



The —Black —Crack —Report



The addiction you don't want to fight

Issue 12, January 2010

10/10ths 2010 Schedule

I am happy to be able to post our current schedule for 2010 and hope to see many of you at the events this year. I am looking forward to getting started and seeing some great friends again at the track. You can be of great assistance to 10/10ths by telling your friends about these events. Our driver base is still building but needs to see additional increases to help take my event jitters away. ☺

- Virginia International Raceway March 15th & 16th (Mon / Tues)
- Putnam Park April 3rd (Saturday)
- Putnam Park May 8th & 9th (Sat / Sun)
- Autobahn June 19th & 20th (Sat / Sun)
- Putnam Park Aug 28th & 29th (Sat / Sun)
- Putnam Park Oct 23rd & 24th (Sat / Sun)

We are able to get started much earlier this year than in 09 and I am hoping for the same perfect weather we had at all our events last year. I have not given up on Mid-Ohio and will still be working on an event there.

Registration is OPEN for all these events on the 10/10ths webpage at:
http://www.1010thsmotorsports.com/2010_Schedules.html

We will be running the same 3 group format with:

- Novice
- Intermediate
- Advanced

The Advanced group will most certainly again get to experience the training style, rolling race starts as this was a huge success in 2009, both for the fun factor and the learning / experience aspect. We have a couple drivers who have already started converting their cars to full race mode as a result of their 10/10ths experience.



RAFT

2010 10/10ths Alumni Program

I have extended the deadline to sign up as a 10/10ths Alumni. It is a great way to save a few \$\$ if you plan to do two or more events or even a single 2 day event by receiving 10% off all registration fees. You can register as a 10/10ths Alumni at:

http://www.1010thsmotorsports.com/2009_Savings.html



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10/10ths Tech Corner

We all know this sport is a bottomless pit in many aspects. Car set-up is one topic that can be discussed and worked on for hours on end. It can also be a very fun experience learning about your car and trying various set-ups to see the effects they have on your car and your driving ability. It can and does make a huge difference in some respects.

The 10/10ths Race Car is no different. Although we have made some great modifications to the car, it can still be faster without spending a lot of money. (That is a great thing)

Simple adjustments to the stabilizer bars are expected to make the car more neutral and thus, allow for power to be put down while still IN the turns instead of what I have to do now, wait to get the car straight and then throttle up.

Although I am certainly not the expert on this topic, I have been finding a lot of great information on this subject and wanted to pass it along.



Keep in mind that various cars will be affected in various ways and you have to find that set-up that best fits the car and YOU.

UNDERSTANDING SWAY BARS

A **sway bar** (also **stabilizer bar**, **anti-sway bar**, **roll bar**, or **anti-roll bar**, **ARB**) is an automobile suspension device. It connects opposite (left/right) wheels together through short lever arms linked by a torsion spring. A sway bar increases the suspension's roll stiffness—its resistance to roll in turns, independent of its spring rate in the vertical direction. The first stabilizer bar patent was awarded to the Canadian S. L. C. Coleman of Fredericton, New Brunswick on April 22, 1919.^[1]





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Principles

A sway bar is usually a torsion spring that resists body roll motions. It is usually constructed out of a U-shaped piece of steel that connects to the body at two points, and at the left and right sides of the suspension. If the left and right wheels move together, the bar just rotates about its mounting points and does not bend. If the wheels move relative to each other, the bar is subjected to torsion and forced to twist.

The bar resists the torsion through its stiffness. The stiffness of an anti-roll bar is based on the fourth power of its radius, the stiffness of the material, the inverse of the length of the lever arms (i.e., the shorter the lever arm, the stiffer the bar), the geometry of the mounting points, and the rigidity of the bar's mounting points. Some anti-roll bars, particularly those intended for use in auto racing, are adjustable, allowing their stiffness to be altered by increasing or reducing the length of the lever arms. This permits the roll stiffness to be tuned for different situations without replacing the entire bar. The stiffer the bar, the more force required to move the left and right wheels relative to each other. This increases the amount of force required to make the body roll.

