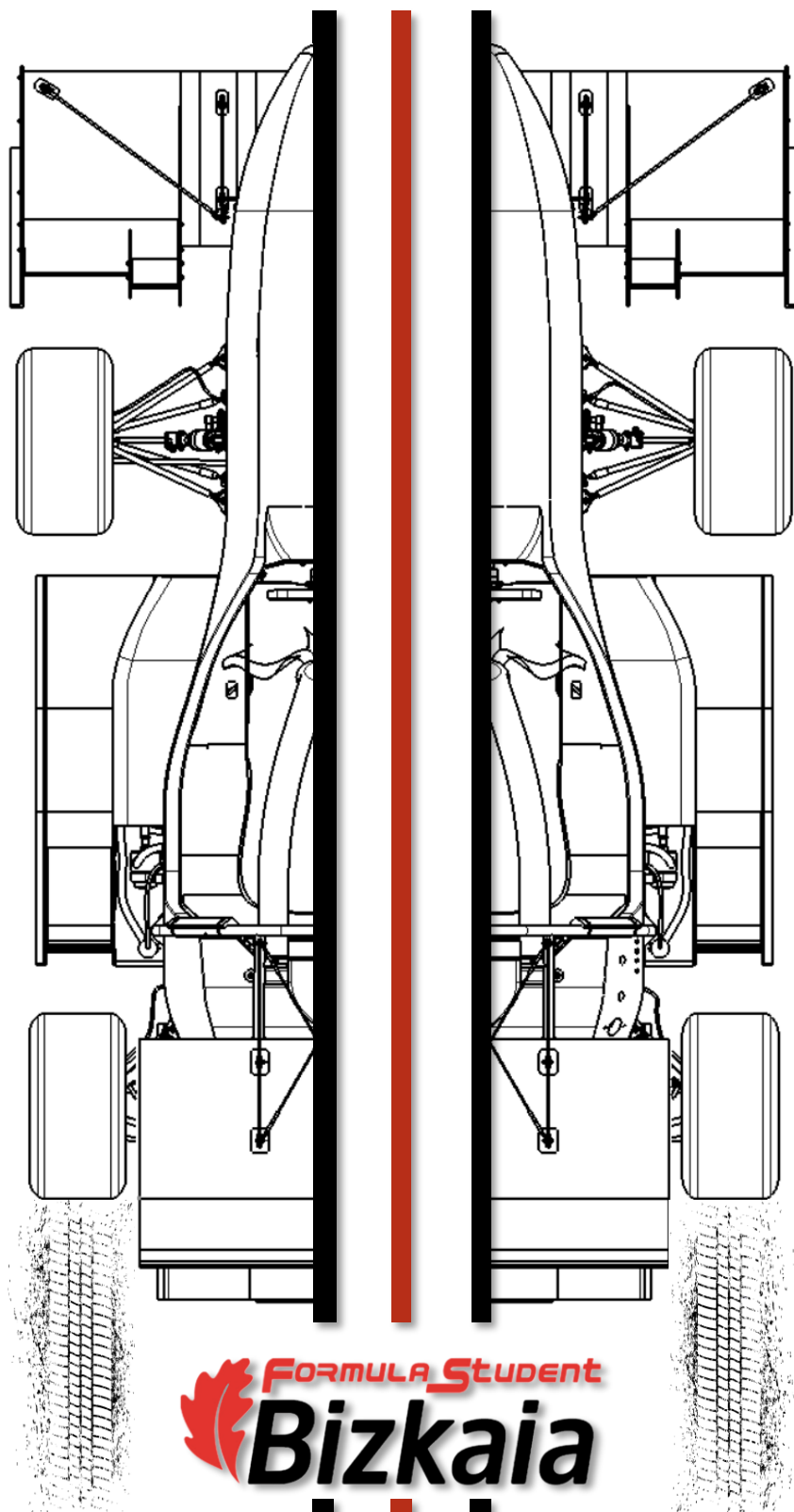




FSB

2020 BOOKLET



FORMULA Student
Bizkaia



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Introduction

“In Formula Student Bizkaia every person is different, but we all have something in common: passion for what we are doing”

Nerea Marrodán

Team Leader



*A long time ago came a man on a track
Walking thirty miles with a sack on his back
And he put down his load where he thought it was
the best (...)
And the other travellers came walking down the
track
Then came churches and then came schools
Then came the lawyers and then came the rules
Then came the trains and the trucks with their loads
And the dirty old track was the telegraph load
(Mark Knopfler, Dire Straits; September 1982)*

We know that the human being has always been travelling, due to pure necessity in ancient times and just for joy later. We usually spend time thinking about journeys we are never going to do, plans that will never happen or places we will never see. However, the feeling of overcoming this sensation has always been present since the Roman era, “Citius, Altius, Fortius” (faster, higher, stronger), which with technological revolution we can translate into: faster, more efficient, more sustainable.

And in the same way as in this life cycle, the basic need of travelling and growing has turned into a project called Formula Student Bizkaia, a revolution in the way of learning for young engineers that makes us feel ourselves putting our grain of sand in technological innovation by means of this non-profit Project, where we share our values as a team.

“Lub Dub” is the phonetic representation of the heart valves’ sound, those which remind us that we are alive, and all that this represents. It is the sound of a single seated vehicle that we yearly design, manufacture, mount and test. All the members participating work with the same aim behind, bringing this car to real life and obtaining the best

results in an international competition. With electric power running through our veins, two motors as heart, the best vehicle dynamics as muscles and complex control algorithms as brain of the vehicle, each one of the elements has its own function. We are all working for the shake of cooperation between teams and companies.

There is nothing more natural than sharing an experience, a vision, a way of thinking. All this makes us grow.

Our project will make us travel, and during this journey we will learn a lot, from ourselves and from the others, and this is a unique chance for it. When finishing our trip, we will discover plenty of opportunities from those companies and organizations that contribute to bring this project to life. With our experience in Formula Student Bizkaia, we will be able to face complex problems with critical thinking and an experience background that we could not have obtained without Formula Student Bizkaia. Apart from that, we will unintentionally have contributed to the future of mobility, allowing other people to carry out their journeys.

All this thanks to the human factor: the one that designs, creates, manages, guides and the one that collaborates. But also the one that helps, the one that produces laughter in the team, the one that suggests, mediates or has a different opinion, and of course any of us who commits with the cause. Just like that man who walked 30 miles and left all of his things and illusion where he thought it was best and ended up turning that land into his home. And then came everything else... What else is about to come?



