LAP 35 — SHOCKING, BUT TRUE!

The suspension is one of the unsolved mysteries of road racing. The variables affecting the grip your car achieves and thus the lap times it produces are numerous and constantly changing. Examples include track and tire temperatures, the condition of the track surface, tire pressure, weight transfer and tire wear. A good suspension represents a compromise that delivers maximum predictability with minimum impact from these constantly changing variables. When we race, we want maximum tire grip and the suspension has the job of delivering it. Our Mustangs suspension allows for slight geometric adjustments that are essentially static in nature and the spring/damper system that affects dynamic response.

When thinking about the spring/dampener system it is easy to understand how springs affect the handling of your Mustang. Springs that are "stiff" have rate characteristics higher than those that are "soft" and make your car respond to load changes with less deflection. This is felt by the driver as a reduction in body roll or tilt as the car turns, accelerates or stops. Unlike the springs, it is harder to understand the affects of the spring dampeners because they affect the "rate of change" of the suspension as it moves. Dampeners, commonly called "shocks" can have a shocking performance impact on your track car.

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Your shocks do not support the car, the springs do. If you check the ride height of your Mustang with and without the shocks installed you'll see it's the same. Shocks are technically dampeners, they resist motion, not load. This means they are only at work when car is in motion, doing their job resisting the motion of the springs. This means they are a dynamic tuning device that can be used to affect the handling of your Mustang when in a transition from one state to another. Remember our goal when driving fast is to maintain balance and rhythm, not upsetting the car when near the limit so the tires can maintain maximum grip and we can go faster. The shocks can help with this by controlling the rate of change when the suspension is upset and attempting to move.

Let's think about what happens when we quickly lift the throttle and apply the brakes at the end of a long straightaway. By definition, weight transfers from the rear of the car to the front, the springs react by compressing and the shocks work to slow the time it takes for the springs to compress. If the springs are soft and the shocks are firm it takes a long time to reach full compression. If the springs and shocks are both soft it takes a shorter time to reach full compression. Most adjustable shocks in use today, including the popular vintage Koni are adjustable in extension (rebound) and not compression. This means the springs are used to tune in compression and the shocks are used to tune in extension. Let's take the same case and consider the impact on the rear of the car. When the throttle is lifted and the brakes applied weight transfers from the rear to the front of the car and the suspension extends and the shocks resist motion while extending. If the springs are soft and the shock rebound is "soft" the springs will reach full extension faster and the tires will maintain more contact with the track surface which results in more grip. If the springs are soft and the shock rebound is "hard," the effect of weight transfer will be to lift the tires from the road surface as the shocks attempt to slow the reaction of the springs as they attempt to maintain tire contact with the track.

That's what happens when braking in a straight line, imagine what happens as you enter that turn you just slowed for. If the rear tires are fully on the track as in the case of soft springs and "soft" shock rebound the car will be "tight" on corner entry which means the rear end is sticking to the track. With the same springs, if the shock rebound is "hard" the tires are in effect producing less grip because they are being lifted by the shocks which reduces the rear grip resulting in a "loose" condition on corner entry. A loose condition on corner entry can be a very good thing because it allows steering of the car with the brake. More brake equals a looser rear that results in turning the car without turning the front tires. Sometimes, getting your Mustang to "turn-in" is a problem and a loose rear end can help immensely. A word of caution, if you overcook a corner with a setup like this it's unlikely you'll be staying on the track because more brake means a looser rear which will quickly result in an off track excursion in a panic stop situation. This will certainly be exciting and possibly quite expensive, so be careful.

The same logic applies to the front of your Mustang because as you accelerate the shocks rebound as weight transfers to the rear and the front springs extend. This means a softer shock rebound means more grip on corner exit and harder rebound means less. This can be useful for reducing "push" or understeer as you put the power down on corner exit. Of course, the front and rear of the car are not independent and act in combination as a system so you'll have to keep this in mind.

Another way to think about tuning your Mustang with the shocks is to consider them helpful in changing handling characteristics only when entering and exiting corners. Then, use the springs to handle the steady state conditions encountered in the middle of the corner.

Try adjusting your dampeners this year, the results just might shock you!

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