In a turn, the **sprung mass** of the vehicle's body produces a lateral force at the centre of gravity (CG), proportional to lateral acceleration. Because the CG is usually not on the roll axis, the lateral force creates a moment about the roll axis that tends to roll the body. (The roll axis is a line that joins the front and rear roll centers). The moment is called the roll couple.

Roll couple is resisted by the suspension roll stiffness, which is a function of the spring rate of the vehicle's springs and of the anti-roll bars, if any. The use of anti-roll bars allows designers to reduce roll without making the suspension's springs stiffer in the vertical plane, which allows improved body control with less compromise of ride quality.

One effect of body (frame) lean, for typical suspension geometry, is positive camber of the wheels on the outside of the turn and negative on the inside, which reduces their cornering grip (especially with cross ply tires).

SPRUNG MASS In a vehicle with a suspension, such as an automobile, motorcycle or a tank, **sprung mass** (or **sprung weight**) is the portion of the vehicle's total mass that is supported above the suspension, including in most applications approximately half of the weight of the suspension itself. The sprung weight typically includes the body, frame, the internal components, passengers, and cargo, but does not include the mass of the components suspended below the suspension components (including the wheels, wheel bearings, brake rotors, calipers, and/or caterpillars tracks, if any), which are part of the vehicle's unsprung weight.

The larger the ratio of sprung weight to unsprung weight, the less the body and vehicle occupants are affected by bumps, dips, and other surface imperfections such as small bridges. However, a large sprung weight to unsprung weight ratio can also be deleterious to vehicle control

Main functions

Anti-roll bars provide two main functions. The first function is the reduction of body lean. The reduction of body lean is dependent on the total roll stiffness of the vehicle. Increasing the total roll stiffness of a vehicle does not change the steady state total load (weight) transfer from the inside wheels to the outside wheels, it only reduces body lean. The total lateral load transfer is determined by the CG height and track width.

The other function of anti-roll bars is to tune the handling balance of a car.



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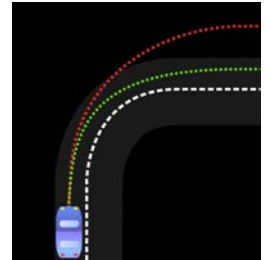
Understeer

Understeer is a term for a car handling condition in which during cornering the circular path of the vehicle's motion is of a greater radius than the circle indicated by the direction its wheels are pointed. The effect is opposite to that of oversteer. **In simpler words understeer is the condition in which the vehicle does not follow the trajectory the driver is trying to impose while taking the corner because the effective slip angle at the front is larger than that at the rear, instead following a less curved trajectory.** Understeer covers several different phenomena; in particular, there is a big difference between linear range understeer, typically between 0 and 0.4g, and limit handling understeer, which is at higher lateral accelerations, and is what racing drivers reference when they use the term. The latter is also often referred to as pushing, plowing, or refusing to turn in. **The car is referred to as being "tight" because it is stable and far from wanting to spin.**

As with oversteer, understeer has a variety of sources such as mechanical traction, aerodynamics and suspension.

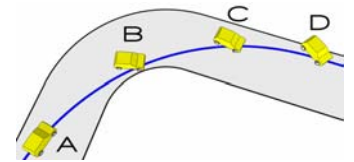
Classically, understeer happens when the front tires have a reduction in traction during a cornering situation, thus causing the front-end of the vehicle to have less mechanical grip and become unable to follow the trajectory in the corner.

In modern race cars, especially open wheel cars, understeering is caused mainly due to the aerodynamic configuration. In this respect, the lack of a heavy aerodynamic load (downforce) in the front side prevents the front tires from gaining enough traction. At the same time understeer can be caused by having a heavier aerodynamic load at the rear end of the car giving the rear tires more traction than the front tires. Also, suspension balance should take into account the types of surfaces being driven—differing levels of friction in each surface influence the potential understeer behavior. Camber angles, ride height, tire pressure and centre of gravity are important factors that determine the understeer/oversteer handling condition.



