

DRIVERLESS

MAGAZINE

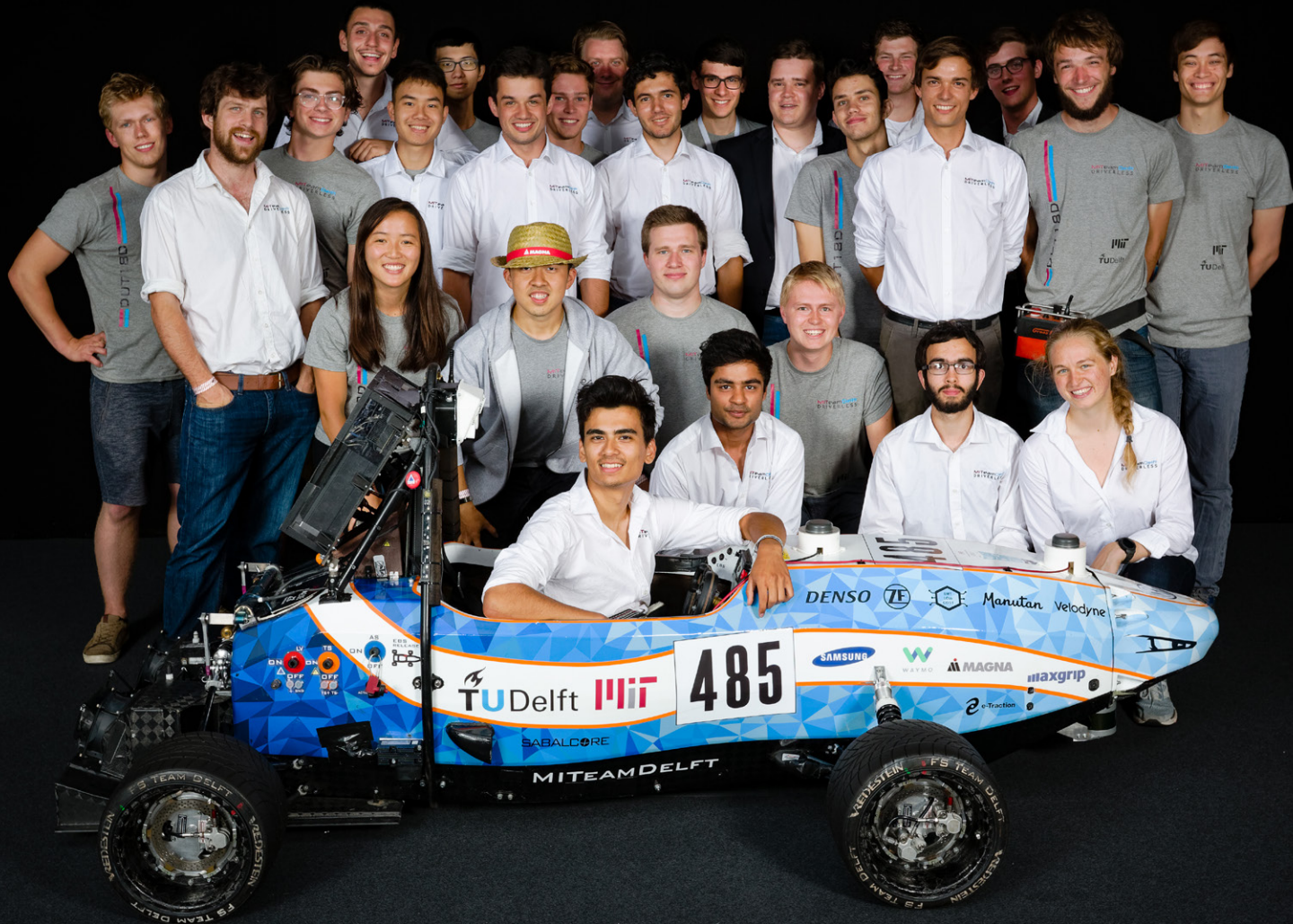


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DELFT
DRIVERLESS
FORMULA STUDENT TEAM

MIT
DRIVERLESS



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WELCOME

The time has finally come. All what we have been working for the past 12 months came together at our two competitions in Italy and Germany. It has been truly an exciting and challenging time for all of us. Countless hours of coding, honest work, lengthy meetings and hard decisions have led us to where we are today. We are so happy with our achievements and how we developed as a team and engineers.

