

**Driver's Ed. Education**  
**A Series of Specifics for Success**  
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**Article #14 – R-Compound Tires 1**

Like many track-enthused people, I have entered into the pursuit of higher performance, fun (hopefully), and challenge in my track driving. Anyone who has used sticky tires before will likely understand my chagrin at "burning up" a set of R-compound tires in less time than I deemed reasonable. From what I have seen since, I am not alone... and from what I have subsequently learned, it is not all that surprising!

There is no doubt; the quickest way to faster cornering is to buy a set of "R", or race compound DOT (Department of Transportation) approved radial tires. They simply stick much better than regular street rubber - period! However, as with most things in life, they have their idiosyncrasies and their own set of special parameters for efficient operation. At the same time, one must be careful to apply the right ministrations to the right patient.

I have done a lot of research on this subject, mostly the best way... by trial and error. Unfortunately, I've found that most of the information floating around out there - the word-of-mouth stuff discussed in the pits that most of us end up relying on - is incorrect, or at best, misinterpreted or misapplied.

### **Tire Temperatures**

This is a hot topic in racing and filters down to driver's ed. Many people have invested in a pyrometer to take their tire temperatures. It seems that the standard goal of most people has been to try and achieve the best relative equality in temperatures across the face of the tire as a means of discerning the correct pressure to be used. This is done by measuring the outside, middle, and inside of the tread surface and noting the difference. If the differentials were too great, they adjusted the pressure in hopes of equalizing it.

Unfortunately, this information - like much of it out there - was derived from bias ply tire experience and has only limited correlation to DOT radials.

Like any other, bias ply tires are designed to run with their tread flat on the road. In practice, the sidewall deflects and deforms considerably to absorb cornering loads and keep the tread surface relatively perpendicular with the wheel. Therefore, tire temperature differentials are a good measure of correct tire pressures. If you had a close temperature spread across the tread surface, it meant that you had a

pressure that was conducive to the proper amount of sidewall flex, thereby keeping the tread surface more completely in contact with the road. Pressure up - less flex. Pressure down - more flex. This was achieved somewhat regardless of suspension set-up.

DOT radials, however, do not rely on sidewall flex to maintain the contact patch. They are designed with a stiff sidewall and steel tread belts that flex very little. These tires are predominantly dependent on camber settings to maintain optimal surface engagement. For these reasons, pressure has much less effect in changing temperature differentials.

Proper radial tire set-up involves varying degrees of negative camber, and



generally, the inside of the tread surface will run hotter than the rest (15-30 degrees) simply because it is in greater contact with the road when driving in a straight line. Within limits, the higher temperature is of no real concern as it is derived from simple road contact, not from potentially damaging cornering overload.

On a properly set-up car with radials, the body/suspension of the car will lean and effectively tip the wheel up into a more perpendicular attitude when cornering, thereby utilizing the entire tread surface. Tire pressure has little effect on the contact patch.

### **Put This Under Your Tongue...**

The tire thermometer, better known as a pyrometer, is becoming a common sight, even at \$100-\$300 per. However, their proper usage seems to be as big a mine field as their purpose. If you're shopping pyrometers, you'd best know what type to purchase and how to use it correctly.

The ONLY type of pyrometer to buy for testing your tire's health is the probe type! Then, only a probe length of 3/8" or longer will do the trick. Here's why.

The surface of the tire is not where the heat damage occurs. The danger zone where the tire will start disintegrating is under the outer tread rubber layer at the Cap Ply (the layer of chord you see when you wear through the tread). Because this area is under the tread surface, you need a probe type pyrometer of sufficient length, and inserted to the hilt, to access it. Otherwise, you are not getting your measurement from the area where the damage is occurring.

Incidentally, for this very reason, the hand-held infrared pyrometers are essentially worthless for gauging your tire's needs. They may seem ultra-trick and real easy, but they only read the surface temp of the tire (which cools almost immediately), not under the tread where the tire will start separating. Buy the infrared style pyrometer to check your brake, exhaust, your driver's forehead... or your pot roast. Buy the probe-type for tire testing.



#### Under Pressure

We now know that the radial tire surface temperature differentials are not truly indicative of the need for pressure adjustments. But they will tell if a suspension adjustment is called for.

If, for example, you measure a surface temperature drop of over 50 degrees from inside to outside, chances are you're running too much negative camber. This means that the tire never leans over - or de-cambers - enough in a turn to employ the full tread surface; it is only riding on the inside half, and that's a lot of unused rubber.

This over-cambered situation will be much more easily and accurately evidenced by excessive inner tire wear, as tire surface temperatures usually drop so fast that it is virtually impossible to get measurements that you can rely on to prove the point. Unless you have a crew to help, of course!

Where air pressure does effect radial tires is in handling feel. Radial tires have produced incredible advances in cornering power, but are much less forgiving at the limit than bias ply tires. A properly inflated radial tire can seem "twitchy" at the limit, where a bias ply tire has a controlled and gradual breakaway. This could lead you to the conclusion that bias ply tires may be a wiser choice until you notice you are going much faster to reach the breakaway point with a radial. Everyone wants to go faster, after all. What other justification do you need?

This twitchy feeling in radials can be tweaked by raising or lowering the pressure of the tire. If the change does not exceed a reasonable margin (4-5lbs either way from the recommendation), this will not adversely effect the tire's health.

However, keep in mind that the fastest drivers usually run at the high end of the tire's pressure range,

as this gives maximum cornering power. They also, ironically, seem to get better tire mileage, which suggests that the tires are actually much healthier at the high end of the pressure scale. This is probably due to the inner structure of the tire being optimized by the higher pressures and working more effectively at handling the cornering forces.

#### So...

What all this tells us is that, given a proper inflation range, a radial "R" type tire will be effected much more by suspension set-up than pressure. This is not to say that over or under-inflation is not of concern. Either of these is a no-no (particularly under-inflation), as the tire will not be operating with proper support and in a mechanically efficient manner, and will suffer internally, with drastic wear or catastrophic failure the result. It is much better to start at a higher pressure and work down, as this will not harm the tire's inner structure.

It also tells us not to look to tire surface temperature differentials as the ultimate sign of suspension or pressure optimization for radial tire use. Because of camber settings, the inside temperature will naturally be higher. As long as this variance doesn't become excessive, things are looking good.

The ultimate guide to assessing the efficacy of your suspension settings is good old tire wear! Again, assuming specified inflation levels and proper toe settings, if you see excessive wear on the inside, you've likely got too much negative camber. Conversely, if you see chunking or blistering on the outside of the tread surface, you likely don't have enough negative camber.

So... Run your "R's" at or near the factory recommendation for pressure, crank in the right amount of negative camber, and watch the wear patterns for the real signs of your success. Save that money you were going to spend on a pyrometer to buy more tires. You'll be going so much faster, you'll probably need them soon!

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**by John L. Hajny**

**I have striven to make this an extremely well written and accurate series on a subject that is not to be taken lightly and can obviously be dangerous. To maintain the accuracy and proper presentation of that message, I would ask that absolutely no use whatsoever of any text herein be made without my express written consent.**

**I ask you to please abide by this request.**

**Thank you.**