

Vehicle Balance

A Simple Explanation of Vehicle Stability in Bends (Jim Cunliffe - Chief Observer)

Normally the faster you want to go, the *higher* the gear you use. But have you noticed that the faster you want to go around a bend the *lower* the gear you have to use? Why?...because of vehicle stability.

So what is stability?

Imagine a wine bottle sat on a table; a slight nudge on the table produces no reaction; it is in a stable condition. Now stand the bottle on its neck and nudge the table, it easily falls over; it is in an unstable condition.

Stability is the ability to resist external forces, and this applies to your car too. It is at its most stable when travelling in a straight line at constant speed with the weight evenly distributed across all the wheels.

Weight Transfer

When you brake the car becomes unstable, weight shifts to the front (increasing grip) and comes off the rear (reducing grip). When you accelerate the opposite is the case, but as weight shifts to the rear, the front tyres not only lose grip but also steering control! If you happen to be in a bend and you brake, the general tendency is for the rear to slide outwards, or if you accelerate, the general tendency is to 'run wide'. The answer is to go round the curve at constant speed with the weight evenly distributed between front and rear.

Gravity

So why do you have to 'accelerate' round a corner - you don't! What you do is press the accelerator pedal to deliver more power to maintain your speed. Think of going up a steep hill and not losing speed. As you begin, speed falls off and you press the accelerator more and more just to keep up your speed – you are not 'accelerating' and increasing speed, even though you are pressing the pedal further – you are giving more power to the engine. Why?

The answer is simple, you have to overcome the force of **gravity** pulling the car back down the hill. At some point as the hill gets steeper and gravity is stronger, you might have to change into a lower gear so the extra engine revolutions give extra power to overcome that gravity.

Momentum

It is just the same for bends, only now gravity is replaced by **momentum** as the external force that has to be overcome. Momentum shows itself as the tendency for the car to continue in a straight line when you want it to turn. The faster you are travelling, the heavier your car, and the sharper the turn, the greater the force of momentum that has to be overcome.

Acceleration

We tend to think that pressing the accelerator always increases road speed (*acceleration*). But we have seen (on the hill) that pressing the accelerator just delivers more engine power, which may or may not result in an increase in road speed.

As you approach a bend and begin to turn the steering wheel, momentum will resist you and push you straight on. The more you turn the wheel the greater the force becomes, and, just like gravity, it will slow you down. Slowing down will transfer weight to the front, and the rear will become more and more unstable and want to slide outwards. To prevent this weight transfer and maintain stability, your car has to be travelling at a constant speed – not slowing or accelerating. So, just like on a hill, you have to press the accelerator down further just to overcome the force of momentum to maintain a constant speed. The force of momentum can be so great in these conditions that lower gears have to be used to access more engine power to overcome that force and keep a constant speed.

Disclaimer: *Driving is never a black and white activity, but full of grey areas, therefore neither I nor my fellow Observers in the St Helens & District Group of Advanced Motorists are liable for any consequences you may experience as a result of reading our advice. You are the driver. You should be in control of your vehicle at all times.*