team Fury døcumentatiøn

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the team

TOOLS OF THE TRADE

- Autodesk Inventor
- Solidworks COSMOS
- CFD
- Graphical Analysis
- Smart Draw
- Edgecam
- Prolight 1000 CNC
- Microsoft Office
- After Effects
- Macromedia Flash
- CS4 suite
- Dropbox
- Basecamp
- Freemind

HISTORY OF THE FURY

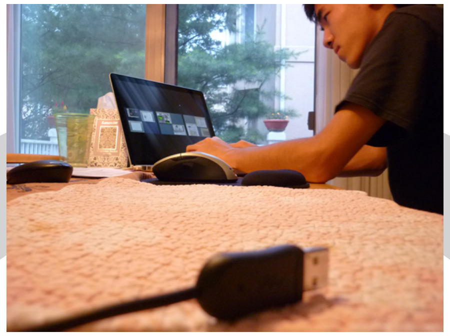
FURY originated with the High Technology High School class of 2003. It was their self-designated mascot and is ours as well.

We are now following in the footsteps of the 2005 HTHS Fury F1 team. For the 2009 F1 in Schools challenge, we represent years of school history and an unfailing conviction to redeem the name **HTHS Fury**.

EXPERTS OF ALL TRADES

A distinguishing factor of the Fury team is the diversity of specialties that its members possess. An entrepreneur, Oliver runs a small online business and is the ideal candidate for team manager. Anthony, on the other hand, loves to craft models in his spare time. Josh is a part-time web designer. Andrei is a well trained public speaker and businessman, and Chris teaches a summer camp course in computer-aided design.

Team Fury was conceived one early morning during Digital Electronics class. We considered the extreme lack of time, unknown resource pool, and uncertainty of obtaining sponsors and funding - then we decided to go for it. We quickly pulled together a task force and exhausted our combined resources through an intensive two month work session. We went through member losses, member gains, personal troubles, financial instability, and even supervisor incredulity; in the end, we prospered as a team and pulled through.

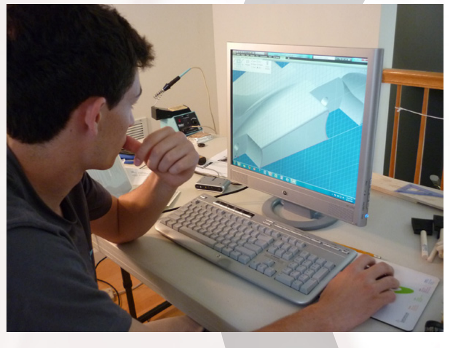


TEAM MANAGER
oliver song

Operating from his trusty laptop, Oliver makes key decisions about the team and offers assistance where necessary.

DESIGN ENGINEER
christian gennaro

An avid students of the sciences, Chris has unrivaled CAD technique and the analytical eye of a hawk.

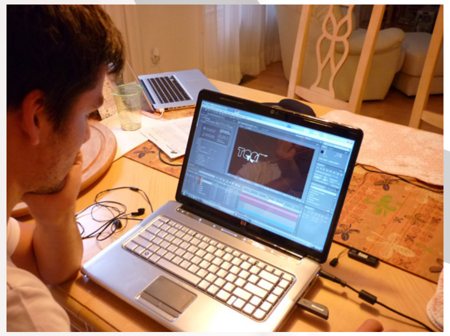


MANUFACTURING ENGINEER
anthony chen

Bringing both car making know-how and a remarkable penchant for COSMOS, Anthony is a crucial component of the F1 team.

RESOURCES MANAGER
andrei tapliga

With a multifarious range of talents (and a broken arm!) Andrei ties up loose ends on the team and keeps our budget within realistic bounds.



GRAPHIC DESIGNER
joshua ma

With his incredible Flash, InDesign, and Photoshop skills, Josh capped off our set of skills with graphical and artistic prowess.

THE MEANING BEHIND THE COLORS

Maroon is our school color. It symbolizes the mixture between red and purple, the colors of attention, action, riches, and mystery. We are passionate about what we do and have great pride for our work.

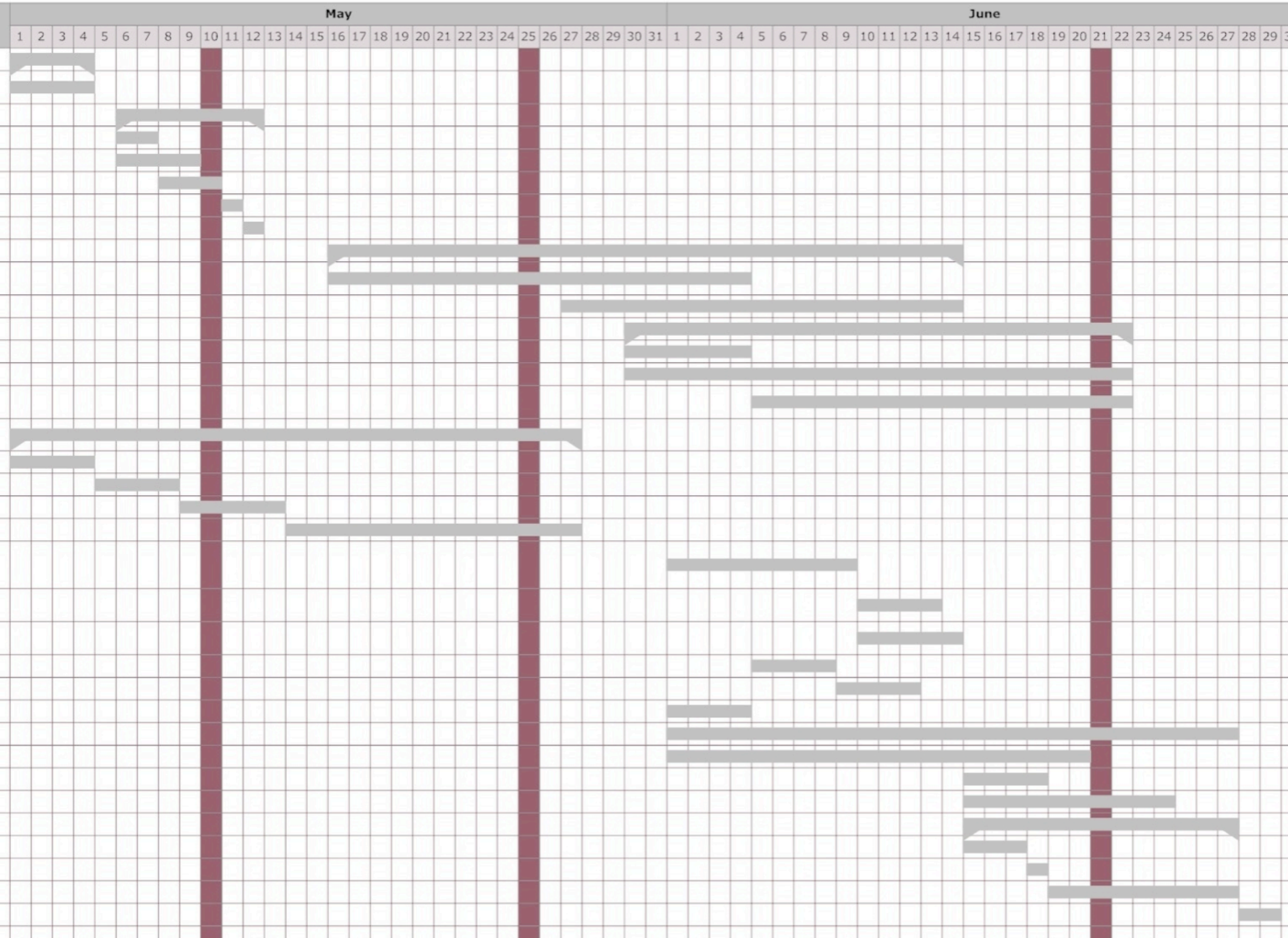
Black symbolizes many things. For us, it means formality, modernity, speed, unity, sophistication, and elegance. These are the tenets of the team FURY creed.

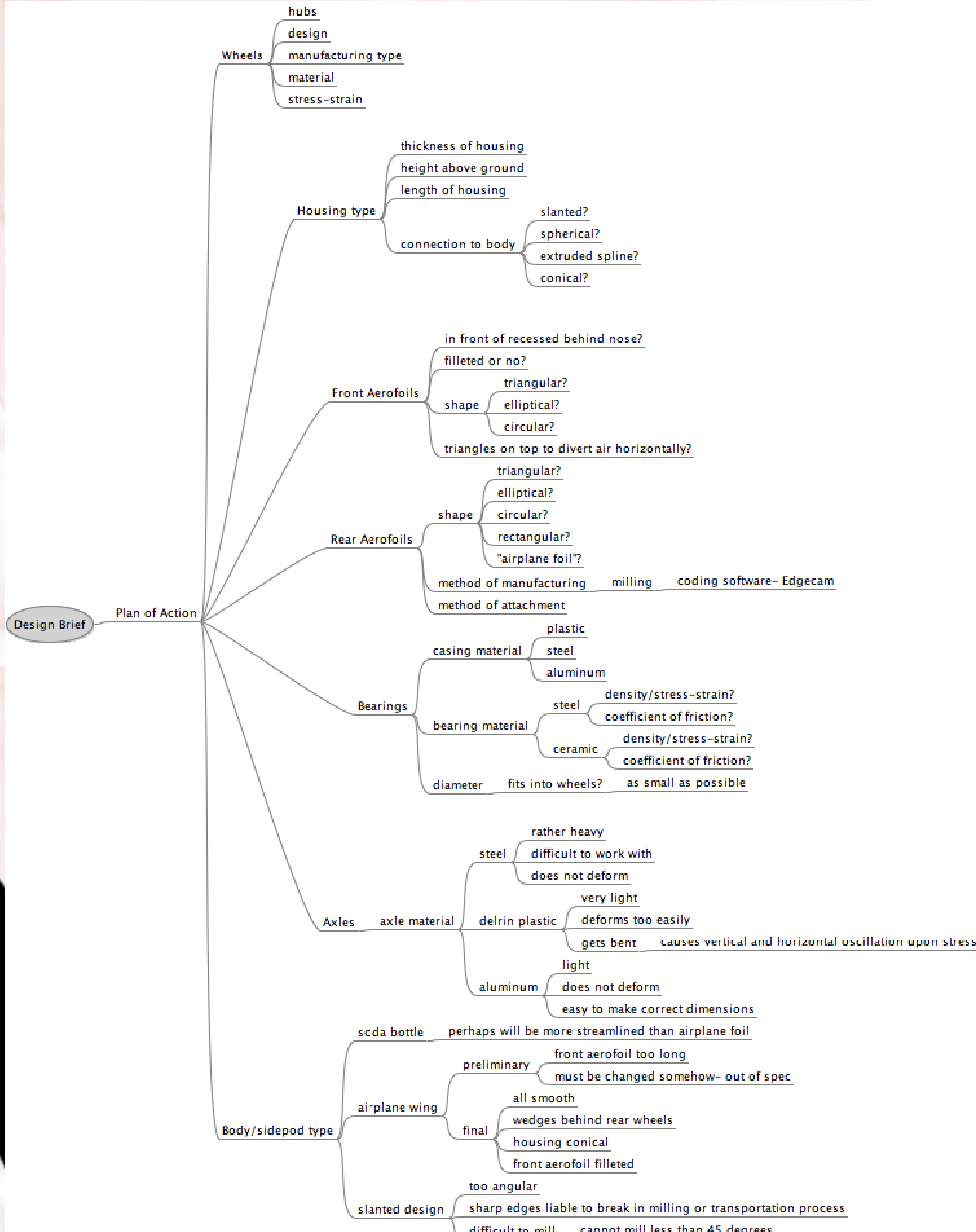
project overview

Because of how the qualification system in New Jersey is set up, our team wasn't made aware of the competition until after the NJTSA state conference. We formed the team and began the planning stages on May 1st. We worked on the project for the next 8 weeks, spending an average amount of 100 man-hours per week. The project was outlined using a modified engineering design process, slightly complicated by the joining and leaving of team members. We always had several tasks running concurrently; because of our significantly handicapped starting time we had to quickly form a plan of action and stick to it without fail.

