How to ROCK the Statics!

Presented by FSAA

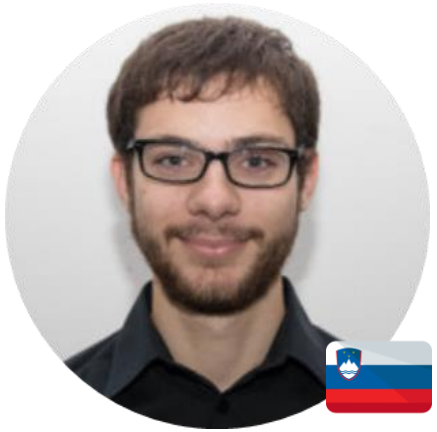
Presenters

Luka Pavlović

Engineering Design

Petra Adamović

Business Plan Presentation



Klemen Pongračič

Cost & Manufacturing

Content

- Introduction
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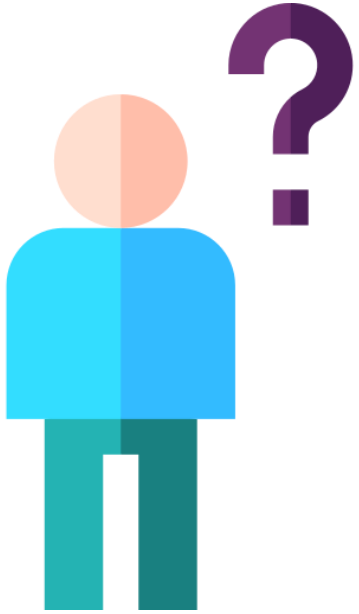
- Engineering Design Event
- Cost & Manufacturing Event
- Conclusion
- Questions

- *Rulebook - Changelog*
- *What does the Judge say?*

Introduction



Beginners

Advanced

*pdf will be available after presentation

Who do you love the most?

“Which of the static events do you think is the most important?”

-Anonymous

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General Advice

Good Practices

- Be on time!
- Be prepared for the event in advance
- All year round – start early and perfect it
- Clear, concise, organized – achieved only with practice
- Feedback – get second opinion

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Business Plan Presentation

Business Plan Presentation

Rulebook - Changelog (S 1.1.1 Clarified Rule)

2023

The objective of the BPP is to evaluate the team's ability to develop and deliver a comprehensive business model. This business model must refer to the team's specific prototype race car or a specific component of it. In doing so, the team must offer the car or component as a product or sell a service that relates to it providing a rewarding business opportunity that creates a monetary profit.

2024

The objective of the BPP is to assess the team's ability to develop and to present a comprehensive business model. This business model must relate to the team's specific prototype vehicle or a specific component of it. In doing so, the business must offer the vehicle or component as a product, or sell a service based on it, providing a rewarding business opportunity that creates a monetary profit.

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Business Plan Presentation

Rulebook - Changelog (S 1.1.3 Removed redundant information)

2023

~~*“The business plan must relate to the specific prototype race car entered the competition.”*~~

Read the Competition Handbooks for further and more detailed information about specific competitions when preparing for them!

Business Plan Presentation

What does the Judge say?

What not to do [Before you start]:

Rushing to start your presentation as soon as you enter the room

Being unaware of your physical surroundings

Being mismatched with your presentation design or your team visual identity

Business Plan Presentation

What does the Judge say?

What not to do [Presentation]:

Using a generic PP templates in a non-creative way	Using “cheap” looking animations	Using a colour scheme that might not show on the screen given at the event site	Using unusual charts and data representation if you are not sure about it.	Not having a table or contents slide OR not having some indicator where we are in the presentation
Not having the team name or at least a car number stated clearly.	Not having numerated slides	Putting too much information on one slide	Talking from your heart and improvise a lot instead of sticking to a specific text	Using difficult to pronounce words just for the sake of using them or sounding professional
Apologizing if you make a mistake while speaking	Not showing any enthusiasm while you are trying to sell something	Using prompts or physical parts for the sake of it	Using country or region specific details, but with wrong emphasis	Reading from papers or cheat sheets

Business Plan Presentation

What does the Judge say?

