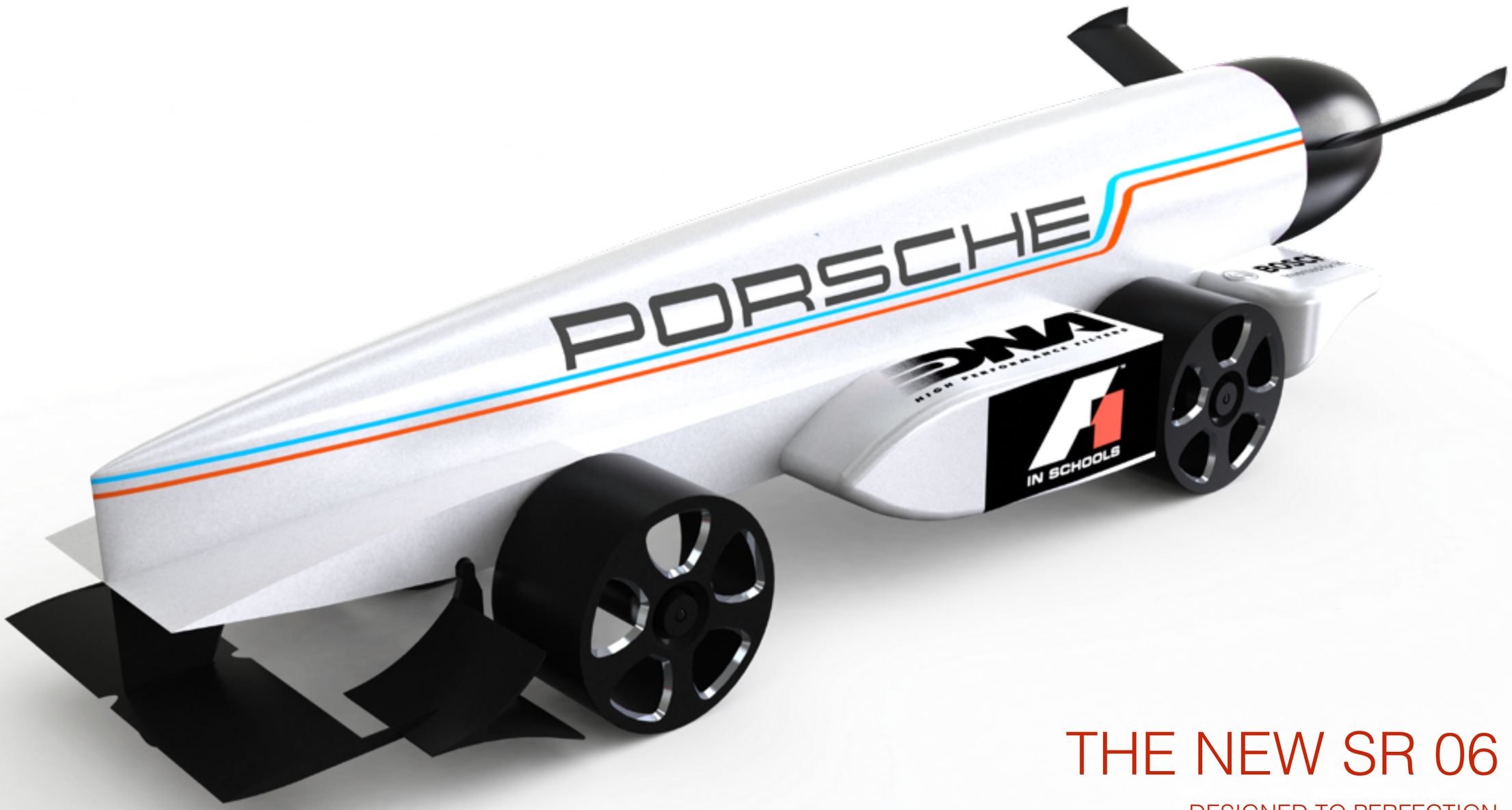
2014 WORLD FINALS PORTFOLIO



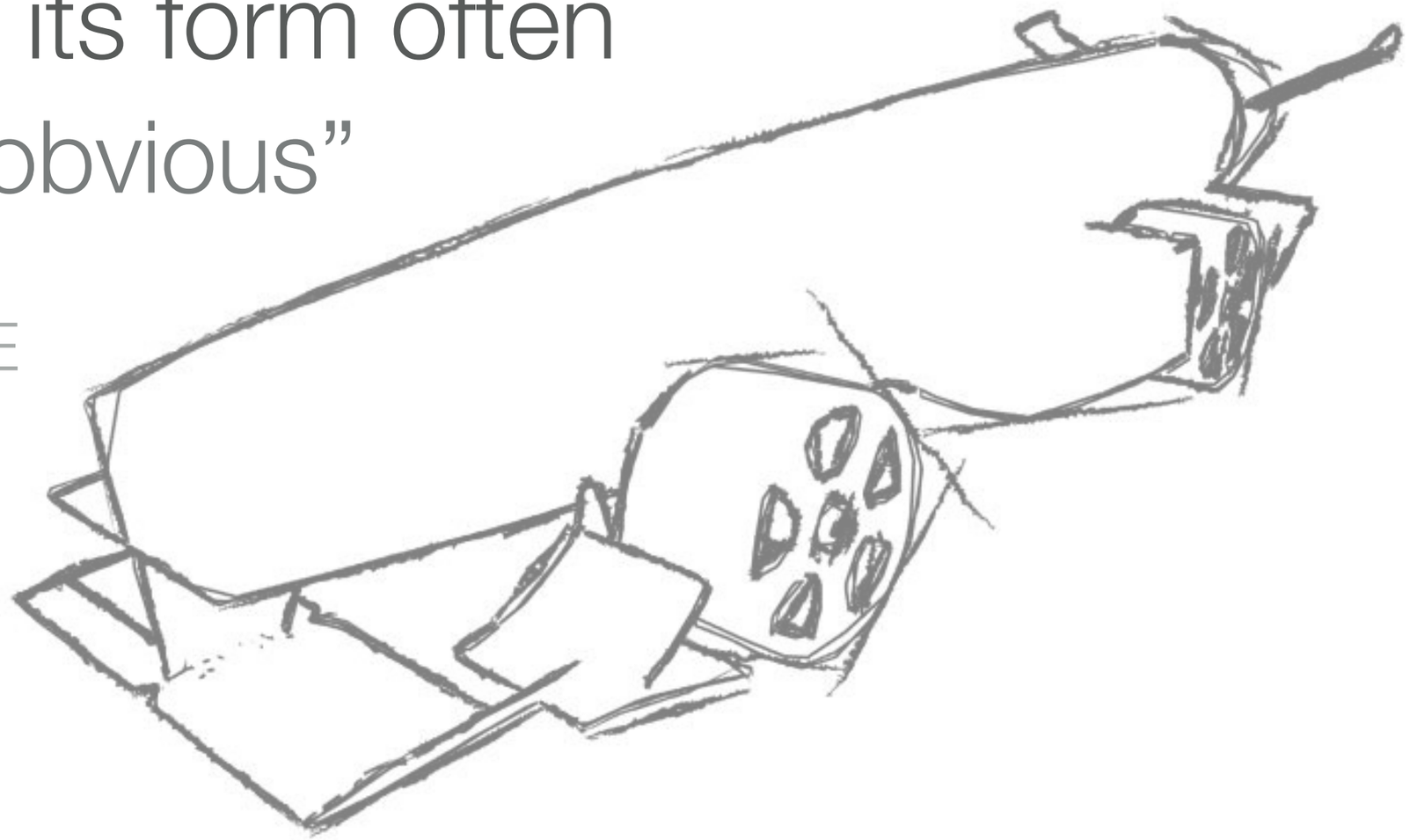
THE NEW SR 06

DESIGNED TO PERFECTION

collaboration | innovation | dedication

"If you analyse the function of an object, its form often becomes obvious"

- F.A. PORSCHE



team interaction

Julian Beyerlein
Team Manager

Role
Julian is the backbone of the Safire Racing team. As team manager he calls in team meetings, heads presentations, leads all the meetings with the team and produces customised portfolios to present our projects to various sponsors.

Collaboration
Julian's writing and communication skills with companies have enabled him to contact potential sponsors, and define sponsorship agreements for the team. His close collaboration with each member of the team is necessary to ensure success in every aspect of our project. Julian keeps all team members in check by motivating them and making sure everyone is successfully fulfilling their role for the team and staying focused and goal oriented.

