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Investigation & Development into Aerodynamics of Mirage RX Supercar

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BEng (Hons) Motorsport Engineering

Introduction

This project aim to improve the aerodynamic efficiency of the Mitsubishi mirage RX supercar from Spencer Sport.

The design of the car was to match British rallycross and world rallycross regulations. Under the updated regulations, rear bumper design was to change.

Underbody, bumper and fender are the main area to be integrated.

Methodology

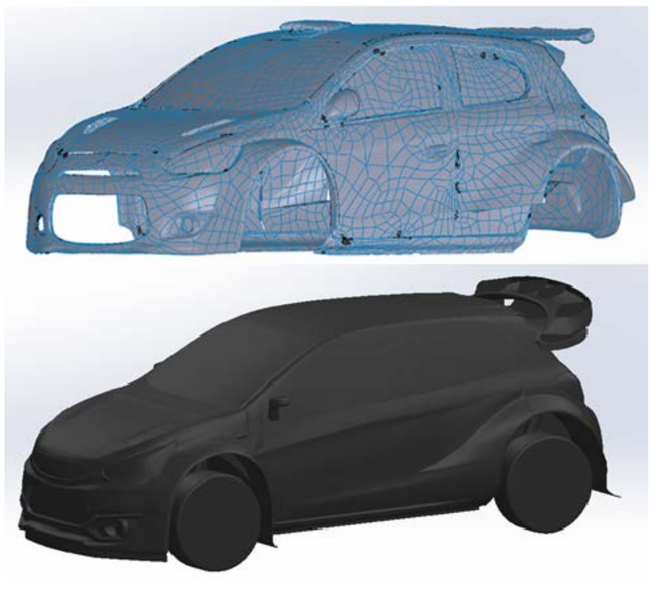
With the Mirage R5 and facelifted bumper surface model received from Spenser Sport, geometry need to be clean up and turn into solid model.

The geometry of the underbody, suspension system, wheels and wing also need to be measure up and create on Solidworks.

After the finalized baseline model had been made, development on the baseline model can be created.

Computational Fluid Dynamics analysis of the models are then made to find out the aerodynamic behaviour in post processing.

By comparing the developed models to the base design, the most efficient model could be determent.

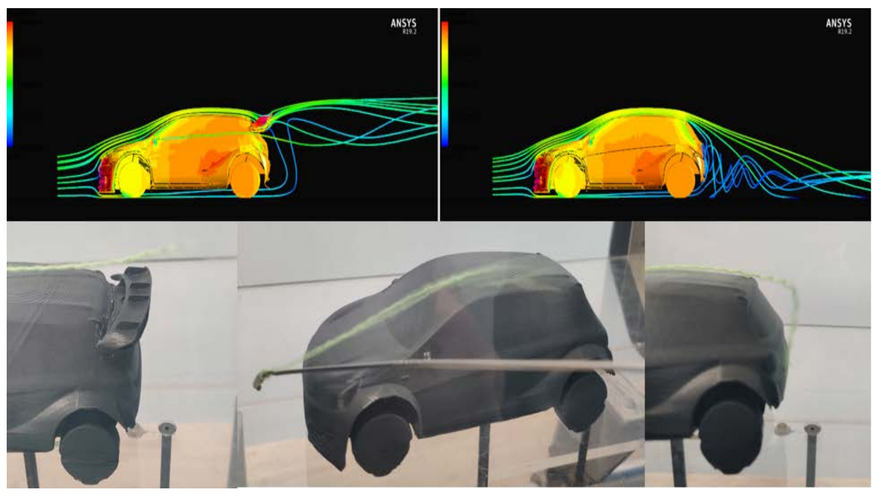


Mirage R5 surface model & final baseline model

Validation

To validate the CFD simulation. CFD study on Mira notch car had been completed and validated with Mira wind tunnel data.

Further validation on 1/24 scale wind tunnel had been completed. It was for visual validation on the flow characteristic in CFD compare to the 3D printed small scale model.



CFD & mini wind tunnel

Underbody

The design concept of the underbody was to create a smooth surface to give less resistance to the airflow under the vehicle. Diffuser also added to the rear section of the vehicle, between the rear floor section and the rear bumper.

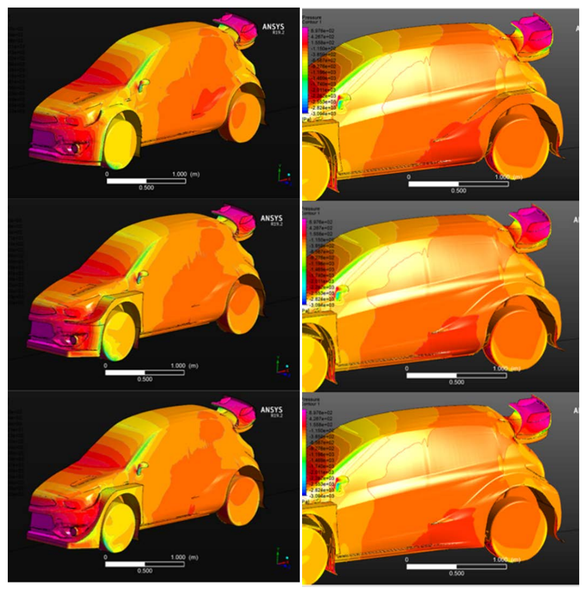
The new under body has gain 2% downforce with no changes in drag, the COP also shifted 0.1m to the back of the vehicle. Which could be counter by a more aggressive front bumper.

Underbody designs

Fender and Bumper

The new front bumper and fender design had gain 13% of down force with10% more drag. The overall lift drag coefficient was still 2% better than the old design.

Though there was one problem which needs to take into consideration. The COP had moved forward 0.3m compare to the final baseline model.



Fender and bumper designs

Conclusions

The aim of the project had been achieved. The study has shown the rally car's bodywork can be further improved, especially at the front.

But project findings also alert to be mindful of COP balancing, which is an area worthy of further investigation and call for driver validation through simulator or life testing.

Final design model

Acknowledgements

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SPENCER sport Ansys SOLIDWORKS

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