



BIG BAR SOFT SPRING SET UP SECRETS

Should you be jumping into the latest soft set up craze for late model asphalt cars? Maybe you will find more speed or maybe you won't, but either way understanding the dynamics will help to improve your corner speeds.

The soft set up is designed to take advantage of spec tires that are now commonplace. New age tires put up with more abuse and resist blistering as compared to those from the tire war era. Taking advantage of aerodynamic benefits created by body designs that are sleeker is part of the soft set up as well. Maximum stability is created through less side body movement. By understanding the goals of the big bar soft spring set up you can find ways to improve your lap speeds.

The new soft set up buzz involves a big sway bar to control roll and the softest front springs possible that are just big enough to keep the nose from bottoming out. Ironically, the new buzz has been referred to as the "soft set up" when in actuality there is much more spring rate added by the sway bar versus the reductions in the front spring rates.

Higher shock rebound rates are needed to control the added spring rate introduced by the bigger front bars. Added rebound helps to tie the body in the lowest nose position possible. Typically, the package is coupled with rear springs that are stiffer than traditional set ups. The stiffer rear springs can be vital to the so called soft set up for a variety of reasons which we will analyze.

Why soft front springs? A big benefit is getting the nose down on the ground. Air that gets under the car creates lift which is just about always bad. Getting the nose down creates more airflow over the entire body creating more down force literally pushing the entire car into the track promoting more corner grip. While the front springs are softer, the big sway bars are adding a large amount of overall spring rate to the car. As you go up in bar diameter the rates increase exponentially.

Why a big bar? Since the soft front springs let the nose settle down to the pavement we then need to keep the body position low throughout the turn. A big sway bar is utilized to resist roll and it adds spring rate as the car enters the turn. We are trading roll rate from the front springs and moving that work to the sway bar. We are also adding overall spring rate and taking advantage of the aero grip created by modern day body designs. The benefit of the big bar is



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that it helps to hold the left front down as you roll through the turn and on acceleration. With the sway bar holding the nose piece low throughout the turn more air flows over the entire body surface creating additional down force and grip. The car being held down low allows for less overall side travel through the turn, hopefully resulting in more overall stability and consistency. With the suspension linkages traveling less after corner entry, the dynamic changes are controlled and the car becomes more predictable throughout the turn. Minimizing travel in the center of the turn is a big piece of the new package and the added bar rate enhances driver confidence. In addition, the center of gravity is lower in time with when the corner loading is at its maximum point. The big bar creates a quicker responding car that feels more stable due to the elimination of nosing over on the RF.

To enhance less lift at the left front tire additional rebound is utilized in the shock package. Shocks with more rebound and less compression are a common practice when utilizing the soft set up. Once the nose settles during braking, keeping it down there becomes the goal. The added rebound helps to keep the car flat and added rebound controls the spring oscillations as well. Shocks need to control the spring rate included both in the springs and in the sway bar. As always, the teams that best match up the shock package will go faster for a longer period of time. In fact, matching the shocks to the overall set up package, track, temperature, and driver style is still a critical piece of the puzzle. Remember, there is generally more spring rate to control and these forces need to be considered when matching your shock package to the new concepts.

Controlling the body angles in the turns helps to create consistency. You can imagine that if the nose piece were low on entry and then lifted on exit that you are introducing variables resulting from the continually changing body position. Constantly changing linkage angle changes have an effect on the handling as well. Lift at the nose and squatting in the rear reduce down force at a varying rate throughout the turn. Nose raise creates additional front lift and rear squat moves the spoiler out of the air for less rear down force. With traditional set ups, the front aero lift and the rear spoiler moving down occur at the worst possible times. Obviously more rear spoiler on corner exit would be good for forward bite and a lower nose piece throughout the turn is going to create more speed. These two gains are included in the Big Bar Soft Set Up. A more constant body position allows the driver to chase the car less as the aero change throughout the corner is more consistent.

With the soft front springs, big front sway bars, and additional rebound the front end is now doing its part. Big rear springs pitch in to keep the rear spoiler up in the wind for more exit grip



and forward bite. Added right rear spring rate holds up the right rear corner helping to keep the left front low promoting more air flow over the body for more overall down force. The big bar soft spring set up gets the front and rear to work together for maximum aero balance and grip.

So now that our soft set up has the body flat, the nose low, the rear spoiler held up in the wind and body movements controlled promoting consistency, this now brings new chassis parameters into the process.

We can look at each corner of the car and think about new dynamics created by the soft set up as compared to traditional set ups. Each corner is affected differently and we can think about the new challenges and consider the adjustments required to make the big bar soft spring set up work best. All adjustments must work together. A complete package is the goal and you must tune the entire car to achieve improvements. A traditional set up that is completely dialed in would be much better than a big bar soft spring set up that did not address all of the variables.

LF

The left front starts out at the tech approved minimum ride height. The soft front springs allow the front end to drop under braking and the big bar, big right rear spring, and added rebound hold the left front suspension for maximum nose drop on entry and throughout the turn. You can see that the added downward travel will have an effect on the camber patterns and adjustments need to be made. With the LF A-arm being shorter than the LF lower control arm your car will lose camber under the left front suspension compression created by the big bar soft spring set up. The shorter upper A-arm decreases in length faster than the lower control arm causing camber loss. This camber loss is opposite of traditional set ups that promote camber gain during upward body movement.