Dalia Abdelrahman
PR and Marketing Manager

Role
Dalia took on the role of being the PR and marketing manager of Safire Racing. She is responsible for organising our marketing events and managing the team's social media accounts.

Collaboration
Her collaborations with newspapers and radio stations make it possible for her to represent and promote our team and our loyal sponsors. Dalia's close work with professional businessmen from Porsche expanded her knowledge on organizing and marketing a team, which she applied on the team, making her a phenomenal PR and marketing manager representative of Safire Racing.

Maximilian Stucke
Design Engineer

Role
Maximilian's role as the design engineer is to design the car by using CAD and CAM programs. He analyses car parts to ensure the perfect aerodynamic to enhance the speed of the SR06.

Collaboration
He is responsible for developing solutions for all digital media and software issues together with all other team members. As the expert in using Autodesk and Inventor, Max worked closely with our sponsor DNA Filters based in Greece through the software Team Viewer all the way from Dubai to design and discuss the development progress of the car.

Nada Tameem
Lead Designer

Role
Nada is responsible for the creative design aspect of the team, which means that she is responsible for all the graphics, corporate designs, the logos and most importantly the Safire Racing team identity.

Collaboration
She works with the marketing departments of our sponsors and designs our uniforms through collaborating with Puma and the logo placement on our car with Porsche to ensure the best results possible.. With the help of Julian, the team manager, she works on the structure as well as the concept clarification of the presentation. She is in charge for the design portfolio of the SR06 as well as the pit display.

Jounes Gross
Manufacturing Engineer

Role
Jounes is in charge for the manufacturing process of the car as well as the pit display. This includes converting CAD to CAM, material analysis, CNC routing and the assembly of the pit display.

Collaboration
To ensure that Max's, the technical designer, visions are realized in the best way possible which requires a close working environment. Insuring the most exact and detailed production of all the parts, Jounes works in close collaboration with DNA Filters and he monitored the process through Team Viewer to keep an eye on the time management.

the evolution of a team

THE VISION

Formula One is a team sport which celebrates the skill of the drivers as well as the vision and ingenuity of the engineers and designers. Formula One in schools is about the chance to experience the commitment, passion and dedication of a motor sports team in a hands on, real life challenge. We were thrilled by being given this chance by our teachers and F1 in Schools and developed a vision of successfully racing an F1 in Schools car and to represent our country in the best possible fashion.

SAFIRE RACING - DEVELOPMENT OF TEAM IDENTITY

From the beginning it was clear, that the ultimate goal to produce the fastest car possible needed a strong team of dedicated people and powerful, experienced partners. With our sponsors who share our visions of excelling in the field of motor sports, we developed skills in different areas of the competition and applied them to our work. We did not want to take anything for granted, redefining every bit of a F1 car and trying to do everything slightly different. We chose a scientific approach to design, questioning everything we have seen so far. The result is the SR06, the Safire Racing F1 car for the World Finals 2014 in Abu Dhabi. The SR06 is not only optically outstanding – it is engineered to test the very edge of the laws of physics within the framework of the F1 in schools rules and regulations.

Safire Racing's 2012-team took part in the F1 in Schools World Finals for the first time in 2012 in Abu Dhabi and placed 14th out of 33 teams. Additionally we won the prize for the best Verbal Presentation!

World Finals 2012

At the 2013 World Finals in Austin/Texas, the Safire Racing Team collaborated with the WhiteBlue Bullets Racing Team from Greece, forming the Safire Blue Bullets Team. We were awarded the Pressure Challenge Award but most importantly the award that perfectly describes our team, the Innovative Thinking Award.

World Finals 2013

UAE Nationals 2012

The 2012 UAE National Finals we won the category prizes for the best reaction time, the best engineered car and the best rookie team , were ranked in 1st place and became the 2012 UAE Champions.

UAE Nationals 2013

In the 2013 UAE Nationals in Abu Dhabi the team never fought through the competition, winning prize for the best verbal presentation and a 2nd overall place.

UAE Nationals 2014

The 2014 Safire Racing Team dominated throughout the competition and won the prize for the best engineered car. The outstanding overall performance brought our team the title of the 2014 UAE National Champions.

rule of a brand

RELATIONSHIP MARKETING

As our “company” strongly depends on sponsorship we recognise the long term value of sponsor relationships and extend communication beyond promotional presentations. Thus we show presence at community events and encourage sponsor interaction.

The most significant events that contributed in strengthening the relation with our sponsors include us, Safire Racing, sponsoring a kart team at the 2013 24-h Endurance Challenge, participating at the official UAE launch of the Porsche 918 Spyder and representing our team and sponsors at the 2nd and 3rd companies cup.

BRAND MANAGEMENT

We are not only a F1 in Schools team but an ambassador for the youth of the UAE as well as for our sponsors. To promote this and to encourage young students to follow in our footsteps we organised multiple events that raise awareness about our team as a brand and our sponsors.

For example, we hosted the 3rd Dubai Youth Science Challenge at our school where more than 150 students were motivated to compete in different areas of science. Furthermore, participating at the “Think Science” competition we gained renown amongst students in the UAE.

e-MARKETING

We use digital media to inform our sponsors and followers about our progress and keep them updated. This is a powerful marketing tool especially for the youth target group. We have our own webpage, Facebook, Twitter, Youtube and Instagram.

BUDGET MANAGEMENT

SPONSORSHIP PACKAGES

Platinum 30.000 AED

- Global Press
- UAE Press
- Marketing Events
- Company Logo on the SR06
- Company Logo on the Team Uniforms
- Company Logo on the Pit Display
- Digital Media Distribution

Gold 15.000 AED

- UAE Press
- Marketing Events
- Company Logo on the Team Uniform
- Company Logo on the Pit Display
- Digital Media Distribution

Silver 5.000 AED

- Company Logo on the Pit-Display
- Digital Media Distribution

Business Plan		Comments	Quantity	REVENUES	COST
				AED	AED
Sponsoring Total				50,000	0
	Platinum	Porsche		30,000	
	Gold	Bosch		15,000	
		Puma		0	
		DNA		0	
	Silver	Continental Tyres		5,000	
Car Parts SR05		Partner		0	0
	Balsa Blancs	sponsor: DNA	10		0
	Body CNC Milling	sponsor: DNA	10		0
	Body Priming	sponsor: DNA	10		0
	Body Painting	sponsor: DNA	10		0
	Aluminium Wheels	sponsor: DNA	40		0
	Aluminium Axles	sponsor: DNA	20		0
	Spoilers (Front & Back)	sponsor: DNA	20		0
Pit Display				0	3,400
	MDF Plywood		15		2,000
	LED Lights		2		500
	Foils		2		100
	Flat Screen Monitor		1		800
Marketing				0	3,300
	Team Uniforms	sponsor: Puma	30		0
	Branding Team Uniforms		30		1,000
	Printing Stickers (Car, Pit-Display)		20		1,000
	Business Cards		8		800
	Printing Design Portfolio		10		500
PR & Media Activities				0	0
	Online Quiz	sponsor: Porsche	1		0
	Porsche 918 Spyder Launch	sponsor: Porsche	1		0
	3rd Dubai Companies Cup		1		0
Travel & Shipping Expenses				0	38,000
	Hotel + Registration Fee		8		38,000
	Transport Vehicles to Abu Dhabi	sponsor: Porsche	2		0
	Pit-Display Transport to Abu Dhabi	sponsor: Continental	1		0
	SR06 shipment from Greece	sponsor: DNA	3		0
TOTAL				50,000	44,700

PROFIT / LOSS	5,300

RETURN OF INVESTMENT - THE FOUNDATION FOR A COLLABORATION

Our sponsors are a logical match to our unique role and Porsche is the key link between the very foundation of motor sports and German technology. All sponsors are significantly collaborating with SF Racing to achieve our common goal: produce the best possible car. This year we were able to extend our sponsorship agreements with our sponsors with world known brands: Bosch, Continental and Puma. We were looking for partners who represent the German working methods and are also relatable to our home country, the UAE. At the last years World Finals in Austin, Texas we have even managed to expand our pool of sponsors on a global scale. DNA Filters from Greece has become a central role in our network, resulting in our high quality products. In return we generate value through media coverage and digital media exposure which can be evaluated versus the cost of comparable advertising space and time. Further ROI is generated by connecting our sponsors and thus creating communication shortcuts to increase business deals.

