



FORMULA 1 VS MOTOGP: WHO WINS WHEN BRAKING IN AUSTRIA? AFTER AUSTIN BREMBO ANALYSES DATA FROM THE SPIELBERG CIRCUIT FOR THE ANSWER

MotoGP or Formula 1: which of the two categories achieves the highest speed? And which is more effective when braking? After having compared data from the track in Austin, we want to see how the two compare on the Spielberg circuit.

The track in Austria hosted Formula 1 last month and will soon host MotoGP as well.

The goal is to see whether the outcome of the analysis in Austin, Texas, is particular to that racetrack, or if the same results apply to the Austrian racetrack as well.

Some may object that there's no room for comparison, since the physical characteristics of the two vehicles are so different. However, both series are the ultimate expression of automotive research, so comparing the two helps us see how far prototypes have come in the two categories.

Besides, Brembo has supplied the most important teams in the two championships for decades, which allows us to present data that will get you thinking.

Before we start, though, let's have a look at the technical specifications of the two vehicles.

	Formula 1	MotoGP
Weight	702 kg driver included	157 kg rider excluded
Engine	Turbo 1600 cc	Aspirated 1000 cc
Rims	13 inches	17 inches
Width Front tires	245 mm	125 mm
Rear tire width	325 mm	190 mm
Discs	278 mm	340 mm

So, without counting the driver, a Formula 1 single-seater weighs four times as much as a MotoGP bike and boasts a significantly more powerful engine (with the added presence of electric engines).

Of course the tires are also different: both the number of tires (4 versus 2) and the size of the tread; Formula 1 single-seaters have significantly wider tires than MotoGP bikes.

Besides the width of the tread, F1 and MotoGP also have a significantly different footprint: the surface of the tire that touches the asphalt. The difference is due to the different way tires are produced for cars and for bikes. While the full width of a F1 tire touches the asphalt, in MotoGP only a portion of the tread actually touches the asphalt.

Let's compare their performance on the Spielberg circuit.

	Formula 1	MotoGP
Fastest lap	1'07"922 L.Hamilton	1'23"240 A.Iannone

When comparing L. Hamilton's fastest lap when qualifying in 2016 to A. Iannone's lap in last month's test, there's a gap of more than 15 seconds between Formula 1 and MotoGP.

The limits of MotoGP are essentially two:

- 1) the time required to slow down enough to take a curve
- 2) the speed when going through the curve.

Several factors come into play in both cases, especially



- A) the different dynamics of the two vehicles, MotoGP needs to factor in the risk of overturning the vehicle;
- B) the significant difference in vehicle aerodynamics, non-existent for MotoGP, but a major factor in deceleration for F1;
- C) the sizeable difference of the tire footprint for the two vehicles.

Three situations measured by Brembo on the Spielberg track help clarify point number 1:

Formula 1 MotoGP

Braking time at curve 1 1.3 seconds 4 seconds

Braking time at curve 3 1.5 seconds 5 seconds

Braking time at curve 8 0.9 seconds 3.5 seconds

Point 2, on the other hand, is well illustrated by the following measurements from the Spielberg circuit:

Formula 1 MotoGP

Curve 1 entrance speed 113 km/h 97 km/h

Curve 5 entrance speed 156 km/h 121 km/h

Curve 8 entrance speed 179 km/h 134 km/h

Naturally, the braking distance for the bikes is also significantly longer on the Spielberg circuit.

Formula 1 MotoGP

Braking distance at curve 1 116 metres 210 metres

Braking distance at curve 2 146 metres 250 metres

Braking distance at curve 5 77 metres 144 metres

Brembo engineers observing the competitions believe it's no coincidence that MotoGP riders in Austin spend X% of the race braking; as opposed to 17 % for Formula 1 drivers.

A difference that determines significantly different lap times.

The explanation is rather simple: Formula 1 vehicles can immediately discharge braking torque to the ground, since balance is not an issue; MotoGP riders, on the other hand, can't use all the force at once, since having only two wheels available means there's a high risk of flipping over.

In addition, the single-seaters have a ground footprint of the four treads that is well over four times that of a MotoGP bike: naturally, the greater the footprint, the greater the opportunity to discharge the braking torque to the ground.

This is why the decelerations that the riders and drivers face are in line with the characteristics of the vehicles that they command.

Formula 1 MotoGP

Average deceleration 4.4g 1.3g

Maximum deceleration 5 g 1.5g

Unlike Austin, the Spielberg circuit places different demands on car versus bike braking systems: according to Brembo's people, the difficulty level is medium for Formula 1, but it ranks as difficult for MotoGP.

What have we learned from this comparison?

Austin wasn't a fluke: braking is significantly more effective for F1 than MotoGP, as confirmed by the comparison with the Spielberg circuit.