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## WELCOME

Mark Ortiz Automotive is a chassis consulting service primarily serving oval track and road racers. This newsletter is a free service intended to benefit racers and enthusiasts by offering answers to chassis questions. Readers may submit questions by mail to: 155 Wankel Dr., Kannapolis, NC 28083; by phone at 704-933-8876; by e-mail to: markortiz@vnet.net. Topics are also drawn from my posts on the tech forums at www.racecartech.com and www.rpmnet.com. Readers are invited to check out these sites, and to subscribe to this newsletter by e-mail.

Mark Ortiz

## SPRINGS, ROLL, AND CORNERING BALANCE

*As I understand it, the stiffer the coil spring, the more weight is put on that corner, therefore planting the tire more. My question is, what is the difference between the stiffer coil vs.body roll? Example: A stiffer RF coil should put more weight on that tire, giving it more bite – therefore making the car steer better. However, you hear all the time about NASCAR teams taking spring rubbers out of the RF when they are tight to allow the chassis to roll over on the RF, making it turn. Is it because this allows the LR to lift, which makes it turn? Please explain, in simple terms.*

Stiffening the right front spring, or adding preload to it, does load that tire more, and does make it produce more cornering force, in a left turn.

However, this comes at the expense of left front tire loading. The spring change can't change the total load on the front wheel pair, only the distribution of that total between the right front and left front. The spring change also can't change the total load on the rear wheel pair, the right wheel pair, or the left wheel pair, only the diagonally opposite wheel pairs.

So rear wheel loads when cornering are also affected by the front springs. The total rear wheel load doesn't change, but its right/left distribution changes, oppositely to the front wheels.

This means that with a stiffer RF spring, the front tires are loaded more unequally when cornering, and the rears are loaded more equally, than with a softer RF spring.

Now here's the key: When you concentrate the load on the outside tire, you lose more cornering power on the inside tire than you gain on the outside one. This is because grip from a tire increases with load, but at a DECREASING RATE.

Therefore, when you load the fronts more unequally and the rears more equally, that hurts available cornering force at the front and improves available cornering force at the rear: tighter car. That's the condition with the spring rubber in the RF. Take the rubber out, and you load the

fronts more equally than before, and the rears more unequally. That helps stick the front, at the expense of the rear: looser car.

It works this way on dirt too, contrary to what some people will tell you.

## SHORTY PANHARD BARS VS. LONG ONES

*Can you help me understand the advantages and/or differences of the shorty Panhard bar (left chassis to left diff.) versus a long Panhard bar, for a dirt modified or Late Model? I know the shorter bars are more aggressive and plant the left rear more. Some say they're harder to drive. Generally speaking, what changes are needed when changing between these types of bars?*

The shorty bar, especially when steeply inclined, jacks the left rear corner of the frame up in response to left-turn cornering force.

Since its angle increases as the car rolls and jacks, the effect increases exponentially as cornering force increases. The angle also varies a lot as the car goes over bumps, so the chassis becomes highly bump-sensitive.

Consequently, the shorty bar is at its worst on a rough, tacky, variable track, and at its best on a smooth, slick, highly consistent track.

Despite the popularity of shorty bars, I question their merit, because you can get as much dynamic diagonal as you want by other means, without the inconsistent behavior. I think a long bar is a clear advantage if the track changes and has bumps, as most tracks do. I doubt that a long bar is even a disadvantage on a smooth dry-slick track, if you set it up right.

Some people believe that the jacking force adds to the overall loading of the axle or tires. This doesn't really occur. The suspension can't push down any harder on the axle than the car pushes down on the suspension (if we ignore the weight of the suspension parts). Raising the rear of the car, even with cornering-induced jacking, doesn't increase total rear wheel load. Raising the left rear does increase diagonal percentage. This makes the rear stick better, at the expense of the front.

Things a long bar calls for, compared to a shorty bar on the same car, include some combination of the following:

1) More static diagonal
2) Lower Panhard bar height
3) Softer rear springs
4) Stiffer front springs