The soft set up usually requires high amounts of LF static camber as compared to traditional set ups. Top crew chiefs check the camber at ride height and then recheck the camber at the anticipated corner ride height. The camber in the center of the corner is most important and static settings need to be adjusted for optimal camber at the center of the turn. The new approach creates static camber settings that seem radical as compared to traditional set ups.



RF

The right front starts out at the approved minimum ride height and drops during braking and moves down even more when the body rolls. Our soft set up with a big bar and high rebound actually allows for more RF drop from static ride height to the middle of the turn. The additional amount of travel created allows for more camber gain as the RF A-Arm is shorter than the lower. Our new big bar soft spring set up will require dramatically less static camber allowing for more optimal camber in the center of the turn. You can see that experimenting with the camber curves and static adjustments require a change in thinking from past ideals.

LR & RR

Bigger springs in the rear create new thought processes as well. More spring keeps the spoiler in the air allowing for more down force and less downward movement of the body. With less movement you may experience the need to vary anti-squat adjustments. Again, our thought processes are different with the new set up. You may find that you need to run more split in the panhard bar to get an equal amount of rear steer as the stiffer springs coupled with the stiffer sway bar create less roll. You might want to experiment with more trailing arm angle as well to help rear steer the car through the center of the turn. The whole mind set relating to the rear linkages needs to be based on less travel. It is very common that you will run considerably more RR spring rate than LR with this set up.

The soft set up should really be reserved for those that already are consistently fast and have a handle on traditional adjustments. In order to achieve improvement it really helps to understand the dynamics behind all adjustments from springs to shocks to weight adjustments before experimenting with the unknown.

Once the decision is made to experiment with soft set ups experience has shown that it is an all or nothing proposition. The soft set up is an entire package versus just a spring adjustment. Moving up one sway bar size and changing 25 lbs. of spring rate is not really embracing the concept. The new bar rates and spring choices are eye popping as compared to traditional set ups, an open mind to these ideas is truly required.

Suspension design over the past twenty years is virtually the same from Nextel Cup to Saturday night. If that is the case then why is this big bar soft spring set up gaining popularity? There are several things that have changed during that time allowing the concepts of the new set up ideal to be possible. First off the new bodies are very sleek as compared to old body designs. Aero



grip is something that has increased steadily over the years. In addition, most people are running tires that run longer. Harder longer wearing tires that do not fall off much have become common. The aero advantages really help to create grip in harder tires. While the aero advantages are vivid, the new era tires are the main reason that the new set up concepts are to be considered. Further, big bars speed the loading to the contact patch and the new harder tires are up to the challenge. We also have more horsepower and more RPM as compared to twenty years ago and more forward bite makes that horsepower more effective. Shock technology has improved and better shock control reduces tire temperature increasing tire wear. Current shock adjustability allows for more grip by keeping the tire on the ground.

If you ran super soft tires it makes sense that the big bar soft spring set up would be fast for qualifying but the tires would fall off or blister on a long run. Blistering tires were common in the tire war days but for now it seems that most divisions are currently being supplied harder, longer wearing tires that easily go the distance allowing more stress to be placed on the contact patch. It makes sense that bigger front bars and more rear spring rate transfer load to the tires more quickly. The point is that sleeker bodies and better, harder tires have made the bigger bars and soft front springs possible. In addition, radial tires create a lot of grip through superior side wall design further enhancing the big bar soft spring concepts.

The big bar soft spring set up does seem to work better, at least to date, on tracks with less banking. Why? Banked tracks compress the suspension due to the higher speed and additional travel. Banked tracks keep the nose piece close to the ground throughout the turn. Sway bars simply do less work on banked tracks as cars compress into the banking where as on flat tracks the roll is much more evident. The aero advantage is created by the banking. Certainly the big bar soft spring setups can still work with banking but you can see that the banking creates some of the benefits naturally. Thinking out the dynamic movements on flat and banked tracks will help you take advantage of the positives on all track types.

Big Bar Soft Spring Benefits:

- The car reacts quicker
- Roll centers and move less in the turn creating stability
- More grip due to Aero advantage
- Lower center of gravity throughout the turn
- More forward bite
- The added front sway bar rate enhances entry confidence



Drawbacks:

- More stress on the tires
- Lots of trial and error testing to identify new baselines
- Sway bar neutral setting and preload becomes critical
- Camber settings become more critical
- Your old set up book will be junk!

Where the big bar soft spring set up works better:

- Experienced drivers and successful teams
- Flat tracks seem more conducive to the principles but it can help anywhere
- On tracks with reasonable grip
- With tires that can take some punishment

Like all new things trial and error testing is a big part of the process. The teams that best understand the dynamic movements will be able to maximize the benefits. The learning curve is dramatic as the big bar soft spring set up breaks many of the rules of the traditional mechanical grip set ups. It is important to remember that while the racing community has labeled this concept the “soft set up” the reality is that there is more spring rate in the car both front and rear. Many of the dynamics change from past ideas and you will find that keeping an open mind to what the driver and car want will result in changes that seemed insane just last week. Testing and persistence just might find you more speed and push you softly into victory lane.

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