

**Safety Tips #38**  
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**Suspenders, Part Deux**

Last month we started a series on motorcycle suspensions system. I ended by promising to do some more research and then write more about what I found. I alluded to discussion of different types of systems and how to set them up.

There have been some innovative approaches to suspension. In the previous article I talked mainly about the most common type: the damper surrounded by a spring and assembled into a single unit. The spring is usually adjustable for pre-load by a stepped collar around the top or bottom of the unit. These are used in pairs, one on each side of the bike, and are usually mounted from somewhere just under the bike's seat to a point on the swing arm, which holds the rear wheel. And most bikes have a telescopic front suspension; they are similar in design to the aforementioned rear suspensions but the whole works, springs and dampers both, are enclosed inside the forks.

But right off the top of my head I can think of other types of suspension systems. There are the "lay-down" shocks that are mounted horizontally underneath the bike's engine or transmission, such as those found on Harley's Softail models. There are mono-shocks. There are BMW's Paralever, Duolover, Telelever, and Earle's Fork systems. There is the RADD suspension found on the Yamaha GTS1000. There are springer and girder front ends.

Yikes! Then I started to do some research on the internet to see if there were any I missed. Oh yes, I found plenty more! In fact, the more I looked into various types of suspensions the more I realized how many there are, and have been in the past, and how difficult it would be to understand them all, list them and explain them. It's

time to reconsider how (in)complete this series needs to be! So let's refocus. Let's look at what suspension is supposed to do and what our goals are in set-up and adjustment. Let's leave the "how-to" part to your relationships with your owner's manual and your mechanic.

The first thing to mention at this point is that, from everything I have been reading, the front and rear suspension systems on any one bike are a *team*. They work together and in conjunction with each other. They must be matched, and set up with regard to the fact that a setting change on one will probably affect the other noticeably. For illustration, imagine a bike under hard deceleration – the front end compresses and the rear end extends. The amount and rate that the front end can compress is dependent on the amount and rate that the rear end can extend. So the front end's ability to compression-dampen is dependent on the rear end's ability to rebound-dampen. And the reverse is true for acceleration: the front end has to extend while the rear end compresses.

Suspension/spring rates and dampening on one end affects what is happening on the other end.

We're going to assume that your bike has springs front and rear. (As I said, there are other types of systems, but there are just too many to cover here.) The first thing to consider when setting up suspension with springs is the *spring rate*. This is the amount that the spring will compress under a certain load. Bikes come from the factory with springs that have a rate that is generally OK for the bike's usual or intended purpose. But bikes that are used for special situations may need to have the springs replaced with others that are more appropriate for their intended service. Also, springs can wear out and need to be replaced. At one point I had a Sportster that I used for two-up touring; the factory springs were insufficient for this purpose. The bike would bottom out on both the front and rear ends when it was loaded and went over a medium-sized bump. I replaced springs on both ends of the bike with some units from Progressive Suspension: problem solved!

Does your bike bottom out under normal usage? If so, you probably ought to replace its springs.

The next thing to consider is *sag*. Taking some measurements is in order here. Measure the height of one end of the bike when the suspension is fully extended. To do this the end of the bike has to be raised until the tire on that end is about to rise off the ground. You may be able to do this by lifting it up yourself if you are strong, or you may need a hoist (unless you have strong friend who is willing to help). Then, while the suspension is extended, measure the height of some part on the top of the bike on that end. Next, let the bike down again; then load the bike with as much weight as it typically will be carrying, like yourself, a passenger (if you typically carry one), and your gear, and then have someone measure the height of the bike at the same point as was used before. The difference between the two figures is the “laden sag.” One source tells us that the laden sag should be about 35% (for street riding). Other sources I have read more or less agree with that figure. Less sag equals a stiffer ride, more sag equals a cushier ride.

OK, so if you have springs that are of the correct rate, and you have them set for the right amount of sag, you are on the way to having your suspension set up properly. The next thing we will consider is dampening, and we will do that in next month’s article.