EVALUATION

We broke down our evaluation into 6 main stages within our engineering process:

Research → Design & CAD → Material Consider-ations → Testing → Manufacture → Assembly & Final Finish

In each of these stages, we considered:

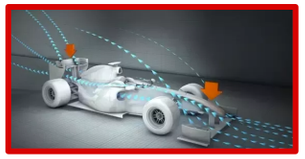
- What went well?
- What did we learn?
- What would we improve?

Evaluating our engineering process was important to our overall development as it captures which aspects went well and which would require more consideration in the future. By identifying areas of improvement, we are striving to consistently better our car as well as our own knowledge, and plan the time, resources and activities needed to be undertaken in the future.

RESEARCH

What went well?
Research of F1 cars, fluid dynamics, sensitivity testing, as well as past experience from the development class of the competition helped to influence the design of our prototypes.

What did we learn?
We learnt that having a strong understanding of the aerodynamics of F1 cars and the forces acting on each component was paramount in producing good quality designs that were able to perform well on track. Research was fundamental in helping us to best understand these principles, alongside our own sensitivity testing, both of which revealed the importance of minimising weight in our design.

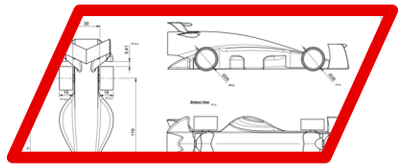


What could we improve?
Researching and applying more aerodynamic principles to our designs as well as considering the importance of the centre of mass more deeply in our next prototype.

DESIGN & CAD

What went well?
Designs were digitalised effectively through sketches and adhered to technical regulations.

What did we learn?
Thorough research as well as virtual testing is paramount to producing a competitive car design. Strong understanding of CAD software makes the process faster and reduces the risk of breaking a regulation. It is also important for the production of high quality renders and engineering drawings.

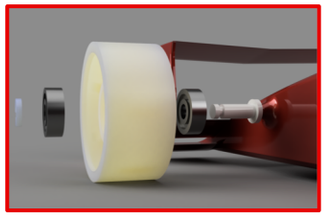


What could we improve?
Having more team members proficient in CAD would reduce time required to digitalise designs and distribute workload more evenly.

MATERIAL CONSIDERATIONS

What went well?
We adhered to the regulation F1 model block for the main body and successfully used SLS printing for our Nylon-12 components as our car suffered no breakages on test runs.

What did we learn?
We learnt a lot about various materials having conducted significant research into different types of 3D printed materials, 3D printers, and bearings. We found that conducting extensive research is vital for optimising the performance of the car.



What could we improve?
We would like to track test various types of bearings to see how they perform over several runs, as previous decisions to choose ceramic hybrid bearings had been based on research only. Additionally, we would like to try smoothing out the wheels with a lathe, as the fine grain of the SLS printing technique leaves a slightly rough texture that could cause more friction.

TESTING

What went well?
We successfully conducted a variety of virtual and physical testing throughout our development process, which helped us make design decisions and modifications that improved the performance of our final car.

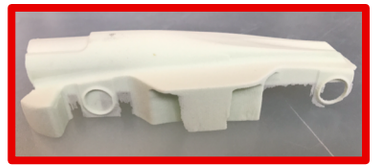
What did we learn?
We learnt how to conduct low speed visualisation, as well as how to analyse results from a wind tunnel, both of which we had not used before. The results of these tests proved fundamental in informing our decision between developing Car 1 or Car 2 further.

What could we improve?
We could set aside more time at the start of the design process to test several designs of different components in a wind tunnel, as testing showed wind tunnel analysis to be very useful. This would allow us to see which are most effective in order to pick the best ones to develop further before testing on a full car model.

MANUFACTURING

What went well?
Our cars were manufactured to the right dimensions using both the F1 model block and SLS 3D printing.

What did we learn?
We learnt about CAM, CNC and 3D printer technologies and how to calibrate your design to each machining method. We also learnt that you need to leave at least a month for the manufacture if outsourcing, as there may be time delays that are out of your control.

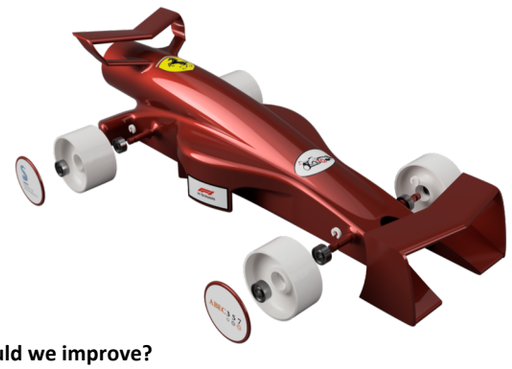


What could we improve?
Make sure to consider limitations in CNC machining earlier on in the design process in order to avoid any machining problems.

ASSEMBLY AND FINAL FINISH

What went well?
Cars were assembled and finished with great care and precision. Highest quality possible was achieved and car looked identical to renders.

What did we learn?
We learnt that bearings had to be handled with great care as not to contaminate them with dirt and dust or deform the balls, and should therefore, be inserted at the last stage of the assembly process.



What could we improve?
Leaving more time at the end of the manufacturing process to be able to prime the car with more coats would increase adhesion of paint and gloss for a higher quality finish.

OVERALL EVALUATION

Overall, as our first time competing in the professional class, we are really proud of what we have achieved. We believe we have successfully designed and manufactured a competitive car conforming to the technical regulations and we are so excited to race it at the North London Regional Finals.

We will measure our success of our engineering on race day using the following criteria:

- A high scrutineering score
- A lap time of under 1.1 seconds
- No breakages on track