



## THANK YOU 10/10ths Drivers, Instructors and Guests

With the end of the 2009 track season, I would like to say **THANK YOU** to everyone who came out to drive, instruct and/or watch our events. The season was more than cut in half due to unforeseen circumstances but the end result was still a promising year. Many problems were faced with the cancellation of events at BlueGrass Motorsports but everyone did everything they could to work with me on it and lessen the impact on 10/10ths. I cannot express my gratitude enough to everyone.

### Some of the years' highlights were:

- **Sunshine and lots of it.**
  - Finally, we got plenty of sunshine and dry track, quite the opposite from 2008.
- **Our first ever event at VIR.**
  - Turnout was low due to late scheduling and lack of previous exposure in that part of the country but the end result was a bunch of happy drives and many encouraging comments to come back in 2010. I will be working on just that and will be bringing a great event to VIR next year.
- **Our first ever "Rolling Race" starts for the RED group.**
  - In keeping with the focus of 10/10ths, I believe in providing a great deal of freedom to our drivers so they can practice and improve on their driving skills. Many of the techniques etc. can ONLY be learned by one method and that is on track experience. We did rolling race starts at both VIR and Putnam which were all very successful.
  - The one thing that makes this freedom work is the great sportsmanship and skill of all of our drivers. We stress it in the drivers meeting but you are the ones that make it work. You should all give yourself a pat on the back for a job well done. These freedoms and the ability to improve your driving skills will no doubt be available in 2010.
- **Our first ever Marriage Proposal**
  - Our November 1<sup>st</sup> event had the added surprise of one of our instructors, Russ Hamilton dropping to one knee and proposing marriage to Ruth Howard. She in return said YES. Congratulations to both of them and I hope they enjoy their very first wedding present, that being a 2 day event pass for Ruth in 2010 to any 10/10ths Motorsports event.
- **Vandalism ??**
  - Yes, it is true and I have found that you should NEVER leave your race car unattended at a 10/10ths Event. I will be providing security guards at all all future events and have developed a list of suspects to be watching for !!!!!





# The —Black —Crack —Report



The addiction you don't want to fight

- **Sponsorship Activities**

- Many thanks to the following:

- **Forgeline Wheels**

- Dave and Steve Schardt attended our August event and discussed wheel safety and performed wheel inspections for our drivers. They also provided some great door prizes. Dave will work with all 10/10ths drivers who are interested in a great set of wheels to give the the best value available.



- **US RaceGear**

- Craig Friesinger attended several events with his on wheels racing safety store, providing a variety of equipment and technical advice to our drivers. Craig also provided some great door prizes.



- **Hawk Brakes**

- Hawk continues to be a supporter of 10/10ths and we now have our own distributorship. If you need brakes, give me a call to receive your 10/10ths discount.



- **Performance Racing Group**

- Greg Robb attended several of our events and gave some valuable technical advice to our drivers on a variety of racing equipment concerns. I will be working with Greg over the off season to expand our relationship for the 2010 season.



## 2010 Schedule

I am currently working on the 2010 schedule and have much work to do but the following tracks have already been scheduled.

- \* **Putnam Park**

- April 3<sup>rd</sup>

- May 8<sup>th</sup> & 9<sup>th</sup>

- August 28<sup>th</sup> & 29<sup>th</sup>

- October 23<sup>rd</sup> & 24<sup>th</sup>

- \* **Virginia International Raceway**

- March 15<sup>th</sup> & 16<sup>th</sup>

- \* **Mid Ohio**

- April 15<sup>th</sup> & 16<sup>th</sup> Tentative

- \* **Bluegrass Motorsports Park**

- TBA

## Christmas Specials

Check out the 10/10ths web site at [www.1010thsMotorsports.com](http://www.1010thsMotorsports.com) for some great Holiday Specials on track time and gifts.



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## 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.



## The Physics of Racing

*Brian Beckman has written many articles about the Physics of Racing and grants the right to use each article in any manner needed to further advance this great sport.*

### Keeping Your Tires Stuck to the Ground

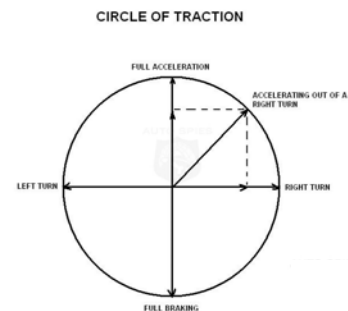
We previously learned that weight transfer is a side-effect of the tires keeping the car from flipping over during maneuvers. We found out that a one  $G$  braking maneuver in our 3200 pound example car causes 640 pounds to transfer from the rear tires to the front tires. The explanations were given directly in terms of Newton's fundamental laws of Nature.

This month, we investigate what causes tires to stay stuck and what causes them to break away and slide. We will find out that you can make a tire slide either by pushing too hard on it or by causing weight to transfer off the tire by your control inputs of throttle, brakes, and steering. Conversely, you can cause a sliding tire to stick again by pushing less hard on it or by transferring weight to it. The rest of this article explains all this in term of (you guessed it) physics.

