



Ross Bentley's High Performance Driving Tips - #9

WEIGHT TRANSFER AND THE TRACTION LIMIT

Knowing the limits of your car is very important. Knowing how to increase the limits of your car can save your life and/or allow you to drive a little quicker. Increasing the limit depends on how you go about handling and reading weight transfer and traction.

When accelerating, feed the clutch out gently, yet briskly, making sure not to slip it. Once the car is rolling with the clutch fully engaged - and your left foot on the dead pedal - then, you can begin full-throttle application.

Always accelerate smoothly in a fluid manner. Squeeze on the gas pedal - don't pounce on it. It should be completely progressive. Change up to the next higher gear before you reach maximum RPM. It is not necessary for full acceleration to red-line it on every shift. In fact, in doing so, you are likely to over-rev the engine and/or exceed the peak torque range.

Under acceleration - as well as in braking and cornering - there is a definite traction limit. This is established by the coefficient of friction between the tires and road, which is limited by the type of tire, effectiveness of the car's suspension, road conditions and balance of the car. Generally, on a dry road, maximum traction occurs when there is approximately 8 to 15% wheelspin. This means a tire develops its most grip when there is actually a certain amount of slippage (due mainly to the elasticity of the rubber tire). At this rate there will be a faint squeal of tires and a faint grey line on the road. Exceeding this amount of wheelspin, or limit, will result in less than maximum acceleration. If you should begin to get this kind of wheelspin, back off the throttle, feathering it until you have controlled traction at maximum acceleration again.

Obviously, this traction limit changes with road conditions. On a wet road the limit is around 2 - 5% wheelspin; on ice 0 - 1/2% wheelspin.

The brakes on the modern high performance car are far more powerful than almost any engine. In other words, the car is capable of stopping much quicker than it can accelerate. And yet, the average driver often only uses half the brakes' capabilities, and then, usually improperly.

Maximum braking occurs with approximately 8 to 15% wheel slippage - meaning the wheels are actually turning slightly slower than they should be for a given car speed. Exceeding this limit leads to lock-up - 100% slip - and loss of steering control. Braking at this limit is called "threshold braking".

The first step in proper braking is actually in how you come off the power. Do not lift off the gas pedal abruptly, but gently ease off the throttle quickly. Then begin squeezing on the brakes, again progressively, until you are at maximum braking - threshold braking. If you exceed the limit for threshold braking and begin to lock-up, ease up slightly on the pedal and then reapply again. You must modulate the pedal pressure using the feedback from the tire noise, the forces on your body and the balance of the car - which is exactly what ABS automatically does for you. Abrupt hard braking will cause the car to nose-dive putting most of the braking effort on the front brakes - the car will not be balanced.

Remember to squeeze the brakes on smoothly, firmly and progressively and then release it very gently, so that you don't actually feel it coming off. Practice this every time you come to a stop in the road - see if you can modulate the brakes so you can't feel the exact point where the car comes to a complete stop. Work on developing a real feel for the brakes; a very sensitive touch is important, especially in poor traction conditions. This is what separates a High Performance Driver from the average driver!

One of the keys to driving is controlling the balance of the car. By balance I mean having the weight equally distributed over all four tires. But to increase the traction limit in any one particular driving direction, we may want to increase the weight, or weight transfer to be exact, over a certain pair of wheels.

Think about it. There are only 4 small tire contact patches (the actual patch of tire that is in contact with the road at any one particular time) that are actually holding you on the road, and the larger the contact patch, the more grip or traction that tire has. By putting weight over one particular tire, you increase the traction capabilities of that tire.

Now, we all know that as a car accelerates, the rear-end tends to squat down. That's because a percentage of the weight has now transferred to the rear. Under braking the car nose-dives - the weight has transferred forward. In a corner the weight transfers laterally to the outside causing the car to lean. Understand, the total weight of the car hasn't changed, just the distribution of it.

You want, and have to, control this weight transfer to your advantage. Again, as the weight transfers onto a pair of tires, pushing them into maximum contact with the road, you have more traction with those tires. Conversely, the tires that become un-weighted lose traction. During cornering, this weight transfer balance can cause the car to either "understeer" or "oversteer" - which we'll look at in a future article.

Until then, concentrate on feeling the weight transfer and traction limits in your everyday driving - and it's effects.

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