#AlwaysDrivingTogether







The phenomena known today as Formula Student, or Formula SAE, it was born in the USA in the early 80's thanks to the Society of Automotive Engineers (SAE). After a few years of consolidation and development, the competition got to UK named Formula Student in 1998 organized by the Institution of Mechanical Engineers (IMechE) to stay. 19 editions later, Formula Student is still growing year after year, reaching such stunning ciphers like 130 participant teams with more than 3000 implied students.

Moreover, this event, that since 2007 takes place at Silverstone circuit, and whose patron is Ross Brawn, it has set a precedent for societies all across the continent, like the Spanish STA.

Nowadays, we can find similar races in Germany, Austria, Spain, Italy or Czech Republic and even more.

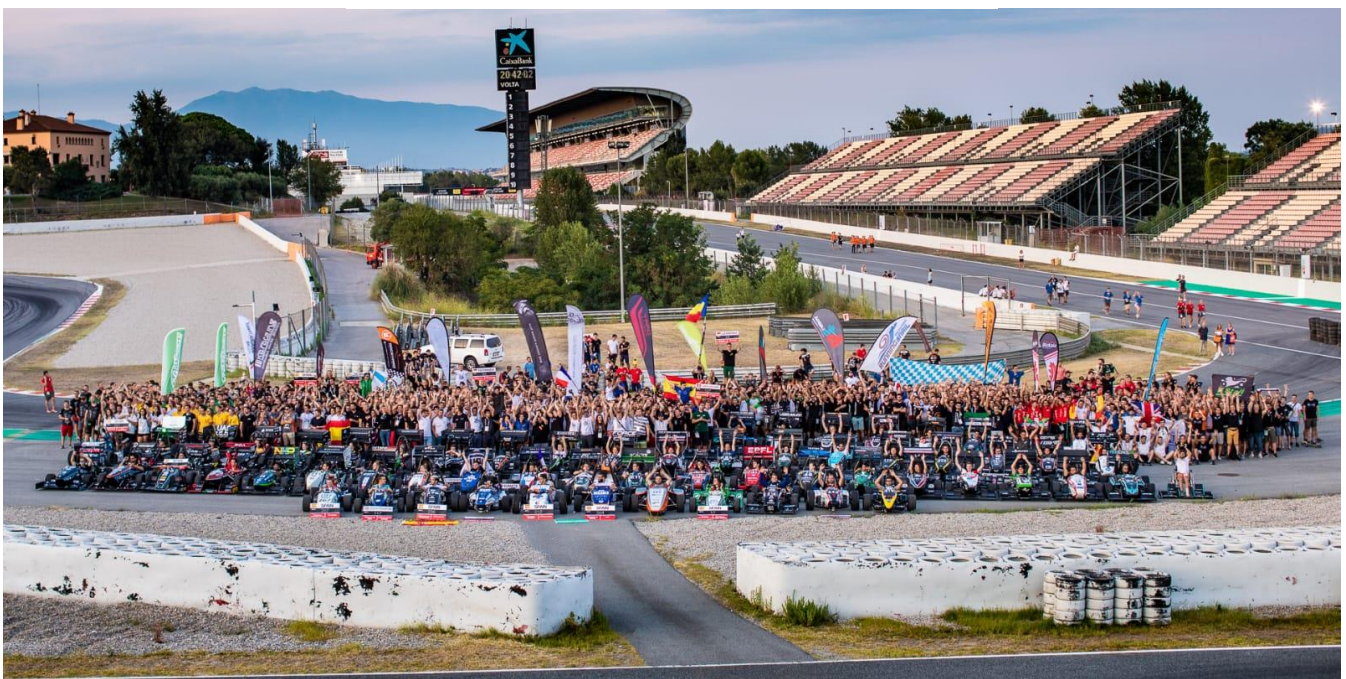
This situation has set Formula Student as most important motorsport competition for engineering students.

Formula Student competitions are based on a strict rulebook, detailed by the organizer at each event, but always with the official SAE regulation as a reference frame. The pillars of those rulebooks are simple: Driver's safety and good engineering practices. From that point, the rules are more permissive, letting designers the freedom to push their designs to the limits of their imagination.

Furthermore, looking for the evaluation not only of the aforementioned good engineering practices, but also the good vehicle performance, the competition consists of a total of 1000 points, which are separated in two main blocks.

"There are two innovative forms of motorsport left: F1 and Formula Student."

Ross Brawn



***"The mission** is to excite and encourage young people to take up a career in engineering. It seeks to challenge university students to conceive, design, build, cost, present and compete as a team with a small single seat racing car in a series of static and dynamic competitions. The format of the event is such that it provides an ideal opportunity for the students to demonstrate and improve their capabilities to deliver a complex and integrated product in the demanding environment of a motorsport competition."*

Dynamic events

Their function is to evaluate the vehicle performance at every situation. The 675 points of dynamic events are divided this way: *acceleration, skidpad, autocross, endurance y efficiency.*

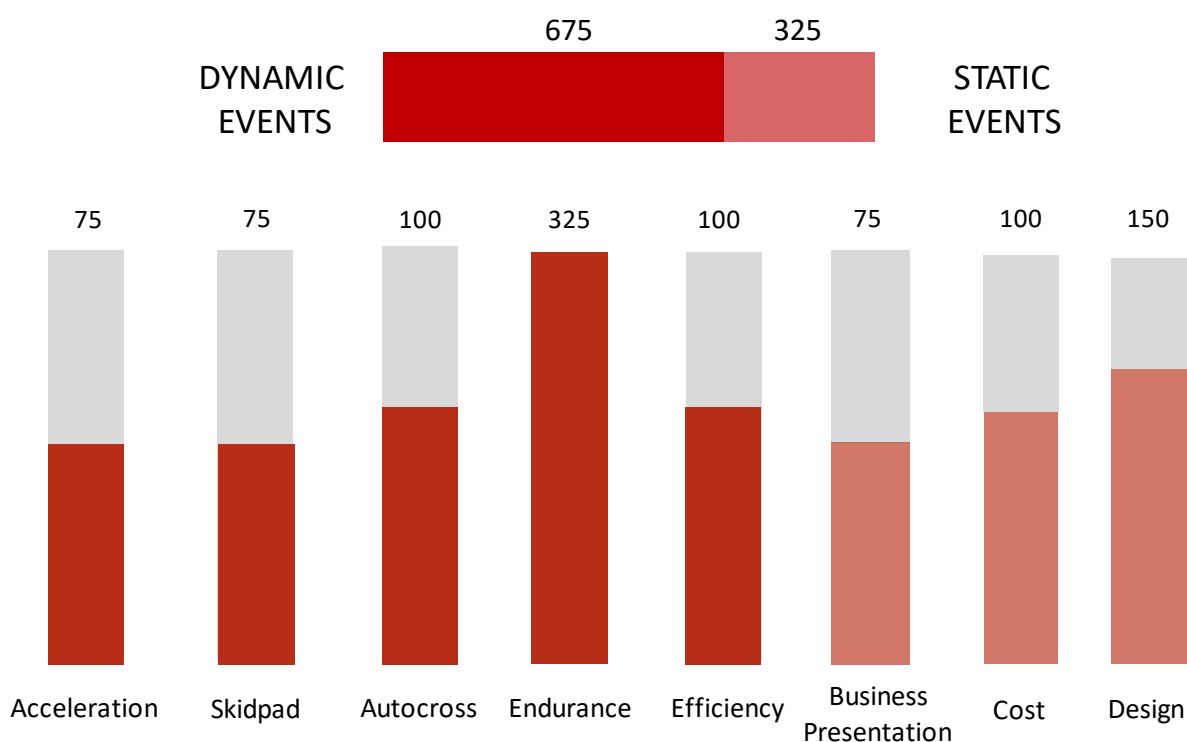
By taking part at these events, where Endurance and Fuel efficiency events are driven simultaneously, acceleration, vehicular dynamics, reliability and efficiency of the vehicle are measured.