TIME MANAGEMENT

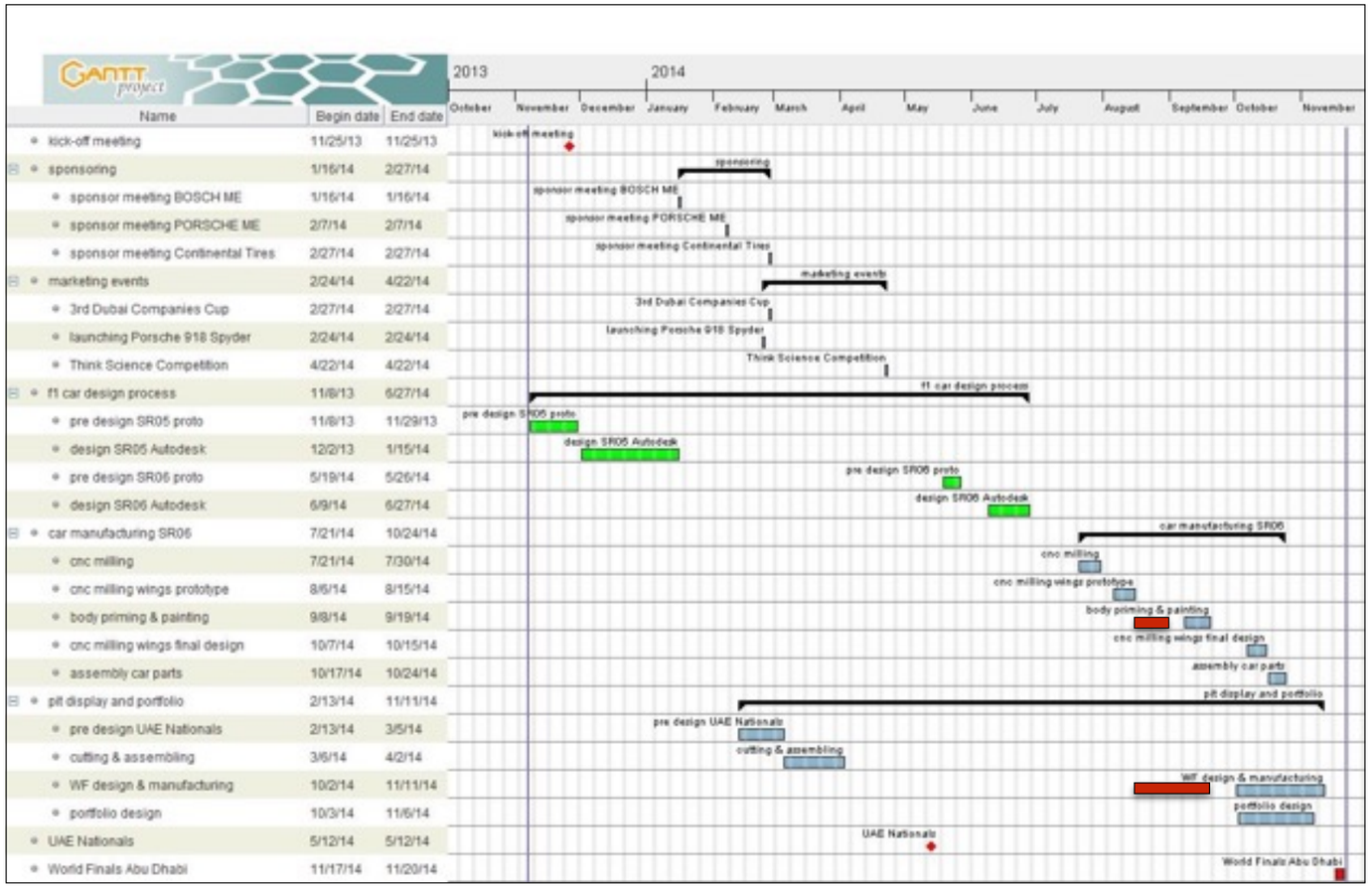
THE PATH TO THE WORLD FINALS 2014

We categorised our project according to the most important elements and identified the scope and time of each phase. This can be seen in the first column on the left. Also depicted is the work flow with manually attached deviations, like delays. Deviations are important to be recognised early as they act as a warning system in our progress measurement.

For example: When our new Lead Designer quit the team unexpectedly we still had unfinished work from his side which was due to the National Finals three weeks from time. In that situation Team Manager Julian Beyerlein stepped in to find a quick replacement of his position and introduced our Lead Designer Nada Tameem to the team, where she got integrated and involved in our tasks & projects. She adapted very quickly and managed to put together the unfinished portfolio in just a timespan of 2 weeks by working closely together with all the team members to receive the missing information.

Every aspect was extremely risky as we depended completely on collaborations with our partners, especially DNA Filters from Greece who is in charge of the manufacturing of the car. Thanks to Julian's management skills and the creativity of the team we were able to get everything done in time. The key element to succeed was our constant, effective communication to coordinate our actions, recognise and solve problems arising and react to changes. We used our office in the German School and Skype as well as social media to communicate and Dropbox and Own-cloud in our webpage to collaborate on files.

Even with unexpected changes and barriers we proved that a well established communication and management internally can withstand any of these challenges. Everybody of Safire Racing contributed decisive work to reach the many milestones on the long path to where we stand today.



RISK MANAGEMENT - WHY TO HAVE A CONTINGENCY PLAN

As shown in our Gantt chart above, indicated by the red bars, not all ideas and plans can be implemented causing delays, therefore it is necessary to have a backup plan. Consequently, we have established different procedures in case of a countermand. This contingency plan has helped us keep track of time and saved us a lot of extra work, e.g.:

1) We designed two different SR06 Wheel designs, which proved to be effective as the backup wheel design makes our car faster.
2) For the Pit-Display we stood in contact with 4 different companies in case our primary designer won't go through with our agreement.

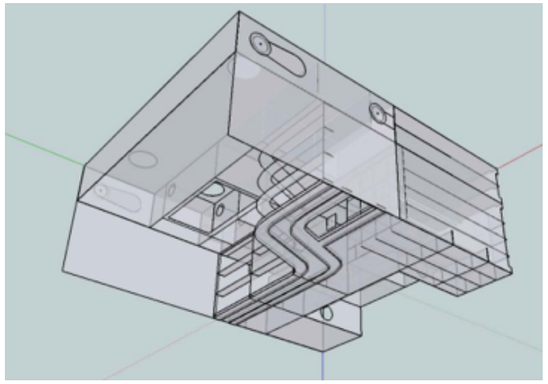
pit display

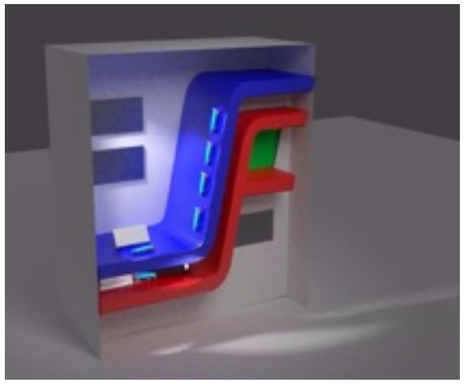
DESIGN IDEAS

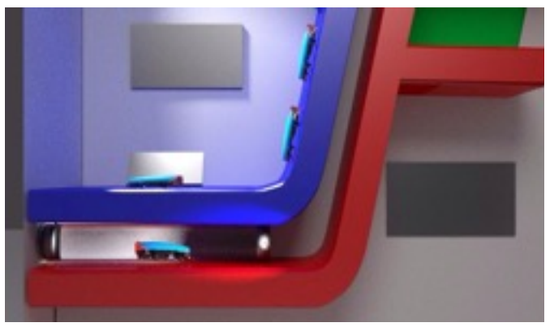
Safire Racing is not only a F1 in schools team. We see ourselves as a brand and to visualise this we chose our dominant and easily recognisable logo to be the centrepiece of our pit display. By doing so we put the main focus on our team identity and gave our pit display a modern, sleek flow and use it as a marketing tool at the same time.

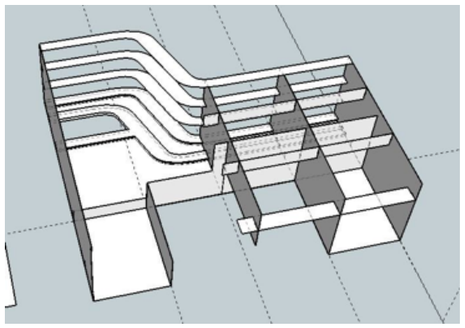
Over the past 3 years we identified ourselves with the colours red and blue, red representing dynamic, energy, speed and passion and blue representing the color of the sapphire, symbolising cleanliness and technology.