What not to do [Q&A]:

Being extremely scared that you won't know the answers

"Fighting" between the presenters to answer the question

Not knowing when to stop answering

Not knowing which data you have in the supporting materials and where

Being afraid of saying something stupid if you don't know the answer

Business Plan Presentation

What does the Judge say?

- “We had the most objections to the financial plans and predictions (they did not take into account the volatility of the market in relation to the ‘agreed’ deals, that is, the conditions - what about materials, what about raw materials, etc.”
- “In the presentations where there was space to present a creative idea visually, they did not make too much of an effort and some ideas remained only as text on paper, which affected the visualization of the solution”
- “Some presented ideas did not have sufficiently well-developed market research, which in one specific case affected the evaluation because the solution is known and already present on the market and is already being used in an identical form”

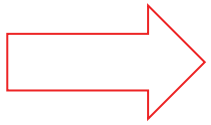
Business Plan Presentation

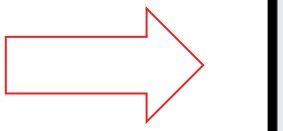
What does the Judge say?

- “Some teams approached the presentation too ‘relaxed’ and presented their solutions rather poorly and were unconvincing”
- “It is perhaps necessary to focus more on the fact that the judges must ‘buy in’ to the idea, that is, persuade them to invest”
- “Some teams did not have their investments worked out in sufficient detail - it was not clear in some situations what the investment is for, how and to what it is divided and in what period the expected ROI is”
- ”One idea was even vaguely fragmented - the solution included two parts of the project, so it was not clear at the end what the investment was needed for at all”

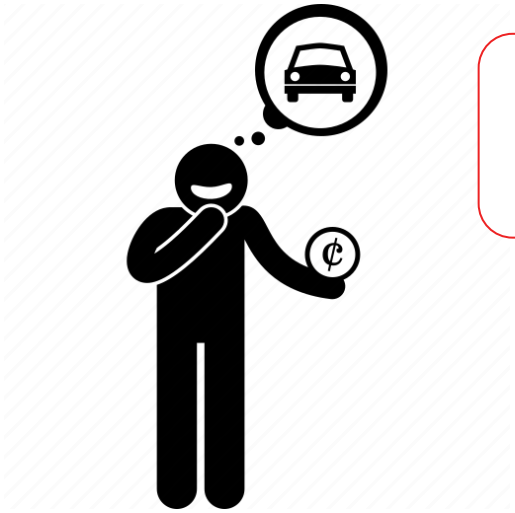
Business Plan Presentation

What does the Judge say?





Back-up slides!



Check the numbers!

Business Plan Presentation

- We know these ***all*** comments are hard to incorporate into your team's work :)
- Not all judges in FS world would agree with their specific field's comments presented in this session
- Take what you can from this, incorporate step by step - don't overdo it!
- And most importantly...

Don't forget to have fun! :D

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Cost & Manufacturing

Cost & Manufacturing Event

Rulebook - Changelog

S 2.4.4 “Fasteners” are additional items necessary to assemble the “part” and should not be listed.

- Existing rule clarification
- No major changes for 2024

- Keep an eye out for FSG Handbook for DBOM and CBOM systems
  (Usually released in December/January)

Cost & Manufacturing Event

What does the Judge say?

- Cost report documents must be understandable to a 3rd party (judges) without ever seeing the car. Supporting Material File helps us to understand and visualise the information from the Bill of Materials
- Everything costs money. Even if a part or an operation was provided from a sponsor, you should still estimate the market value of the received material or service
- Do not place parts in ‘alternative’ systems to avoid extra work. Rather than look for minimal effort, show us what you can do!
- Try to be complete. Machining cost involves a lot more than just electricity. Ask a sponsor for advice

Cost & Manufacturing Event

What does the Judge say?

