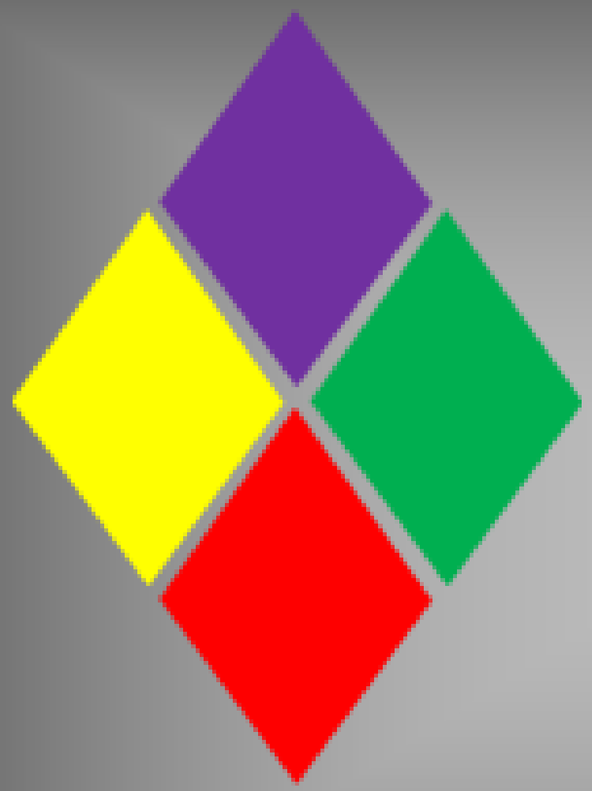

Four Horsemen

Design and Engineering

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Introduction to F1 in Schools

Formula 1 Racing

Formula 1 (also known as F1) racing is a racing competition that combines mechanics and design to create the fastest racecar. Based in Europe, F1 has been allowing engineers the opportunity to build the fastest car since 1950.

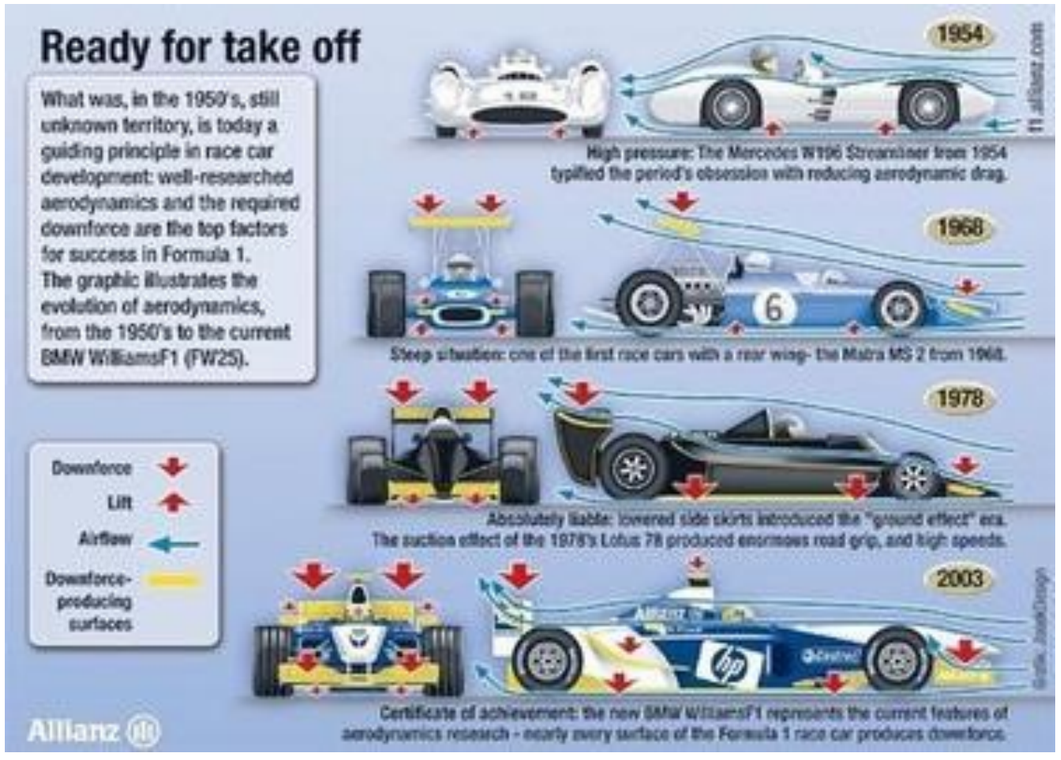
Formula 1 in Schools

F1 in Schools is a perfectly scaled replica of Formula 1 racing. This allows high school students to manufacture and design a model car that fits all the requirements of an actual car. Students compete in teams of three to six against other teams by fundraising, designing, and building a car in order to succeed. F1 in Schools is preparing young adults for the future by educating the importance of collaboration and giving them the experience of a lifetime.