At the same time static events are being performed by a team, and mandatorily before taking part at any dynamic event, a scrutineering must be passed by each team. This technical inspection is carefully made by the scrutineers, which are in charge of preventing any car of running if the team doesn't prove it is ready to it. It includes a brake test, a tilt test to simulate lateral forces, and a rain test for electric vehicles.

Static events

They are those events where the vehicle stays switched off. They suppose an amount of 325 points, and they are distributed as follows: *Business Case, Cost Event y Design Event.*

Where there are respectively evaluated the strength of a business plan based on the vehicle's concept, the justifying of a 1000 units' production costs, considering also the manufacturing and sustainability, and the defense of applied design principles, taking into consideration al the alternatives and the justifications used, as well as the reasoning and validation level of the implementations. General knowledge is indispensable, as well as deeper knowledge in some other areas.



History of the team

FSB2008



FSB2009



FSB2010



First years

Formula Student Bizkaia was born in 2006 as an innovative project of the Department of Mechanical Engineering. After two years of learning, the first prototype was finished, and it was able to participate in each static event. In 2009 the second vehicle saw the light, showing an amazing evolution that made the judges feel delighted.

Consolidation

In 2010 the third vehicle was manufactured, specially focused on dynamic events. FSB2010's design was a big step forward: lightweight, power, manoeuvrability... That fact was clearly seen with the improvement in the position obtained, which was the fifty-seventh.

FSB2014



FSB2015



FSB2016



Technological innovation

The FSB2014 turned out to be the most reliable car, obtaining the best results of any electric vehicle developed by the team, getting the first national place and winning the fuel efficiency event.

2015 was a year of high technology development, through the implementation of composite materials in most of the elements of the vehicle. The main exponent of this change was the carbon fibre monocoque, manufactured by using materials which are the future in automotive and aerospace.

Then, the FSB2016 was even more innovative than its ancestor, with a powertrain unit based on two electric motors and a ten inches unsprung mass system as highlights. These technical improvements, coupled with profound changes in the team's image and methodology, close the year with great achievements such as the team's best acceleration time ever, with 3.9 seconds, and a new personal record in the static events, highlighting a great sixth place in the cost event.

FSB2011



FSB2012e



FSB2013



Expanding horizons

In 2011 a new car took a qualitative leap participating in two competitions, adding the Formula Student Spain at Barcelona Circuit, to the traditional event held at Silverstone. The team climbed eight positions from the last year in FSUK and achieved the fourth place at Montmeló, ranking the best position that a Spanish team has ever achieved in the competition.

In 2012 the jump was even bigger, since two cars were manufactured from scratch. One of them kept the past year's line with an internal combustion engine, which took part in FSS and FSUK, having its best position at Silverstone Circuit, the thirty-ninth.

The other one, was an innovative electric propulsion vehicle that participated at Barcelona Circuit. This car passed each dynamic event, becoming the first one of an electric vehicles saga.

In 2013 season, Formula Student Bizkaia reached the first place in the business presentation event. There were also great results in Barcelona, where the team got the second national position.

FSB2017



FSB2018



FSB2019



Looking for the podium

2017 meant an important milestone in the Aerodynamic study, manufacturing and mounting for the first time all the Aerodynamic package in the car.

The FSB2017 has been the car which has obtained more prizes in competition, with a first place in the *Business Case*, second place in acceleration event, fifth in the *Design Event*, sixth in the *Cost Event* and the prize "GKN Lightest Weight and Best Value Electric Vehicle".

In 2018 all the accumulated knowledge and experience in Formula Student Bizkaia, turned into a solid base that would lead to a big technological challenge in 2019.

Having a reliable and high performance car, has made the team reach a higher level, by means of the implementation of innovative technologies that had never been used before, such as energy recovery system, new control algorithms or the a carbon fibre suspension system.

Moreover, the FSB2018 obtained the first place in *Business Case* again, and the third one in *Cost Event*.