- Vehicles must be presented for cost and manufacturing judging in finished condition, fully assembled, complete and ready-to-race
- Scoring high using “fancy” equipment such as giant banners and tablet computers is not guaranteed. Your knowledge and preparation should be your greatest assets on a C&M Event
- A good presentation will help you score higher. Know your car and know your documents
- Do not put dedicated drawings of standard parts such as bearings, screws, pins, nuts or washers in Supporting Material File

Cost & Manufacturing Event

Q&A Topics

- For a lot of questions, the answer is written in the rules
- Every item listed in CBOM must have a cost value
- Use comments in CBOM and use them wisely
- The location of Assembly processes is determined by the team. Decide for a system and stick to it for the whole document
- Parts provided by sponsors count as bought parts. If they were designed by the team, the process should be described in DBOM/CBOM. Handling of confidentiality agreements is up to the competition/judge

Cost & Manufacturing Event

General advice

- Use documents from previous years as a starting point and improve them according to feedback from the judges
- Work on Bill of Materials and Supporting material can start right after the design freeze. Use them as they also have a purpose
- Get your whole team involved in making Cost Report Documents
- Practice looking up parts in your documents
- Get feedback from the judges

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Engineering Design

Engineering Design Event

Rulebook - Changelog

FSG

Category	Points
Overall Vehicle Concept	20
Software	10
Vehicle Performance / Aerodynamics	30
Mechanical / Structural Engineering	10
Tractive System / Powertrain	20
LV-Electrics / Electronics / Hardware	10
Autonomous Functionality	30
Driver Interface	10
Engineering Design Report (EDR)	10

Table 7: Maximum scores in engineering design event

Category	Points
Overall Vehicle Concept	20
Software	20
Vehicle Performance	20
Actuators	10
LV-Electrics / Electronics / Hardware	20
Autonomous Functionality	60

Table 8: [DC ONLY] Maximum scores in engineering design event

FSA

AT 5.1.2 Engineering Design Scoring Criteria

Rules 2026\Table6 is void. The Judging Criteria for FS Austria are

- Design Report
- Design Approach
- Knowledge/Understanding
- Execution/Build
- Use of Resources
- Creativity/Innovation
- Presentation
- Documentation & Management

in the engineering fields

- Suspension
- Frame & Body
- Aero
- Drivetrain (EV/IC)
- Electronic Systems
- Ergonomics

for 10 (intermediate) points each. The final design score will be calculated from the intermediate score through normalization and scaling.

FSAA

SCORING (CV/HV & EV):

Category	Points
Aerodynamics	24
Chassis and Ergonomics	24
Electrical and Control Systems	24
Overall Vehicle Concept and Management	24
Powertrain	24
Vehicle Dynamics	24
EDR	6

SCORING (Concept Class Driverless – CCD):

Category	Points
Aerodynamics	15
Chassis and Ergonomics	15
Electrical and Control Systems	15
Overall Vehicle Concept and Management	20
Powertrain	15
Vehicle Dynamics	15
Autonomous Functionality	50
EDR	5

Engineering Design Event

General Info

- Is it your first time presenting?
- Confidence - no wrong answers
- Clean and Tidy – the vehicle must be presentable, as should you
- From paper to hologram – ask yourself: “Does paper report/banner/ppt/… add value and complement your presentation?”
- Preparation is the key to success

Engineering Design Event

What does the Judge say?

- Doing something purely for the sake of innovation – make changes and improvements because it is in your best interest and the goal of having the best (fastest & most reliable) vehicle on the track

- Be proud of your work - when the teams don't prepare for the event, they give the impression that they came here just to work and show off that they finished another event, and not to stand out in front of the others

Engineering Design Event

What does the Judge say?

- Basics - not knowing the theory of your work is a huge minus, and it's an absolute no-go when we hear "well, we didn't change it because it worked last year”
- Based on what? - it is very important to substantiate the claims and answers you give. The display of the data you examined during the development of the vehicle must be prepared in advance on your computers/printouts
- Theory vs. practice – without validation your results are meaningless and are not a long-term forward path to success

Engineering Design Event

What does the Judge say?

Examples

- *Suspension kinematics* -> should be better prepared and know why you chose exactly this kinematics (camber curves, toe curve, roll center heghts, antisquat/dive…) and not something else
- *Peak loads* -> have better explanation on how you determined peak load cases and safety factors for designing the suspension components
- *Dampers* -> measure damper characteristic on shock dyno, also check if all dampers are matching through full range of compression/rebound settings. Explain how you are tuning dampers, how you are using wheel travel sensors to tune dampers (damper velocities, histograms…)
- *Steering system comploiance/freeplay* -> most teams have considerable freeplay in steering system (mostly in steering wheel quick release hub), would be good to eliminate this

Engineering Design Event

What does the Judge say?

