



Team AIB Racing

Five Page Proposal
F1 in Schools Season 2014/15

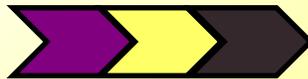


Logos and Colours

The team felt that the colours used for the team logo, the car and the uniform, needed to be attractive and appealing. We looked at various different colours, however we thought that the colours used should be relative to our main sponsors, AIB Ballina. Finally, we decided our colours are; purple, yellow to give our colour scheme a lift to make it stand out more, and a charcoal colour to compliment the other two colours. We contacted a local graphic designer from Dark Blue Web Design and he agreed that these particular colours would work for our team logo. We also needed to portray these colours on our car. We have incorporated our three main colours into the logo, car and uniform.



Above and right - Some logo designs and our Graphic Design Manager Paul sketching out preliminary logos
Below right - Our chosen colour scheme



Uniforms

As part of a drive to get local businesses involved with the team, we have secured a sponsorship deal with a shop named Gift-It to provide us with high quality custom shirts for the competition. We also plan to purchase jackets with part of the money raised from sponsorship.

AIB

On meeting with AIB Ballina they were immediately very interested in helping us to achieve success. We agreed a sponsorship deal and incorporated AIB into our team name. This mutually beneficial relationship provides us with financial and business advice and AIB can continue with their strategy of supporting local communities.

Profiles

Aaron Hannon: Team Manager

Aaron's role as manager is to ensure the smooth running of the team throughout the competition. As part of this he is constantly in contact with all members of the team, to keep everyone up to date on the status of each part of the project, and to make sure deadlines are being met. In his role as design engineer, he tries to come up with innovative designs capable of breaking records.



Paul Flynn: Graphic Design

Paul is responsible for designing the website, editing, portfolio graphics and representation of the team. He is also in charge of the design of the official Team AIB Racing uniform, for developing the logo and colour schemes and the placement of the logos of our sponsors on the car. For this he needs to consult the Design Engineer regularly to see if his ideas fit the shape of the vehicle. Paul is also in charge of the website.



Robert Grimes: Sponsorship and Media

Robert is in charge of bringing new sponsors on board and ensuring a positive relationship ensues. Marketing the teams brand and communicating with the media to maximise exposure is Robert's responsibility. He also strives to ensure that all sponsors are happy with their decision to invest in our team. He keeps in constant contact with the sponsors to ensure this is done.



Enda Flanagan: Resources and Manufacturing

Enda's job as part of the team is to make sure that he can source materials that the design department identify, and to report back the cost and feasibility of these items. He is responsible for the purchasing all test and manufacturing materials, and keeping in contact with suppliers. He is also responsible for the manufacture of the car, and the final finishing touches which have to be made by hand to the car.

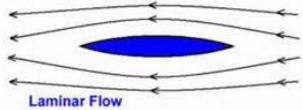
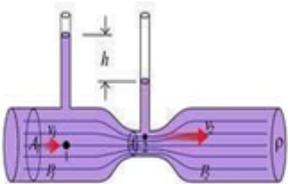


Key Findings

Venturi Effect – This is a case of the Bernoulli principle in which air flowing through a pipe, is compressed when the pipe's cross-sectional area is decreased, and then is released when the cross sectional area increases again. When air flows through a venturi the static pressure is converted to velocity pressure. An application of this on our car is the diffuser.

Drag – Drag is the force opposing the motion of an object relative to air. There are two types of drag which concern us – skin friction and form drag.

Downforce – This is downwards thrust which keeps the car on the track, created by the aerodynamic features of the car. It provides more grip and stops the car losing energy and speed by coming off the track.



From Left to Right;
The Venturi Effect diagram
Laminar Flow,
Equation for Drag,
Wing diagram
Angles of Attack chart.

