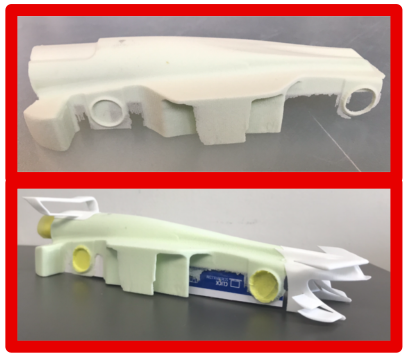
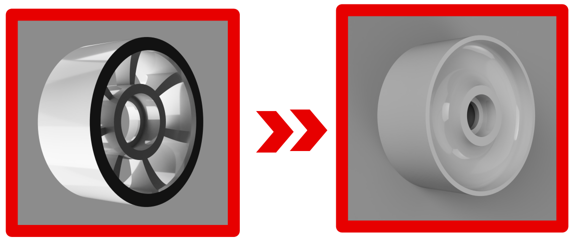
DESIGN ALTERATIONS

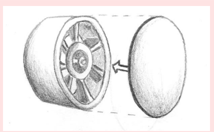
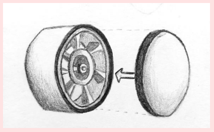
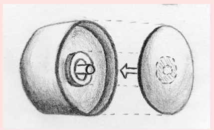
POST MANUFACTURE CHANGES

- With the first round of prototypes, we realised that we had made some areas on one of our designs too thin for the CNC machine to cut properly. We were able to use other materials to reconstruct the missing sides in order to proceed with the testing and although this meant that the car's weight was unbalanced on the track, it at least allowed us to properly test the shape of the car in the wind tunnel. Of course, we immediately modified our CAD to ensure that the walls would be thick enough, should we chose that design as our final one.



- When the fully manufactured prototypes were weighed, we realised that both were significantly under the weight limit, furthermore, our use of steel bearings (instead of the ceramic bearings that we would use for the final cars) meant that the actual cars would also be roughly 3g lighter than these prototypes. The most efficient way to add the extra weight required to meet the 50g weight limit, was to increase the volume of our 3D-Printed components (as the density of the 3D printed material was greater than that of the F1 Model Block). So as not to alter any dimensions and thus, the airflow around the car, the components we chose to add volume to were the wheels. Luckily, our previous design, consisting of seven spokes, meant that the wheel was almost hollow and therefore very light. By getting rid of the spokes and turning the wheel into one solid block we were able to increase the weight without changing their dimensions. The wheels were also the best component to chose, as their symmetry meant that the added weight was evenly distributed, keeping the car well balanced.

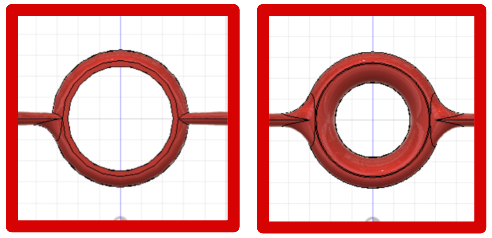


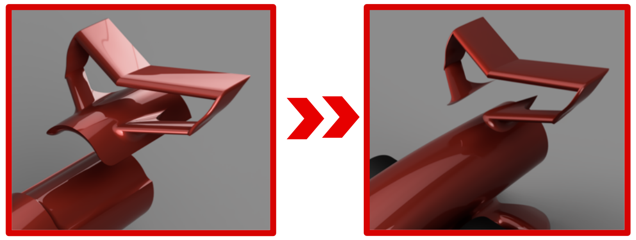
Concept Sketch:	*Idea:*
	A sticker covering the wheel. It would adhere to a thin ridge on the edge of the rim and rotate with the wheel. However, there would be a risk of the sticker peeling off and if the sticker was not perfectly centered, it could cause the wheel to bounce when rotating at high speeds.
	A thin plastic disk that would fit inside the wheel. The rim would have an internal ridge so that a cover could be glued on once the wheel was assembled, with the cover ending up flush with the edge of the wheel. This would mean, however, that the cover could not be removed once the wheel was assembled.
	A cover that would clip on and off the axel, remain stationary as the wheel rotates around it. There would be no risk of upsetting the balance of the wheel, however, we would have to make sure that it did not obstruct the rotating rim in any way.

We ultimately decided to go for the clip on/off cover, which could be removed should any final adjustments to the wheels/axels be needed.

POST-TESTING CHANGES

- When we 3D printed the parts, we realised that the tether line guides looked very thin and fragile. Although they were able to withstand the 200g test weight, we decided to modify our CAD and thicken them a little more, just in case the stress on the when the car was raced on track was more then expected. We also decided to slightly modify the shape of the tether guides, making them more rounded, to minimise the friction between the track tether line and the car.

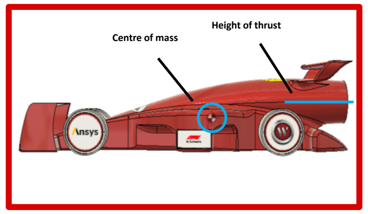


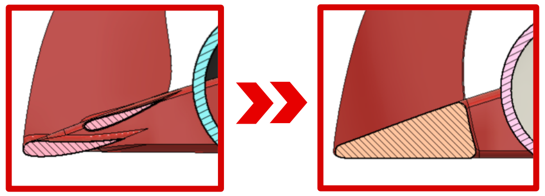


- In our initial design, the rear wing support structure (3D printed), formed part of the rear of our car. However, after going through the technical regulations, we found that as per article 15.5, the minimum 3mm safety zone around the cartridge chamber had to be made entirely of 'F1 Model Block material'. This meant that we had to modify our rear wing support structure, to sit on top of the safety zone, rather than form part of it.

FINAL MODIFICATIONS

- We came to realise that producing downforce with our front wing would not be necessary and that the main function of the component should be to act as a stabiliser. This is because the car's source of thrust would be higher than its centre of mass, meaning it would have a natural tendency to push the front of the car towards the ground anyway, reducing the risk of the nose lifting up at the very start, thus reducing the need for downforce.





As a result, we further reduced the angle of attack on the front wing and then removed the small angled aerofoils on either side of the nose, creating a smooth transition between the nose and endplates. (This decision was also informed by CFD testing, as it helped to reduce the areas of turbulence (seen on Page 5) in front of the wheels.)

- The flow channels we had designed on either side of the car initially got wider as they swept through the sidepods. This meant that they would act as diffusers: increasing in cross-sectional area as the air flows down, thus reducing the pressure of the air on exit, effectively 'sucking' the car down onto the track. Although this would provide better traction, it would also mean that less of the car's thrust contributes to it linear speed, thus reducing the lap time.

We therefore made a very simple adjustment, making the entire flow channel one maximum width. This also helped to reduce the frontal area slightly, which would only help to make the car faster.