The Gantt chart below, drafted in the initial stages of the project, helped us tremendously throughout the design process. We had to conduct multiple tasks for each person in our 5 person taskforce, and we documented this multitasking as shown. We had a total of two months to complete the process, starting in early May and ending in late June

Number	Task	Start	End	Duration
1	Introduced to F1 project for TSA	5/1/2009	5/5/2009	4
1.1	Collecting and consolidating team members and team roles	5/1/2009	5/5/2009	4
2	Development of Car	5/6/2009	5/13/2009	6
2.1	Identification of the given problem	5/6/2009	5/8/2009	2
2.2	Brainstorming	5/6/2009	5/10/2009	4
2.3	Thumbnail sketches	5/8/2009	5/11/2009	2
2.4	Design matrix	5/11/2009	5/12/2009	1
2.5	Finalizing our design	5/12/2009	5/13/2009	1
3	Modeling in Autodesk Inventor	5/16/2009	6/15/2009	29
3.1	Testing different aspects of design in COSMOS and VWT	5/16/2009	6/5/2009	19
3.2	Checking specifications for CAD model	5/27/2009	6/15/2009	19
4	Procuring of sponsorship funds	5/30/2009	6/23/2009	23
4.1	Making sponsorship portfolio	5/30/2009	6/5/2009	6
4.2	Contacting sponsors	5/30/2009	6/23/2009	23
4.3	Tallying budget and transferring funds through PFA	6/5/2009	6/23/2009	17
5	Artwork	5/1/2009	5/28/2009	25
5.1	Team colors	5/1/2009	5/5/2009	4
5.2	Cover page	5/5/2009	5/9/2009	4
5.3	Paint scheme	5/9/2009	5/14/2009	4
5.4	Logo	5/14/2009	5/28/2009	13
6	Obtaining necessary manufacturing materials- balsa wood, bearings, aluminum, etc	6/1/2009	6/10/2009	9
7	Milling rear aerofoils and attaching them to car	6/10/2009	6/14/2009	4
8	Lathing aluminum stock to wheel specifications	6/10/2009	6/15/2009	5
9	Painting car	6/5/2009	6/9/2009	4
10	Testing car with CO2 for times	6/9/2009	6/13/2009	4
11	Purchase team uniforms	6/1/2009	6/5/2009	4
12	Team website	6/1/2009	6/28/2009	26
13	Miscellaneous merchandise	6/1/2009	6/21/2009	20
14	Powerpoint Presentation	6/15/2009	6/19/2009	4
15	Portfolio	6/15/2009	6/25/2009	9
16	Tri-fold design	6/15/2009	6/28/2009	12
16.1	Designing	6/15/2009	6/18/2009	3
16.2	Adding and compiling material	6/18/2009	6/19/2009	1
16.3	Printing with plotter	6/19/2009	6/28/2009	8
17	TSA Nationals- 2009 USA F1	6/28/2009	6/30/2009	2



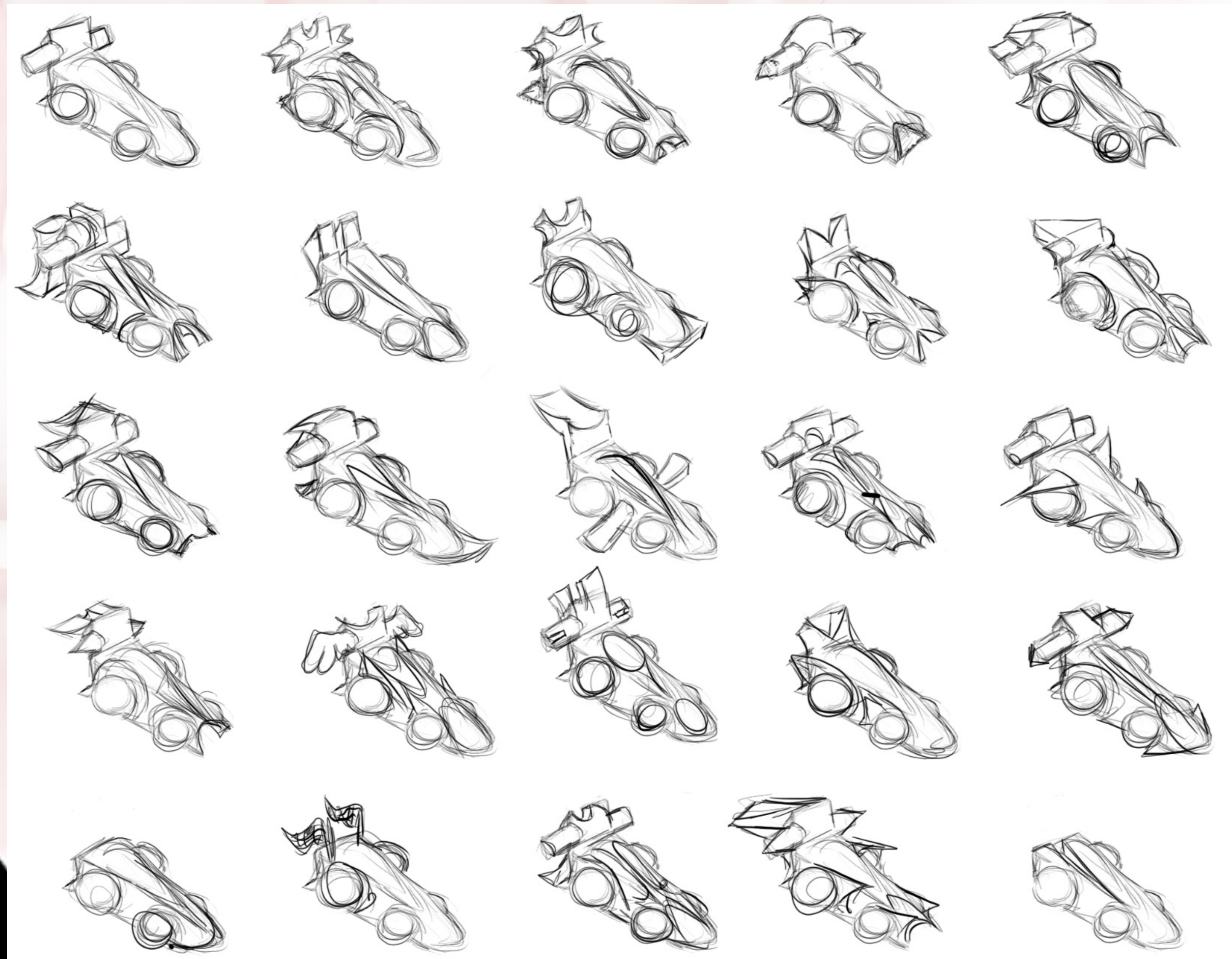


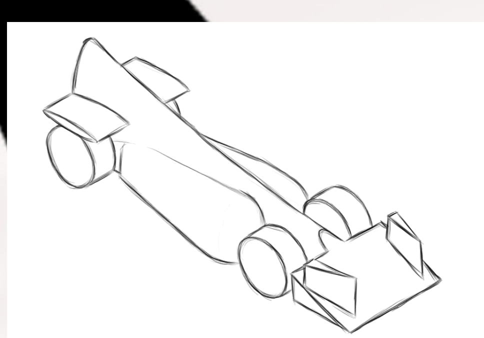
EXPLORING THE MIND

In addition to using gantt charts to organize our work force, we also used various mind mapping software such as FreeMind. To the left is an example of one of our comprehensive "mind map procedure" thought processes. It depicts the design process we went through in the manufacturing and designing of our car on a large scale.

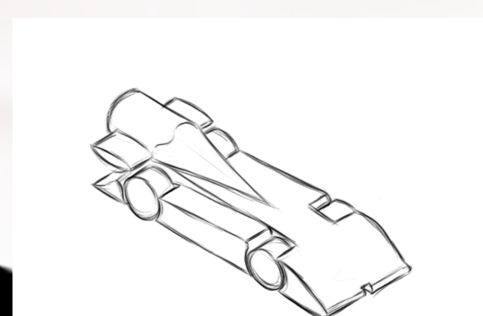
PRELIMINARY IDEAS

We followed our modified HTHS engineering design method for the design of our car. Below we've depicted one of our multiple "thumbnail sketch" spreadsheets, with the portion indicated in our engineering design method diagram. After many rigorous hours and sleepless nights we finally reduced our design concepts to these three main ones: "soda bottle", "airplane foil", and "slanted with vertical airfoils." Further testing would narrow it down to the "airplane foil" design, with modifications to the front aerofoil.

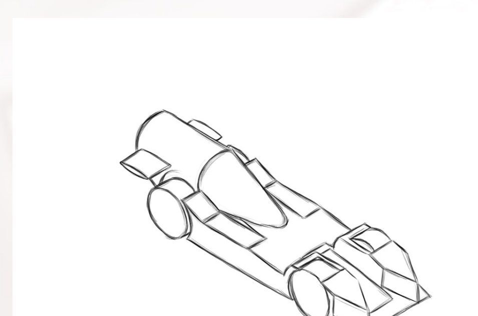




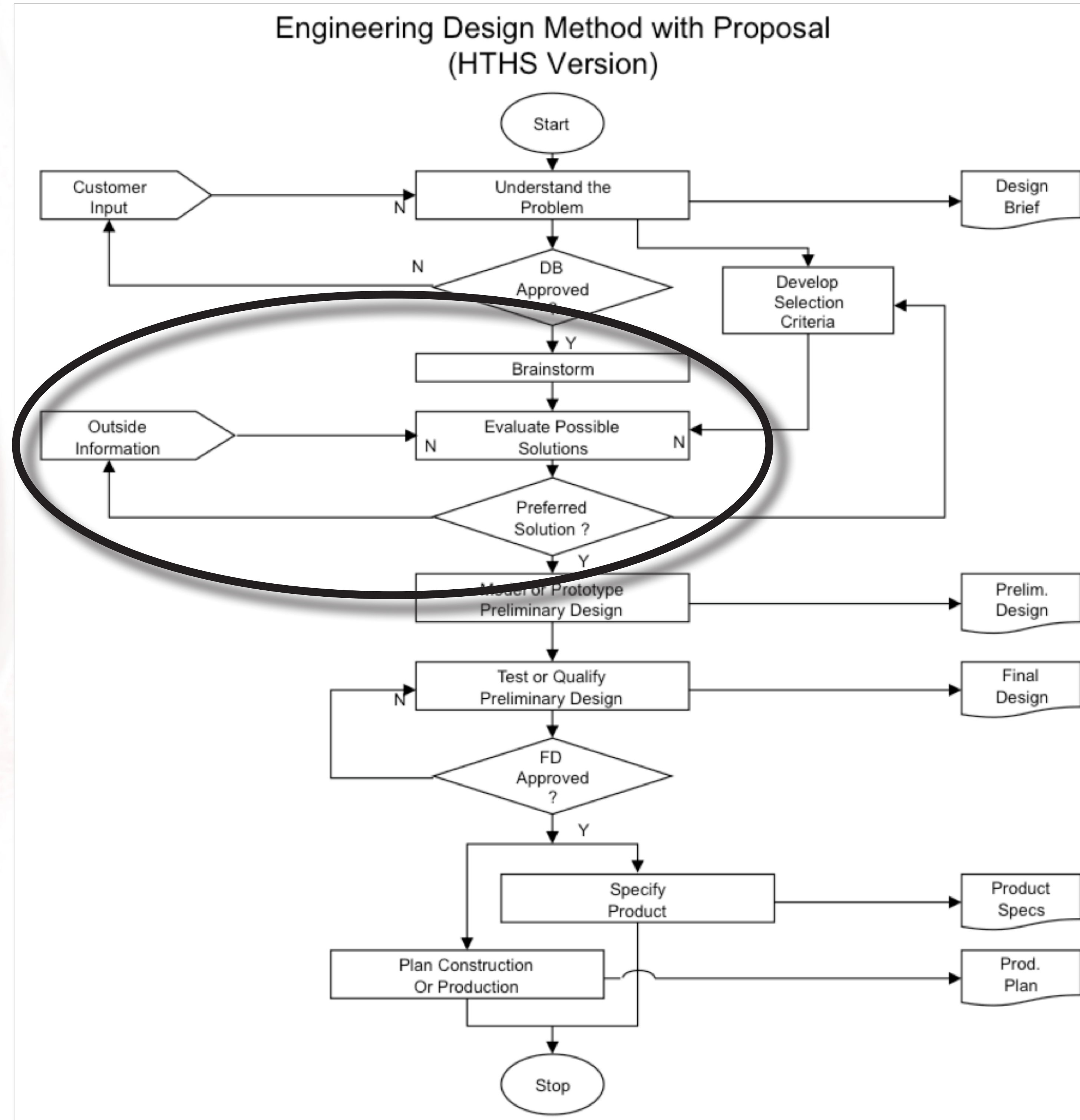
"soda bottle"



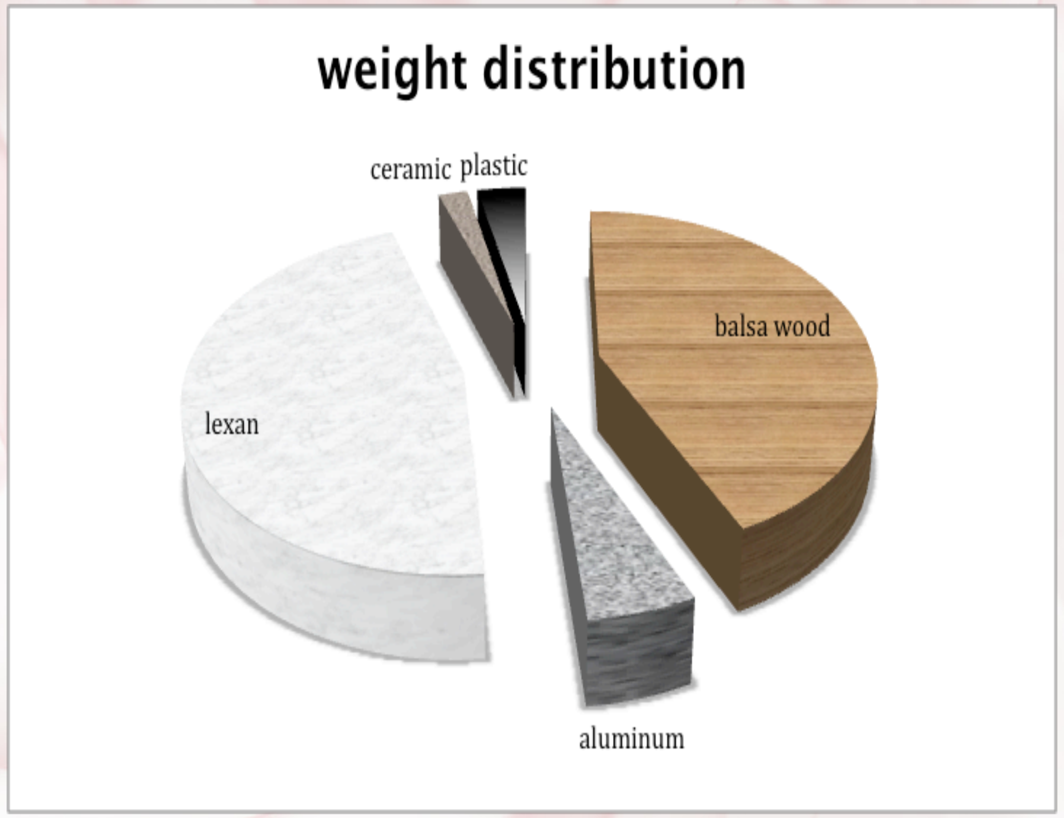
"airplane foil"