We managed to highlight and make our logo on the pit display very striking by placing LED lights behind the logo on the red and blue team colours. The basic white color of the pit display was chosen to emphasise the red and blue colours and give it the clean, organised, precise look that the team was aiming for.









SUSTAINABILITY AND BUDGET

Since the 2013 World Finals in Austin Texas we have managed to put our sustainable Pit Displays to use. The 2013 World Finals Pit Display was kept at the Laurel Mountain Elementary School to inspire and motivate the young students to get involved in the F1 in Schools Competition as well as the 2014 UAE Nationals Pit Display, which is currently showcased at our school.

We chose the affordable opal white acrylic for our pit display. This gave it a modern and also very professional look. Acrylic can be bought at a reasonable price as well as glued easily with chloroform and it is also very light. This makes it easy for the team to handle and transport all elements.

FINAL DESIGN

For the design of the 2014 World Finals Pit Display we have combined our knowledge from our previous trials to put together the perfect final piece. We combined MDF plates because they're easier to cut or manufacture and got a company to make the final piece for us to ensure a perfected smooth finish.

car component ideas

BODY SHAPE

The shape of the car body is directly linked to aerodynamics of a rocket powered open wheel car which is way distinct from a typical F1 car. In order to reduce downforce and drag we designed various body shapes.

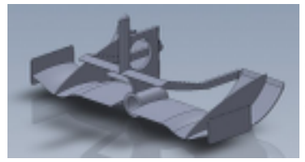
An horizontal shape of the body which guides the air laminar over the car and a bullet like cartridge chamber to enhance a good aerodynamic results. The front wing is incorporated in the design and forms a v-shape to split the air above and underneath the car to generate minimal downforce on the front wheels.

A horizontal conventional shape which is modified into a curved crescent shape. The front wing is closed to guide the air nearly complete over the car body and the cartridge chamber is more connected to the main body to split the air earlier to both sides.

A complete unique vertical orientated body with a long nose cone and a bullet rifle shape splits the air sideways and reduce drag and downforce and stabilize the car on the track for a straight run. The cartridge chamber is incorporated in the whole body to reduce turbulence.

WINGS

Similar to a rocket or a dragster car we know that down force is not necessary so we had to come up with some clever ideas to incorporate the compulsory wings in our design.



The shape is based on a F1 car design with flat front wing elements and deflectors on the side to stabilize the car on the track. Furthermore the wing support element in a shovel like design guide the air above the front wheel. Those delicate structures requires a stereo-lithographic printing from liquid epoxy

Straight and flat front wing elements that split the air horizontal and the wing support structure which split the air flow nearly equal above and below the front wheel. The deflectors stabilise the car on the track. Furthermore the tether line guide is build in the wing structure.

A lighter version of the previous idea with modifications of the tether line guide as well as the vertical mid support structure that is related to the position of the photo sensor at the finish line. The wing support structure is open to reduce turbulence and compressed air between the wheel and the wing.

WHEELS

According to the rules the car has to have four wheels which have to roll. Each material will cause friction on the track which is counterproductive for the track time. Another point is the weight of the wheel which effects the rotational momentum.

The wheel is made from aerogel, a super light and stiff material which is used in the marine industry. It can be milled on a router and drilled to guarantee a perfect shape. A disadvantage of the material is the rough surface which has to be covered or filled to achieve a smooth finish. Furthermore the connection between the axle and the wheel is difficult to handle.

A light wheel made from liquid epoxy through stero-lithogrphic printing was another idea which allowed us to produce extremely light wheels which allowed us to incorporate the bearing, e.g. our magnetically levitated bearing or our sapphire bearing which are difficult to handle.

Aluminum is a hard but also light metal which can be easily milled on a CNC router for a perfect round shape as well as sharp edges. In addition in can be anodised in a chemical process to reduce the electrostatic force. The machining of the material to implement the bearings is another aspect that has to be considered.

BODY SHAPE AND AERODYNAMICS

THE FORM DEFINES THE FUNCTION

The main research can be found in depth study of long distance rifle bullet design revealed that minimal drag can only be reached if it is possible to shape ogives according to a minimised Sears-Haack-algorithm. This results in Von Karman-like curves as solutions to the Max-formula. During the last three year we constantly improved this mathematical projection. We were able to reduce the width of the car by 7 percent. Furthermore the decrease of the whole contact surface by 18 percent improves the drag which is shown in the diagram in the middle. This enabled us to improve the performance of the SR06 on the track.

In collaboration with weapon specialist Mr. Joe Peters and engineer Mr. Dino Nikolaidis from DNA Filters Maximilian managed to design the SR06 as state of the art piece. The car combines a stunning design with superior performance and reliability which we tested extensively at the F1 in Schools track at Yas Marina Circuit, Abu Dhabi.

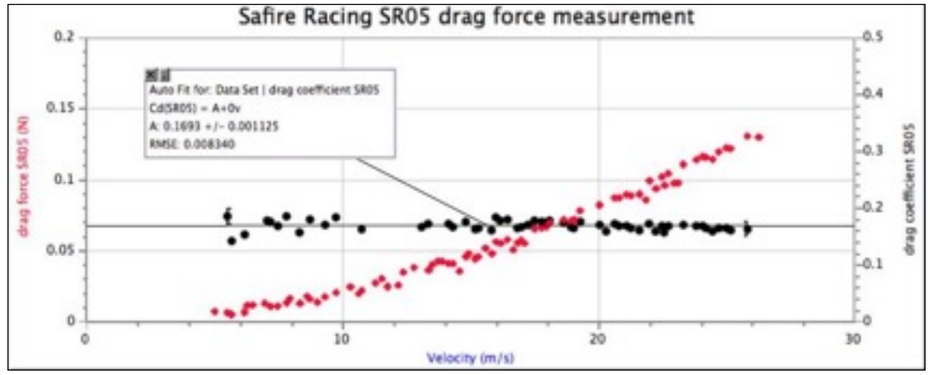
Testing the aerodynamics of Max's design ideas in the virtual reality of flow simulations was the most important step in the quest for the best possible design. They were the only proof that some ideas actually do work as intended – especially when it comes to spoilers. A massive step in the development process was the influence of different front and especially back wing design on the air flow around the wheels and the chamber. Read more about this fascinating aspect on page 15?

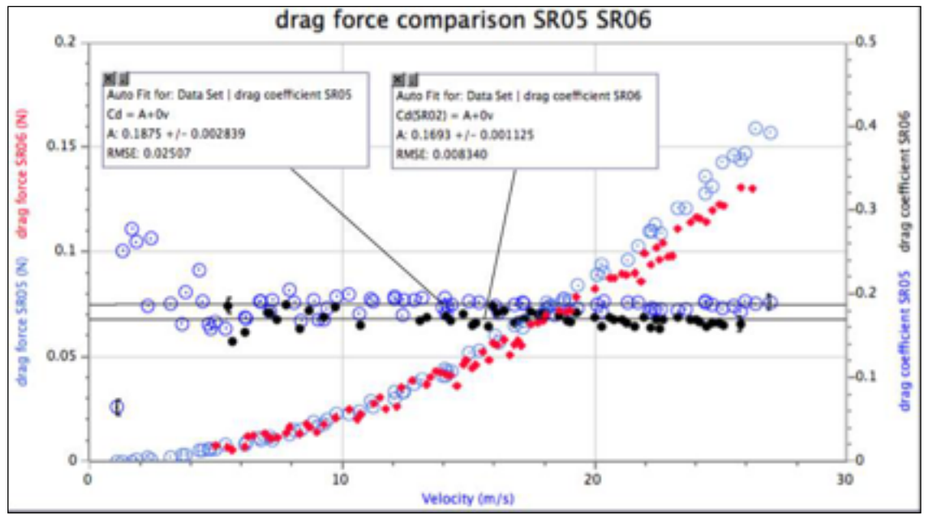
SR04 c_W=0.29

SR05 c_W = 0.28

SR06 c_W = 0.24

$$y = \frac{R}{\sqrt{\pi}} \cdot \sqrt{\arccos\left(1-\frac{2x}{L}\right) - \frac{\sin\left(2 \cdot \arccos\left(1-\frac{2x}{L}\right)\right)}{2}}$$



