



Ross Bentley's High Performance Driving Tips - #18

BALANCING CARS

As I've said many times in previous articles, balancing the car is the key to driving safer and faster. By having the car balanced, you are maximising the tire's traction - the more traction the car has, the more in control the car is (safer), and the faster you can drive through a corner.

Let's review. By having the car balanced, I mean having the weight of the car equally distributed over all four tires. Remember that there are only the four small tire contact patches (the part of the tire that is in contact with the road at any one particular time) that are actually gripping the car to the road. The larger the contact patch, the more traction that tire has. By putting more weight over one tire, you increase the size of the tire's contact patch, and therefore, increase the traction capabilities of that tire.

Now, as a car accelerates, weight is transferred to the rear (the back-end squats down), increasing rear tire traction. During braking the exact opposite happens - the car nose-dives (weight transferred to the front) and front tire traction is increased. While going around a corner, weight transfers to the outside tires, increasing their traction.

But - and this is the big "but"(excuse me!) - when the weight transfers onto a pair of tires, increasing their traction, weight is being taken off of the other two, *decreasing traction*. The overall effect to the car is a decrease in total vehicle traction, because this increase/decrease is not proportional - the un-weighted tires lose more than the weighted tires gain

Let me explain it this way. If you were to quantify the amount of traction each tire has, and gave it a corresponding number, that would be what I call the tire's "traction unit number". For example, with a car sitting at rest (assuming it has equal weight distribution over all four tires), each tire has, let's say, 10 units of traction - for a total of 40 traction units gripping the car to the road. Now, when you corner, weight is transferred to the outside tires, increasing their traction - giving them 15 units of traction. But, at the same time, weight is removed from the inside tires, reducing their traction - resulting in 3 units of traction each. The total for the car is now $15+15+3+3=36$, which is less than before you caused the weight transfer by turning. And, the more the weight transfers, the less the total vehicle traction will be.

Now, obviously, it is impossible to drive a car without causing some weight transfer. Every single time you brake, corner and/or accelerate, weight transfer takes place. However, as you can see, the less weight transfer that occurs, the more overall traction the car has.

So, you want to drive in such a way as to keep the weight of the car equally distributed over all four tires at all times - in other words, balance the car. How? By driving smoothly - turning the steering wheel as slowly and as little as possible (you know that if you jerk the steering wheel into a turn, the car leans, or transfers weight a lot; if you gently turn into a corner the car does not lean as much), and squeezing on and easing off the brakes and gas pedal - never making a sudden or jerky movement with the controls. Now you see why it is important to drive smoothly, and how it can affect the balance and overall traction of your car.

However, there is also what I call "dynamic balancing" of the car. Not all cars have perfect 50/50 weight distribution to begin with (in fact, very few do). As well, once a car's weight does transfer, it affects the handling characteristics, resulting in some amount of understeer or oversteer. So, a driver must try to compensate for this by controlling the weight transfer to balance the car into a neutral (no under or oversteer) handling situation. To do this the driver may have to effect the weight transfer so that statically there would be more weight on the front or rear, but dynamically the car is perfectly balanced.

I will also mention at this time that the one area of most drivers' technique that adversely effects the balance of the car the most is in the transition from braking to acceleration in the early phase of a corner. A driver should be able release the brakes and begin application of the throttle without feeling the transition whatsoever.

This concept of balancing a car may be a little confusing, but if you think about it, and practice it, you will be a much safer and faster driver - what else in the world could a person ever want!

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