Research Process

As a rookie team last year, the Four Horsemen conducted research to see what the ideal F1 in Schools car would look like. This was carried out through contacting fellow teams, such as Octane Racing, and surfing the web for ideas and how they could be implemented. Such ideas were centered around aerodynamics and how to create a streamlined car.

We looked at current Formula 1 cars and the specific aspects of those cars that apply to aerodynamics. In order to understand the forces in play as the car traveled the track, we accounted for all forces of the friction of the track, air going against the car, gravity, normal force, and the resulting lift force of the combination of the car moving forward



Design Process

After the Four Horsemen researched the different aspects of an F1 in Schools car, the next step was to design the ideal car using a Computer Aided Design (CAD) software to both conceive the car's initial design as well as follow regulations. Using Autodesk Inventor Professional 2016, the dimensions of the standard F1 in Schools block (220mm X 65mm X 50mm) were created to slowly be siphoned off as the design came to fruition. The car is modeled after the Four Horsemen inaugural car, which was among the fastest at the 2015 Arizona Regional Competition. That design has been transformed this year to become more aerodynamic due a funnel-like front and smooth backside. The defining feature of the car is its underside flaps, which help direct the air off the wheels to increase speed.

Following the initial design, it appeared that amendments could be made to the neck of the car and the flaps to increase its aerodynamic ability. The neck was narrowed to reduce the quantity of air hitting it to create drag and the flaps widened to increase streamline ability.

Other adjustments were made following the initial Computer Numerical Control (CNC) milling as some problems arose when scaling and adjusting measurements as this process will be detailed in the Computer Aided Manufacturing (CAM) Process later on.

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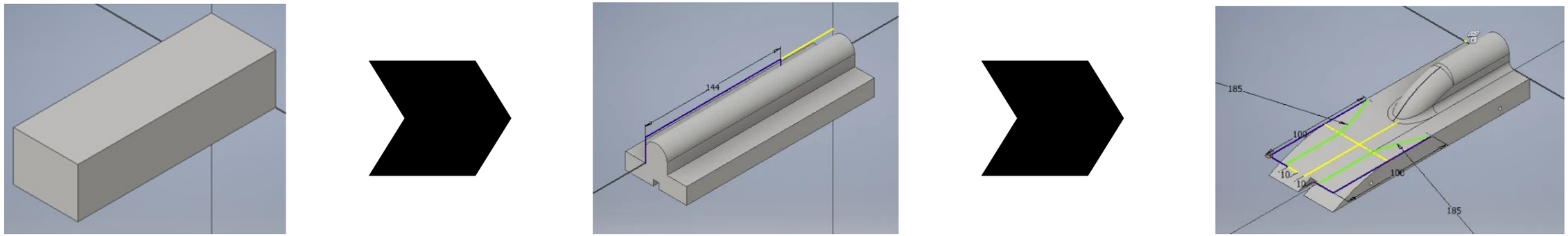
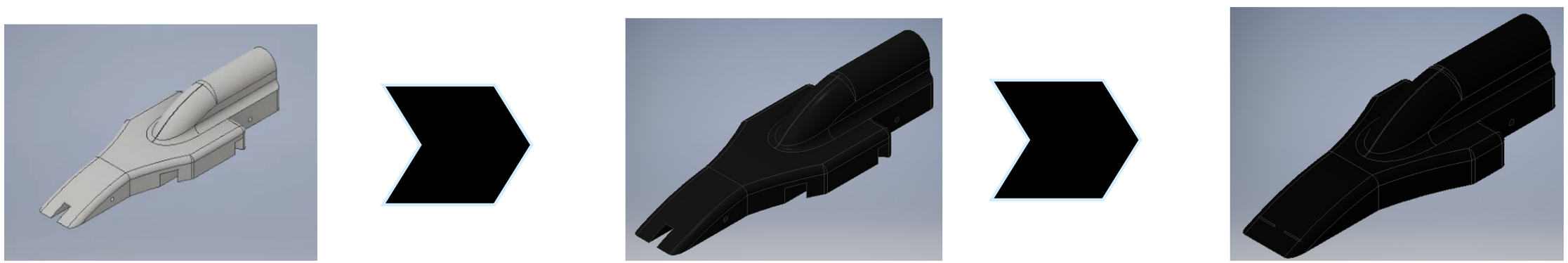
Computer Aided Design