FSB 2019



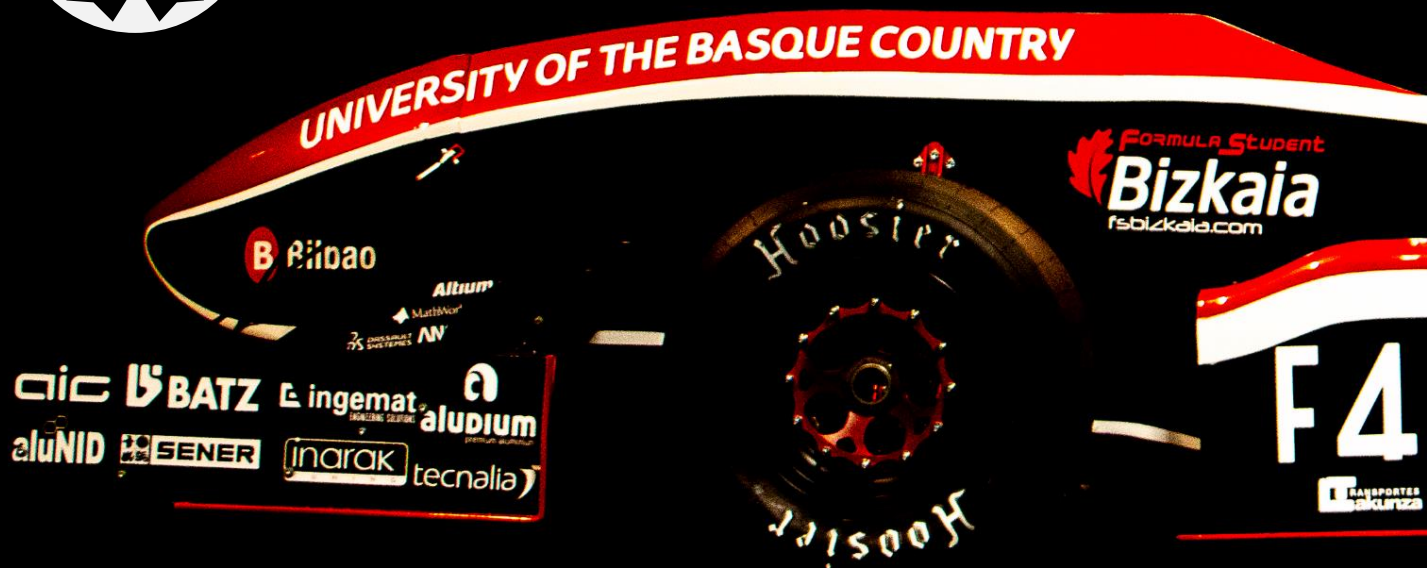
Business Case



Cost Event

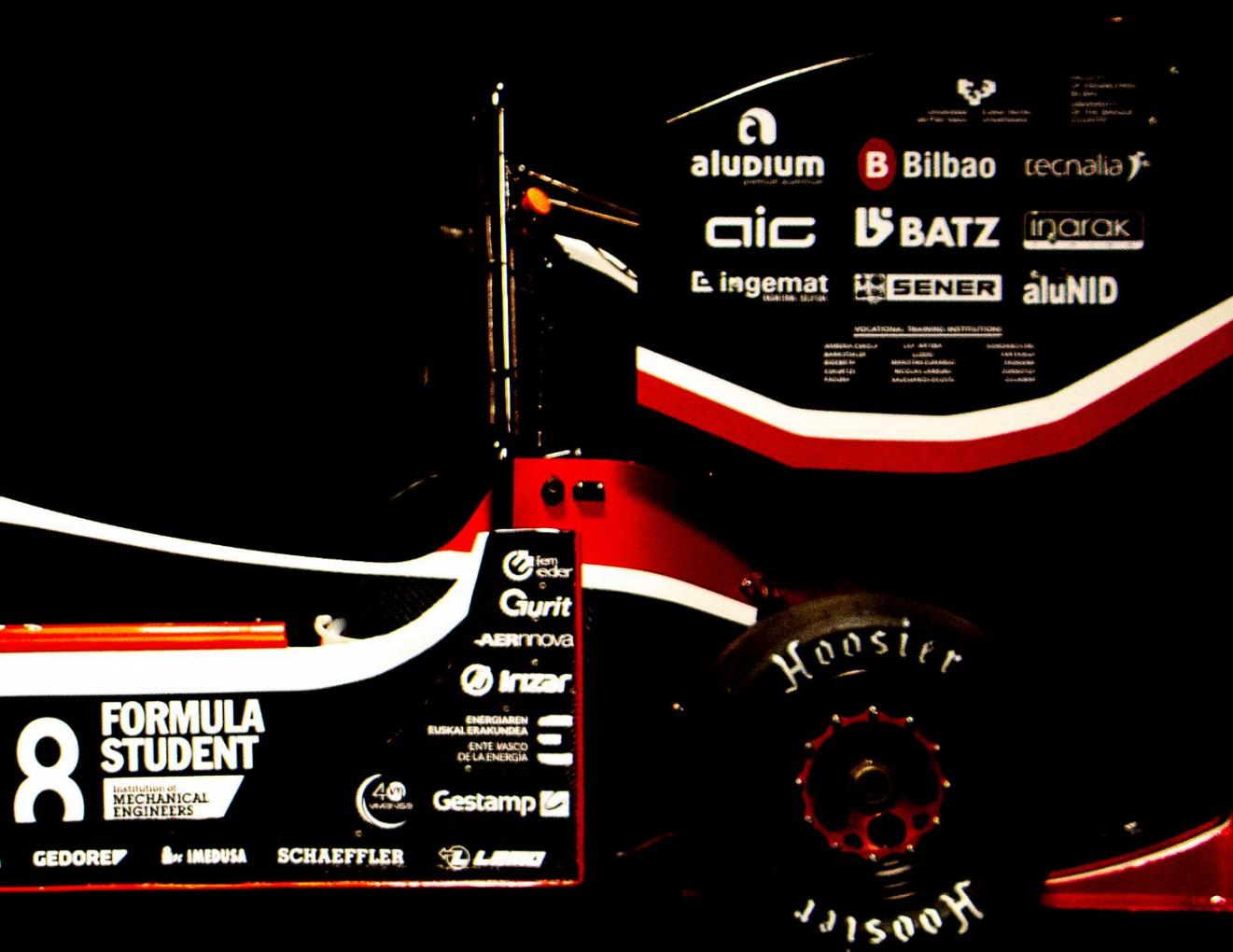


Design Event



High performance

And at last, it is the turn of the FSB2019, it has not only shown excellent reliability like the previous prototype, but also, it has achieved efficiency levels never seen before. And all this is reflected in the results which have been the best in the history of Formula Student Bizkaia: Top10 in both competitions. Getting 540 y 502 points in Formula Student UK and Formula Student Spain respectively.







FSB 2020

Present

Mikel San Segundo

Technical Manager
Design

“As we couldn’t find the car of our dreams, we decided to make it by ourselves.”

Álvaro Feijóo

Technical Manager
Manufacturing

“Keep your goals always present, they guide the way that you follow.”

Iván Cadarso

Technical Manager
Electric

“The only current thing that our car has is the one that flows in the wires, because every other thing makes us a unique team.”

Another season competing at the highest level

In Formula Student Bizkaia we are not going to make with the results of last year. After a good season, the only goal in the team is to continue improving. At a technical level, in regard to design, innovation and the upgrading of all the subassemblies, we will advance with excitement in every detail, piece and new implementations along the process of design. The FSB2020 will be a single-seater where you will be able to see the love and experience of everything that we have learnt during these years. In addition, it will stand out because of its character, showing off every optimization from the previous model and amazing everyone wherever it goes.

FSB 2021

Future

Iker Raigoso

Technical Leader
FSB2021

“If an instrument is lovely on its own, imagine an orchestra. When the effort of all our designs becomes true, the track will be our stage.”