Laminar Flow – This is when the air travels as if in parallel layers, with no disruption between each of the layers. The opposite of this is **Turbulent Flow** which has chaotic changes in pressure and velocity which decreases the speed and stability of the car. Thus we wish to design our car so that the air flowing around it does so in the Laminar Flow style

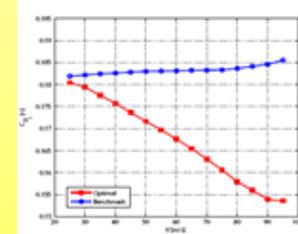
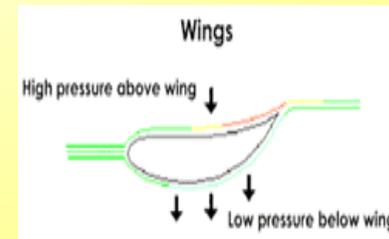
Bernoulli's Principle – This states that an increase in the speed of air leads to a decrease in the pressure of the air. Conversely, if the speed of the air decreases, the pressure will increase. An application of this is the wing of the car in which high speed low pressure air flows underneath the wing and lower speed higher pressure air flows above it, thus creating downforce.

Centre of Gravity – This is the point in the car through which the forces of acceleration work through and the point in which the mass acts through. Ideally, it is located between both axles and as low to the ground as possible. A lower centre of gravity, more centrally located, will lead to less car 'squatting'. That is the nose cone lifting up off the ground, which reduces speed and loses energy.

Exclusion zones – The 15mm exclusion zones on the back of both wheels will lead to a vortex being created at the back of the wheel, thus creating form drag. One of our design concepts to overcome this was to place small 'tunnels' (NACA Ducts) of air travelling from the front of the car to the exclusion zones to push air in there and reduce the vortex.

Wheel Design – The distribution of mass in the wheel will impact the inertia of the car and further calculation and testing will be required to optimise this design. The shape of the wheels will impact their aerodynamic impact and we plan to enclose the inner and outer wheel to minimise drag

$$D = \frac{1}{2}(\rho S) C_D V^2$$



Key Dilemmas

Long or Short? – Another factor noted from our research was that shorter cars create less skin friction and longer cars channel the air better. We plan to test this to see which works best, and we will try to find a for optimal performance.

Angles of Attack – The angle of attack of a wing affects the downforce it creates but creates more form drag if the angle of attack is greater than zero. With so many different factors in play, such as the centre of gravity, to hold down the front of the car, we believe that the front wing should be used to deflect air off the front wheel, reducing drag. In addition, to minimize drag the rear wing should be kept to angle of attack of zero.

How much Mass? – As per Newton's second law $F = ma$ where F = force applied, m = mass & a = acceleration. Thus, the same force will generate greater acceleration for a lower mass. However, considering the canister runs out of gas after about 0.3 seconds, the ability of the car to maintain its speed (its inertia) will come into play. Also, mass will impact wheel to track friction. Further detailed analysis and testing will be required to find the optimum mass for performance.

Height – A car with a lower centre of gravity may have more stability on the track, this will require testing to prove the best

Processes

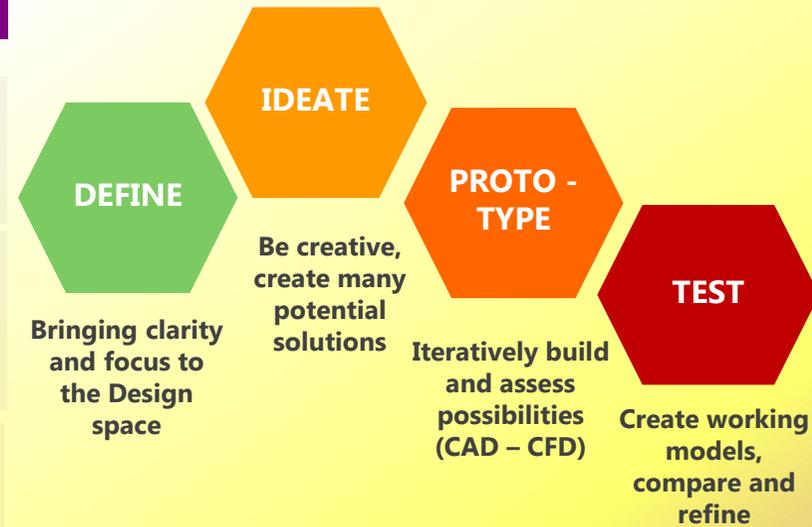
To get the most out of our creativity we decided to follow a systematic design process. We used the “**Design Thinking**” Process Guide from the d-school at Stanford University as a basis for our design work.

To define what we set out to do as regards design, we had a look at all of the relevant **regulations**, looked at the laws of **physics** involved, did extensive **research** into the subject and looked at the **properties** of the materials to be used, i.e. balsa wood.