Growing as a team, especially with an international cooperation over more than 5000 kilometers appart is not trivial at all. But with a goal in mind, strong hands and bright minds, everything is possible in this world. When half of our team from the States arrived in europe one week before the events the level of stress on each and every one of us was as high as never before. The atmosphere was merely sparking, while we were working 24/7 on getting the car up to performance specs and rules compliant. We were late on schedule and facing that our expectations did not meet reality was just like seeing a sledgehammer slowly advancing to crush our dreams.

With everybody on the edge and the competition so close it was difficult to keep functioning well together. In order to get ahead of the situation, we put every effort in pulling ourselves together, appointing an overall team captain as a go to person for everyone, the day and night crew, the delft and MIT side, the part and full timers. Finally, after all this time, we were one team, under one flag, going to competition. We are MITeamDelft.

MITeamDelft
DRIVERLESS

In the end, it is just amazing what we managed as a first year's team. Everybody gave their best and for that we are so thankful. But not only the team made this possible. All our partners, some of which we met at competition or at one of our events. Thank you so much for believing in us, for the support and your open ears!

FORMULA STUDENT ITALY

This Summer we took our autonomous DUT18D race car to our two planned competitions, to find out how well it stacks up against the Driverless cars from other Formula Student teams like ours from all over the globe. First off, Italy. The country of good food, sunny beaches and race cars. But we were not preparing for vacation, a week full of hard work and emotions was lying ahead of us



THE EVENT

FS Italy takes place at the Riccardo Paletti Circuit, which is just below the river from a little village southeast of Milan. As it is quite a drive away from the Netherlands, we decided to split the journey there up into two parts. The first day we, along with our teammates from MIT, drove from our Delft workshop over to a hostel in a beautiful little town in the Austrian Alps. The second day we made our way from there to the student teams' campsite in Italy near the race track.



One thing to be noted for the FS Italy trip: as soon as we got out of our cars, we realized that the Italian heat was going to play a big role in this competition. Almost every day we were there it was above 30 degrees Celsius with no shortage of: sunshine, drivers in their full fire-retardant suit desperately trying to stay cool with umbrellas, and empty water bottles scattered around everywhere.

Now, for these Formula Student competitions; aside from the car and camping supplies, you also essentially take an entire workshop along with you (including shelves, tools, tables, carts, electronics; a special thanks to Manutan for supplying most of this) to be able to get the car in a working state and keep it in that state. Packing, moving, unpacking

and keeping track of everything could already be considered a decent undertaking (some teams even brought large trailer trucks with them)... In any event, we unloaded our vans at our designated spot on the large Formula Student campsite, and set up our home base. Within a few hours this stretch of grass right next to the river was converted to a full-on student tent camp, with teams boasting their own flags to mark their spot.

The next day we were allowed on the track and we could set up our pit; our workstation on the actual race track where you work on/keep your race car. Again here, all the teams were unloading and setting things up, and you get to see in person what car designs all the other student teams came up with, and which color scheme they picked for their car.

After setting up the pit, our focus was on passing 'scrutineering' and scoring high on the 'static events'. Scrutineering is composed of a bunch of tests your car has to pass to ensure that it is rules compliant, as well as safe enough to drive around on the race track. Here the competition's judges check the car's construction, check the electronics, the car is tilted to see if it isn't prone to tipping over, a rain test is performed to see if it doesn't short-circuit. Finally, a brake test is also performed; especially with the Driverless cars it is pretty important that if the car were to veer off-course, that it's able to stop quickly. These scrutineering tests were mixed in with the 'static events', as the name would imply; these are events where you can score points but your car does not move. As Formula Student is an engineering competition, a heavy emphasis (even more so for the Driverless category) is put on your car's design and how much you've thought about everything surrounding your car.