The design for our car this year is definitely based off of our car from last year, with a few changes. We kept the general shape and the car and the air channels about the same, while changing some of the dimensions. It started out as a block with dimensions 200mm X 65mm X 50mm and slimmed it down to have the dimensions 200mm X 64.145mm X 40.75mm.

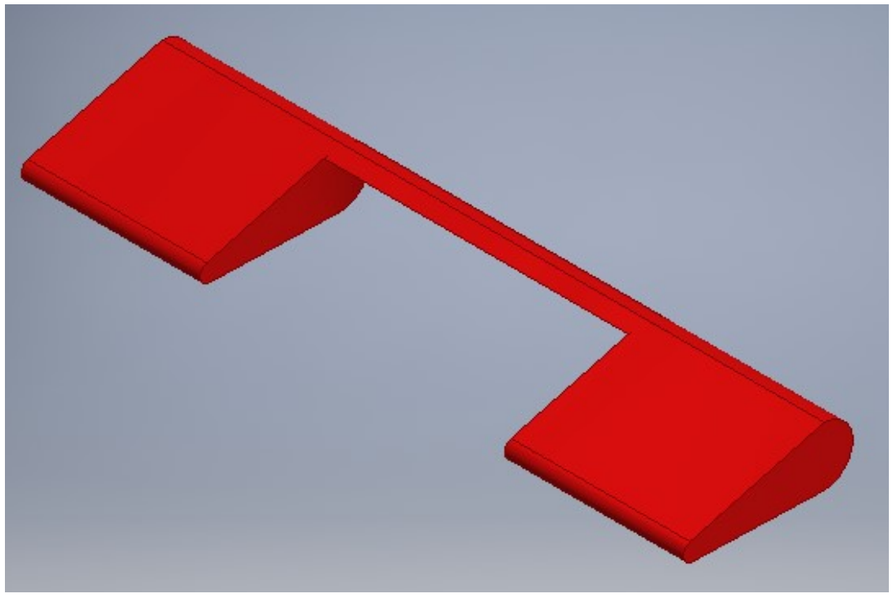


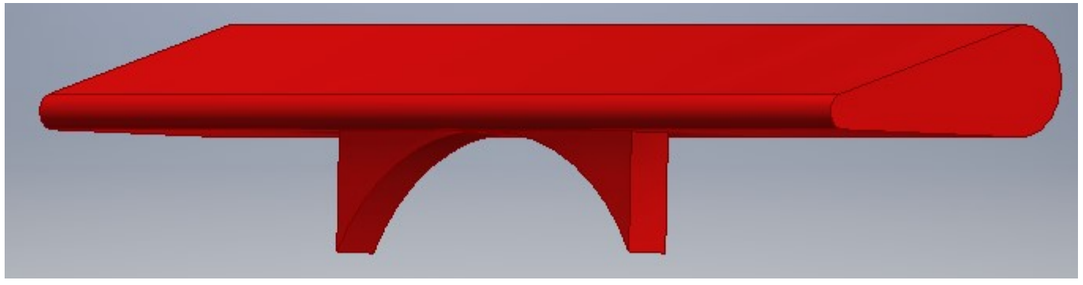


Wings

Front Wing

The front wing of the car is 3D printed and has a small, thin piece of material attached to the nose of the car that allows for more stability and security. The longer pieces on the outsides are for the purpose of streamlining the air around the car to create a smoother ride along the twenty-meter track.