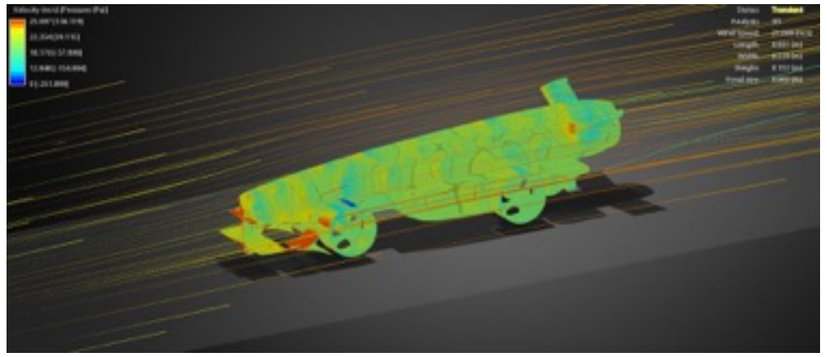


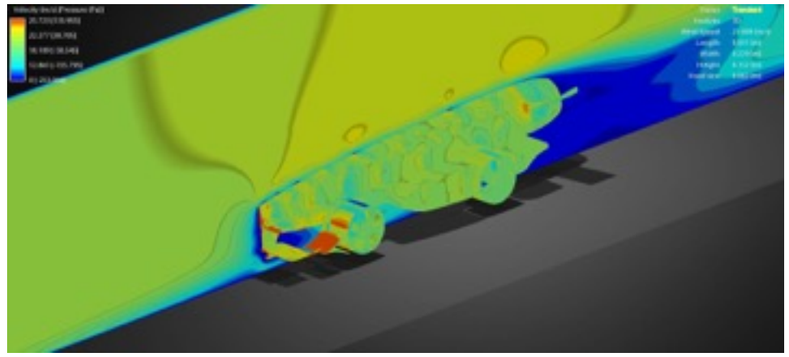
COMPUTER AIDED TESTING

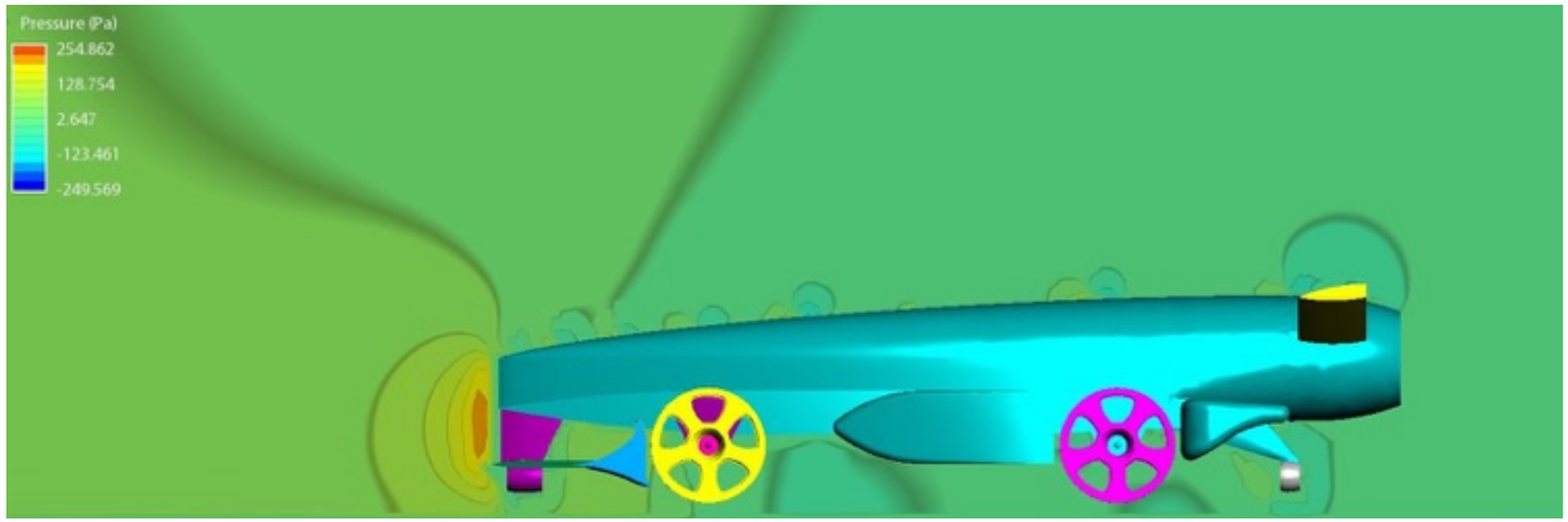
The bulk computer aided testing prior to wind tunnel testings and actual race tests are flow simulations. Velocity streamlines, pressure or vortex density offer detailed insight into potential effects on the car. A perfect example is the implementation of our back wing structure to reduce turbulence behind the cartridge chamber and generate a laminar air flow. Furthermore it creates an air pressure inside the cone, like the structure of a jet fighter which generates a supersonic.

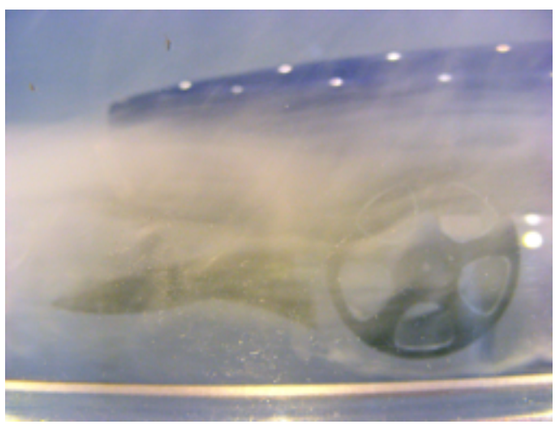
WIND TUNNEL TESTING

We used the SR05 prototype which has the same body shape and front wing configuration as the SR06 for the wind tunnel testing. Laminar air flow hits the car which stands on a pressure plate connected to a force sensor. A second force sensor is well behind the car and connected by a 1mm carbon rod. We can reach air speeds up to 25 m/s and measure forces with a precision of +/- 0.001N. We use a fog machine to visualise streamlines and see the air flow especially at the front wing and nosecone.
The SR06 was developed to prove that it is possible to design a F1 in Schools car with seriously good aerodynamics. This was thought to be extremely difficult because these cars have open wheels, exclusion zones and a huge cartridge chamber at the back. The wind tunnel confirmed our flow simulations – the use of Von-Karman-curves can reduce the vortex density behind the car to almost zero.







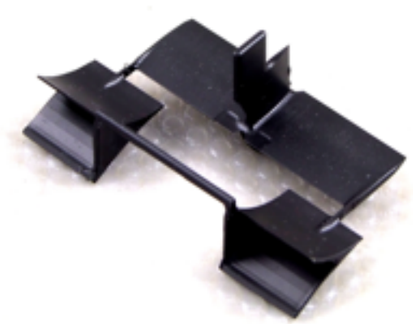


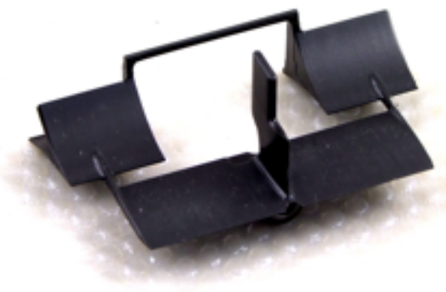
testing - development III

WINGS

The idea is to split the air horizontal on the front wing and wing support structures to guide nearly 50 percent airflow underneath the front wheel. This generates a stream which supports the rotation of the front wheel and accelerate the car. We used this concept for the SR05, our UAE National car and developed it further. Through our unique manufacturing process we could reduce the weight and still keep the same stability ans stiffness which is important for the impact after the finish line.

The incorporation of the back wing to the main body as an extension of the chamber is the most significant design feature and the result of Max virtual flow simulations. The air is guided smoothly around the edge of the cartridge chamber and will not cause massive turbulence behind it. But more important is the secret which lays inside the chamber. Find out more on the next page “Innovations”.