"slanted with vertical airfoils"



materials used



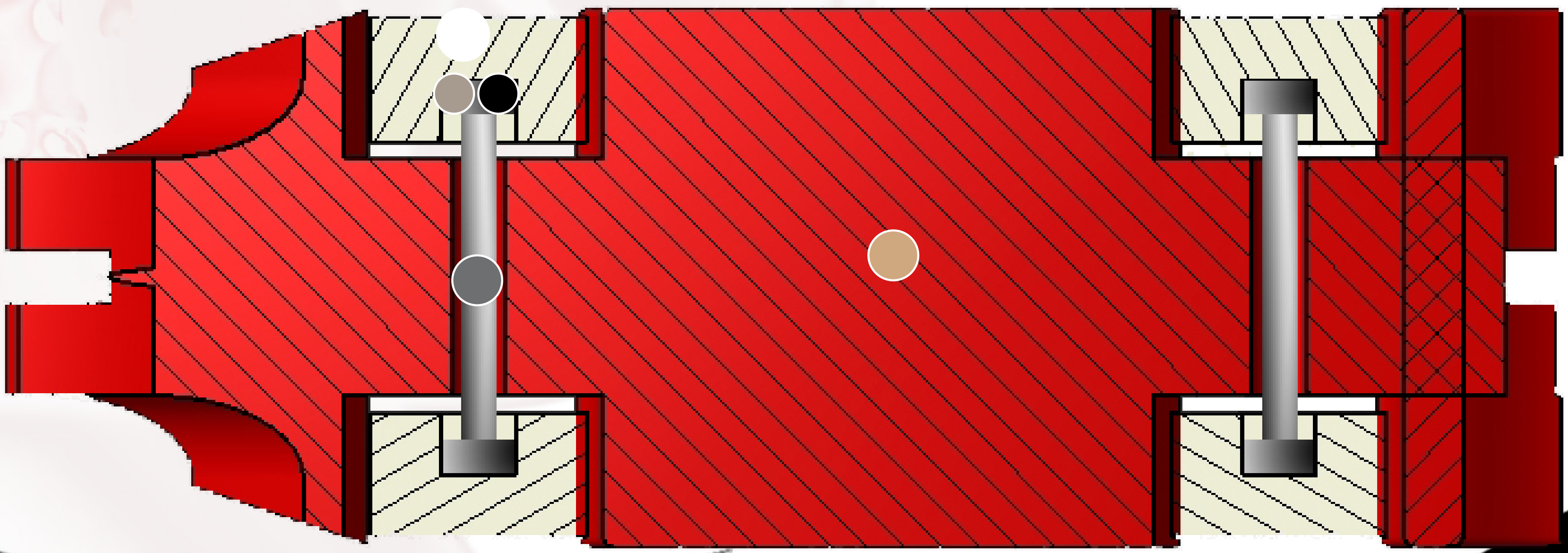
Materials were chosen carefully, for various reasons including weight, ease of access, ease of milling, and durability.

Balsa wood was the most certain choice for the body, as it allowed the body to be extremely lightweight. Especially important to maximize the acceleration and speed of the car, balsa wood was provided by the manufacturing center and the F1 car kit.

The wheels were milled out of **Lexan** blocks, provided by High Technology High School, and Lexan allowed for simpler milling as well as a certain degree of rigidity.

Ceramic in the bearings allows for even less friction, while the **plastic** casing is an inexpensive method to give structure to the bearing.

Aluminum axles are lighter than steel, but still allow for strength and sturdiness.



physics behind the car

LIFT

A minor force, lift results from Bernoulli's Princple, which states that a faster region of moving air over a slower region of moving air will result in low pressure above and high pressure below. The overall pressure pushes upwards, lifting the car.

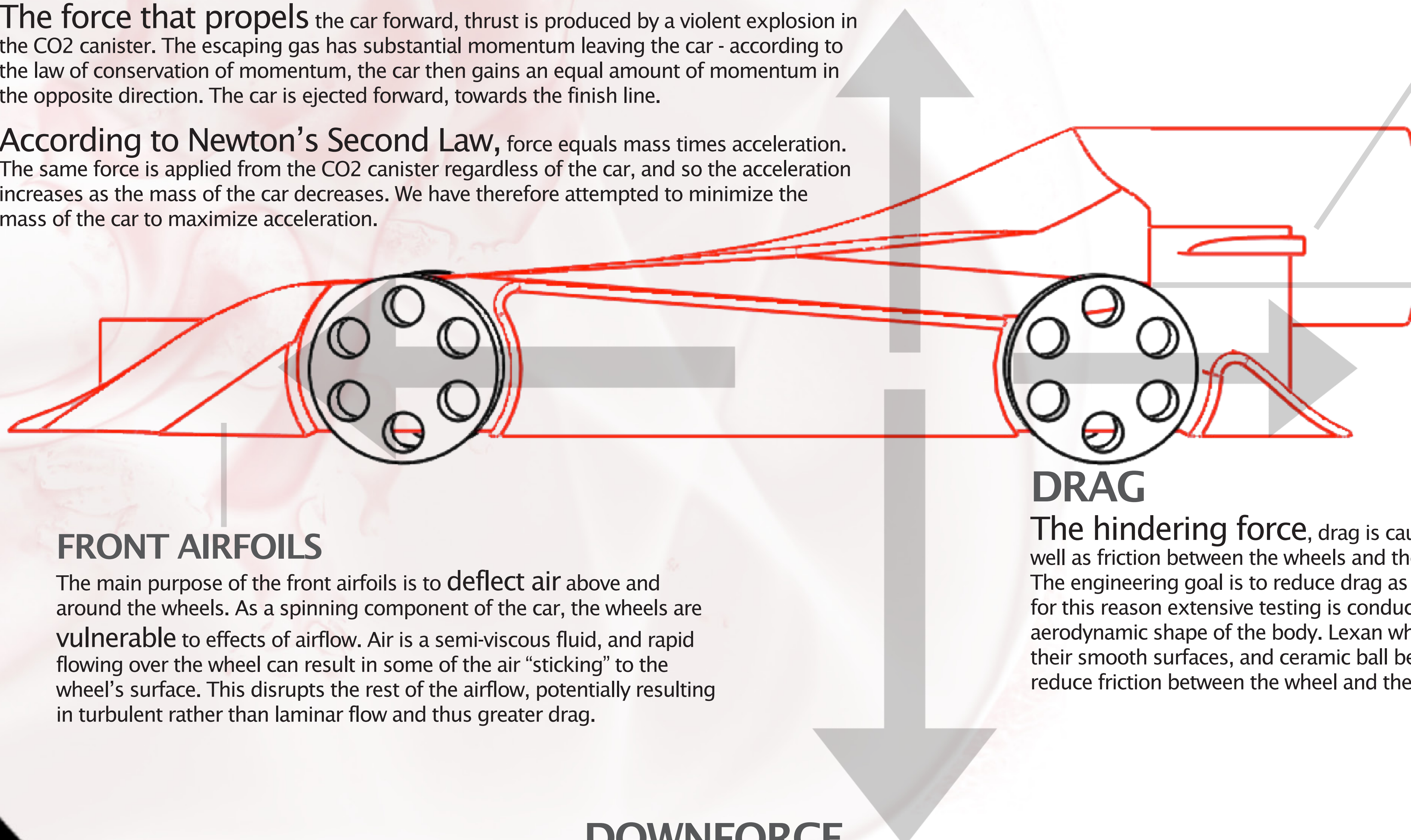
THRUST

The force that propels the car forward, thrust is produced by a violent explosion in the CO2 canister. The escaping gas has substantial momentum leaving the car - according to the law of conservation of momentum, the car then gains an equal amount of momentum in the opposite direction. The car is ejected forward, towards the finish line.

According to Newton's Second Law, force equals mass times acceleration. The same force is applied from the CO2 canister regardless of the car, and so the acceleration increases as the mass of the car decreases. We have therefore attempted to minimize the mass of the car to maximize acceleration.

REAR AIRFOILS

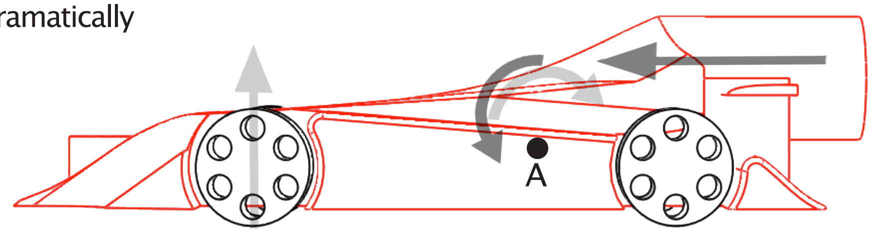
In conventional F1 cars, airfoils are meant to be pushed downwards by flowing air. At the cost of greater drag, this is meant to increase downforce and allowing for better turns (see DOWNFORCE). As this is not necessary in the Fury, airfoils are minimized to reduce drag.



LEXAN WHEELS

One reason for choosing lexan to make the wheels is the rigidity of the wheels. The CO2 explosion results in force located a distance away from the center of mass of the car. According to the laws of physics, a torque, or rotating force, is produced that pushes the front of the car *into* the track. As a result, the front wheels are very slightly compressed.

Through testing, we found with plastic wheels this actually results in slight oscillations in the car that disrupt airflow and increase drag. Lexan wheels, on the other hand, are much sturdier and do not compress as much, therefore resulting in optimal performance.



A torque analysis about the center of mass (A).

FRONT AIRFOILS

The main purpose of the front airfoils is to deflect air above and around the wheels. As a spinning component of the car, the wheels are vulnerable to effects of airflow. Air is a semi-viscous fluid, and rapid flowing over the wheel can result in some of the air "sticking" to the wheel's surface. This disrupts the rest of the airflow, potentially resulting in turbulent rather than laminar flow and thus greater drag.

DRAG

The hindering force, drag is caused by air resistance as well as friction between the wheels and the surface of the track. The engineering goal is to reduce drag as much as possible - for this reason extensive testing is conducted to optimize the aerodynamic shape of the body. Lexan wheels were chosen for their smooth surfaces, and ceramic ball bearings dramatically reduce friction between the wheel and the axle.

DOWNFORCE

Downforce is produced by a) gravity and b) pressure from air flowing above the car. As downforce increases, friction between the car and the track's surface increases. This friction allows the wheels to grip the surface better.

However, there is a marked difference between a real F1 car and this model car. Whereas real F1 race cars need wheel traction to make turns on a track, the Fury solely needs to maximize straightline speed. Furthermore, the wheels do not provide the thrust - the CO2 canister does. Downforce is essentially only useful in preventing the car from lifting off of the track, a completely plausible scenario resulting from a lightweight car and speeds as fast as 20 meters per second.

wheels

Designing and manufacturing our F1 car wheels was one of the most challenging and demanding tasks.

We spent long hours researching different wheel materials, ideal diameters, and milling sequences.

We hand coded our wheels' CNC code and milled them out of lexan blocks.

We then used a bandsaw to cut them to the right width, sanded with 1000 grit sandpaper, and used a blowtorch to polish them to perfection.

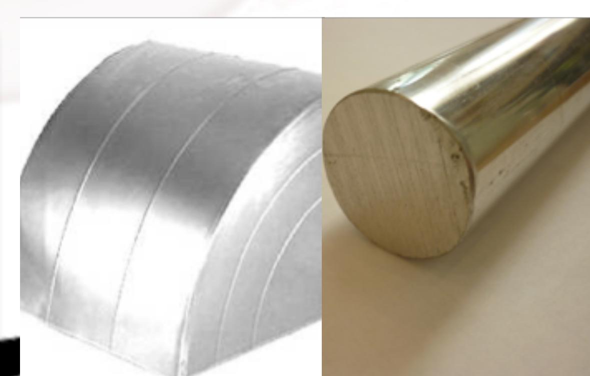
Although they are heavier than average F1 car wheels, we believe they are ideal for our situation.

```
%
; N1 =========Code For Wheels==========
N2
N5 G01
N10 M03 S2000
N15 M06 T2
N16 M03
N20 G90 X0 Y0 Z0
N25 Z-.200
N30 X0.054 Y0
N35 G03 X0.054 Y0 I-0.054 J0
N40 G90 X0 Y0
N45 Z-.400
N50 X0.054 Y0
N55 G03 X0.054 Y0 I-0.054 J0
N60 G90 X0 Y0
N65 Z-.600
N70 X0.054 Y0
N75 G03 X0.054 Y0 I-0.054 J0
N80 G90 X0 Y0
N85 Z-.62992126
N90 X0.054 Y0
N95 G03 X0.054 Y0 I-0.054 J0
N100 G90 Z1
N105 X0 Y0
N110 X1.02755906 Y0
N115 Z-.2
N125 G03 X.5135 Y0 I-.5135J0
N130 G90 X.5135 Y0
N135 Z-.4
N140 X.5135 Y0
N145 G03 X.5135 Y0 I-.5135 J0
N150 G90 X.5135 Y0
N155 Z-.6
N160 X.5135 Y0
N165 G03 X.5135 Y0 I-.5135 J0
N170 G90 X.5135 Y0
N175 Z-.62992126
N180 X.5135 Y0
```

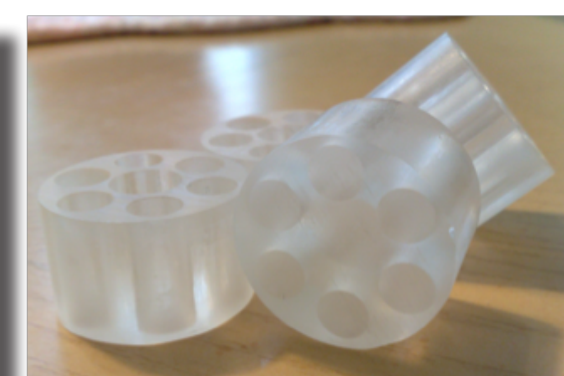
We started with the original plastic wheels that came with the F1 car kit. For the car design we had optimized, it was too large in diameter and too dense.