Oversteer

Oversteer is a phenomenon that can occur in an automobile while attempting to corner or while already cornering. **The car is said to oversteer when the rear wheels do not track behind the front wheels but instead slide out toward the outside of the turn. Oversteer can throw the car into a spin.** The effect is opposite to that of understeer. **The car is referred to as being "loose" because it is not stable and wants to spin.**



Causes

The tendency of a car to oversteer is affected by several factors such as mechanical traction, aerodynamics and suspension, and driver control, and may be applicable at any level of lateral acceleration. Generally, oversteer is the condition when the slip angle of the rear tires exceeds that of the front tires, even when they are both small. *Limit oversteer* occurs when the rear tires reach the limits of their lateral traction during a cornering situation but the front tires have not, thus causing the rear of the vehicle to head towards the outside of the corner. The driving technique called opposite lock is meant to cope in this circumstance. *Trailing Throttle Oversteer (TTO)*, a.k.a. "snap-oversteer" is induced by the weight balance of the car shifting from the rear to the front, this may happen if the car is cornering under throttle, causing the car to settle on the rear, if the throttle application would be removed -- e.g. as to reduce the radius of the turn -- the balance would suddenly shift to the front, giving less traction on the rear, if the car was already at the traction limit before the driver lifted the throttle it is very likely to cause a TTO. Rear wheel drive cars are more prone to oversteer, in particular when applying power in a tight corner. This occurs because the rear tires must handle both the lateral cornering force and engine torque. **An oversteering car is alternatively referred to as 'loose' or 'tail happy.'**

- A. The car has turned in normally and is aiming towards the apex
- B. The rear wheels have started to lose adhesion, the driver compensates by steering left to keep steering aligned to the desired driving line (counter steering)
- C. The driver has maintained control of the car and continues to follow the desired line
- D. The car is at the limit of left hand lock, a spin is likely at this stage unless dramatic corrections are made.



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Oversteer & Understeer In race cars

A car that tends neither to oversteer nor understeer when pushed to the limit is said to have neutral handling. It seems intuitive that race drivers would prefer a slight oversteer condition to rotate the car around a corner, but this isn't usually the case for two reasons. Accelerating early as the car passes the apex of a corner allows it to gain extra speed down the following straight. The driver who accelerates sooner and/or harder has a large advantage. The rear tires need some excess traction to accelerate the car in this critical phase of the corner, while the front tires can devote all their traction to turning. So the car must be set up with a slight understeer or "tight" tendency. Also, an oversteering car tends to be twitchy and ill tempered, making a race car driver more likely to lose control during a long race or when reacting to sudden situations in traffic.

Carroll Smith, in his book "Drive to Win", provides a detailed explanation of why a fast race car must have a bit of understeer.

Even so, some successful race car drivers do prefer a bit of oversteer in their cars, preferring a car which is less sedate and more willing to turn into corners (or inside their opponents). It should be noted that the judgement of a car's handling balance is not an objective one. Driving style is a major factor in the apparent balance of a car. This is why two drivers with identical cars on the same race team often run with rather different balance settings from each other. And both may call the balance of their cars 'neutral'.

Understeer or Oversteer behavior can be tuned out by changing the proportion of the total roll stiffness that comes from the front and rear axles. Increasing the proportion of roll stiffness at the front will increase the proportion of the total load transfer that the front axle reacts and decrease the proportion that the rear axle reacts. This will cause the outer front wheel to run at a comparatively higher slip angle, and the outer rear wheel to run at a comparatively lower slip angle, which is an understeer effect. Increasing the proportion of roll stiffness at the rear axle will have the opposite effect and decrease understeer.

Drawbacks

Because an anti-roll bar connects wheels on the opposite sides of the vehicle together, the bar will transmit the force of one-wheel bumps to the opposite wheel. On rough or broken pavement, anti-roll bars can produce jarring, side-to-side body motions (a "waddling" sensation), which increase in severity with the diameter and stiffness of the sway bars. Excessive roll stiffness, typically achieved by configuring an anti-roll bar too aggressively, will cause the inside wheels to lift off the ground during very hard cornering. This, of course, is only possible if the regular spring rate actually allows the outside wheels to handle the much increased load. This can be used to advantage, in fact many front wheel drive production cars will lift a wheel when cornering hard, in order to overload the other wheel on the axle, so limiting understeer.



