal body. The body is the part that moves back and forth as you flip the lever, usually has teeth to press against the left dropout. The cam is well shielded against contamination and can be lubricated by applying a couple of drops of oil every couple of years.

Exposed cam design:

In the 1980s, a variant type of skewer was introduced, one that is less expensive to manufacture, and is sometimes a bit lighter. This type uses a split external cam that straddles the end of the skewer. External cam skewers use a curved plastic washer between the cam and the toothed metal washer that presses against the dropout.

This type was originally marketed as an "upgrade" because they could be made a little bit lighter.

Despite the marketing hype associated with these "boutique" skewers, they are actually considerably inferior in functionality to the traditional type. The exposed cam can not be kept as clean and well lubricated as the shielded one can.

In addition, the exposed cam is a larger diameter, (typically 16 mm versus 7 mm for an enclosed cam), so the friction is acting on a longer moment arm (the radius of the cam).

The result is that the exposed cam type provides very much less clamping force for a given amount of hand force on the lever.

Fortunately, the move toward "boutique" skewers happened after the industry had mostly moved to frames with vertical dropouts and forks with lawyer lips (ridges or bumps that keep the wheel sort-of attached even if it has been installed improperly). The exposed-cam skewers are generally okay for vertical dropouts in back and for forks with lawyer lips, but should not be relied on with horizontal dropouts or plain forks.

The problem is that, due to the location of the disc caliper, when you apply the front brake, the reaction force tends to pull the axle downward and out of the fork's axle slot. Normally the quick release skewer will prevent this, but there have been reports of skewers spontaneously loosening up. Skewers don't loosen up with traditional brakes because the stresses are always in pretty much the same direction. With a disc brake, however, the braking reaction force pushes the axle downward, while gravitational forces push the axle upward. It is this repeated alternation of force directions that tends to loosen up your skewer.

If you're using a disc front brake, I strongly advise checking the skewer tension regularly.

I also suggest using only enclosed-cam type skewers with front discs.

Overview

I suspect that discs are the wave of the future and that fifteen years from now it will be hard to believe that people used to tour without them. Nevertheless, disc brakes for touring cannot really be considered a mature technology, and the disadvantages of them pretty much cancel out the advantages. **AC**

Sheldon Brown expounds on all sorts of bicycling issues. More of his insightful ruminations can be found at www.sheldonbrown.com.