We then considered balsa wood. Balsa wood wheels were easy to manufacture and very light, about 0.0051 lb/in^3. However, they were too soft and easily deformed under pressure. Also, they warped under higher moisture levels and temperatures.

We moved onto aluminum, which was denser than balsa wood (about 0.098 lb/in^3) and difficult for us to mill. The stock was cylindrical and we did not have the proper machinery at hand to mill to our standards of accuracy.

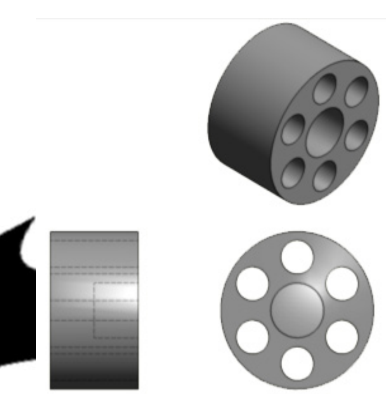


We finally settled on Lexan, which was less dense than aluminum (about 0.043 lb/in^3), just as rigid, and easier for us to obtain and manufacture. Also, their transparency made bearing insertion simpler.



ORTHOGRAPHIC VIEW

The bearings, 9mm in diameter, are inserted into the center hole. The tolerance we built into our CNC code was .01 mm, a near-perfect fit.



axles and bearings

PLASTIC AXLES
We started with plastic Denford axles. These were "self-lubricating, lightweight, and extremely easy to customize." However we found that the axles were easy to flex and became bowed after prolonged use. This bending caused our wheels to be slightly misaligned and caused unnecessary horizontal oscillation down the track as well as non-parallel wheels.

STEEL AXLES
As we started looking for different axles, we considered different metals. Steel came with our F1 kit, and it seemed like a reasonable material. We conducted some testing and found steel to be an extremely rigid but rather heavy material. As we were trying to minimize the mass of the Fury car, weight needed to be eliminated where possible.

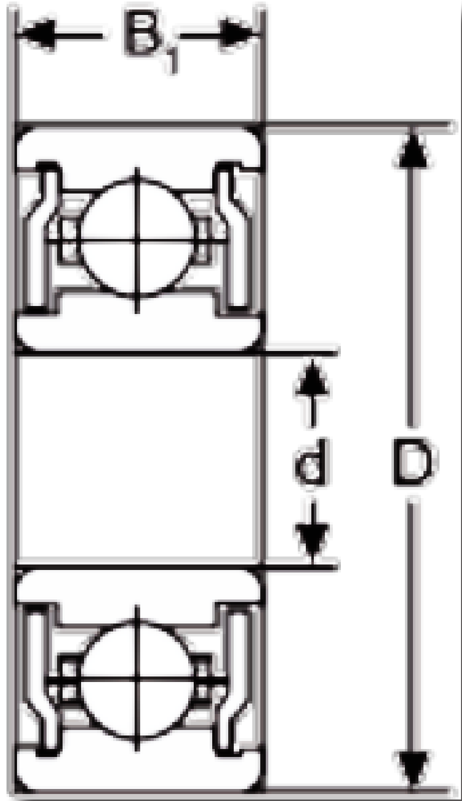
ALUMINUM AXLES
When considering the choice between steel and aluminum, we found through evaluations that aluminum was not as rigid as steel, but for our purposes (65 mm length) it would not significantly bend in any direction. Also, aluminum was significantly less dense than steel, making it the optimal choice in axle material.

STEEL BEARINGS
We originally had settled with steel bearings from Pitsco. We decided that these bearings were too large in diameter, reducing the amount of mass we could take away from the wheel and thus the potential speed of the car.

CERAMIC BEARINGS
We were provided ceramic bearings from Boca Bearings. These 9mm ceramic ball bearings had many advantages over steel. Besides being lighter, they were also less elastic, less likely to expand in heat, and better removers of friction.

Left: A computer rendering of our bearings, created in Autodesk Inventor 2010.

Right: A cross-sectional illustration of the bearings, courtesy of Boca Bearings.

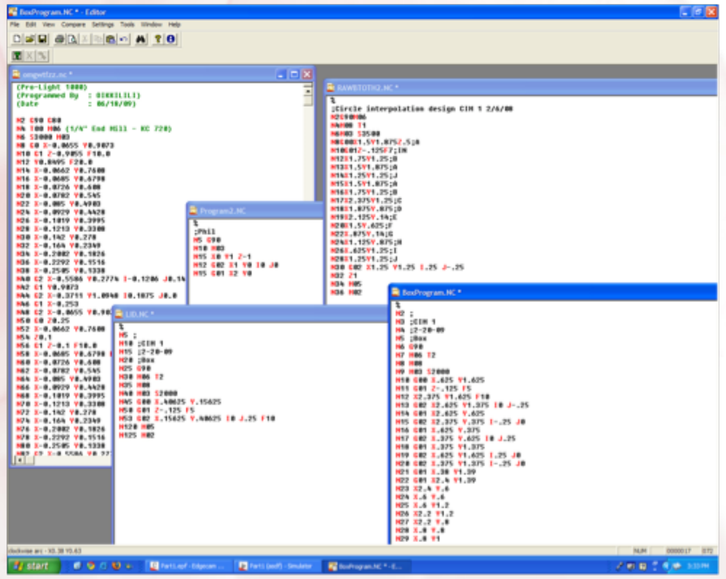


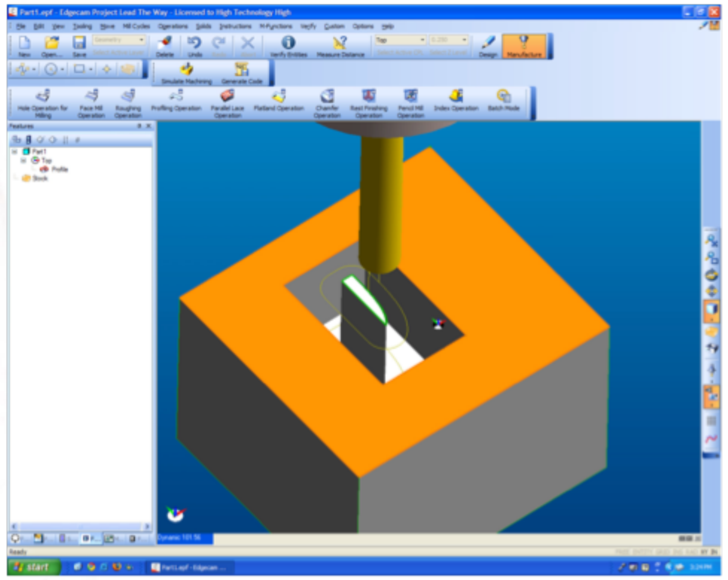
rear aerofoils

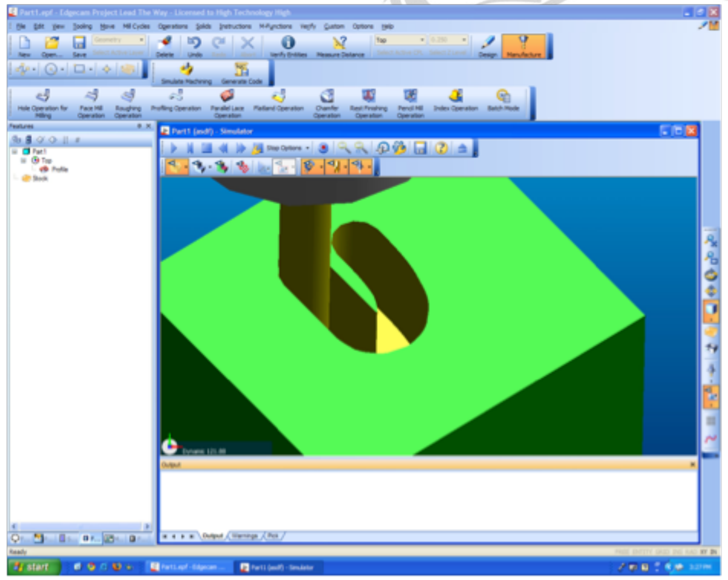
A CHALLENGE TO OVERCOME

Since we could not mill the rear airfoils straight through the manufacturer due to **specification constraints,** we had to mill them ourselves.

Even with our custom milling configuration machining the correct shape and dimension of rear aerofoil was difficult because of the small scale of the aerofoil and the softness of balsa wood. We went through the redesign and manufacturing process 16 times while modifying spindle speed, feed rate, plunge, bit width, tooth number, and the thickness of the aerofoil. We went through many revisions of the aerofoil design and our **improvements in airflow** are significant.





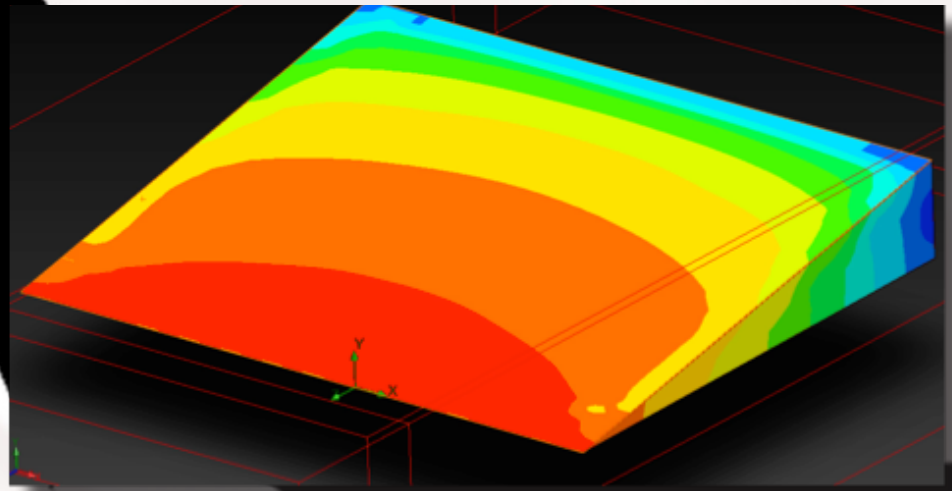


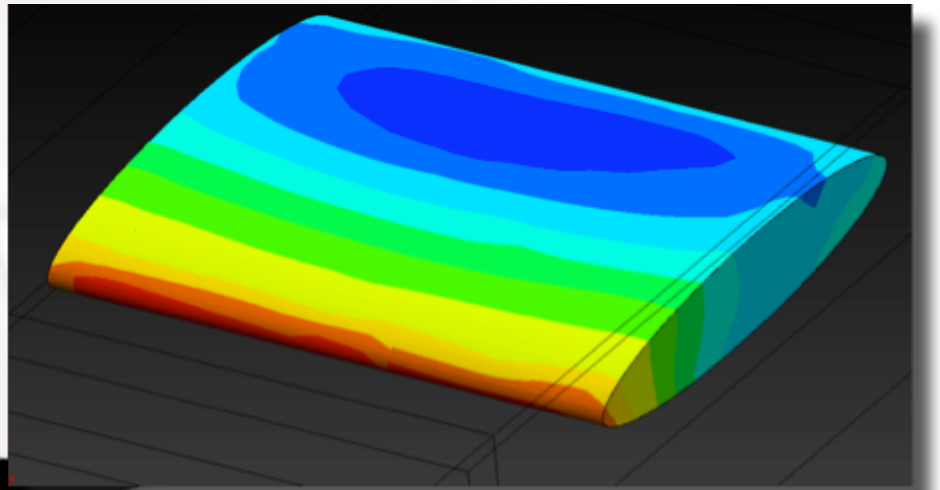
Our CNC coding process was extensive. As in the image on the upper left, we made many different version of our CNC code. We experimented with arcs, ellipses, and triangles. When we were finally satisfied with our code, we verified through the simulation program and ran it through the mill. Often the mill bit would destroy the fragile balsa wood fin, requiring additional attempts before perfection could be achieved.

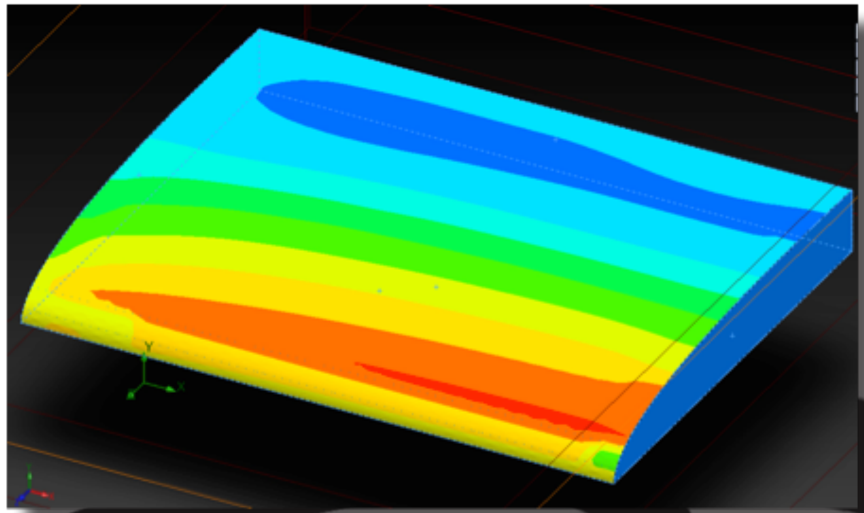
Our rear aerofoil started with simplicity in mind. We had a limited amount of time to spend on these according to our project overview Gantt chart, and we aimed to finish quickly. However it quickly became apparent that the design would be much more difficult than anticipated.

We moved from a triangular prism to an ellipsoid profile. This was thicker (within the 1mm spec) and more aerodynamic.

In our final iteration we beveled the top of the aerofoil to have a sharper front side growing thicker towards the back. We modified the thickness, deliberating between 1 mm and 6 mm. We eventually settled on 5 mm, since 1 was too thin to be firmly attached to the housing and 6 was too thick to be aerodynamic.