For ideation, we began to draw sketches of various ideas and think of ways to **overcome problems** which we had discovered in the **define** stage. We **brainstormed** various ideas and tried to build off each other’s ideas.

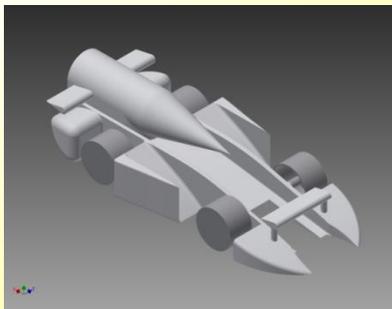
To prototype, we began to design CAD models in **Autodesk Inventor**, such as the design directions below. We then used **CFD** to calculate the **aerodynamic efficiency** of designs, and we used the analysis to **improve and refine** the designs in each one.

For testing purposes, we will use 3D printed models and buy spare balsa wood to **physically test** the different designs we have and try to **combine our best ideas**.



Design Direction 1

Focus on a conical shape in front of the canister with a raised front wing. We also looked at side pods with a wider rear.



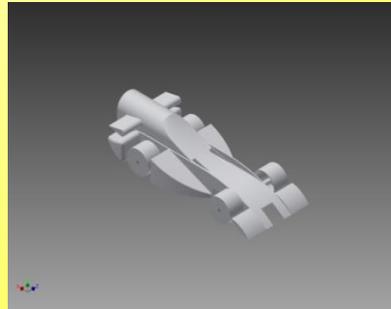
Design Direction 2

Focus on a design with a lowered front wing and adding a diffuser on the underside of the car while using side pods with the same width throughout.



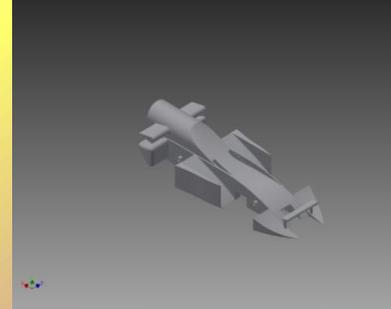
Design Direction 3

Focus on creating downforce from the front aerofoil wing with various attack angles. The canister section and side pods are refined, and NACA ducts added.



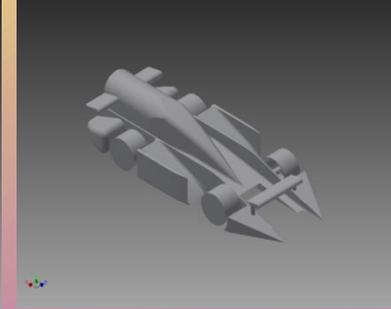
Design Direction 4

Focus on a combination of features from previous designs (side pods from Design 2, the front wing from Design 1 and the canister section from Design 3)



Design Direction 5

Focus on reduced car width, adding a smooth transition to the canister section and creating flow paths for along the underside, to enhance the diffuser effect



Sponsorship Packages

In order to raise funds to help get our team running, we drafted and created a sponsorship information letter which outlined information about the competition and our team. Before sending out the letter we first rang different business to see if they were potentially interested with this business venture. In the letter we outlined the different sponsorship packages available and the benefits of each. We believe the packages we created appeal to all types of businesses in today's economic climate.

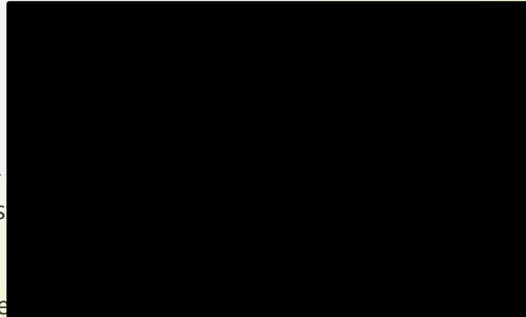
Sponsorship Meetings

After all sponsorship packages had been sent out we set up meetings with the aim to negotiate with potential sponsors. This was a very important step for us as it proved to all sponsors that we were serious about our belief in the team and our ability for success. In these meetings we discussed our aims, past successes and how we planned to go about making their monetary sponsorship drive us to success. Out of these meetings we secured our title sponsor, AIB Ballina.