WHEELS

During the last three years we had various ideas like aerogel covered with a shrink tube or aerogel with a self developed nano-coating and PTFE, which we tested intensively. All of them where quiet light, sturdy and fast but didn't match the results we were expecting after the research. Therefore we decided to test the wheel design which our sponsor DNA Filters from Greece put on the prototype of the SR05. It is a milled aluminum wheel with an anodised finished. The main advantage of a milled wheel is the perfect circumference combined with the electrostatic property of aluminum. Those wheels doesn't cause electrostatic interactions which was shown by the track times at the 2014 UAE Nationals. We were absolutely astonished. In addition for the World Finals 2014 we used the open wheel design from the SR05 Prototype to reduce the weight of each wheel and change the momentum for a better rotation.

COMPUTER AIDED TESTING

The SR06 consists of many parts that are prone to high stress during racing. The effects of such stress can be evaluated and tested by finite element analysis. We meshed Autodesk step-files with LISAFEA and studied various influences. FEA can add valuable information when applied correctly. The simulation allows to find the perfect balance between the thickness of the PA 6.6 which is necessary for the impact after the finish line and the weight to guarantee a fast car.

The use of PA 6.6 in combination with the unique machining enabled us to develop our wings which was one of the problems we faced in the last year at the World Finals where our 3D printed front wing couldn't show the constancy which we calculated. After a few runs it cracked which caused unnecessary penalty points.

REINVENTING THE ROCKET ENGINE

As all F1 in Schools cars are propelled by CO2 rocket engines it seams only natural to think about specific impulse. Most people would think this is pointless as the throat is punched by a needle in an automated procedure and there is nothing to change this. But there is still the nozzle which is not present at all in those cars.

WING DESIGN

The back wing and the wing support structure is the most significant and innovative feature in the design of the SR06. The idea is simple: Incorporate the wing and the support structure into the body to minimise the drag and allow the air to flow laminar around the exhaust gas.

Inspired by the locomotion of cephalopods, e.g. sepia we chose a cone shape back wing design which is attached to the cartridge chamber.

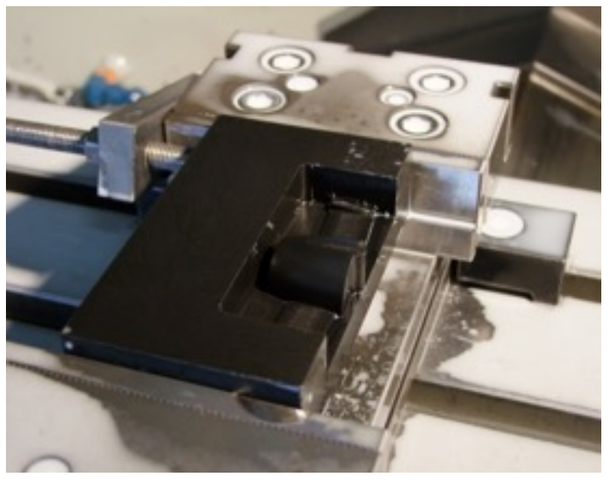
INNOVATING CNC FOR PA6.6

With our state of the art wing designs comes the matter of fragility. We could have 3D-printed the wings but ABS or PLA printed wings do neither have the stability of milled PA6.6 nor the razor-sharp edges we would want.

At that point we invented “sandwich milling”. The idea is to mill a little part of the wing from one massive part of PA6.6. As long as the material is quite thick it will not bend and perfect edges can be milled with a 1.5mm ball cutter.

Then we fill the empty space with polyurethane resin and let it cure. Now the block is strong again and we can continue milling from a different angle.

Thus we have PA6.6 wings with unprecedented sharp edges. Find out more on page “CNC machining”.



CNC MACHINING

The manufacturing is one of the most complicate aspects of the F1 car as it might happen that design elements are hard to mill or even not possible. From our experience with the milling of the SR01 to SR03 we knew that there is a problem with the build up of balsa shavings. We broke a nose cone of the SR01 once.

FROM A SOLID BRICK TO THE PERFECT CURVE

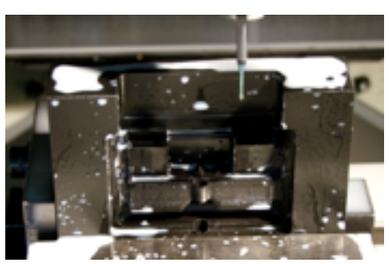
The first important step is the positioning of the balsa brick. To hold the balsa blank in place we designed a jig made from aluminum 7075 t651. Our partner DNA Filters produced this. For the bottom side we milled a PA6.6 jig that we spliced 80 % of its length, so it can close 0.3-0.4 mm when the vice applies force. We used this technique for the first time when we produced the SR04 last year for the World Finals in Austin, Texas. With the help of a metal band saw the nylon jig can be spliced.

Machining the rear, sides and the top is the second phase. An 8mm drill is cutting of the wood to shape out the cartridge chamber as well as the bullet rifle form.

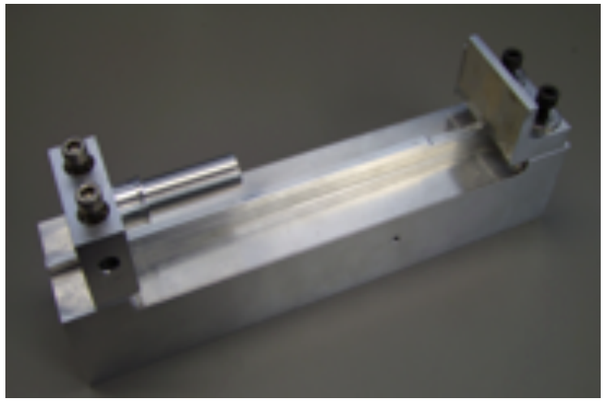
The third and last phase is machining the bottom side. The car will be clamped into the nylon jig for a fixed position and the drill removes the last wooden parts, which are not necessary.

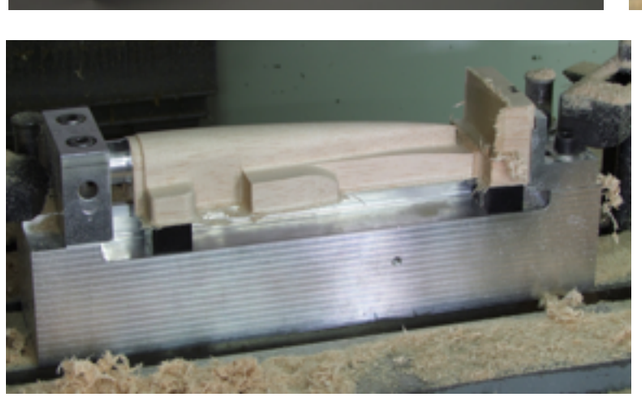
In collaboration with our partner DNA Filters from Greece we managed this important part of the project and produced the SR06 more efficiently. This development enabled us to produce a prototype to see how the research and the computer aided tests will effect the real car on the track. Thee results from our first test session enabled us to develop and modify our front and back wing slightly for a better weight distribution and airflow.

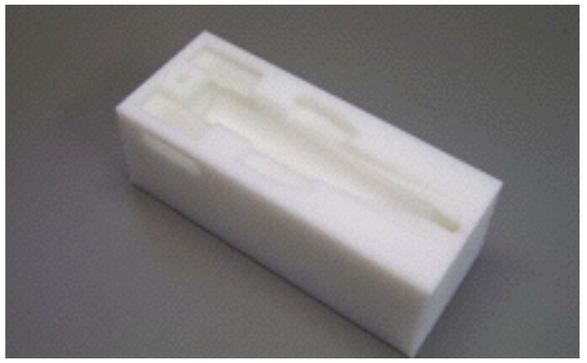
WINGS AS SHARP AS RAZORBLADES

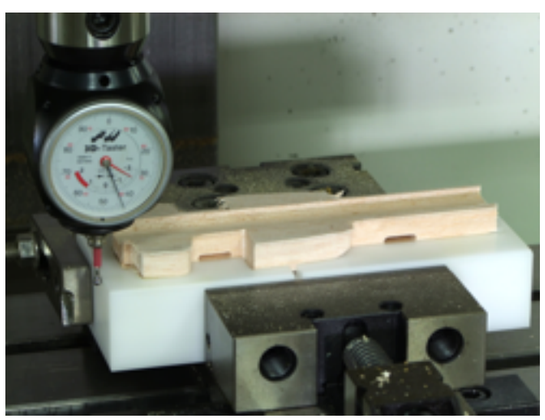


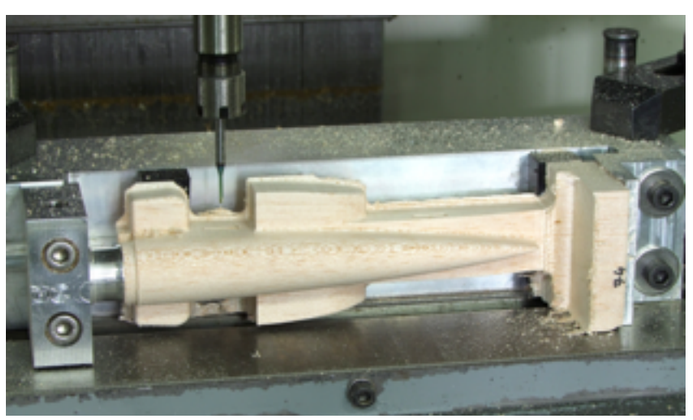
The front and rear wing as well as the wing support structures are CNC milled from a solid nylon brick. Only one half of the final structure will be cut with a 1.5 mm ball drill to produce sharp edges. This results in a stable but still flexible wing which enables the perfect split of air in relation to our aerodynamics.