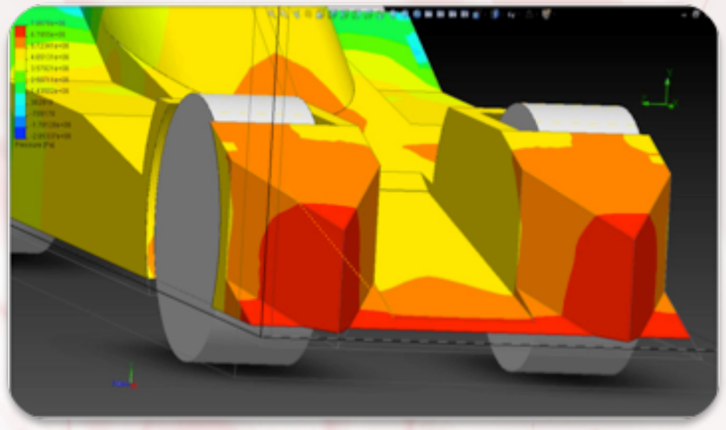




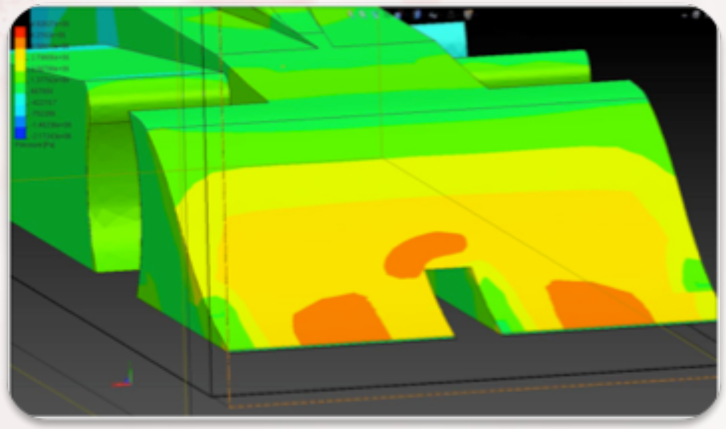
front aerofoils

We went through many different ideas for a front aerofoil (see the thumbnail sketches on page 6). Towards the end of our design research, we arrived at these three aerofoil formats: vertical triangular wheel housing, airplane-wing aerofoils, and "true aerofoils" airplane wing.

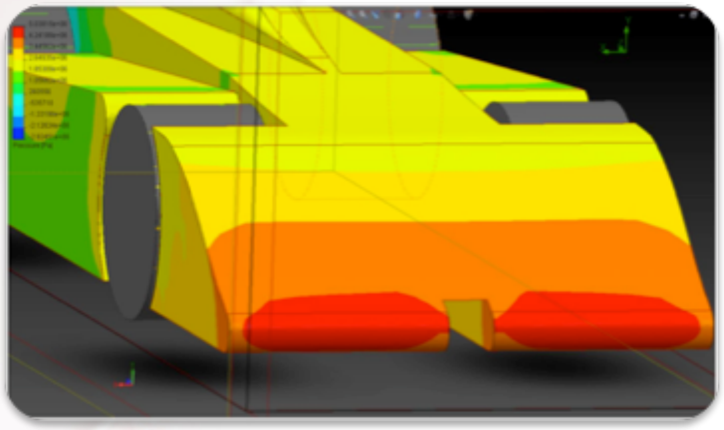
We started with a very rudimentary triangle slanting downwards with two triangles extruded vertically upwards to deflect air around the front wheels



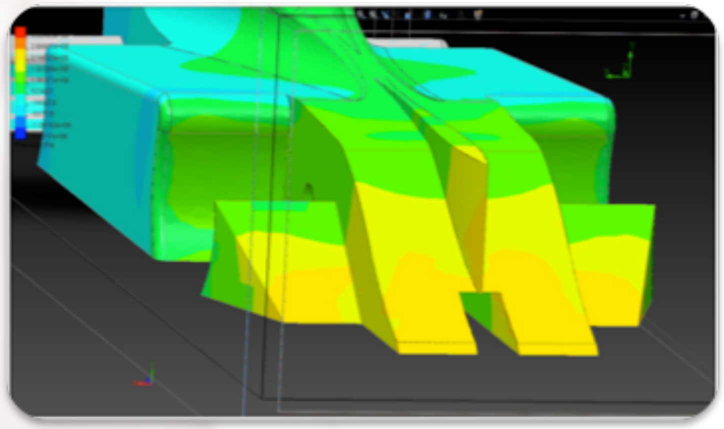
We changed the design to a simple extruded spline curve. We got this inspiration from the wing of an airplane.

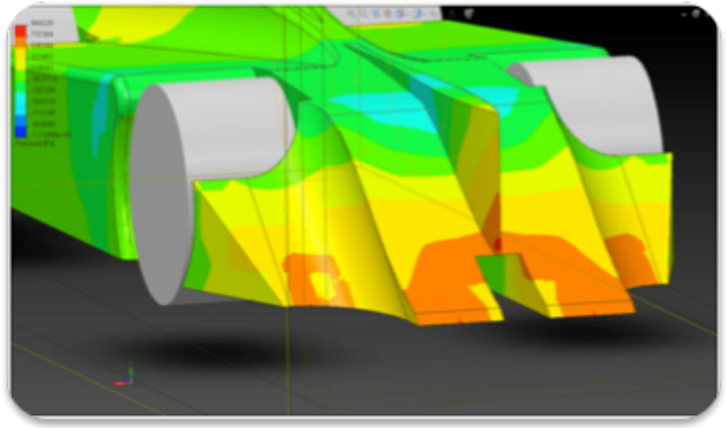


We created a fillet on the front edge in order to stay within spec. This created lift elements and countered our low profile.

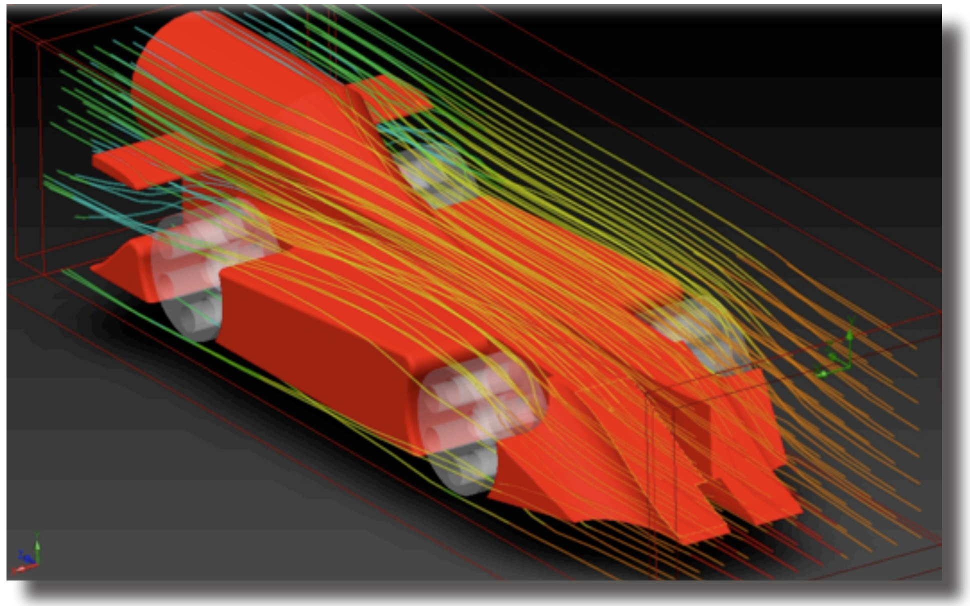


We changed the front to two tapered triangular sidepods, "true" front aerofoils. We also added the nose-piece in this version, a vertical piece for IR detection purposes.





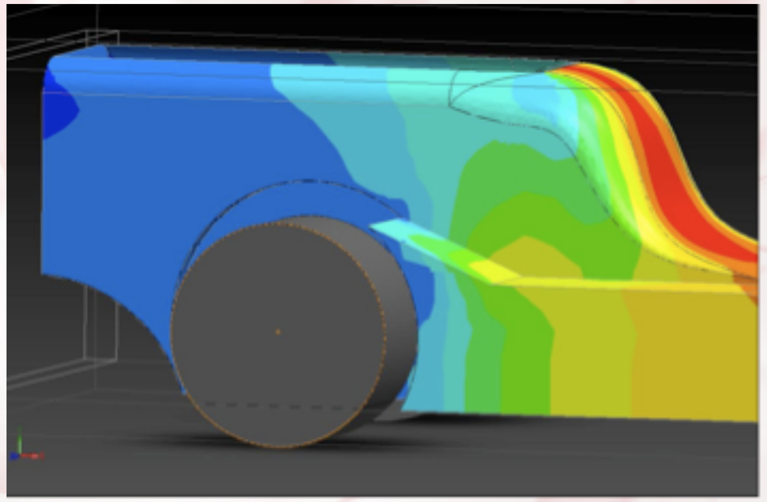
We filleted the edges of the previous version due to manufacturing limitations, with a slight increase in pressure concentration on the nose.



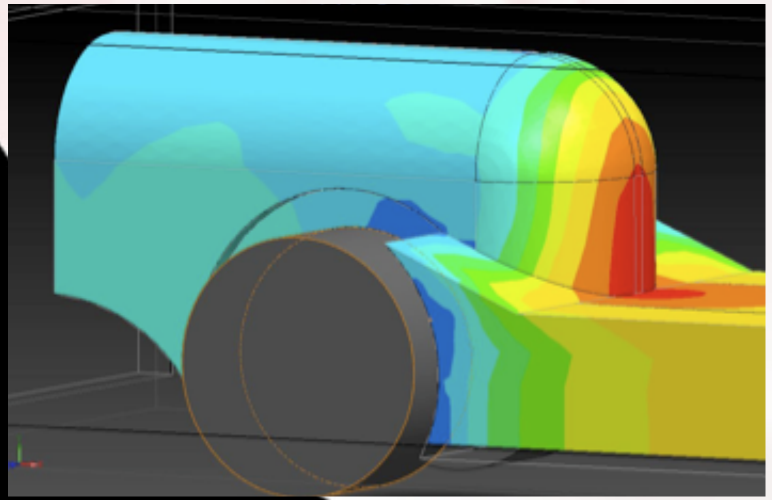
housing

Incredibly vital to the performance of our car, the housing underwent various iterations. The aerodynamic features of the housing add mass to the car but can lower air resistance. We had to find an optimal trade-off through experimentation and a whole lot of CAD modeling.

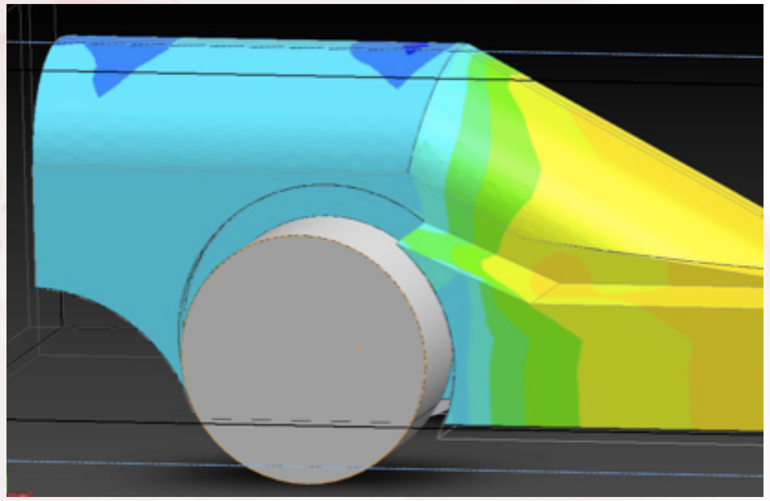
We started out with a rudimentary housing - a filleted rectangular prism.

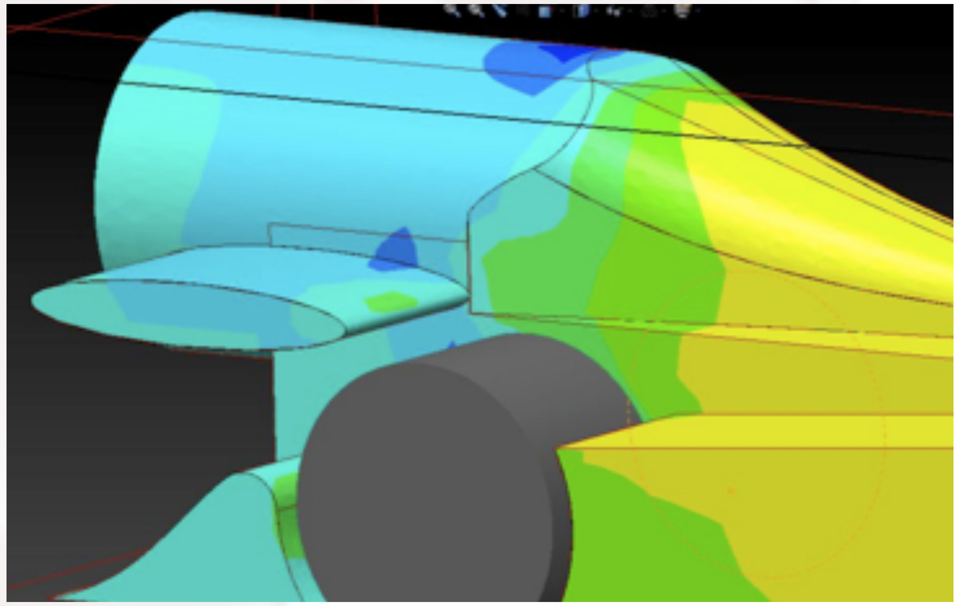


We then moved on to add fillets, rounds, tapers, diagonals, and ended with an ovular extrusion in front of the housing to deflect air around that region. This design evolved into a spherical shape, reducing drag but still having an intense pressure region at the base.



We concluded that the mass gained by adding a gradual slope was worth the drop in drag, from tests with the COSMOS airflow simulator. We made such an extended triangular housing, and noticed an immediate drop in resistive drag and small viscous forces.