The first of these static events was the Business

Presentation; how you would build a successful business model around Driverless Formula Student cars. Our two suited up presenters Egor & Ivar (they were also very happy to be suited up in the Italian heat) impressed the judges with their business plan for "Formula AI". A new and exciting Formula competition where actual drivers compete against autonomous race cars in a bracket system; "the ultimate battle between man and machine". Thanks to their idea and presentation, we wound up in the top 3 finals, meaning they got to give the presentation again on the big stage for a large crowd. The second static event we did was Design Judging. Here a large group of judges showed up to our pit, to ask our team members about how our car was built, how the autonomous systems were built, and more importantly; why we chose to design them that way. Straight after this event, a new delegation of judges showed up to also ask about what we spent on which part, for the Cost and Manufacturing event.

After your car passes scrutineering, it is safe enough to partake in the 'dynamic events'. This includes linear acceleration, doing an "8"-track and doing laps of a track with straight pieces and turns. Unfortunately, in Italy we had a fair few issues with getting the car to drive as desired. The largest contributor was the temperature; due to the heat some of the electrical components were giving rather strange outputs. We tried our best to get the temperature of the car under control with a mixture of ice, dry ice and crafty umbrella placement, but the heat still resulted a lot of problems for our brake test. The last day that we could do scrutineering, we kept at it for the entire day, trying again and again... This was also a day where it fortunately was a bit cooler, with some rain predicted in the late afternoon. We had been at it for quite some time, and the judges told us we had one last try before they would close the brake test... we gave our car one last go and it finally drove straight on its own and stopped within

the required distance! Our blissful happiness was soon mixed in with quite a bit of stress, as rain started pouring down immediately after the car had stopped. and we had to rush the car below our tent to keep it from becoming a self-driving bath tub.



With our delayed braking test success, we did miss most of the dynamic events. On our last competition day, we tried to get our car in working order for "Autocross" event; completing a lap autonomously with the race car as fast as possible on a track unknown to the car. Unfortunately, we could not get our car to complete a full lap here.

Nevertheless, we did quite well overall in Italy. At the award ceremony, we got the #2 prize overall in the Driverless category, and the #1 prize the Design Judging event. The car also got a bonus Lamborghini award for "Best Integration between powertrain and chassis controls", but last year's Electric team gets the credit for that one, as they built the base car.



2nd place overall



1st Engineering Design



2nd Business Presentation

FORMULA STUDENT GERMANY

The packing procedure was about the same for FS Germany. This time around the drive was a lot shorter, so in one day we could drive from our workshop to Hockenheim and build up the entire camp. The temperature was also a lot more pleasant; about half of the days were filled with modest sunshine, the other half with typical German rain.



THE EVENT

FS Germany was a lot bigger and more of a spectacle than Italy; the Hockenheim circuit is massive, with large covered grandstands, buildings and a big central tower. There were also many sponsor stands sprinkled between the team pits, where students would line up for free goodies, slushies and coffee daily. Lastly, the opening and awards ceremonies were done really professionally. It was held straight above the pits, with seats for all the teams, fancy light effects and music. There were also large monitors for displaying what was going on on the main stage, slideshows of beautiful sent-in photographs of the event, and well-edited videos that really captured the atmosphere of the entire event.



FSG was also very much stricter than FS Italy. In Italy, pretty much the entire team could be close to the car during testing and driving, and the Driverless timetable seemed more like a guideline than something that was written in stone. In Germany however, only the team members with the proper 'dynamic area' vests could be anywhere near the car in a gated off area, kept under constant watch by a bouncer. In typical precise German fashion, the schedule was also holy here. Scrutineering this time around went pretty smoothly



and we passed it without much hassle; during the rain test our car's power did shut off. We were worried that it shorted, but it turned out we forgot to charge the remote controller (with the emergency stop button). The battery on it died during the rain test, which caused the car to shut down. After another hose, the car passed the test. We did the Business Presentation, Design Judging and Cost & Manufacturing events again. This time around the latter two were on a big showroom floor with a bunch of other teams instead of our pit, which made it a lot more of a spectacle. On this floor you could see a bunch of representatives from every team dressed up professionally, with their race car surrounded by attributes, imagery, and stylish decor.