cad & cam process

TRANSMITTING THE TOOL

The score is the message but it needs a translator, in fact a conductor to transmit it to the right tool. We use Edge Cam for the CAM process and to generate tool paths and .nc files – G Code. We chose to mill in the order explained on the left due to the complexity of the body and the limitations when clamping the balsa. The clamping force has to be spread over a very large area to avoid damaging the body. So if we would machine the bottom first it would be 'unsafe' to clamp the part correctly.

"➢1 CO chamber. Tool-12mm Flat 4 flute carbide cutter
➢2 Rear end. Tools- 8mm R1 corner radius 4 flute carbide cutter &
6mm R1 corner radius 4 flute carbide cutter & 5mm R0.5 corner radius 2 flute carbide cutter
➢3 Right side. Tools- 3mm spot drill HSS & 1.5mm drill & 2mm Flat 4
flute carbide cutter & 3mm Flat 4 flute carbide cutter & 6mm R0.5 2
flute carbide cutter.
➢4 Left side. Tools- same as right side.
➢5 Top. Tools- 8mm R1 corner radius 4 flute carbide cutter & 6mm
R0.5 corner radius 2 flute carbide cutter & 2mm Flat 4 flute carbide
cutter & 4mm Ball 4 flute carbide cutter.
➢6 PA6.6 clamping jig for clamping the body in order to machine the
bottom side. Tools- 8mm R1 4 flute carbide cutter & 6mm R0.5 2flute
carbide cutter & 4mm Ball 4flute carbide cutter.
➢7 Bottom side. Tools- 8mm R1 corner radius 4 flute carbide cutter &
6mm R0.5 corner radius 2 flute carbide cutter & 2mm Flat 4 flute
carbide cutter & 4mm Ball 4 flute carbide cutter.
➢Spindle speed 6000 rpm
➢Feed from 600mm/min to 3000mm/min
➢Coolant NO!

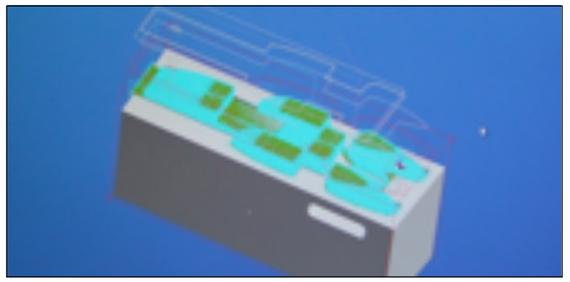
THE TOOL IN PROGRESS

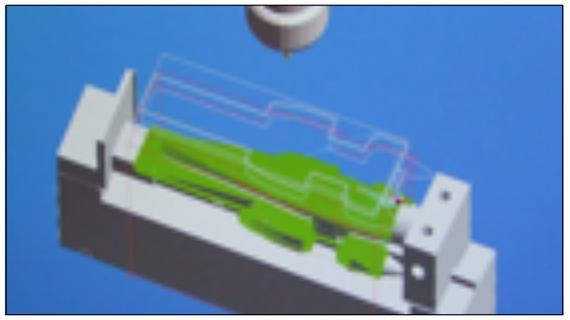
In order to manufacture the car we needed to think about how we should mill the different sides out of the balsa blank. This is an essential step to guarantee an efficient milling process. Our strategy for the PRIMERO 3 AXIS CNC Milling Machine KM 450 L can be compared to a score written for an orchestra. The interaction of each part merge to a complete piece.

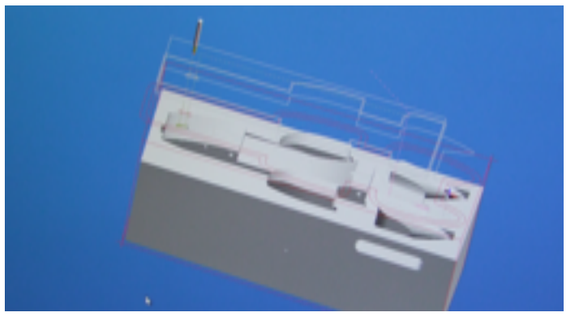
```
* Turret No. :   6   Diameter :3.000     MM   DRILL
* Turret No. :   7   Diameter :1.500     MM   DRILL
* Turret No. :   5   Diameter :2.000     MM   FNDMTL
* Turret No. :   4   Diameter :3.000     MM   ENDMILL
*
*
*************************************************************************
* Machine Tool   : PRIMERO "M" Series Generic Mill
* Part Name      : LEFT SIDE 1
* Sequence       :
* Programmed By  :
* Date           : 10/07/13
* Time           : 10:43:13
*
* Total Machining Time (including Toolchange) : 6.406      Minutes
*************************************************************************
*
%
:0001
(LEFT SIDE 1)
N1 G71 G90 G40
N2 G90
03 T06 (DNA PONTA 3 MM)
N4 G54 M06
N5 S4500 M3 M41
N6 G0 X-183.152 Y-20.005
N7 G43 Z5.0 H06
N8 G99 G81 Z-17.0 R5.0 F400.0
N9 X-164.852 Y-20.05
N10 X-74.852
N11 G80
N12 Z50.0
013 T07 (1.5DRILL)
N14 G54 M06
N15 G90 S4500 M3 M41
N16 G0 X-183.152 Y-20.005
N17 G43 Z1.0 H07
N18 G99 G81 Z-21.0 R1.0 F400.0
N19 G80
N20 G99 G81 X-164.852 Y-20.05 Z-34.5 R5.0 F400.0
N21 X-74.852
N22 G80
N23 G0 Z50.0
024 T05 (2FDNA)
N25 G54 M06
N26 G90 S4500 M3 M41
N27 G0 X-183.152 Y-20.005
N28 G43 Z5.0 H05
N29 G98 G81 Z-18.5 R1.0 F400.0
N30 G80
```

THE FINAL PIECE

Similar to a an orchestra who wants to perform a concert it is essential to practice the play. We used CAM simulations since 2013 to imitate the real milling process which allowed us to find mistakes. Here is an example of the SR04 which we used last year for the World Finals in Austin, Texas.







evaluation

Since forming the Safire Racing Team and participating in F1 in Schools in 2012 our aim has been to push boundaries of each element of the project through our innovative approaches and scientific researches. This mentality guided us through three National Competitions and three consecutive World Finals. Each year we have learned from both our success and failures and used every experience to grow and excel beyond our expectations.

TEAM WORK

The Safire Racing team structure has been the basis of the project and is the main reason for the results that we achieved throughout the years. The collaboration of each team member with other team members as well as with companies and individuals outside of the team has ensured the team great success in every aspect of the project by incorporating not only the individual's knowledge but also getting professional external advice and internal inspiration from other team members.
Communication of the members with each other has been a curtail aspect and the only way to get things done in our team. For example for the portfolio our Lead Designer, Nada, has to collaborate and gather the information needed from all other team members in order to be able to put together the perfect final piece. Making sure every member is staying motivated and fulfilling his or her role effectively is another aspect that we successfully achieved through always staying united and empowering each other to push our individual boundaries.

CHALLENGES

One of the many challenges that we faced was dealing with a tight time schedule, which has taught us good organizations and time management skills. Paying attention to exact details like competition rules and regulations through having well-structured communication base is a necessary aspect of this competition and of a strong-dedicated team. Another challenged we faced as a team is getting the recognition and support of companies around the UAE as they do not seem interested in supporting education based organizations or student competitions. We have learned that a well structured presentation and persistent approaches show the potential sponsor that you are confident, which increases the chances of convincing them. In other words we took these challenges to our advantage by learning, growing and pushing our boundaries through them.