Adding future challenges

The automotive world is immersing itself in a reality associated with electrification, sensor systems, Torque Vectoring strategies, implementation of new materials ... In addition to this, the Formula Student competition is more demanding every year: acceleration records, higher aerodynamic coefficients than in Formula 1 itself, accelerations of 3 g ... The FSB2021 is the answer to this reality. With this car the team plans to jump to a new design concept, which involves several challenges such as the implementation of all wheel drive, integrated control algorithms, a complete redesign of the suspension system and a design that maximizes aerodynamics.

Isabel Albizu
Organization Manager

“Managing the team is a challenge. I have the opportunity to be constantly working with people. The way to achieve success is to take care of the human factor.”

Pedro Zamacona
Financial Manager

“It's not just about the bills of the past, but about the projects of the future. Ready to check it out? ”

Jone Miren Remón
Marketing Manager

“If you think that management work is not very demanding, I assure you that giving an image at the level of our car is a challenge.”

A high performance team

Not only does the result count, the work along the way is decisive, and managing the day to day is one of the team's biggest challenges. In Formula Student Bizkaia we compete internationally and that means being up to date in all areas.

Through the implementation of creative methodologies, we are able to inspire each team member, adding value to the designs and getting our experience and knowledge in them. In addition, we take care of the knowledge transfer, leaving a memory that can be consulted in the future.

We learn the importance of managing resources efficiently (economic, human, temporary ...). Our main objectives are training for our professional future, sustainability and people management, since having a motivated team is essential.

It is also important to take care of our image, setting an example of a professional and united team wherever we go.



Team

Faculty Advisors



Charles Pinto



Javier Corral



Asier Zubizarreta



Mikel Díez

Team Managers



Nerea Marrodán
Team Leader



Iker Raigoso
Technical Leader FSB2021



Mikel San Segundo
Technical Manager
FSB2020



Iván Cadarso
Technical Manager
FSB2020



Álvaro Feijóo
Technical Manager
FSB2020

Organization group



Isabel Albizu
Organization Manager



Pedro Zamacona
Financial Manager



Jone Miren Remón
Marketing Manager



Ainhua Ye

Aerodynamics group



Maria Xuan Celaya
Aerodynamics Manager



Gonzalo Fernández De Castro



Asier Del Pozo



Idoia Bueno

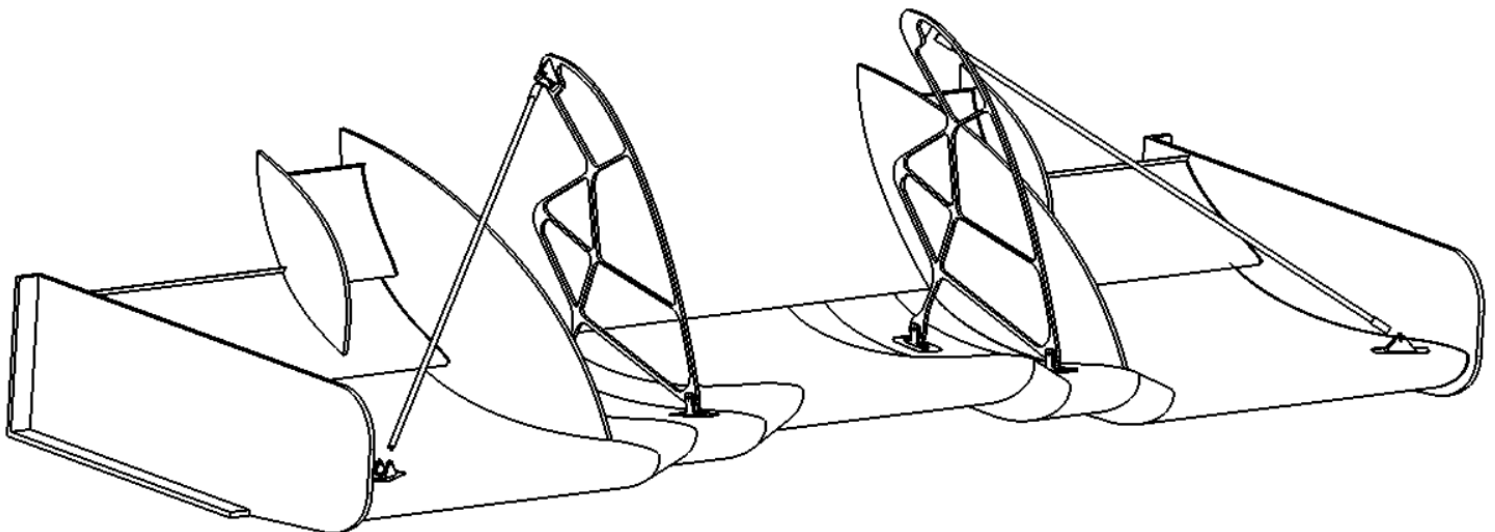


Iker Castellano



Aitor Antón

“In the Aerodynamics group we take care of the air flow so that it is distributed optimally around the car, generating aerodynamic load and reducing wind resistance. We also make the car more efficient, studying different cooling systems.”