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Adjustable Roll Bars

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So

FRONT

If you SHORTEN the Lever Arm, you STIFFEN the Bar and therefore, you INCREASE UNDERSTEER

If you LENGTHEN the Lever Arm, you LOOSEN the Bar and therefore, you DECREASE UNDERSTEER

REAR

If you SHORTEN the Lever Arm, you STIFFEN the Bar and therefore, you LOOSEN the Chassis

If you LENGTHEN the Lever Arm, you LOOSEN the Bar and therefore you TIGHTEN the Chassis

Check Out the New 10/10ths Hat



The new 10/10ths Hat is in stock and available. This one size fits all hat is made with some great stitching and simply looks fantastic. You can find it on the 10/10ths website along with our cool T-Shirts.





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You Can Help 10/10ths Motorsports !

I hope you enjoy the monthly 10/10ths Motorsports Newsletter. Please feel free to forward this to any of your friends and point them to the 10/10ths Motorsports website. I believe word of mouth advertising is the best route to introduce both new drivers and experienced drivers to the 10/10ths Motorsports events. For those that have come out to the events, Thank You Very Much and I look forward to seeing you again.

Guest Article

It's *Never Too Late to Become A Scout!*

By Greg Robb, Performance Racing Group

For all racing teams, club racers and track day participants, the season is over. You have a ton of projects around the house. You need to get re-acquainted with your family (remember them?). After all, you have plenty of time until your next event, right? Wrong!

Now, many of you will start getting ready for your first event just a week or two *before* your first event. After all, you have those household projects and the family to deal with. Well, the truth is that next season starts the day after the last event. I have been on several professional race teams that did not figure that out, milking the calendar until February. At an Indy car race in Australia, a media person asked me how far behind the front row we were. I replied "3 months". So for you late starters, you will be disappointed in the money, effort expended and the results achieved. When you start behind, you will always be behind.

That being said, you ask, "what has to happen?" Planning - *realistic, reasonable* planning. First, set the goal - what is it and how will you measure success? 2 seconds a lap faster, win a race, win a championship? How will you get there? Set a *realistic* goal. There is no point in setting goals that your equipment, resources, and driving skills are not yet up to reaching.

Now that we have figured out an achievable goal that you would be pleased with, how do we get there? First things are time and money. How much of both are you willing to expend? This question is *critical* to everyone from track day guys to Formula 1 teams. When you decide this going in, the investment that follows is easier to justify.

How much time will you invest and what distance are you willing to travel? How much time will you devote to pre-event preparation?

Preparation is everything. Let me say that again. *Preparation is everything!* Club racers and track day guys tend to struggle here most. In particular, more the former than the latter. I have seen things going on in the paddock that make me wonder in amazement. You came to the track to run your car, not work on it. So shop time is critical. It can be pretty expensive to travel 3, 4 or 500 miles only to work on your car outside. Now, don't get me wrong, amateurs are not the only ones that fail here. In 2008, I did a lot of Grand Am stuff. One particular Grand Am GT outfit was the most lethargic effort I had ever seen. In 2009, there was a Firestone Indy Lights team that was absolutely *painful* to watch. The car was always dirty, falling apart and terribly slow. Poor preparation does exist at all levels. Do not fall into this trap. Set a reasonable schedule that you can comfortably work with.

Now that we touched time factor, let's go to the money factor. What are you willing to spend? Again, be reasonable and wise. Every lap cost some amount of \$.

Nothing is free and quality is expensive. So like at home, set up a budget and stick to it. Being that man and machine are in motion, things can happen. Things that nobody plans on (it always happens to someone else, right?). So the budget needs to be flexible to deal with unforeseen circumstances. So think about what you comfortably spend without getting into trouble with your better half.

In part two, bring your knife and fork - we will get into the meat of all this.



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