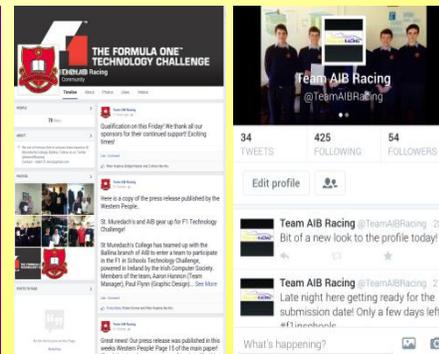
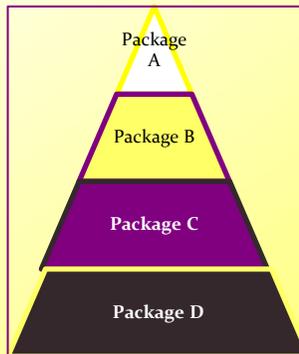


Our Corporate Sponsors

AIB Ballina
Corroy Trading
Hollister ULC
Collins Plastics
Dunnes Stores
C and C Cellular
L. Doherty Mens
Office Pro
MCM Insurance
World of Wonder



We, as a team, were aware from a business's perspective that budget constraints in the current economic climate are tight. We wished to get more widespread involvement from local businesses by providing packages which were appropriate for small and medium sized businesses.



Social Media

To help improve our brand exposure and give us more options for communicating with the public and our sponsors, we have decided to employ social media. We use websites and services such as Twitter, Facebook and Snapchat, and update these on a regular basis with the view to increasing our online presence.

Media Exposure

In order to gain maximum exposure for our brand in the locality, and to express the feelings and images of creativity, innovation and high standards, we decided to focus heavily on getting our message out to the public via local media such as newspapers. Our first press release featured in the main section of the paper, with a half page spread. We also have a planned interview with Mid-West Radio where we wish to further enhance our profile in the community.

Far Left: Team with sponsors AIB & Corroy Trading
Left: Hierarchy of sponsorship deals
Left: Twitter account (@TeamAIBracing)
Right: First press release featured in the Western People newspaper



Website

We have recently started to work on our website, www.teamaibf1.com, in collaboration with Dark Blue Web Design as part of sponsorship agreement with the firm. As part of this deal, we have received assistance in creating and developing our logo, and in preparing our website for launch. We feel in the new age of technology, a website is a vital asset.

Financial Planning

Team AIB Racing - Regional Finals Budget Expenditure Proposal

Item	Units	Cost per unit	Total
Manufacturing			
Test Cartridges	100		
Balsa Wood	10		
Wheels			
Axles	100		
Bearings - Test	10		
Bearings - Race	1		
Display Stand			
Materials			
Promo Boards	2		
Promotional			
Business Cards	100		
Website	1		
Posters	20		
Other			
Travel			
Uniforms	4		
Total			

Events Planned

Although some businesses locally, due to financial constraints, were not in a position to come on board as corporate sponsors, they offered us prizes to utilise in a Christmas raffle to raise funds. We are currently in the process of applying for a Garda permit for the event. We already have commitments from a number of sponsors to contribute prizes, such as hampers, vouchers and equipment. We also have planned some promotional events linked with our School Bank to give ourselves maximum publicity within our school.

Time Management

Because time is of the essence in this competition, and to ensure we achieved maximum performance in all areas, we created a timeline for project management purposes. We created the timeline together as a team, so we could collectively agree on realistic dates and targets for the season leading up to the Regional Finals. Aaron as Team Manager will monitor activities and ensure the team is achieving the key milestones as planned.



Non Corporate Sponsorships

As part of our drive to include as many local businesses in our project as possible, we pursued the option of sponsorships agreements with services or items being provided to us instead of money being awarded to us. We have already secured some deals of this type with Dark Blue Web Design, Gift It and Moy Valley Resources. However, we plan to attempt to secure many more of these sponsorships to help us cover the costs of manufacturing, poster and sponsor board printing, and uniforms. We are currently in negotiations with a number of providers for these products and we feel confident we will striking a deal with these firms.

Promotional Materials

As part of our continued drive for our brand to have the maximum reach in our local community, we have decided to allocate some of our budget towards materials and promotional posters to distribute locally. We believe that not only will this increase the awareness of our team, but it will benefit our sponsor relations as we plan to use this venture to provide them with a platform to get their message out to the community. We wish to create well designed, eye-catching business cards, posters and leaflets.