Chassis group



Imanol Díaz
Chassis Manager



Kerman Gorroño



Andoni Egurrola



Laura Ruíz



Xabier Rojo



Asier Vergara

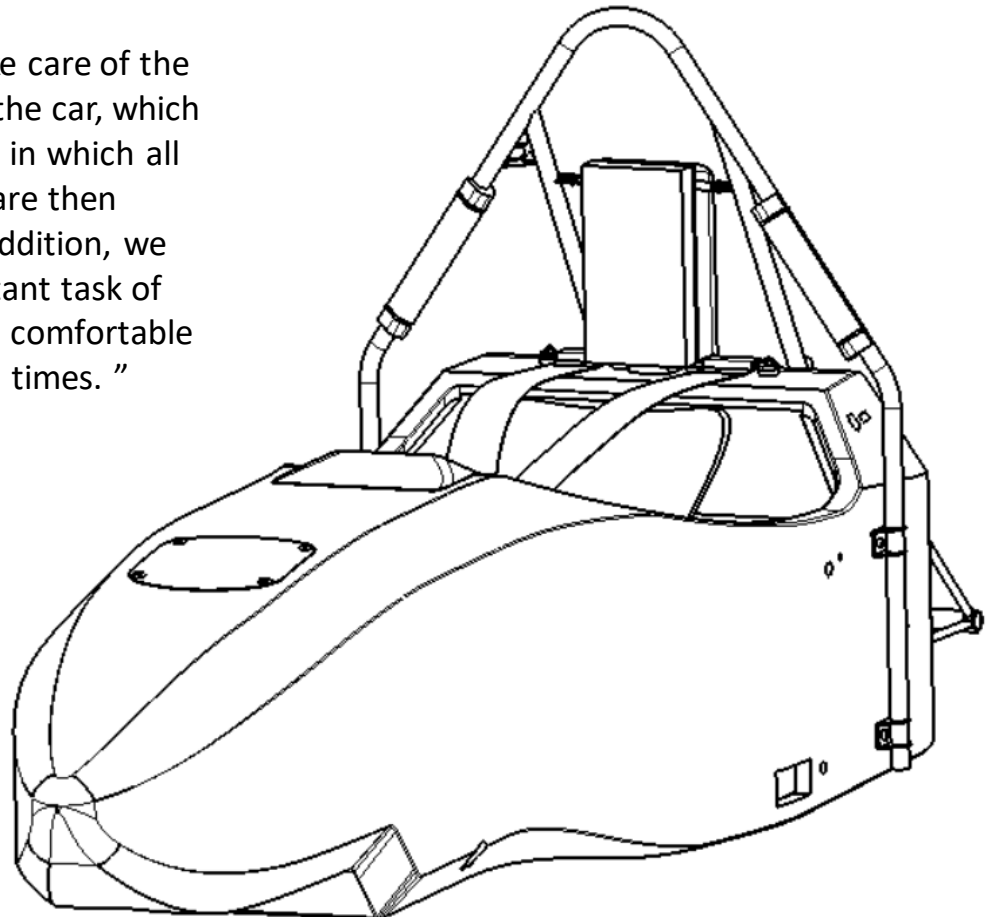


Álvaro Gonzalez



Jorge De La Fuente

“In chassis we take care of the main structure of the car, which defines the body in which all the subsets are then distributed. In addition, we have the important task of making our driver comfortable and safe at all times. ”



Dynamics group



Ander Gómez
Dynamics Manager



Kevin Cadavid



Josu Presilla



Daniel Pangua



Begoña Ubiria



Alex Ayarza



Leire Olaeta



Jon Hueso

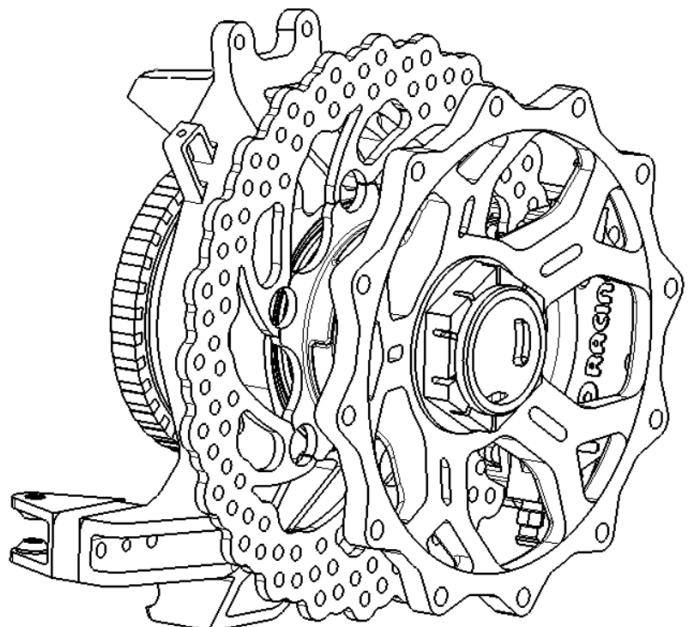


Ander Igual



Leyre Barcina

"Thanks to the Dynamics group, the wheels follow the profile of the asphalt perfectly, achieving better maneuverability and also that the vehicle is predictable for the driver and obeys all his actions. Vehicle dynamics is essential to improve lap time, and this includes suspension, wheel, steering and pedal, among others. "



Electronics group



Borja Guillermo Díez
Electronics Manager



Mario Rodríguez



Markel Botas



Jon Serna



Xabier Echaniz

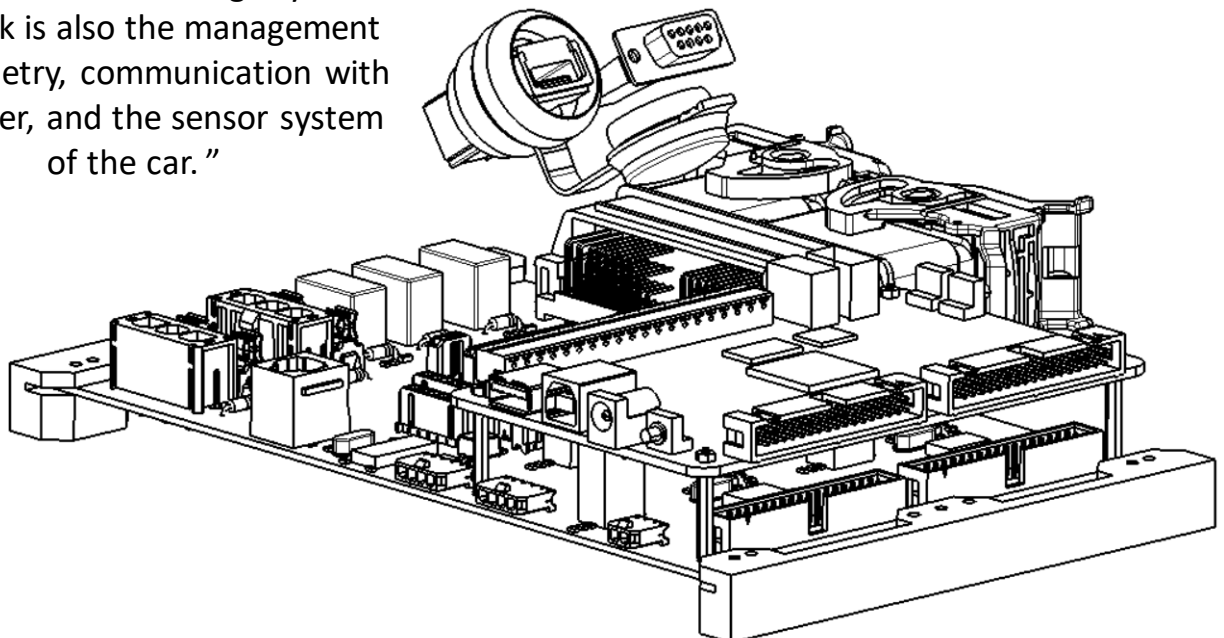


Egoitz Andrés



Alejandro Moreno

“In Electronics we take care of the design and manufacture of the car PCBs and the control software that form the low voltage system. Our task is also the management of telemetry, communication with the driver, and the sensor system of the car.”



