

# FSAEJ Design Judging

## A Student Guide for Understanding the Process

The Design Event begins from the moment you submit your Design Documents (Design Report = DR, Design Spec Sheet = DSS). Particularly as stated in Article 17 of the 2020 FSAEJ Participation Rules, the FSAEJ emphasizes the preliminary evaluation by design documents in order to conduct a fair and accurate evaluation while the screening time is limited. Please carefully read this document and other related documents, understand what is expected in the Design Event and submit a document with high completeness.

As an example of what NOT to do, which we often see in the DR, "Honda CBR 600 RR PC 40E was adopted as a power train, tuning MOTEC ECU control, maximum power was achieved at 60.7 kW" and so on. We can find it in the DSS. It is the DSS that describes "what you adopted" and you should describe "why you adopted it" for the DR. There is NO answer to design a racing car. Design Event evaluates your approach to achieve your target performance, what to consider, what to verify, what to manufacture, taking into account all trade off. The judge will try to see the depth of your consideration through the DR and DSS. Judges will not only see DR this year, but also past year's DR. (Of course, for the rookie teams this is not the case) Please note we make a distinction between teams who have taken new considerations in their Design Documents and teams whose documents have carried over from their seniors. e.g., if around one-third or more of the document is copied from a previous will be regarded as "not submitted".

During Design Judging your team will be interviewed. The design judges have already seen your vehicle's resume in the form of your design report. This has allowed the judges ample time to preview the strengths and weaknesses of your design. More importantly, it has provided some insight into your design approaches, decision making ability, organization, test and development programs, and vehicle features that you consider worthy of notice. With this information the judges will tailor questions specific to your design goals as well as cover the basics of sound engineering design.

Your vehicle is the most visual end result of your efforts. You must have one in order to be judged. However, your vehicle is only a part of what will be judged.

Remember, the Design Event is a "competition of analysis". If you get the design drawing of the top team of Europe or the United States who has never been to the FSAEJ and order it to a professional outsourcer, you may be able to exhibit a wonderful vehicle. However, this is not valued in the Design Event because it is not YOUR original design or production.

Engineering knowledge and understanding are the not-so-visual results of your efforts. The judges will be asking questions to determine your depth of knowledge, and intimate understanding of your design. A team that appears with a competitive vehicle will score low if they cannot answer the judges' questions. Those teams who demonstrate a thorough knowledge and understanding and present an impressive car will receive high scores.

The judges want to know how you developed your vehicle. What were the goals? Do your goals make sense? Was there a consistent design philosophy or methodology? Do you understand the functional requirements of your vehicle's components and systems? Do you understand the laws of physics behind their operation, the materials from which they were constructed, and the manufacturing processes used? Why was this system chosen over others? What was your test program for validating your design? How did your theory compare to actual results? What changes were required after testing?

If it is on the car, be prepared for in-depth questioning. If the person who designed something graduated or is otherwise not present during Design Judging, that does not excuse the team from fully understanding that item. The explanation: "it worked well last year" does not demonstrate adequate depth of knowledge on the subject. You will receive little to no points for answers like these.

There is no specific "perfect vehicle" that the judges are looking for. In fact, one of the things most judges enjoy most about FSAE is the great variety of vehicle designs. The answers you supply depend entirely on how you defined your car's design, and performance goals. As long as those goals make sense within the framework of the rules, you will score Design points.

We often see the expression "I optimized \*\*\*\*\*" in the Design Report. However you should realize that the phrase "Optimization" is the word that judges most dislike. There are advantages and disadvantages for all the parts and characteristics, and it is the design process that achieves target performance while balancing them. As a matter of fact, there are only two

"optimum" characteristics in one way "lighter weight is always better" and "lower center of gravity height is always better".

### **FSAEJ First Round Design Judging**

During the first round of Design Judging the judges will concentrate on the fundamentals that apply to all vehicles. Fundamentals are things that are absolutely required to make the car accelerate, decelerate, corner, and comply with the rules. The well prepared team brings all of their documentation (notes, pictures, spreadsheets, broken developmental parts, etc., etc.), on all aspects of their design, to the first round, just in case a judge finds time to ask more detailed questions. The old Boy Scout motto: 'Be Prepared' applies here.

First round design judging (interview) time will be utilized as follows. (Times are approximate)

#### **Photographing (-5minutes)**

Please bring the vehicle and supporting materials to the examination area 5 minutes before the start time of the examination. First, take pictures with the cowl attached, and then take pictures with the cowl removed. Please prepare to remove the cowl within these 5 minutes. This photograph will later be used by the judges to remember the details of the vehicle, share them with other judges and score correctly.

#### **Setup (2minutes)**

The judges will introduce themselves and their specialization at the start. They are, in principle, composed of three experts in the body, suspension, and power train. Besides this, experts in aerodynamics, ergonomics, composites, racing team management are turning around each screening tent as a floating judge. At this time, quickly make a strategy as to which judge you should appeal to yourself.