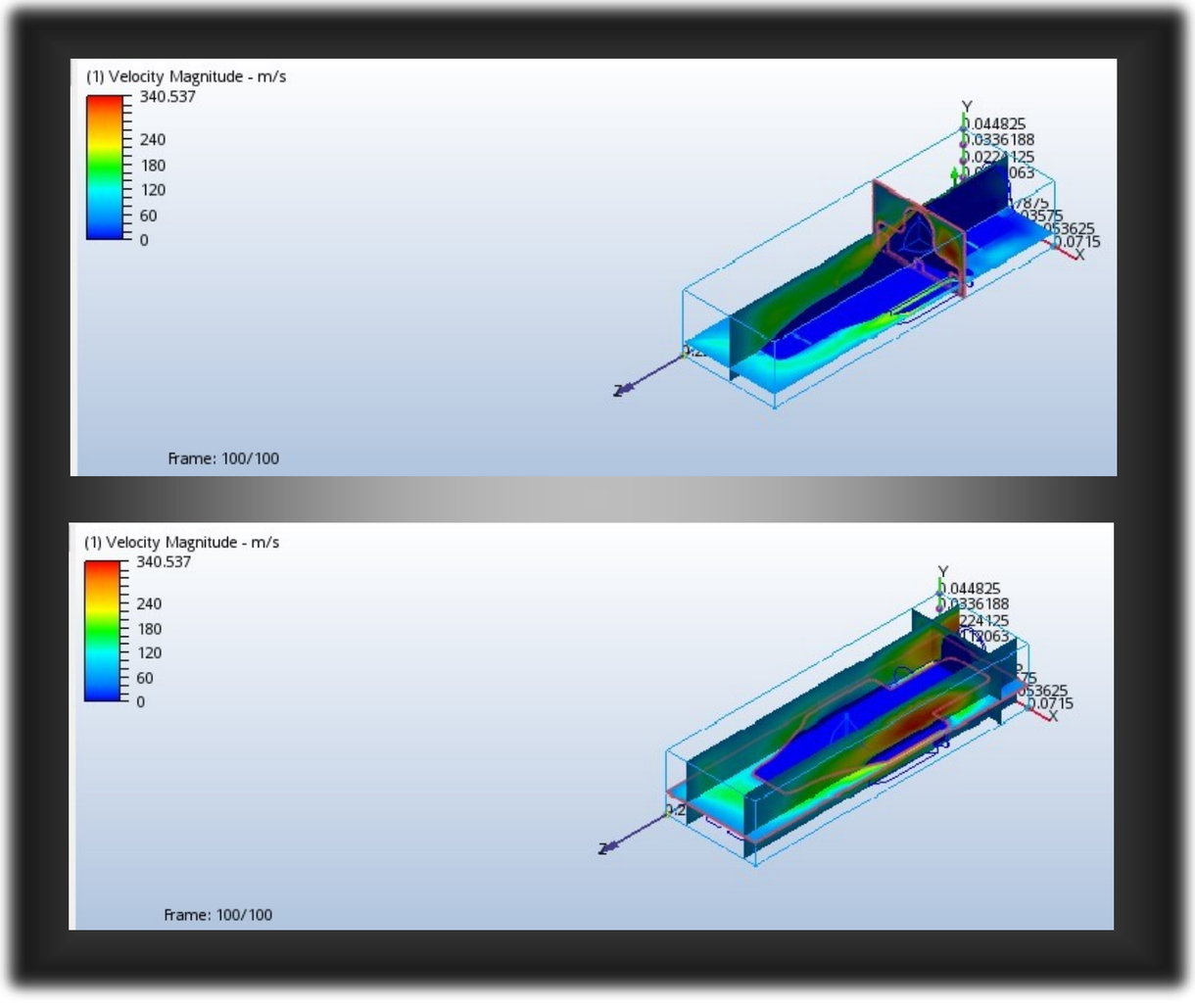




Back Wing

The back wing is 3D printed and fits snugly to the CO2 chamber for maximum stability. The sloped design allows for the air to be easily flowed off of the car.