Powertrain group



Aritz Larruskain
Powertrain Manager



Asier Lejarza



Ricardo Maté



Asier Bilbao



Mónica Hernández



Asier Ibarrondo

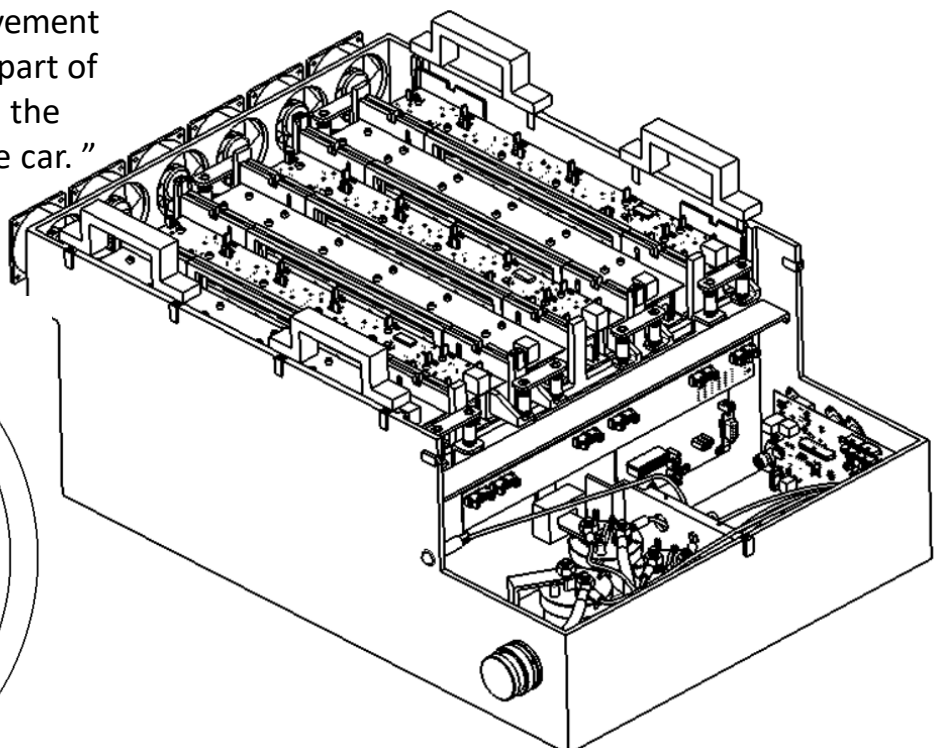
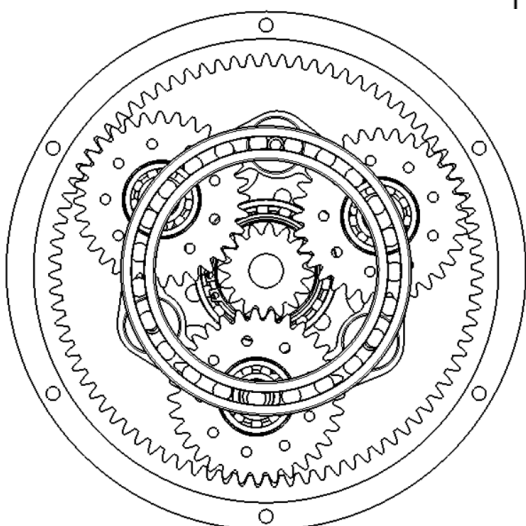


Martín López



Miguel Vázquez

“In the Powertrain group we are responsible for the successive processes that take place to convert the energy stored in the batteries to the movement of the vehicle. By analyzing each part of this process, we are able to get the maximum performance out of the car.”



Simulation group



Eric Parra
Simulation Manager



Mónica González



Jon Altonaga

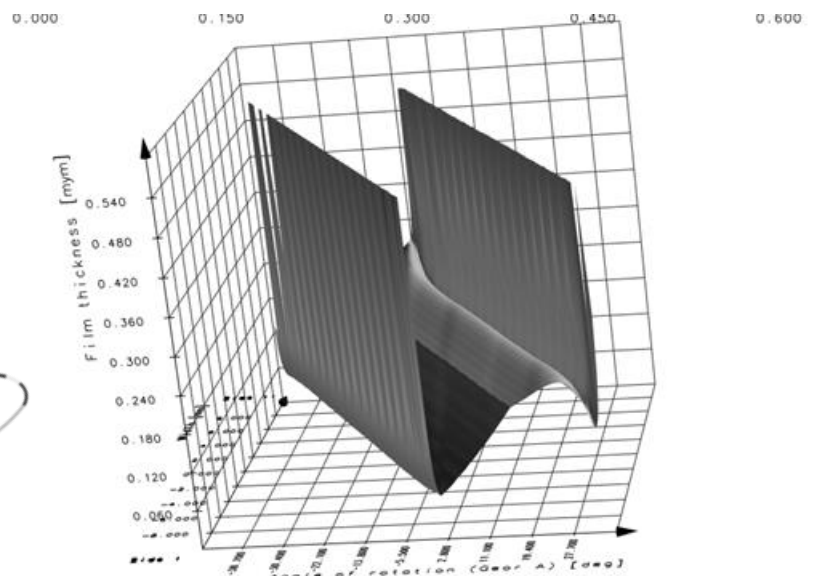


Aimar Alonso



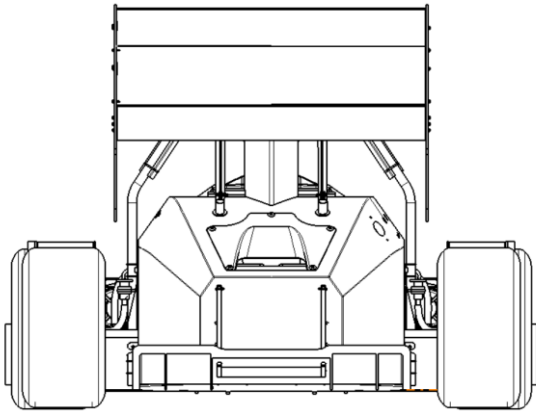
Adriano Navarro

“In the Simulation group we are responsible of getting the maximum potential of the car. We take care of the modelling, analysis and technological development of the vehicle. Many of the designs are based on our studies, and at the same time they serve as a starting point to create the complex control algorithms that govern the car. ”