#### **Introduction (At your team's discretion) (3minutes)**

You will have a short amount of time to initially present your vehicle to the judges. However, as mentioned at the beginning of this guide, judges have already perused the design document already. Describing the same things as the report does not lead to the score addition. Please understand that the competition examination day is the place to confirm the results of the document examination in front of the support material and the actual vehicle and evaluate the efforts of the team after report creation. Here it is a good idea to introduce the items you want to emphasize particularly, such as improvements and verifications done after DR submission, not written in the DR, confident points.

#### **Questioning (22 minutes)**

Your team will now break up and meet with judges inspecting specific sub-systems of the vehicle. These judges will determine which teams advance to the next round. In doing so they will cover many areas and each to the depth allowed within the time available. Do your best to see that exceptional features are not missed. Also, be understanding if the judge needs to switch to another subject.

You need to have at least one "expert" for every vehicle system that you consider to be important. FSAE is an educational process and we like to see that knowledge spread over many students. It greatly hinders the judging process if the same person has to answer questions for all of the major systems. Having more people who can properly answer questions helps your score. If you think of this judging experience as a multi-channel transfer of data that is exactly what it is. Engaging at least one knowledgeable student per judge is ideal for maximum knowledge transfer.

You may be asked at any time to show calculations, photos, or other documentation to back up your claims. Be able to present these quickly to keep the process flowing. The design process often starts with hand-written calculations and sketches. Do not be afraid to show them. You must be able to answer basic questions without reference material.

If you are not the best person to answer a question, it is perfectly acceptable to point the judge to the person who can. It is also much better to say "I do not know" than to try to fool an expert.

Specific areas into which the judges will be questioning are not provided in advance since the judges are there to cover

the entire car and will adjust their questions, to some extent, to the areas that you believe are important, and that you have demonstrated expertise in. This is why they need to know your design goals. You may still be asked questions that you do not want to hear. However, you can minimize that and help the judges to understand your vehicle by stating these goals.

Only 6 team members are allowed in the judging area. Allow room for the judges to move freely about the car and visual aids. Students who will be answering questions need to be immediately accessible. Photographing of whole landscape at preparation and introduction stage from outside the examination area by team members is allowed. You want to post pictures such as "Design Event has started!" on the website of your team. However, photographing / recording by an explanatory person in the area, and all taking and recording after the question and answer stage are prohibited. It is also the responsibility of the team to prevent shooting by other teams.

### **Review (3minutes)**

Finally, the three judges will give a brief review on their respective fields. However, score sheets etc. are not handed over in this place. Please promptly and safely leave the examination area after the review.

### **Scoring**

On the next day of the examination, judges will meet in a room, taking several hours to exchange their evaluation result each other, adjust and level their score for fair judgement. There we discuss about each team's design concept and depth of understanding, etc. using photographs of vehicles and remembering conversation with team members. As a result, we will select the top two to four as the design finalists. We will release scores for the other teams. The score breakdown of each team will be sent at a later date.

Until 2018 the score presented at the convention was the same as the score sent at a later date, but in after 2019 it will be as follows.

Competition score (Official score) = Real score raw value × 150 / First place real score raw value  
Score sent at a later date = Real score raw value

The purpose is to use 150 design scores effectively in the total score 1000 points of the FSAEJ.

If we set the score of the first place to less than 150 points, the presence of the Design Event will be lowered by itself, so in principle we would like to score 150 points in the first place. For this reason, until 2018 we adjusted the actual score of the first team to 150 points. But for the score 150 points we need to give full marks for all the items such as a suspension, body, powertrain. In this case we can't advise the point which should be still improved.

Actually, for example, there are rarely teams that can score full ten points in terms of "Creativity". For this reason, we have decided to announce the score raw value later from 2019. Thus for the design finalists, the score informed later on will be lower than the official score announced at the event, please do not panic.

### **FSAEJ Design Final**

The Design Final will be held in Meeting Tent 1. Teams that have advanced to the final must arrive at the venue with their cars, items for appealing to the judges, panels, and the like at least 20 minutes before the start of the event.

The car does not have to be in drivable condition for the Design Final. At the final venue, since video will be shown via a monitor, teams should keep that in mind and prepare a presentation that will appeal to observers. Take sufficient safety precautions when jacking up the car, and the like.

A maximum of six from each team (excluding interpreters) are allowed within the Design Final judging area. However, these do not have to be the same member who attended the Design event.

The Design Final will involve questioning by the head of the Design Final judging committee as well as several other judges. The head of the judging committee will question each finalist team in turn, and the other judges will question the other teams during that time. The questioning by the head of the judging committee and special judges will be broadcasted within the venue.

In case of bad weather, the Design Final may be held at the finalist's pit areas. In this case, an announcement will be made 1 hour before the scheduled Design Final Start time. The finalists must present their vehicle in the pit area and make preparations to enable inspection by several judges.

This is an emergency measure. In this case, the Design Final will not open for the audiences and will not be broadcasted.