This knowledge, coupled with a good "instinct" for weight transfer, can help a driver predict the consequences of all his or her actions and develop good instincts for staying out of trouble, getting out of trouble when it comes, and driving consistently at ten tenths. It is said of Tazio Nuvolari, one of the greatest racing drivers ever, that he knew at all times while driving the weight on each of the four tires to within a few pounds. He could think, while driving, how the loads would change if he lifted off the throttle or turned the wheel a little more, for example. His knowledge of the physics of racing enabled him to make tiny, accurate adjustments to suit every circumstance, and perhaps to make these adjustments better than his competitors. Of course, he had a very fast brain and phenomenal reflexes, too.

I am going to ask you to do a few physics "lab" experiments with me to investigate tire adhesion. You can actually do them, or you can just follow along in your imagination. First, get a tire and wheel off your car. If you are a serious autocrosser, you probably have a few loose sets in your garage. You can do the experiments with a heavy box or some object that is easier to handle than a tire, but the numbers you get won't apply directly to tires, although the principles we investigate will apply.

Weigh yourself both holding the wheel and not holding it on a bathroom scale. The difference is the weight of the tire and wheel assembly. In my case, it is 50 pounds. Now put the wheel on the ground or on a table and push sideways with your hand against the tire until it slides. When you push it, push down low near the point where the tire touches the ground so it doesn't tip over.





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The question is, how hard did you have to push to make the tire slide? You can find out by putting the bathroom scale between your hand and the tire when you push. This procedure doesn't give a very accurate reading of the force you need to make the tire slide, but it gives a rough estimate. In my case, on the concrete walkway in front of my house, I had to push with 85 pounds of force. On my linoleum kitchen floor, I only had to push with 60 pounds. What do these numbers mean?

They mean that, on concrete, my tire gave me  $85 / 50 = 1.70$  gees of sideways resistance before sliding. On a linoleum race course (ahem!), I would only be able to get  $60 / 50 = 1.20G$ . We have directly experienced the physics of grip with our bare hands. The fact that the tire resists sliding, up to a point, is called the *grip phenomenon*. If you could view the interface between the ground and the tire with a microscope, you would see complex interactions between long-chain rubber molecules bending, stretching, and locking into concrete molecules creating the grip. Tire researchers look into the detailed workings of tires at these levels of detail.

Now, I'm not getting too excited about being able to achieve  $1.70G$  cornering in an autocross. Before I performed this experiment, I frankly expected to see a number below  $1G$ . This rather unbelievable number of  $1.70G$  would certainly not be attainable under driving conditions, but is still a testimony to the rather unbelievable state of tire technology nowadays. Thirty years ago, engineers believed that one  $G$  was theoretically impossible from a tire. This had all kinds of consequences. It implied,

for example, that dragsters could not possibly go faster than 200 miles per hour in a quarter mile: you can go  $\sqrt{2ax} = 198.48$  mph if you can keep  $1G$  acceleration all the way down the track. Nowadays, drag racing safety watchdogs are working hard to keep the cars under 300 mph; top fuel dragsters launch at more than 3 gees.

For the second experiment, try weighing down your tire with some ballast. I used a couple of dumbbells slung through the centre of the wheel with rope to give me a total weight of 90 pounds. Now, I had to push with 150 pounds of force to move the tire sideways on concrete. Still about  $1.70G$ . We observe the fundamental law of adhesion: the force required to slide a tire is proportional to the weight supported by the tire. When your tire is on the car, weighed down with the car, you cannot push it sideways simply because you can't push hard enough.

The force required to slide a tire is called the *adhesive limit* of the tire, or sometimes the *stiction*, which is a slang combination of "stick" and "friction." This law, in mathematical form, is

$$F \leq \mu W$$

where  $F$  is the force with which the tire resists sliding;  $\mu$  is the *coefficient of static friction* or *coefficient of adhesion*; and  $W$  is the weight or vertical load on the tire contact patch. Both  $F$  and  $W$  have the units of force (remember that weight is the force of gravity), so  $\mu$  is just a number, a proportionality constant. This equation states that the sideways force a tire can withstand before sliding is less than or equal to  $\mu$  times  $W$ . Thus,  $\mu W$  is the maximum sideways force the tire can withstand and is equal to the stiction. We often like to speak of the sideways acceleration the car can achieve, and we can convert the stiction force into acceleration in gees by dividing by  $W$ , the weight of the car  $\mu$  can thus be measured in gees.

The coefficient of static friction is not exactly a constant. Under driving conditions, many effects come into play that reduce the stiction of a good autocross tire to somewhere around  $1.10G$ . These effects are deflection of the tire, suspension movement, temperature, inflation pressure, and so on. But the proportionality law still holds reasonably true under these conditions. Now you can see that if you are cornering, braking, or accelerating at the limit, which means at the adhesive limit of the tires, any weight transfer will cause the tires unloaded by the weight transfer to pass from sticking into sliding.

