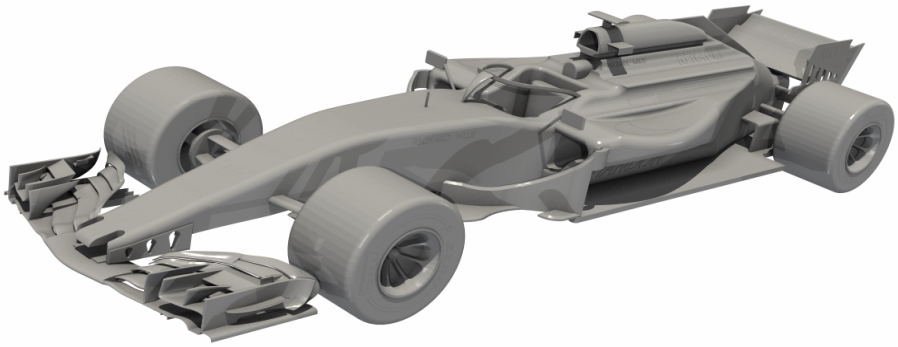
Aerodynamic study of Formula-1 car

Abstract- This article explains the aerodynamics study of Formula-1. The Formula One car's design has constantly evolved throughout the sport's history, as teams attempt to both out-smart their competitors and keep up with ever-changing regulations. Since aerodynamic performance is one of the most important factors in a car's design, teams fluid dynamics is the numerical study of moving liquids and gases, to model the flow of air behind the car as it races to the finish line. Fundamental to this study are the Navier-Stokes equations, which are so complex that they cannot be solved directly. The mathematicians turn to powerful computers to provide approximate but accurate solutions. This computation is done using an opensource software OpenFOAM v5.0 with simpleFoam solver and laminar flow condition.

Problem statement

The most important consideration in F1 car design - the difference between designing a championship-challenging machine or a tailender - is aerodynamics. The main forces considered during aerodynamics of F-1 car are Lift, Drag, Downforce, Thrust. To reduce Lift and Drag some features are added to the many sports car. They make significant changes in the values of drag and lift. Frontwing, Bargeboards rear wing are the most effective features. In the high-speed racing, every angle of this features matters. Streamlines of the velocity profile and pressure distribution are the only way to understand the aerodynamics of F-1.



Initial Conditions:

Solver - simpleFoam
inlet velocity – 350 km/hr
Pressure – 0 Pa
Drag coefficient – C_d
Lift coefficient - C_l