"**Unity** is strength… when there is **teamwork** and **collaboration**, wonderful things can be achieved."

- M. STEPANEK -

F1 CAR PROGRESS

From our three years of experience and research we were able to create new innovations like the magnetically levitated sapphire bearing and a suspension system that are completely unique and rare in this student competition.
To turn these into reality our team needed a lot of time and supportive partners like mister Joe Peters that share our passion and dedication to engineering.
With unique innovations comes a high risk the computer aided tests might not meet the expectations one tries to achieve. This has brought us to the conclusion that simplicity and reliability are the most important factors when designing and manufacturing which is reflected in the SR06. Even these factors are not easy to achieve and need supportive partners like our gold sponsor DNA Filters to fulfill our expectations of making the best manufactured car possible.

SF car evolution

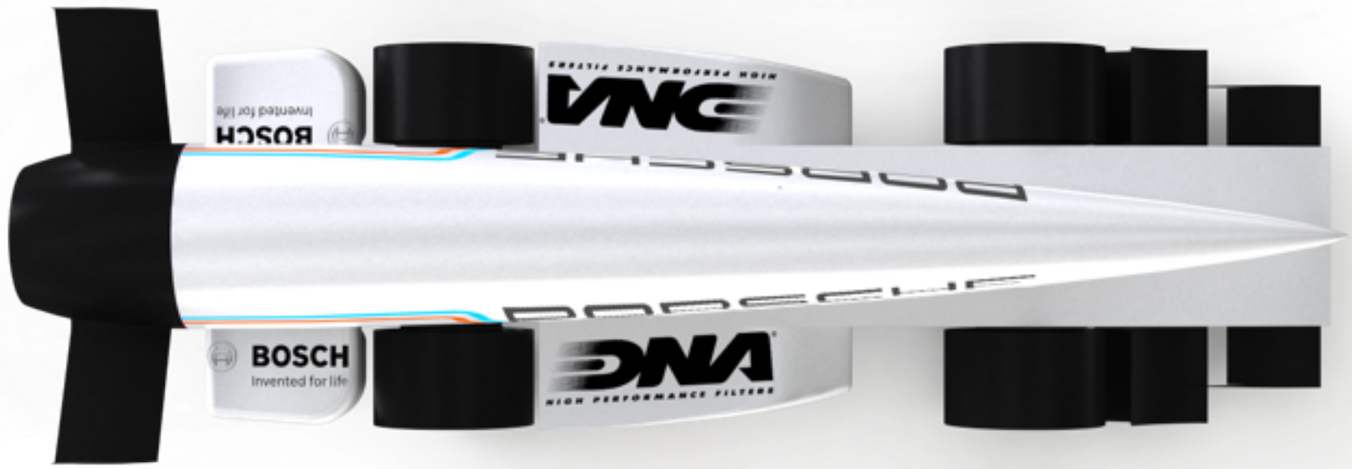
EVOLUTION SR 01 - 06

DESIGNED TO PERFECTION

collaboration | innovation | dedication

3d renderr

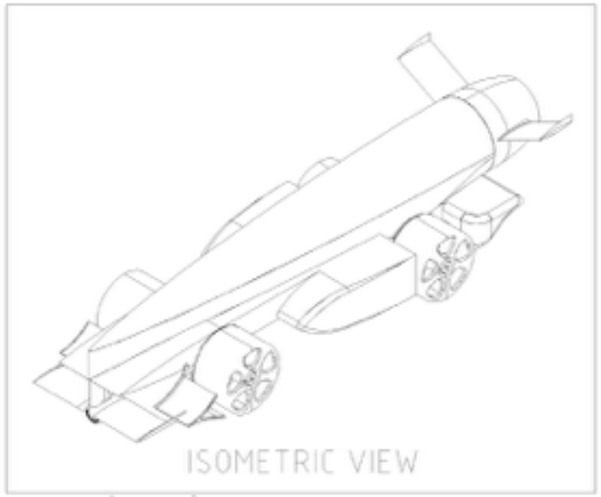

PORSCHE
DNA
HIGH PERFORMANCE FILTERS
IN SCHOOLS

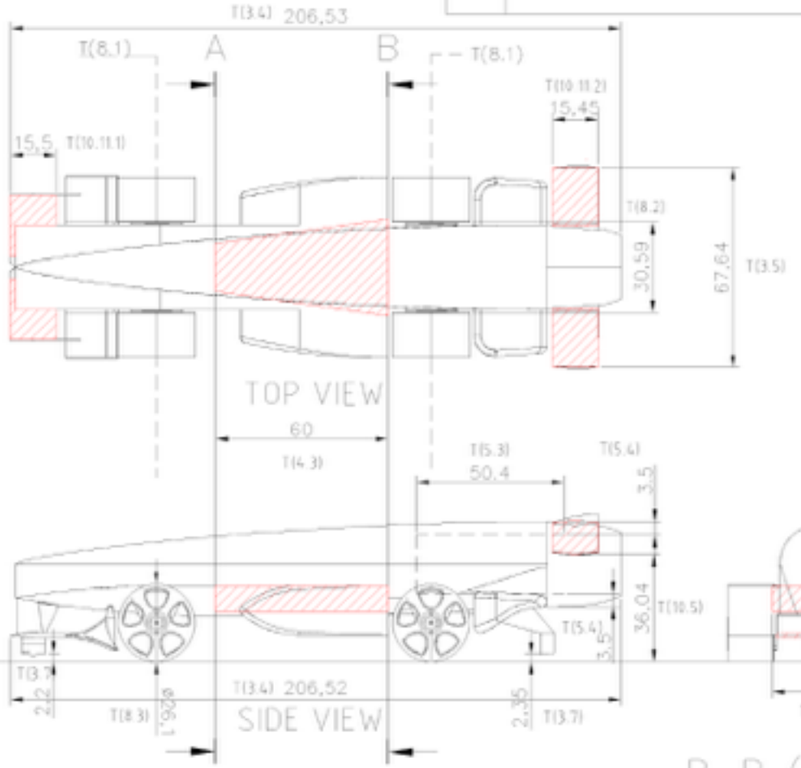

BOSCH
Invented for life
DNA
HIGH PERFORMANCE FILTERS

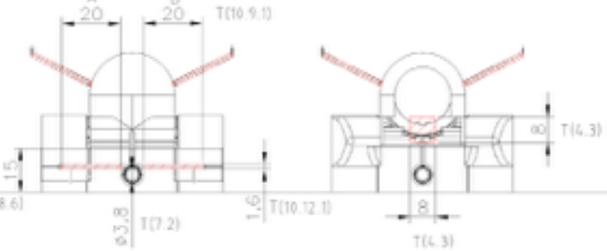
exploded view render

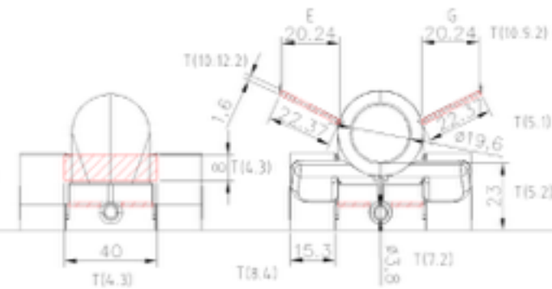
orthographic drawings

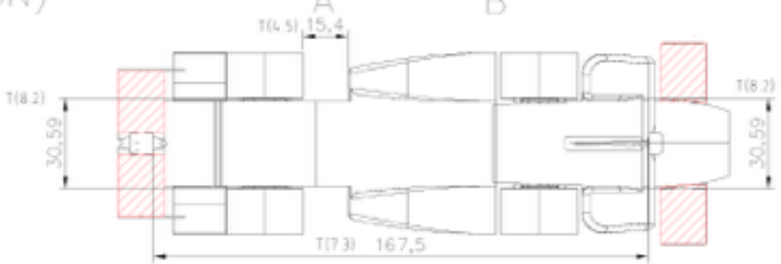
RevNo	Revision note	Date	Signature	Checked











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APPR	09.11.2014	Julian Beyerlein	
ISSUED	09.11.2014	Safire Racing	
REV	02		
CONTRACT NO			

SHEET	0001
SCALE	1.66:1

safire racing

Ortho - 3rd Angle

Units: Millimeters

Tolerance defined by technical regulations

DWG NO

0001 - SR06 Ortho