The judges liked our performance in the Design Judging, and Cost & Manufacturing events enough that we made it to the finals of these. For the latter finals we got to go to the 4th floor of the central tower of the circuit, with a pretty spectacular view of the pits and testing areas. Here we had 15 minutes to figure out the logistics of converting our Driverless FS team to a functional Driverless car manufacturing company, and how we would alter the car's design and manufacturing processes along with it. After

presenting this and receiving a lot of questions from the judges, they seemed satisfied and we could go down again..

We did run into some issues at the 'acceleration' event. Here the car has to accelerate in a straight line as quick as it can. Our car had a tendency of veering off to the left, and after many attempts, we unfortunately did not get any points for this event.



Photo: ©FSG Schulz

This, again, had eaten up a lot of our time; so the last dynamic event where we could score any points was the "trackdrive" event. Here the car has to do 10 laps as quick as it can on an unknown track. After one aborted start, we really wanted to show off that our car does in fact work... On the second attempt it drove past the start line, turned the first corner.. and kept going! We anxiously waited as it finished the first lap.. and the second.. and the third.. and just kept going without any issues. Then we hit the 9th lap, and things became tense again.. Would it finish all 10 laps? The car steered around all the corners correctly and drove up to the finish line .. and stopped just BEFORE it! Turns out it actually precisely drove 10 laps.. just not the extra meter to actually get across the finish line.. That was a bit of

a bummer, but in this particular you get points for the successfully driven distance. And in any event, we were very happy that the car successfully drove that far completely on its own.

This marked the end of the Driverless dynamic events, for the rest of our time in Hockenheim we could watch all the electric and combustion cars WITH drivers zip past.

At the awards ceremony in the Driverless category we won #2 for our Business Plan event, and #1 for the Cost & Manufacturing.. When it came time for the overall Driverless prizes, we were sure that we would not be on the podium. There had seen other Driverless teams with cars that were performing phenomenally.. When it came time for the host to announce the #3 place overall however, she remarked "...it was good, but they kind of stopped just before the finish line"... Before that line could sink in, we saw our car number appear on the big screen... then the entire team sprinted towards the main stage to claim our trophy!

Given the fact that this is the first year we partook in this competition category, and with all of the problems that the car faced, we are extremely happy to have been on the podium at the biggest Formula Student event on the globe. The rest of that night was dedicated to celebrating our victory!



Photo: ©FSG Maru



3rd place overall



3rd Engineering Design



2nd Business Presentation



1st Cost and Manufacturing

THE NEW TEAM

ONE TEAM, TWO CARS



This year will be a challenge! We are now one team with two projects. Last year, you had in Formula Student Team Delft two different teams with two different cars. This year, we combined many departments and we believe that this will have more gain out of this. So, we are one team with two projects.

As a team-building activity, the core team went on a holiday in the South of Limburg. There we had a lot of talks and shared what we want to reach together this year. On the last day of our holiday, we went on karting to already feel what the races should feel like.

Since August the core team got started to prepare everything for the whole team. The core team set up a team structure, a top-level concept, and a team goal. The team is bigger than ever, we are now with over a hundred students in Delft and we still have more than twenty-five people at MIT. Together we will work on our team goal what says: "DUT20 will win Formula Student Germany 2020 Driverless and Electric with one dedicated and combined team that embraces the twofold nature of this challenge, by sharing and optimizing the use of resources; FSG Driverless will be won by focusing on autonomous performance running on a reliable base vehicle and FSG Electric will be won by focusing on high speed lateral performance".

Last Monday we had the kick-off at Brunel in Rotterdam. The whole team got to know each other and there we revealed in what department everyone will be working in this year. The team members got excited and we could officially say that Dut20 is a fact! For the next month, the team will do a lot of research on the two projects.

The rules of Formula Student Germany already came out. For the electric project, there was a big surprise, we are now allowed to use fans to create more downforce. For the driverless project, we hope that next summer the car will drive faster than any car with a driver. We will still be using the DUT18-car as last year. This because a lot of sensors are already implemented which saves us time and money. Last year the aero wasn't on the car because it would not affect yet due to the pace it would drive on. Hopefully, we can drive on our tire limits next summer. The DUT19-car will be used for the electric project to do a lot of testing and the car will be used for events.

We are already looking forward to the design presentation in January, then the two projects will be presented to the world!

- Julie Weyns
Team Manager

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