

Tuning with camber

Generally a car with a **lower roll center** will be **more stable at high speed**. The chassis reacts slower to transients. A car with a **higher roll center** will generally be **less stable** at speed but will **respond faster to transients**. They will also be less forgiving. Modern cars with their lower roll centers feel easier to drive as a result. They feel more stable and this is important for high speed straights and big jumps. The wide track and longer wheelbases over the older cars also help this. However **low roll centers** come with a price. It **makes it harder to turn**.

Now keep in mind if you are running a certain roll center at one end, start by setting it about the same at the other. For a 2WD rear motor buggy, I'd start by setting it very low. If you have problem pushing through the corners, raise the roll center in the rear a bit until it's balanced the way you like it. Don't necessarily be content there though. You should try to then raise the roll centers all around and drive it again. You'll know where to finally stop when you are finding the car too touchy in the high speed sections.

Shock and spring stiffness also play a role. The lower your roll centers, the more the shocks and springs control the lean of the car. The higher your roll center, the more the suspension itself controls this and the less of an effect the shocks and springs have on it.

The lower your roll centers, the more important having a stiffer set of springs or thicker shock oil becomes since more forces are applied to them in corner. *"But you said to adjust the shocks and springs only around how the car handles the bumps and not it's cornering ability."* **Yes I did.** Hopefully your setup will all work out but what happens if your conditions require a fairly soft suspension setup but very low roll centers? If this happens then you need another way to control roll and **that it with sway bars**. Not all cars have them but some do. It's not to say you always need one either but you might. You might not need them at each end either. Perhaps you only need one in the rear or only in the front. Then how thick of one do you need? These are all very hard questions to answer but the best thing to remember is that if you need one, make it as light as possible while still getting the job done. Don't automatically assume you'll need one right off the bat though.

Camber link length

In regards to camber link length, since our roll center isn't just one static point we need to establish that it moves over a certain range. Let's say we have 2 identical cars sitting at a level with the arms ride height. Let's say that the camber links are pointing at exactly the same direction as each other. Let's just say they are perfectly parallel to the arms. As the suspension

compresses, these links move too as they have to. However one of our vehicles has shorter links than the other. When the suspension is at max compression, the vehicle that has shorter links will have them pointing at a much steeper angle than the vehicle with the longer links. At this point the vehicle with the shorter links has a higher roll center than the one with the longer links, even though at our ride height they were at the same point.

- **Short camber link = higher roll center**
- **Longer camber link = lower roll center**
- **moving links outwards but keeping them the same length = slightly raising roll center**

Now let's say we have 2 vehicles as above with the same setups sitting at level ride height. Now let's say they each have the exact same length camber links. One of them has it's camber links sitting exactly parallel to the arms but the other has the inside end of the links mounted a little bit lower which means the link slopes down towards the car a little bit. The one with the lower inner location has a slightly higher roll center. Now as the suspension compresses and the links move up, this one still maintains a higher roll center than the other one. The difference between them is pretty constant everywhere.

- **Lower inside end of camber link = higher roll center**
- **Higher inside end of camber link = lower roll center**

Alright so now you're wondering how to dial in the roll stiffness using your camber links. First off, by this point you should have your shocks and springs sorted out. The car should handle the bumps and landings well. If you changed any of your shock or spring settings based on its cornering ability, change it back!

I prefer to start with a ride height where the arms are level. At this ride height I also like my camber links to be level. I generally set them for about as long as I can get them provided they aren't longer than the kingpin to kingpin distance on the arms. When you push down on the vehicle at each end, any camber gain (wheel lean) you get should be equal front to rear. At least at this point it should be.

This is just a starting point. Things are going to change quite a bit before we are done. Now go drive it. Try many things. Go fast into a corner and hit the brakes hard. Does the car plow through the corners or does the back end swing around? Accelerate hard out of the corners under power. Does the car have severe push where the front inside wheel comes off the ground or does it over steer?

Coming out of a corner

Let's say **under hard throttle out of a corner the inside front wheel lifts off the ground** and you get severe under steer. Most people would be tempted to stiffen the rear springs. Don't do this! **You do need more roll stiffness though so start raising your rear roll center.** I prefer to keep the links level at level ride height so I'd start shortening the links. Keep testing out of a corner. Does the problem fix itself or does the wheel keep coming up? Can you lower the front roll center? Can you make the front link longer? This will reduce some front roll stiffness allowing the front to roll more. You want all 4 wheels on the ground in a corner!

- **Understeer out of corner = increase height rear roll center, decrease front roll center**
- **Oversteer out of corner = lower rear roll center, increase front roll center**

Going into a corner

What happens if you are going hard into the corner and slam on the brakes? Does the rear end fly around resulting in a spin? If it does you may need to compromise on some things. If this scenario takes place, too much weight is transferring forward which means less front end rake is required. (TRL22 has adjustable rake) So for the rest of the world who can't correct this issue, what can we do? Well one thing I didn't get into is the **front caster blocks. Play with different types** here as they each have a different effect on off throttle turn in vs on throttle turn exit. You may also need to dial out some of the rear roll stiffness again to get some inherent on power turn exit under steer back. You are going to have to adjust your driving style.

- **More caster = more stability on straight and going into corners, less steering mid corner**
- **Less caster = less stability on straights and going into corners, more steering mid corner**