

Aerodynamics in F1: Overview of the aerodynamic development approach of a modern F1 Team

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Abstract

Plotting the lateral acceleration through cornering of racing cars over the years, what has been a limited increase for several decades, due mainly to tyre improvements, turned into a dramatic growth around the 1970s. Cornering acceleration grew from less than the gravitational acceleration (g) to more than $5g$ on a modern F1 car. This revolution has been possible thanks to the deployment of aerodynamic devices and the generation of downforce. As tyres increase lateral forces with increasing vertical loads, allowing for higher cornering speeds, an increase in such vertical loads through downforce appears particularly suitable for a race car, given aerodynamic forces scale with the square of the speed of the vehicle.

Because of the importance of aerodynamic performance, aerodynamicists have perfected with time sophisticated development tools and approaches. Nevertheless, teams have to move within the constraints of the regulatory framework provided by the Federation Internationale de l'Automobile (FIA).

In this presentation, after a brief introduction of Mercedes F1 Team and the role of aerodynamics in F1, the most relevant elements of Sporting, Technical and Financial regulations are presented to explain how certain constraints contribute to the challenge of developing a modern F1 car.

Moreover, an overview of the aerodynamic development approach of a modern F1 Team is presented, describing CFD simulations, wind tunnel and track testing, together with the challenges that every part of the process entails.

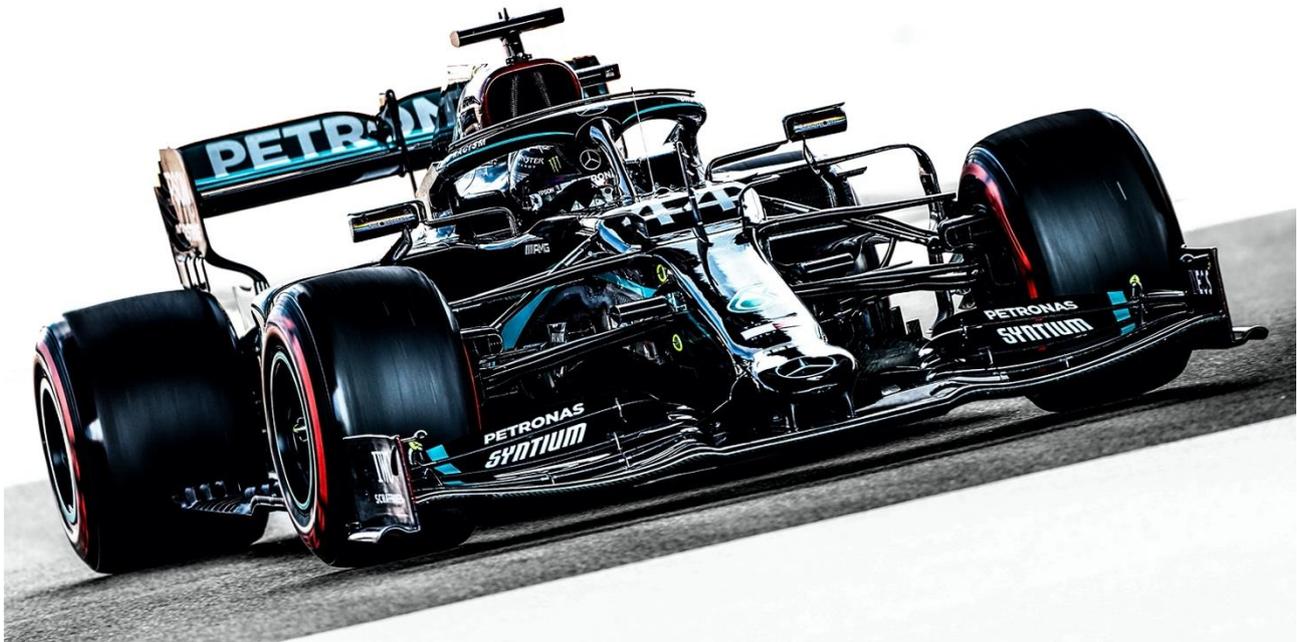


Fig. 1 'Mercedes-AMG F1 W11 EQ Performance'

References

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