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Tech Watch

Why unsprung weight is so important



INSIGHT

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On the launch of the new Speed Triple in Spain (see page 2-3), Triumph was emphasising not so much the amount of weight lost compared with the old model, but from where it was lost. And while Suzuki's achievement in shedding 8-9kg from the 2011 GSX-R600/750 compared with the current models is impressive, what's really exciting the race teams is how much of that is unsprung weight (see page 13).

Unsprung weight is anything that moves due to the suspension being compressed – not only the wheels, tyres and brakes, but also the fork legs and internals (even the oil), swingarm, shock and suspension linkages.

Suzuki has concentrated on all of these, using lighter linkages and losing almost 1kg from the swingarm, while Triumph has fitted significantly lighter wheels to the Speed Triple and has even shaved the brake discs from

The Speed Triple's lighter wheels reduce weight where it really matters

5mm thick to 4.5mm, in order to reduce weight where it really matters.

Weight on the front wheel is the most influential of all – and it matters for four different reasons. The first is the most direct and obvious: like weight anywhere on the bike, performance is improved when it's reduced because the engine has less mass to accelerate. So the bike is faster, the brakes have less to stop and don't have to work so hard, and changing direction is easier because it takes less effort to turn a lighter bike around.

The wheel is unsprung mass, too, which is the mass that has to move up and down relative to the rest of the bike when it's going over a bumpy surface. The heavier the unsprung mass, the more

effort is needed to move it, so minimising it makes the suspension more responsive and faster to react to bumps. In turn this keeps the tyre in more consistent contact with the ground, improving grip – the general ride quality and rider comfort are improved as well.

Weight in the wheel, tyre and brake discs has two further effects. When you accelerate on a bike, you're not only increasing its speed along the road, you're also making the wheels spin faster – an increase in their energy which saps engine power. When you brake, not only does the bike get slower, the wheels' spinning slows as well, and the heavier they are, the more effort that takes.

Finally, spinning wheels produce strong gyroscopic forces, and the heavier the wheel the greater these are. These resist changes of direction and steering effort, so they can be good for stability but bad for agility – and in a sports bike agility matters.

The combination of all of these means losing 0.5kg from a front wheel can have as much influence as losing 5kg from the rest of the bike – 10 times as effective.



New Speed Triple has 0.5mm thinner brake discs to reduce unsprung weight