- Big picture - When comparing the concepts of a part of a system, the impact on the entire car should be considered.
  Example: we have teams that have an LV battery, and some have a DCDC inside a HV battery, and both teams assure me that their solution is better but can't argue that very well. One argument is that you have a smaller mass because there is no LV battery, but they forget that, for example, DCDC will influence the HV battery to be larger, need additional cooling, etc.
- Transfer of knowledge – Show during presentation and through your supporting material if and how the transfer of knowledge exists in your team. This can be achieved with two people present at the presentation, showing the documentation of your process, how you improved on your previous design, testing and analysis, testing notes…

Engineering Design Event

What does the Judge say?

- Testing – Creating and sticking to test procedure
  Example: Team tested their car a lot, but it happened again that their VCU overheated during endurance, which could easily have been discovered during testing
- A look back to the past - A lot of teams say that you have improved the reliability of the car, but you have no metrics for it or an explanation of what was the problem with the previous car

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Q&A

Q&A for Statics | 1

Question	Answer
How is a fair judgement between the different judging groups, especially in FSAA guaranteed?	That's a great question. The fairest way would be to have the same judging group for all of the teams. But there would still be differences since you can't expect judges to have the same criteria in the morning or the evening. So it is important to know there will always be inconsistencies. Judging like that is inherently subjective. Knowing and accepting that, we can do our best to try to eliminate as much of the variabilities as possible. At FS Alpe Adria we do a lot to try to achieve that: we have briefings and meetings for the judges before the event. We go through the rules, show some examples, and educate everyone on the way they should judge so that the criteria are similar. They will never be the same, since each judge has a certain freedom so they can adapt to the team. We do not want to have each judge asking the same question, that would be against our and the spirit of FS. We incorporate feedback from previous years and try to improve. Another part is using normalization and scaling to try to eliminate the differences between groups before the scoring. We have judging team leaders, that are in communication with the other leaders and their judging team, so they can spot any irregularities and try to prevent them and resolve the issues.
How will software (like AMS, MCU, not AS) be integrated into Statics or Scrutineering in the future? CBOM would be hard, but will there ever be focus on that?	In regards to statics, we must be careful to keep Formula Student accessible to everyone. It is possible to make a perfectly working (non DV) car with no software knowledge required from the teams. And unlike Aerodynamics, this requires a whole different field of engineering, to which some teams don't have access. But it is definitely a topic worth looking into.

Q&A for Statics | 2

Question	Answer
is it possible to have too much supporting material for cost?	Yes. But the answer is not number of pages, but if it still comprehensible. And please do not include technical drawings of standard components (ie. Bolts, nuts, washers,...)
It is ok to have any type of space in Engineering desing for some explanation of HR of the team?	Yes, if you feel this is an important aspect of managing your team you should include it in 'Overall Vehicle Concept and Management' category.
What is the maximum number of presenters for the Business Plan Presentation Procedure?	For FS Austria: Maximum of 2 persons on-site. And additional people that take part virtually must be introduced, see FSA competition handbook for more details. For FS Alpe-Adria: There is no limit (per rules). We advise you that you have the amount that best helps you present the BP to the investors. It is also a good idea to ask/notify the judges/investors if there is a larger group of people presenting, just so they can expect that and fully understand the situation (they can also limit you if they deem it necessary). Don't forget - always introduce ALL of the presenters, otherwise they must not partake in the presentation. Always keep in mind that the investors have a limited time to listen to you. It is all a game, but you should nevertheless act as if they have an imaginary bag of money to give it to your investment idea. If you have too many speakers, it will be hard for them to follow and to "get to know" each of the persons they will give their money to. Also, it is a good idea to bring your other team members who participated in the idea and have some answers to potential judges' questions, in case one of the presenters don't have.