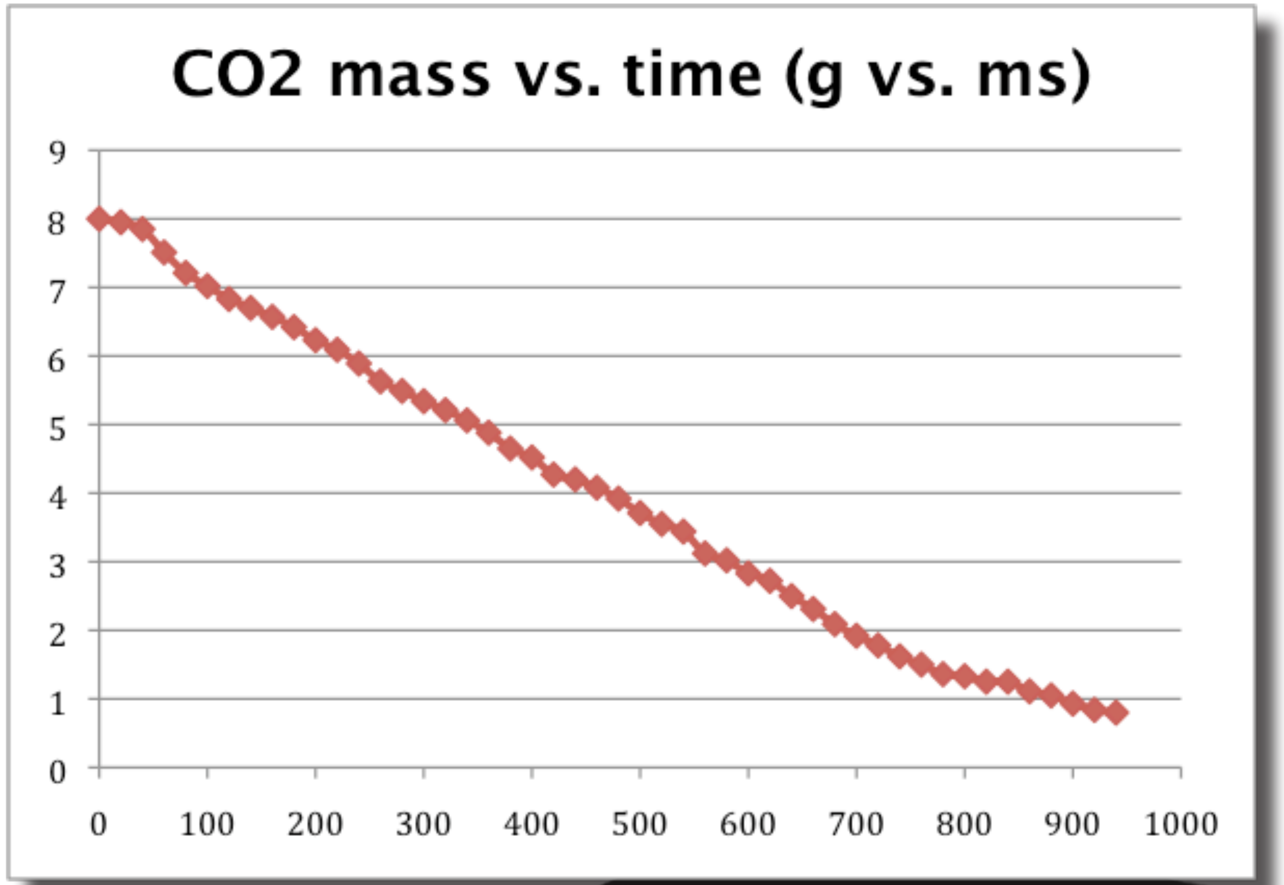


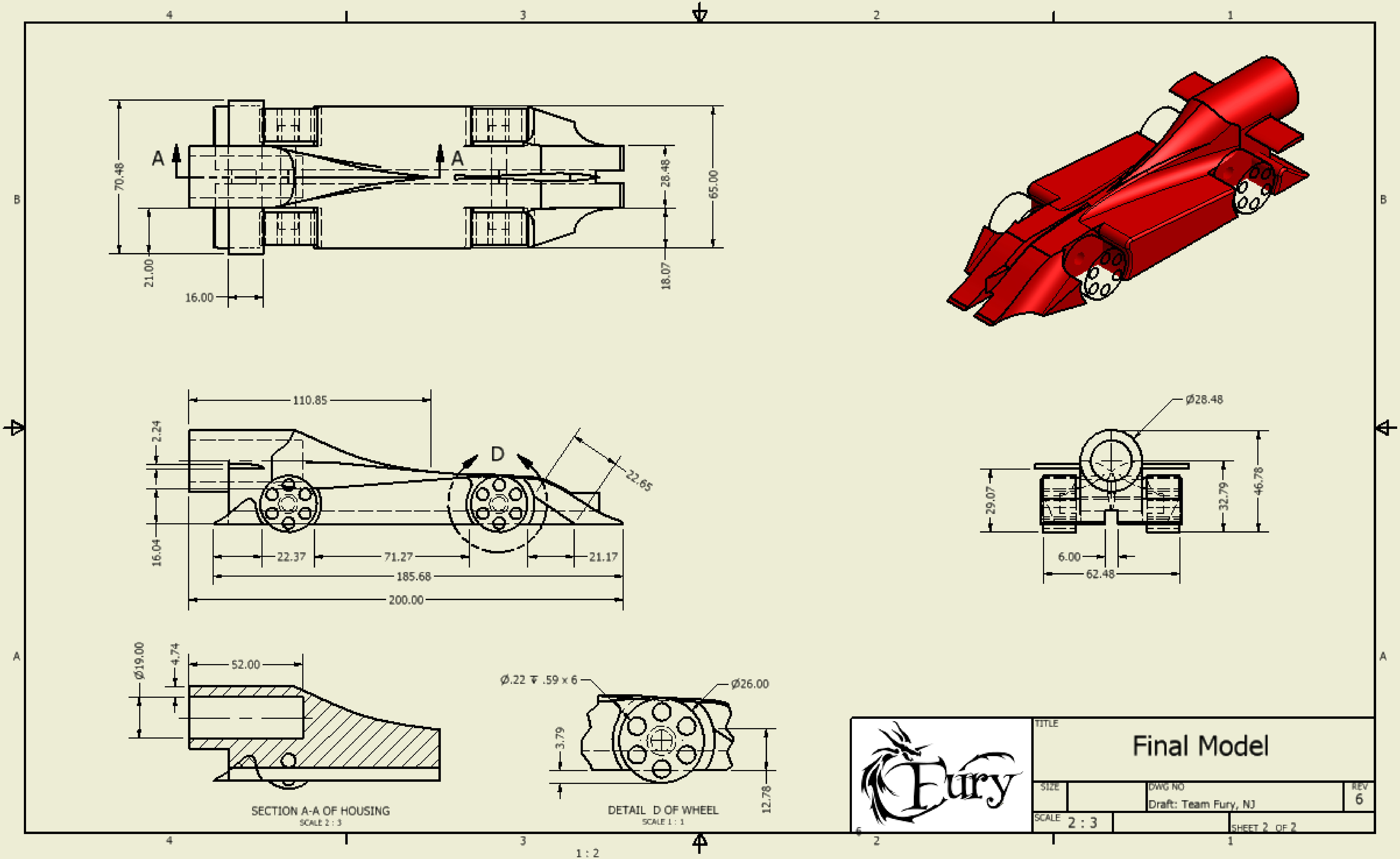


After some experimentation, we created a concave housing instead of one with a direct slant, which significantly reduced pressure and viscous forces on the housing and rear aerofoils of the car.

ENGINE SPECS

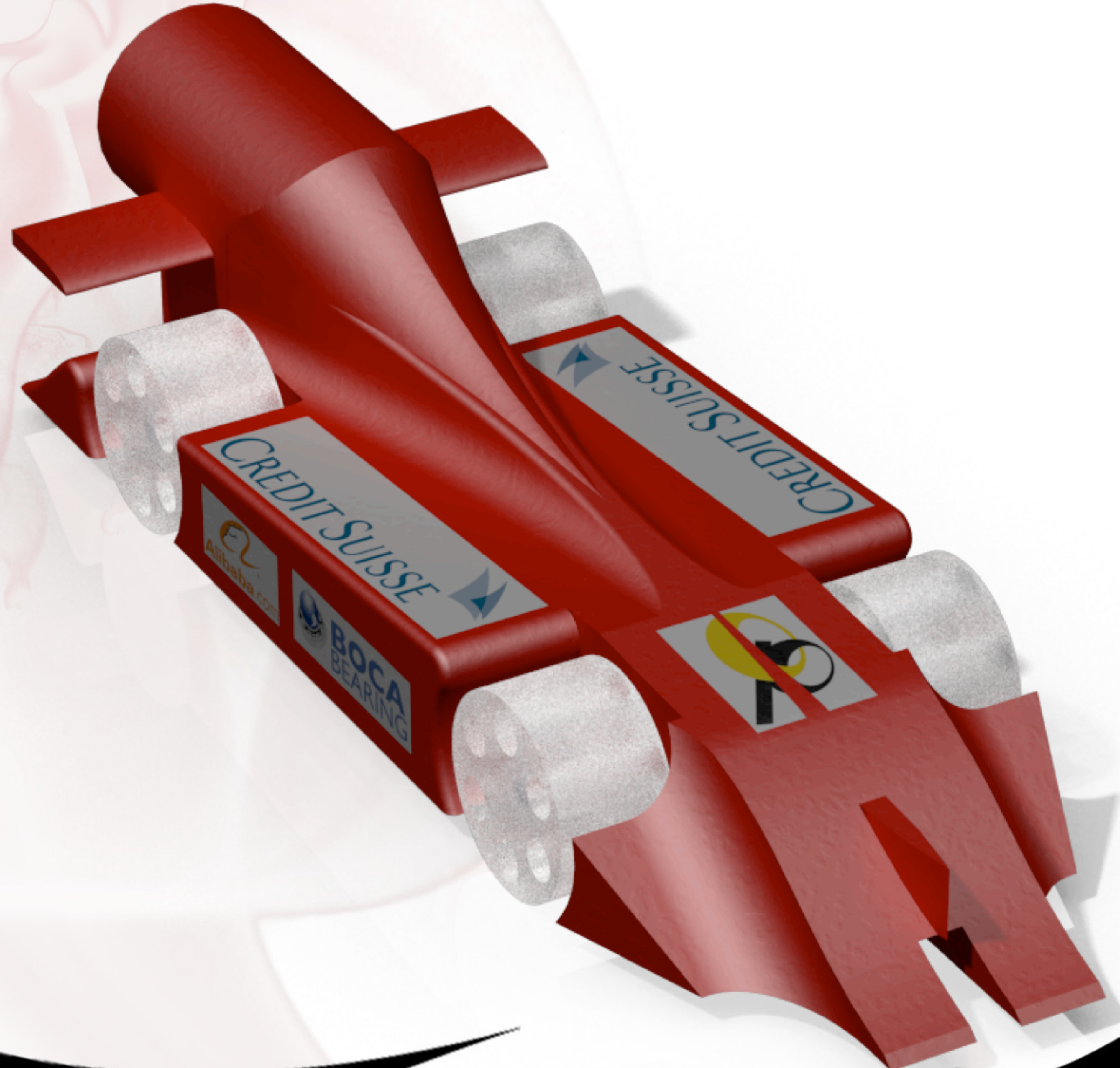
- 8g CO2 per race (capacity)
- length 64mm
- width 20 mm
- weight 25 g
- start by striking needlte

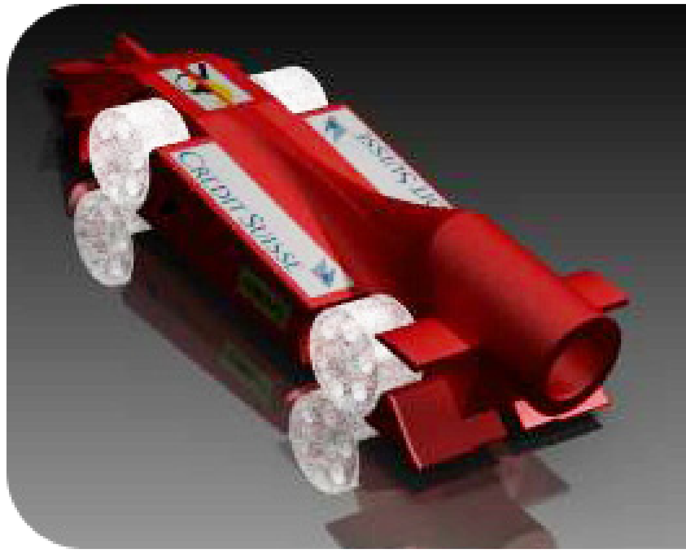




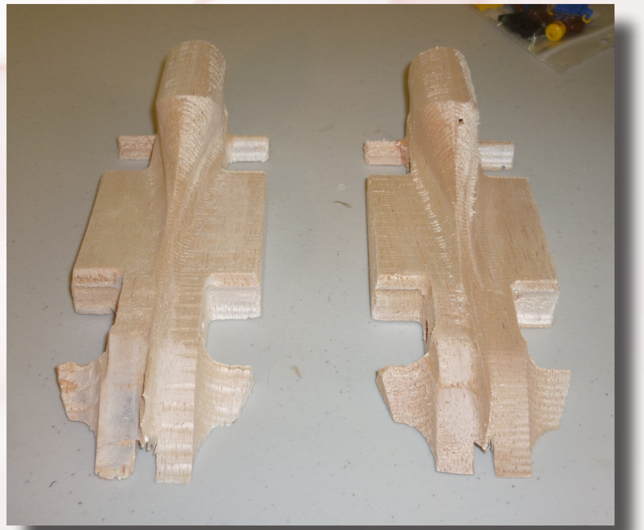
A
A
70.48
21.00
16.00
28.48
65.00
18.07
110.85
2.24
D
22.65
16.04
22.37
71.27
21.17
185.68
200.00
Ø28.48
29.07
32.79
46.78
6.00
62.48
Ø19.00
4.74
52.00
SECTION A-A OF HOUSING
SCALE 2 : 3
Ø.22 ↧ .59 x 6
Ø26.00
3.79
12.78
DETAIL D OF WHEEL
SCALE 1 : 1
Fury
TITLE
Final Model
SIZE
DWG NO
Draft: Team Fury, NJ
REV
6
SCALE
2 : 3
SHEET 2 OF 2
1 : 2