#AlwaysDrivingTogether



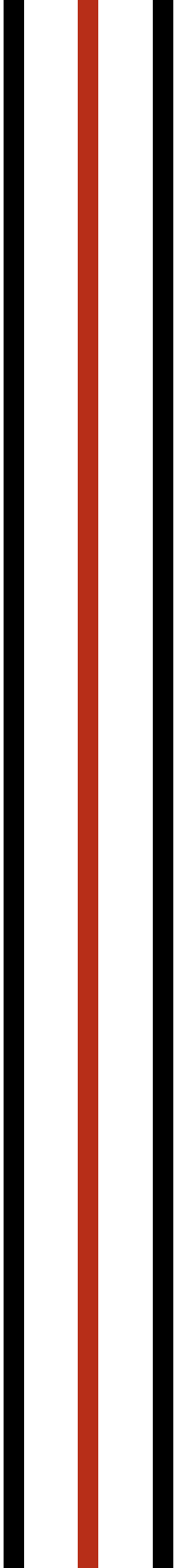
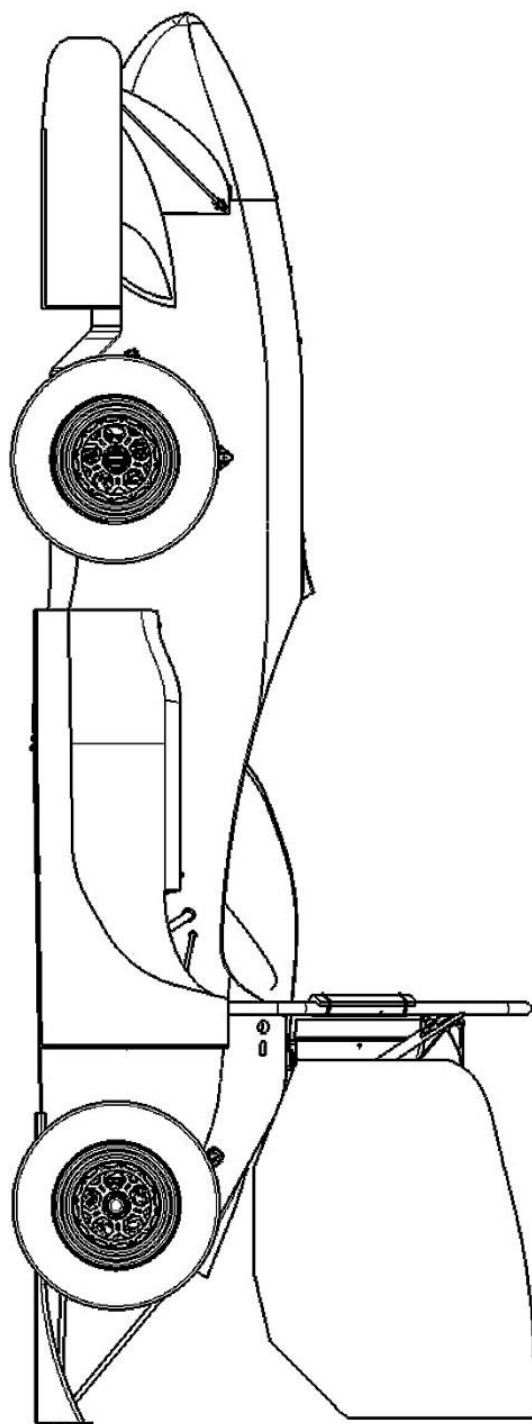
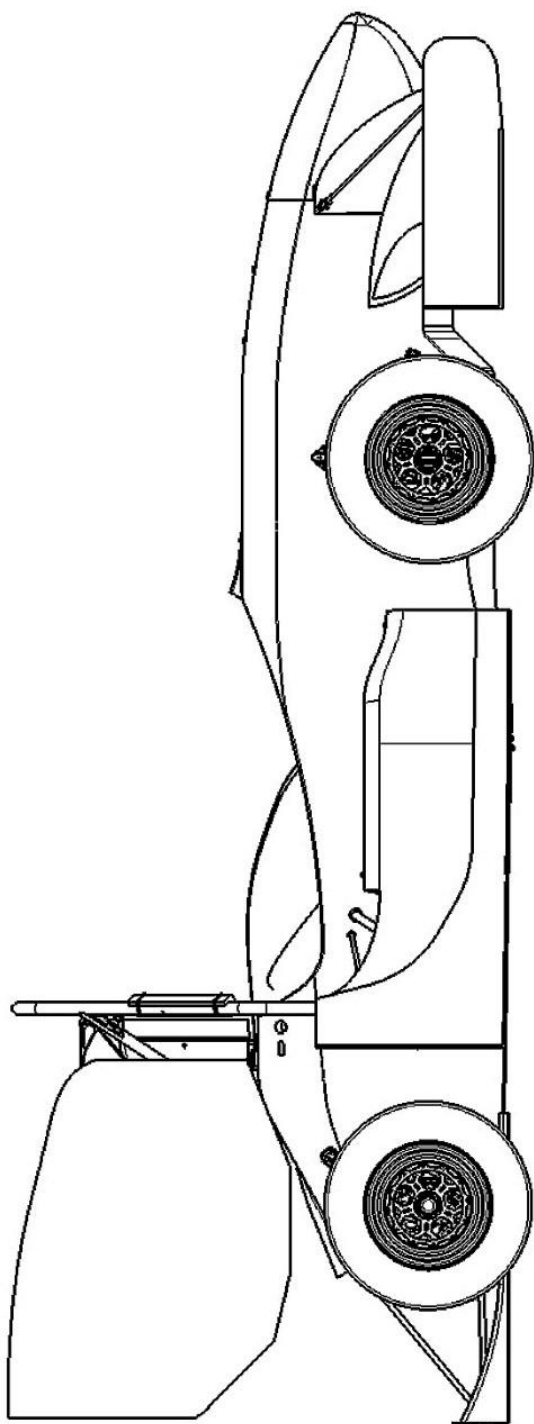
	Bronze	Silver	Gold
	Up to 999€	From 1.000€	From 3.000€
Broadcast of the collaboration in social networks	✓	✓	✓
Media presence in the event signboards	✓	✓	✓
Company logo on the team website, link to your company's website included	✓	✓	✓
Sponsor visibility in the car		✓ Mid	✓ High
Mention of the sponsor in press releases			✓
Company logo on the official team polo shirt			
Availability of the car for company's own events*			

* Depending on the car's availability

** Subject to the value of the contribution

Collaborate with us!

Platinum	Software	Technical Consultants **	Institutional support
More tan 10.000€	Software Lincenses	Consulting and information	Establishments and venues
✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓
✓ Very High	✓ High	✓ Mid	
✓	✓		
✓			
✓			



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