

CFD ANALYSIS OF THE HALO'S WINGLETS AND POSSIBLE AERODYNAMIC IMPLEMENTATIONS

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BACKGROUND

Formula 1 in recent years has looked a lot at driver safety, trying to improve it as much as possible. For this reason, during the 2018 season debuted the Halo, a device that is mounted above the cockpit to ensure the complete safety of the driver and indeed it must support the equivalent of 12 tons of weight. During these last few seasons, the Halo has been featured in many accidents, saving the pilot's life on several occasions.

From an aerodynamic point of view though, this device proved to be quite a challenge as its introduction led to a deviation of airflow directed to the rear wing, causing a decrease in the creation of downforce, and in the mass of air entering the inlet of the engine, causing a decrease in performance for the engine (Papadopoulos,2020).



(GreZ,2022)

AIM

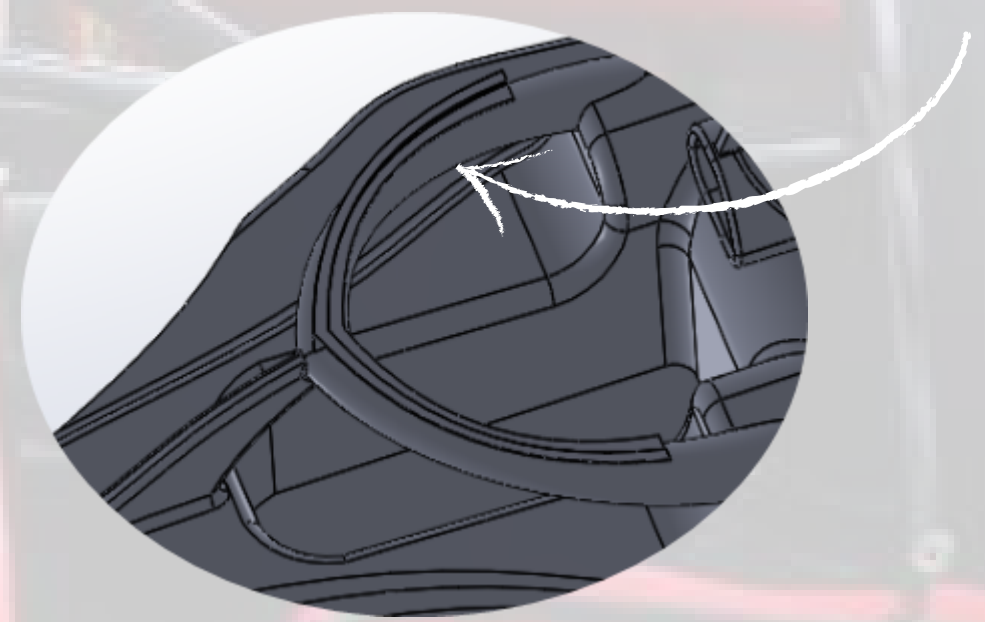
The purpose of this study is to analyze two different configurations of devices that can be installed on the Halo, namely a winglet with one and two layers, and analyze when they can improve downforce and drag compared to a vehicle with halo only.

DESIGN & METHODOLOGY

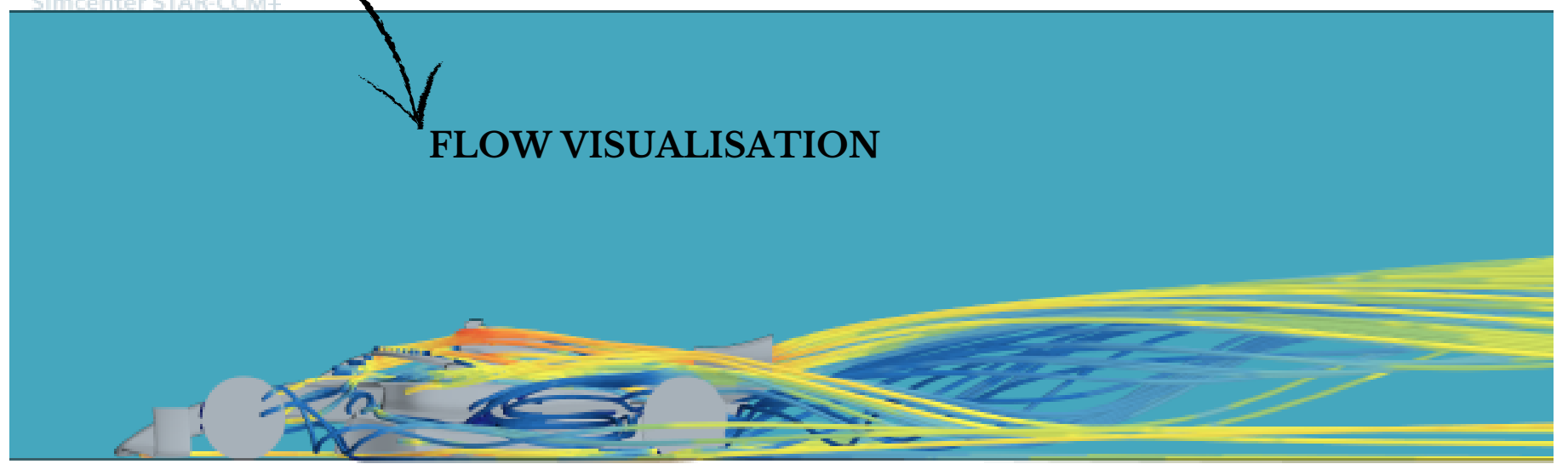
The study was carried out using a CAD geometry of a Formula 1 car taken by Simscale database while the geometries concerning the winglets in one and two layers were made later using Solidworks.

The simulations of the design created was done with CFD programme named Star CCM+.

TWO LAYERS WINGLETS DESIGN



FLOW VISUALISATION



RESULTS

The research carried out through CFD analysis, showed that the devices introduced produced an increase in downforce of 1.9 % and 2 % for one-layer and two-layer winglets respectively. An increase of only 0.53 % and 0.79 % for one-layer and two-layer winglets respectively created by these devices is shown.

In particular, it was also calculated the percentage of influence that the halo, together with the devices installed, compared to the coefficient of resistance and lift has to justify how the introduction of these types of devices on the halo continues to improve the overall performance of the car.



REFERENCES:

1. Periklis Papadopoulos and Mark Lin, 2020, 'Effect of Halo Protection Device on the Aerodynamic Performance of Formula Racecar'. Available at: <https://publications.waset.org>.
2. Grez, M. (2022) Formula One driver Zhou Guanyu says halo device 'saved me' during high-speed crash, CNN. Available at: <https://edition.cnn.com>. (Accessed: 10 April 2023).