realistic rendering





manufacturing



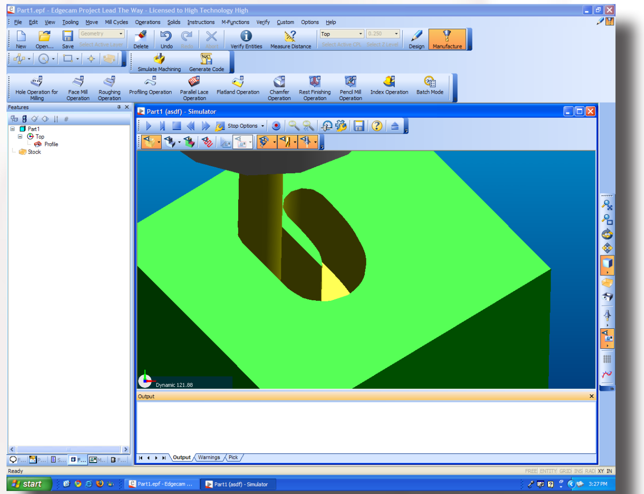
MAIN BODY

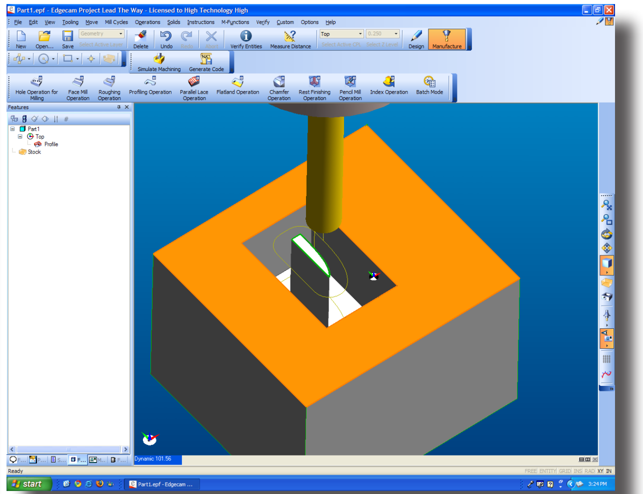
The **body** of the Fury car was milled through Richland High School. The .stl files were sent digitally by email, and the information was input into a Denford Router 2600 pro. A block of balsa wood was milled by the machine to produce the start of the model car. The product would be later sanded and painted.

WHEELS

The **wheels** of the Fury car were milled using a Prolight milling machine at High Technology High School. A Lexan block was used with CNC code written by hand. The front and side of the wheels were milled out (see first image to RIGHT), and a bandsaw was then used to separate the wheels from the block.

The bandsaw cut 1mm wider than the actual height of the wheels, leaving a thin film in front of the six holes drilled around the axle hole. This prevented air from flowing into the wheels and made the car more aerodynamic. Because there was a thin film, the wheels were then “popped” from the blocks using an X-acto knife.





REAR AEROFOIL

Because of milling constraints, the **rear aerofoils** had to be milled separately. Using Inventor, the aerofoils were designed and then exported to Edgecam, through which CNC code was generated. The code was used on a Prolight milling machine at HTHS. The machine milled away the front and side of the aerofoil from a block of balsa wood in a process similar to that of the wheels.

The rear aerofoils were then carefully attached to the main body at the correct places.

AXLES AND BEARINGS

Bearings were purchased pre-made and carefully glued with Super Glue into each wheel. **Axles** were made from aluminum rods, cut to the correct length and filed to perfection. Bushings were used to hold axles firmly in place and wheels were then attached to the axles.

painting and decoration

SANDING

After the cars were received from the manufacturer, the wood was smoothed using sandpapers ranging from 100 to 1000 grit. This was to remove any minor defects in the milling, perfecting the structure of the car.

SEALING

To properly seal the porous balsa wood, sanding sealer was applied to both cars. The sealer made the wood surface smooth and prevented the wood grain from showing through the paint. The sealant was applied three times to each car, and the cars were sanded smooth after every coat. This practice ensured a high quality smooth surface ready for paint application.

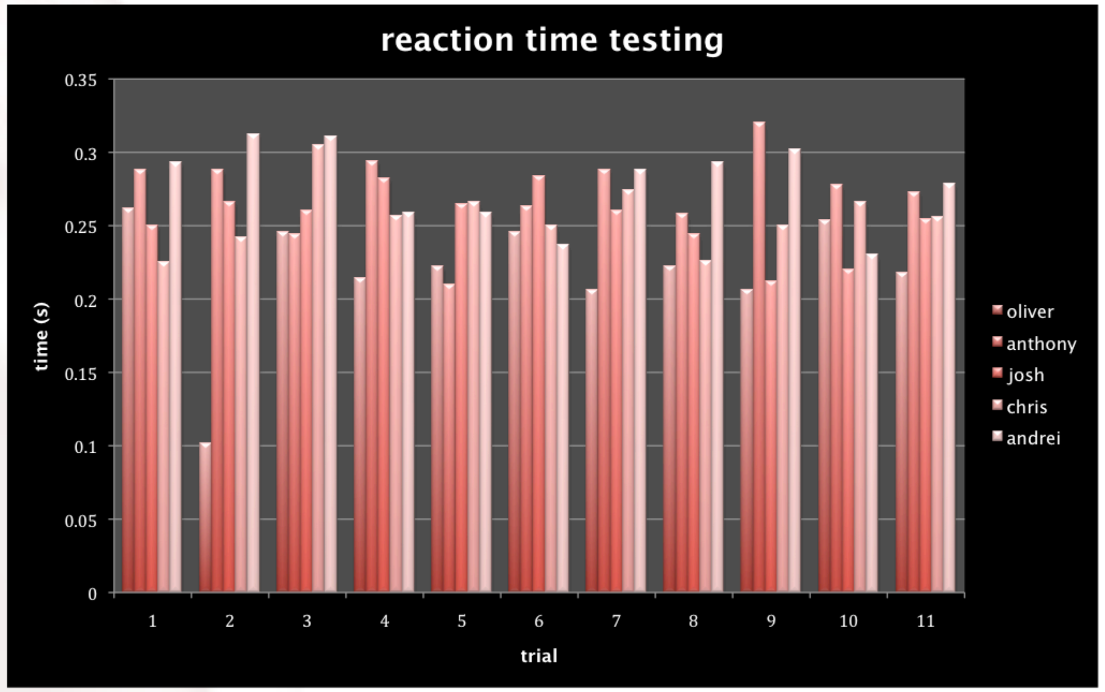
PAINTING

The paints used were Testors Enamel in the colors of Gloss Red, Gloss Black, and Silver. The paints were thinned using Testors brand thinner, for use with a Badger brand single action airbrush, which operated at 40 psi. Paint was thinned with a thinner to paint ratio of two to one. The paint design was predetermined and drawn on a piece of paper. Tamiya brand model masking tape was utilized to mask parts of the car and achieve the desired pattern. The first coat of paint was silver which was then masked. Black coats then red coats followed, with their own masks.

DECALS

After sufficient coats of paint were applied, a coat of Future brand floor wax was sprayed onto both cars in preparation for decal application. Decals were previously printed out on special water decal paper and were applied on top of the Future floor wax coat. After the decals dried, a final coat of Micro Gloss was applied to each car to give both vehicles a glossy finish.

teamwork



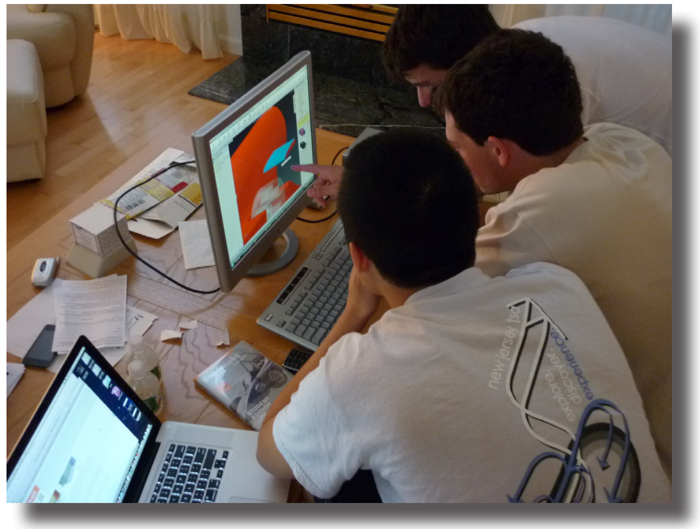
MAKING THE CUT

To determine the best person for reaction time racing, we conducted a series of trials testing our reaction times. The test was simple - a dot would change color at a randomly determined time and the user was to click the mouse as soon as the dot changed colors.

It was determined that Oliver had the fastest reaction time, 0.218s, and he is our designed driver for the TSA national conference.

THE KEY TO SUCCESS

Perhaps the strongest aspect of Team Fury is the intense collaboration and interdependence of its members. Each team member was assigned a role, and by doing so responsibilities could be assigned and work proceeded at a rapid rate. Communication was essential; members needed to be kept up-to-date with every development and feedback could be provided by everyone.



To facilitate this, we used an online application called **Basecamp** to manage milestones, to-dos, and most importantly messages. Like a message board, teammates could discuss important issues in an organized and documented fashion, while updates could be rapidly announced.

As for files, **Dropbox** was utilized to provide almost instantaneous synchronization of files. Working from one shared folder, any changes to it on one teammate's computer would be made to the other folders as well. It was absolutely crucial for the manufacturing engineer, for example, to be working from the newest model produced by the design engineer. Meanwhile, the resources manager could update the Excel spreadsheet on expenditures on every single computer without any hassle. Dropbox reduced file sharing from a consuming bout of emailing and Flash drive sharing to a simple background process. Furthermore, Dropbox provided an effective backup system - files, current and deleted, could be accessed and restored from online.

Furthermore, we avidly utilized screen-sharing, which allowed for real-time collaboration even when we couldn't meet up physically. While Anthony went on vacation to Canada, for example, he could still remain up-to-date and see, live, the work we were doing.

sponsorships and expenditures

Fury

Our financials were a race from the start. We only had two months to finish our project, so we had an incredible challenge convincing sponsors to support us. This was one of thve most resource intensive legs of the process. Starting by preparing a proposal indicating the goal of this project and the intentions behind it, we contacted people we knew and reached out to companies as well. Overall, the team managed to raise about $1500 in funds. These constraints on funding have chllanged us to be as economically savvy as possible.

Without our sponsors, none of this project could have been conducted. Through the generous contributions of various corporations and groups, we were able to secure enough funding to purchase essential services and materials for producing the model F1 car and its presentation. Crucial aspects such as milling and important touches including team uniforms were made possible with financial support from **Credit Suisse, the HTHS PFA, SBCVC, The Neurology Specialists of Monmouth County NJ, OPlabs, Cybercom Technologies, Alibaba, and Boca Bearings.**

CREDIT SUISSE

Credit Suisse is a world-leading financial services company, providing essential financial advice to clients throughout the world.

HTHS PFA

The High Technology High School Parent-Faculty Association includes a student funding board that has supported us through the Student Activities Fund generously provided by Mr. Simon.

SBCVC

Softbank China Venture Capital assists entrepreneurs in mainland China as well as Hong Kong, Macao, and Taiwan who wish to start Internet companies. It is known for the experience of its senior level executives and family of over 100 companies and affiliates world wide.

The Neurology Specialists of Monmouth County, NJ

The Neurology Specialists of Monmouth County, NJ are a group of expert doctors with years of experience, specializing in a myriad of services ranging from electroencephalography to BoTox injections to lumbar puncture.

OPlabs is a small startup from Lincroft, NJ started with the goal of helping individual inventors connect with specialist manufacturers. They also offer web design and maintenence services, found at http://oplabs.net.

Cybercom Technologies

Founded in 2003, Cybercom Technologies is a small management services firm specializing in helping upper and lower level management in technology geared services.

Alibaba.com

Based in Hangzhou, the Alibaba Group specializes in business-to-business trade, online retail, and business management software.