Actually, the transition from sticking 'mode' to sliding mode should not be very abrupt in a well-designed tire. When one speaks of a "forgiving" tire, one means a tire that breaks away slowly as it gets more and more force or less and less weight, giving the driver time to correct. Old, hard tires are, generally speaking, less forgiving than new, soft tires. Low-profile tires are less forgiving than high-profile tires. Slicks are less forgiving than DOT tires. But these are very broad generalities and tires must be judged individually, usually by getting some word-of-mouth recommendations or just by trying them out in an autocross. Some tires are so unforgiving that they break away virtually without warning, leading to driver dramatics usually resulting in a spin. Forgiving tires are much easier to control and much more fun to drive with.



# The —Black —Crack —Report



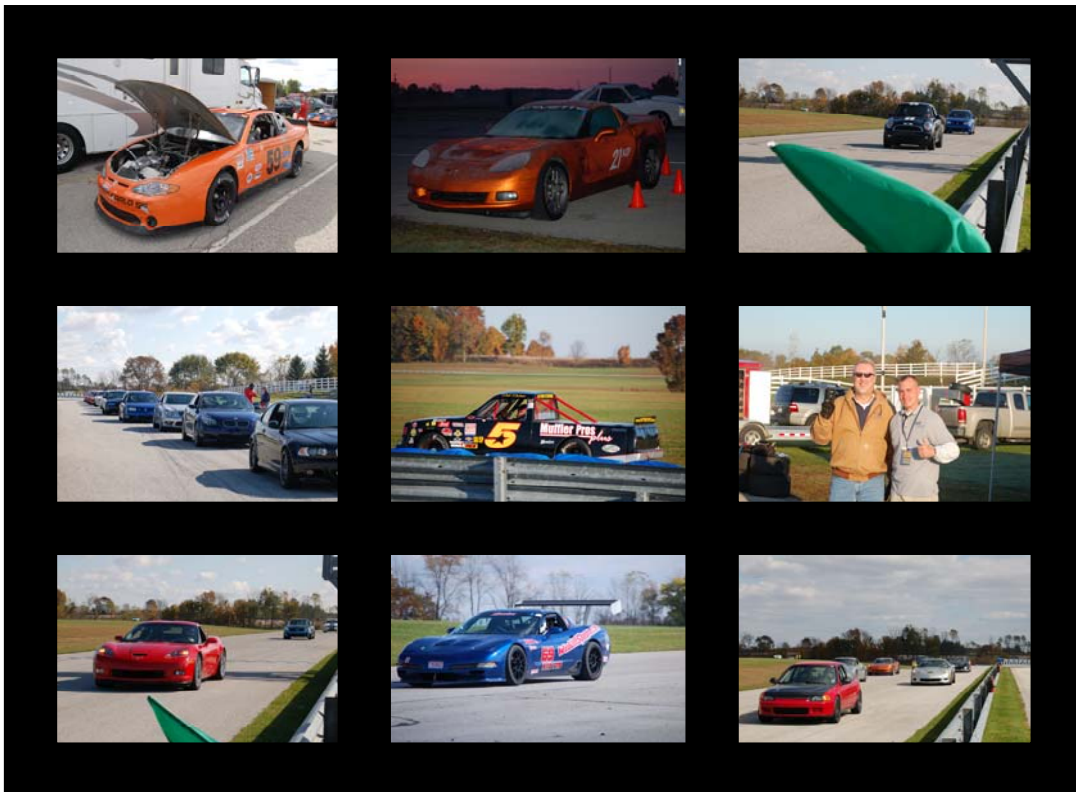
The addiction you don't want to fight

"Driving by the seat of your pants" means sensing the slight changes in cornering, braking, and acceleration forces that signal that one or more tires are about to slide. You can sense these change literally in your seat, but you can also feel changes in steering resistance and in the sounds the tires make. Generally, tires 'squeak' when they are nearing the limit, 'squeal' at the limit, and 'squall' over the limit. I find tire sounds very informative and always listen to them while driving.

So, to keep your tires stuck to the ground, be aware that accelerating gives the front tires less stiction and the rear tires more, that braking gives the front tire more stiction and the rear tires less, and that cornering gives the inside tires less stiction and the outside tires more. These facts are due to the combination of weight transfer and the grip phenomenon. Finally, drive smoothly, that is, translate your awareness into gentle control inputs that always keep appropriate tires stuck at the right times. This is the essential knowledge required for car control, and, of course, is much easier said than done. Later articles will use the knowledge we have accumulated so far to explain understeer, oversteer, and chassis set-up.

## Some Photos from the October and November Events

**Another great event with many great drivers in attendance, THANK YOU.** The weather was very good and everyone got plenty of track time. The wide range of car types made it very interesting walking through the paddock as well as on the track.



*RAFT*



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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.

### Please Visit our Great Sponsors



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