Computational Fluid Dynamic and Testing



Red Trigger Reaction Times

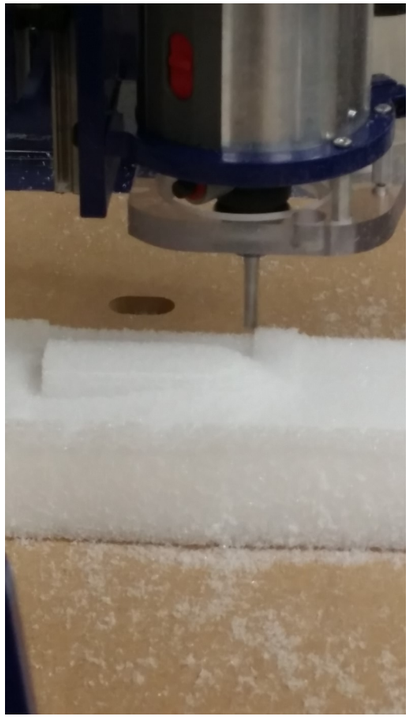
	TJ	Ben	Kyle	Andrew
Trial 1 (seconds)	0.168	0.197	0.209	0.193
Trial 2 (seconds)	0.181	0.177	0.196	0.168
Trial 3 (seconds)	0.200	0.218	0.196	0.192
Trial 4 (seconds)	0.187	0.205	0.174	0.192
Trial 5 (seconds)	0.181	0.197	0.193	0.164

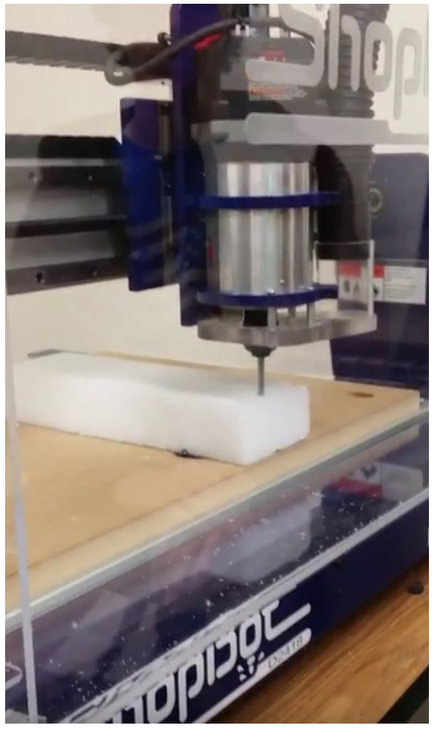
Average and Standard Deviation

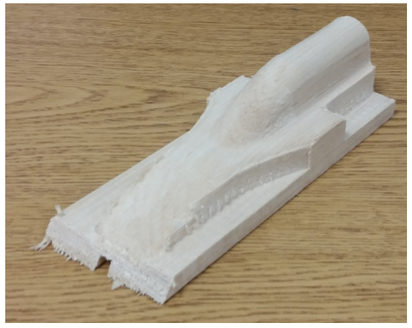
	TJ	Ben	Kyle	Andrew
Average Time (seconds)	0.1834	0.1988	0.1936	0.1818
Standard Deviation	0.010365326 81588	0.013326666 49999	0.011253443 917308	0.01296765 2061958

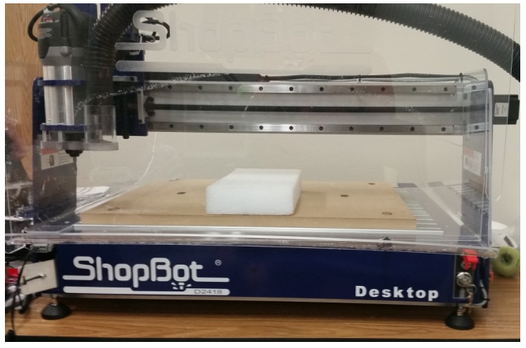
Computer Aided Manufacturing

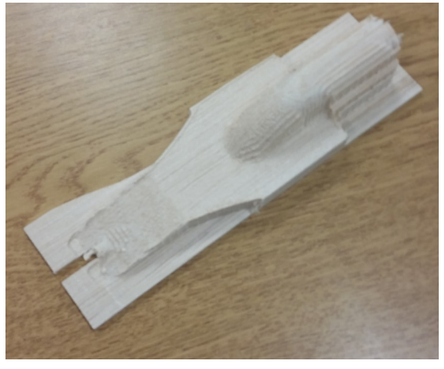
In order to convert a designed car to a fully functioning one, for F1 in Schools purposes at least, it must be transferred to a CNC milling machine. Perry High School has its own ShopBot which, was able to mill the aforementioned design. The first step was to mill out of white Styrofoam to determine where the machine should be zeroed and give an understanding of what could go wrong and how they can be prevented. Once the white foam was mastered, a piece of balsa wood was used to mill the design. The same fine tuning occurred until wit was perfected. For the final cars, out of the Composite material, the machine milled flawlessly.











Orthographic Rendering