Q&A for Statics | 3

Question	Answer
Do software costs need to be included in the CBOM? If so, associated to which process? I am referring to for example PCB softwares, ECU, coding licences...	As long as it is required for manufacturing, it may be included in the CBOM. See rule S 2.6.3.
Is it ok to bring some pieces that broke during the test before the competition, and showing the judge why it broke and how the problem has been solved?	Yes, that can be beneficial. If it shows your design process and your problem-solving abilities or explains the decisions behind your design, this would be a good way of relaying that. In general, it is good to support your claims with 'physical' evidence (in this case physical can also mean stuff on your computer).
BPP: how to present an old modest idea and go to the final with it? Cuz i have a feeling that all the ideas for sure was already presented from other teams	There is a slim chance of going to the finals with an 'old modest' idea. If the idea is not profitable and worthwhile for investors, your chances of success drop significantly. If you feel like there are no more ideas, go to some of the finals (or watch them on YT), try googling, ask your professors (or somebody from the industry), and try AI tools. When you exhaust every one of those options, I'm sure you'll have plenty of good and fresh ideas to start your BP and go all the way to the finals. Don't forget - the idea is only a (very important) beginning, it's the hard work after that brings you success. Try to look for an idea in a field other than engineering and racing. I don't know how to explain it well, but let me give you an example: in hydraulics and robotic engineering field, engineers lately often find revolutionary and innovative solutions looking at how nature solves these problems. The elephant's trunk is a way of designing a robotic arm, a hummingbird's and insects' wings are a possible solution to design new types of wings in aircraft and so on. So, the conclusion here is that sometimes, the answer for a specific field lies outside od the specific field.

Q&A for Statics | 4

Question	Answer
Cost: how to do a good Real Case and to give the right answer for the cost understanding questions?	Base the Real Case on things you know. Do as much preparation as possible and don't be afraid to ask for help from your team mates, if you don't know the answer.
S3.7 Engineering Design Scoring - What falls under the software category?	‘Software’ category is for FSG competition. We advise you that you ask FSG directly (via email is a good way to contact them - or rules question).
On chassis and ergonomics in ED, how much importance have chassis and how much ergonomics	They are both connected in such a way, that one without the other is not possible. There are always compromises to be made and you can favor one over the other. How you explain your decision to the judges is important, you must show why your choice was the best option for your team and your car design. Also: the judging categories are being changed for FSA 2024, see competition handbook.
For the BPP, does an idea based on giving an alternative use to a commercial electronic component used in our car be valid? For example a sensor	If you buy a commercially available part and then use it for something that is not related to your car any more, then no, there is not really a connection to your car any more. It would be different, if your "company" has by themselves manufactured a component that is used in the car and then you present an alternative use of that component as your business plan - that of course would be valid.
During the EDR, can we show how a piece works by remove it from the car?	After you have pasted Scrutineering, you may only change limited aspects of the car, see IN1.5.1. So in most cases it makes more sense to have additional parts ready which are already separate in order to demonstrate the function. Yes, you can remove and/or disassemble any part of your car if it helps with your explanation/reasoning ('any' meaning following the above explanation). Make sure you are prepared to do that and that you’re not wasting the judge’s and your time (maybe have a team member on standby who can do that while you explain or talk about other topics).

Q&A for Statics | 5

Question	Answer
For EDR: we are still a young team, which means that we do not have access to a lot of data of previous cars. How should we address this lack of data in EDR?	Your EDR doesn't need to be based on your previous decisions and changes that you made. You need to have a reasoning behind your decisions and that can be based on your previous iterations and/or on your calculations, validation, experiments, testing etc. So having not a lot of data from previous years shouldn't be a factor in making a good EDR as long as you explain your process and how and why your design choices came to be.
@statics: how u motivate people for statics? (If u are at a technical university)	Well it isn't easy :D But that doesn't mean it can't be done. Firstly, try to be open and honest with your team regarding the statics, how they work, what they need to do, and how important they are. They are not just worth 325 points, they affect your design, knowledge transfer, problem-solving, validation, evolution and so much more. Try to show them (maybe with help from the professors or real-world examples) the importance of soft skills, presentation making, report writing, and other tasks that every engineer does daily. You can include your sponsors, have a trip to their offices and factories, and ask them what structure they have, so you can see the importance of tasks that are not wrenching and modeling. Include presentations of their work in your team meetings as that is a good way to practice presenting in small chunks and they get used to it + it helps the whole team know what is going on (and by extension, work better together). (Sub)system/category leaders can encourage members to write reports/notes regularly and check progress each month. It makes writing EDR and other reports so much easier before the competitions.

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Thank you for participating!

MEOW IF YOU ARE STILL HERE AND NOT JUST AFK