BOCA BEARING

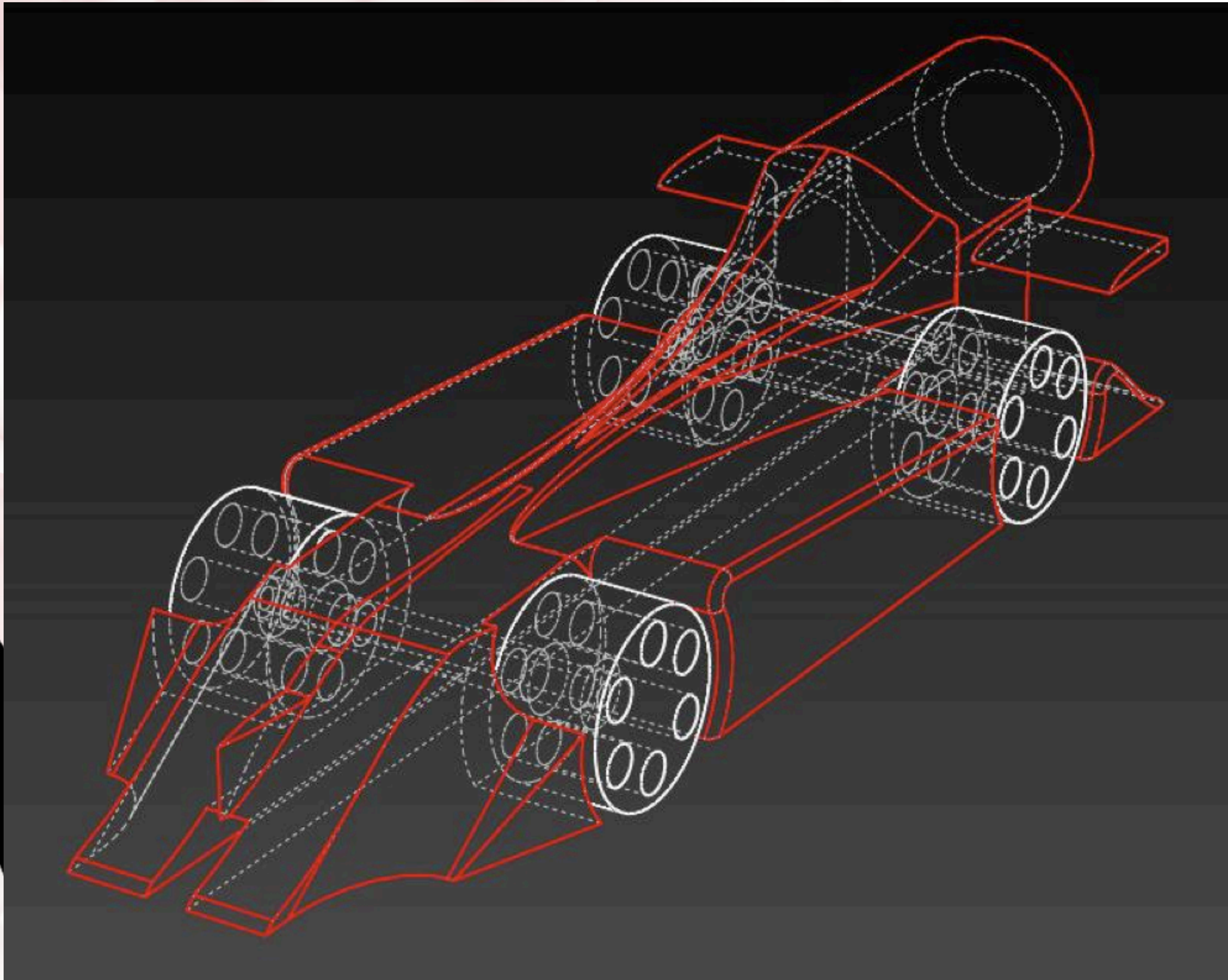
Boca Bearings sells miniature bearings for a wide variety of uses ranging from industry to hobbies to recreational activities.

Expenditure Report

High Tecnology High School F1 in Schools

Payee	Category	Memo	Amount Paid	Total Paid
Richland High School	Manufacturing	Milling of Cars (2)	-$127.47	-$127.47
SpeedyMetals.com	Manufacturing	Aluminum Stock for Wheels	-$24.00	-$151.47
Hobby Masters	Manufacturing	Car Paint	-$11.99	-$163.46
Boca Bearings	Manufacturing	Ceramic Bearings (8)	-$144.55	-$308.01
Pepboys	Manufacturing	Sandpaper	-$8.75	-$316.76
Bushings	Manufacturing	PITSCO	-$8.35	-$325.11
HPS LLC	Manufacturing	Decal Paper	-$19.17	-$344.28
CustomSportswear	Presentation	Pit Crew Uniforms	-$444.80	-$789.08
TouchScreens.com	Presentation	15" Touchscreen Add-On	-$188.00	-$977.08
DieCastFast.com	Presentation	Rotating Car Display	-$32.96	-$1,010.04
Alpha Graphics	Presentation	Triboard Poster Printing	-$169.83	-$1,179.87
Michaels	Presentation	Felt Cloth	-$20.00	-$1,199.87
Alpha Graphics	Presentation	Portfolio Printing	-$20.00	-$1,219.87
Credit Suisse	Funding	Sponsorship	$800.00	-$419.87
HTHS PFA	Funding	Sponsorship	$200.00	-$219.87
SBCVC	Funding	Sponsorship	$200.00	-$19.87
Neurology Specialists of Monmouth County, NJ	Funding	Sponsorship	$50.00	$30.13
OPlabs	Funding	Sponsorship	$50.00	$80.13
Cybercom Technologies	Funding	Sponsorship	$50.00	$130.13
Alibaba	Funding	Sponsorship	$50.00	$180.13
Boca Bearings	Funding	Sponsorship	$144.55	$324.68

thank you

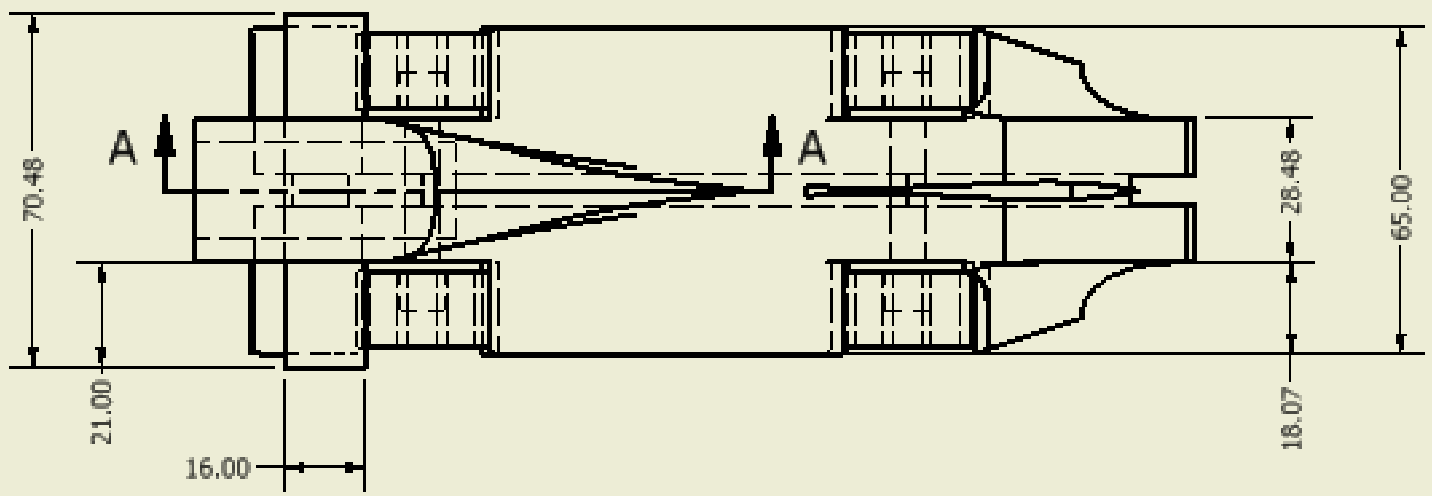


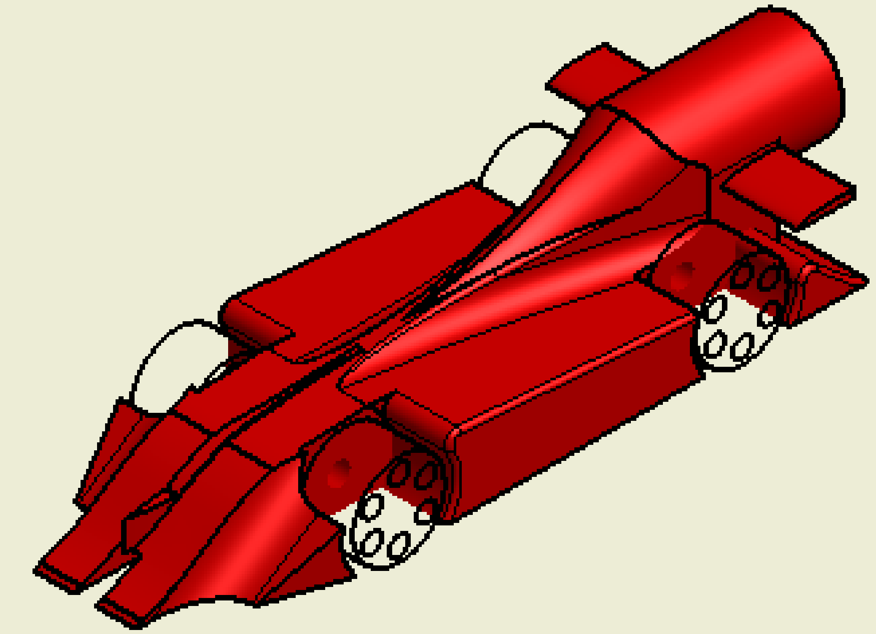
A UNIQUE OPPORTUNITY

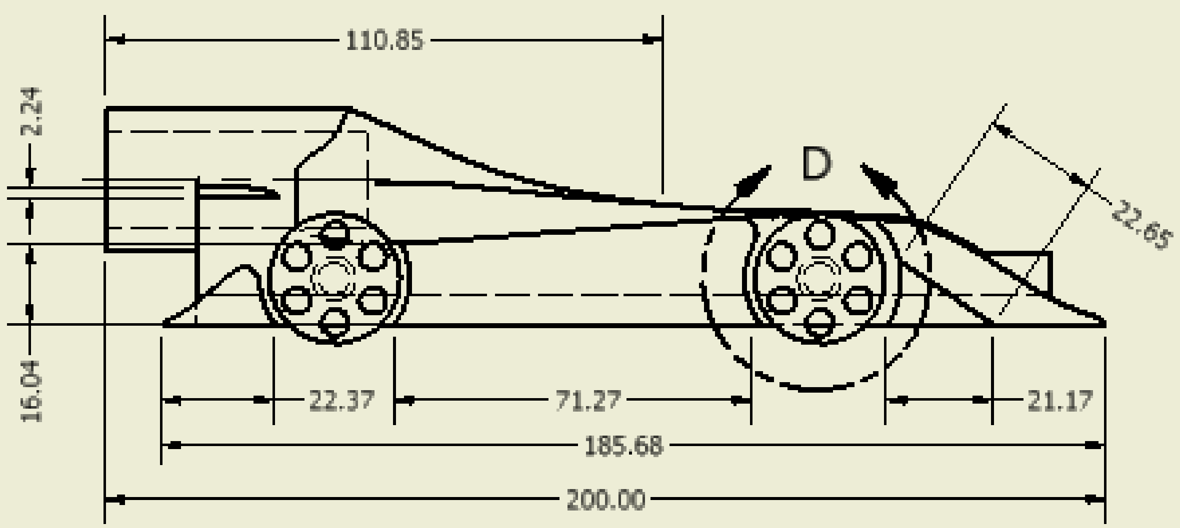
The HTHS F1 team would like to express its appreciation to the F1 in Schools competition. Through this competition, we have dramatically expanded our knowledge and understanding of CAM, CADD, and CIM systems.

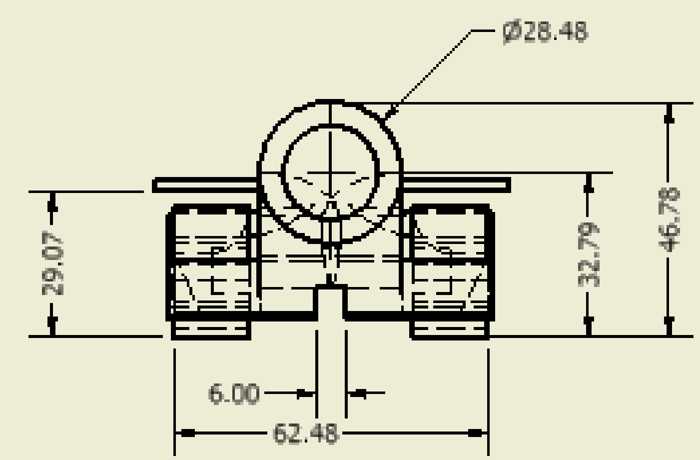
The F1in Schools competion challenged us to learn new techniques and to become familiar with exiciting technologies that professionals often work with. Meanwhile, it presented us with the unique challenge of finding sponsors through an arduous but exhilarating process.

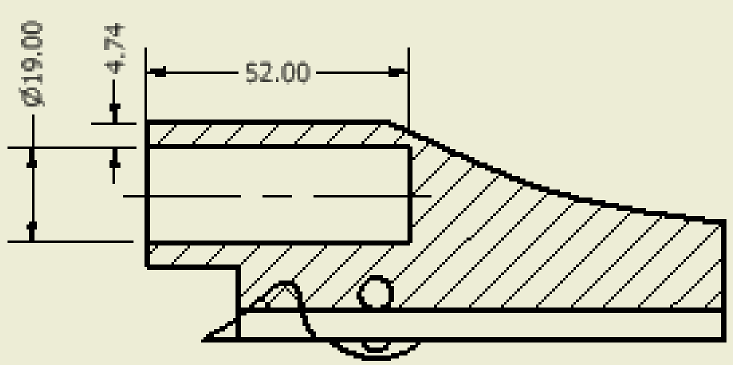
The past few months - and the week to come - is an experience we will never forget.



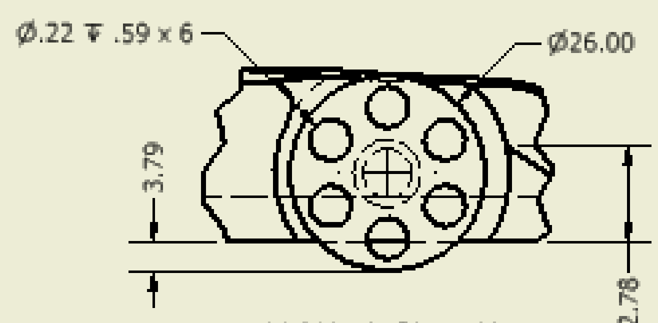








SECTION A-A OF HOUSING
SCALE 2 : 3



DETAIL D OF WHEEL
SCALE 1 : 1

TITLE			
Final Model			
SIZE	DWG NO Draft: Team Fury, NJ		REV 6
SCALE 2 : 3		SHEET 2 OF 2	

1 : 2