

TRAINING

CORRECTING OFF LEAN

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Take any weekend ride and you will see riders cornering with an off-lean. This technique – if you can call it that – is more than just poor riding, it is downright dangerous! Here's the how and why of off-lean, and why you don't want to ride with it.

Here is a rider with extreme off lean



Many riders have a bad habit of riding corners with an off-lean, but let's start with defining that. What is an "Off Lean?".

Simply put, the bike is leaning one way and the rider is leaning the other.

WHY IS THIS SUCH A BAD THING?

Some people believe that it is correct to 'push the bike down'. This is totally incorrect, for cornering on the road at speeds above 30km.

Let's have a look at what happens with the physics of motorcycle dynamics and how the rider can affect the bike, either positively or negatively.

Here is a motorcycle balanced on its wheels, traveling straight and the rider sitting centrally:



There is a natural pull of gravity pulling down, the centre of gravity (COG) is a combination of the bike's mass and the rider's mass and in this case, the COG is higher than it would have been than the bike on its own. The rider definitely affects the COG.

WHAT WOULD HAPPEN IF THE BIKE WAS TO CORNER WITHOUT THE RIDER?

The bike must lean into the corner to counter the centrifugal force, which would pivot the bike over the top of the tyre's contact point, causing it to fall to the outside of the corner.

The COG moves slightly away from the centre line of the bike.



The COG shift – although minor – helps the bike to resist the centrifugal force. The major effect is that the bike leans against the centrifugal force. *The bike turns in the direction that the road is going.* This is a good thing.

If we try to corner without leaning in, the centrifugal force has an unwanted effect.

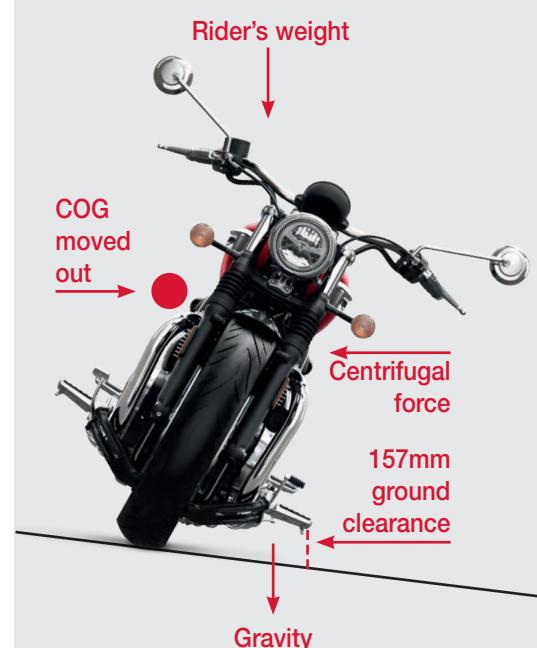


Which quickly becomes...

HOW DOES THE RIDER'S WEIGHT AFFECT THE BIKE?

First, let's see how it can badly affect it.

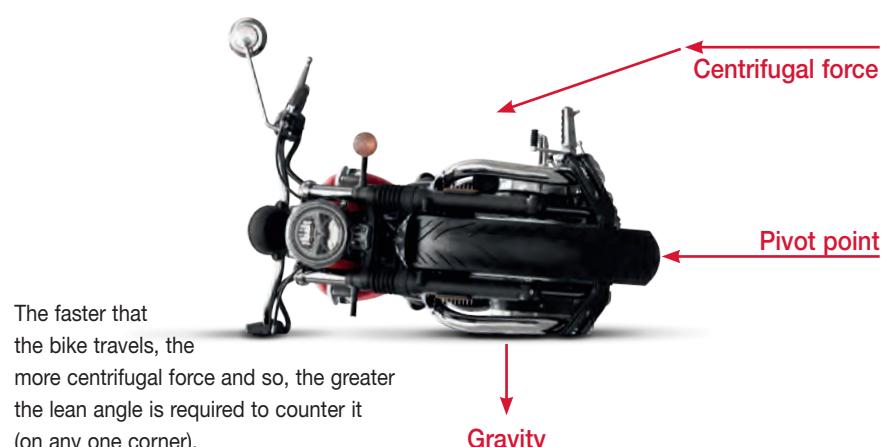
If the rider off-leans (pushes the bike down), their weight moves the COG away from the corner.



The COG now assists the centrifugal force to try to make the bike fall over, so the bike must lean further against the centrifugal force for it to turn in the direction the rider wants to go. The rider is actually working against the bike and the bike must compensate for this.

The result is that ground clearance is reduced.

This is a bad thing.



NOW LET'S SEE HOW THE RIDER CAN POSITIVELY AFFECT THE BIKE.

If the rider leans in (into) the corner;



The combined weight of bike and rider are now on the inside of the corner, and so the COG moves to the inside, assisting the bike to resist the centrifugal force. Now the bike can turn with a much-reduced lean angle. The ground clearance is increased. This is a very good thing!!!

WHY IS GROUND CLEARANCE SO IMPORTANT?

It is always a bad thing to have the ground

clearance reduced. It could be a matter of just a few millimetres difference, but it can dramatically affect the outcome of small mistakes such as carrying too much speed.

If the bike runs out of ground clearance, it will refuse to turn tighter. In a corner with bad camber or a diminishing radius, no further lean is possible, and the bike will very likely leave the road. The majority of open road motorcycle accidents are single vehicle, "rider loses control and leaves the road at the exit of a corner" events. With large numbers of riders leaning the wrong way, this is not surprising. A large percentage of these crashes could easily have been avoided. By keeping the bike on a lesser lean angle, there is still enough clearance to gain a small amount of extra turn-in and save the day.

Any bike will perform better in a corner if it is kept at a lesser lean angle; the suspension will work better and so will the tyres.

If the bike is on a lesser lean angle, the weight of the bike is better applied to the tyres and so their contact patch and grip is maintained to a higher degree.

Corners are not always smooth, if the bike is leaned in to the point of nearly touching the road and then the bike goes over a bump, the suspension will absorb the bump, but the lowest part of the bike (normally somewhere in the middle of the bike) will touch down.

The bike immediately has a third contact point and the bike's weight is shared across the three points. This is the moment that the tyres could let go.

Correct rider lean angles are especially important for bikes with a lesser ground clearance, like cruiser bikes, but it is important for all types of bikes. A simple, slight lean-in by the rider can hugely affect the lean angle of the bike.

It's so much easier to quickly add a touch more lean if the rider is already leaning the correct way. This can help dramatically on a tightening corner or a corner where the camber changes part way through.

HOW DOES THE RIDER ENSURE THAT THEY ARE NOT 'OFF LEANING'?

Very simple: ask the question; "Where is my head?"

If your head is on the outside of the bike in a cornering turn, you are off leaning.

You will not be alone, roughly 80% of riders are making this mistake every time they ride and this is making their riding less enjoyable, and more dangerous:

They fight the bike's natural ability to turn
They increase the likelihood of grounding the bike

They make things incredibly difficult for themselves when the corner tightens or if they have misjudged their speed.

If you are traveling behind a friend, it is very easy to see. Do your friend a favour, at the next stop tell them what you've seen. They are probably completely unaware that they are making things hard for themselves.

Leaning in helps any style of bike, the physics don't change.

