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## Engineering in sim racing: what is it, what could be, but probably never will

The popularity of sim racing took off in 2020 after COVID-19 restrictions severely limited real racing. Le Mans Virtual in rFactor 2, IndyCar iRacing Challenge and eNASCAR iRacing Pro Invitational Series included many professional drivers from the respective series alongside the best sim racing specialists. Later, many motorsport teams created factory pools of simulator drivers and signed partnerships with esports agencies for brand promotion.

As a company focused on data science in motorsport, we launched our sim racing program in 2020 to test our software and train new staff in a highly competitive and diverse environment. Since then, our engineers participated in over 100 races and many top series, from SRO Intercontinental GT Challenge to the Formula Sim Racing World Championship.

Are engineers important for drivers and teams to succeed in sim racing? Is sim racing a good training ground for engineers? This article discusses our experience and perspectives on performance, strategy and race engineering in sim racing.



Our Bentley Continental GT3 during SRO IGTC Endurance 2022.

### Performance Engineering

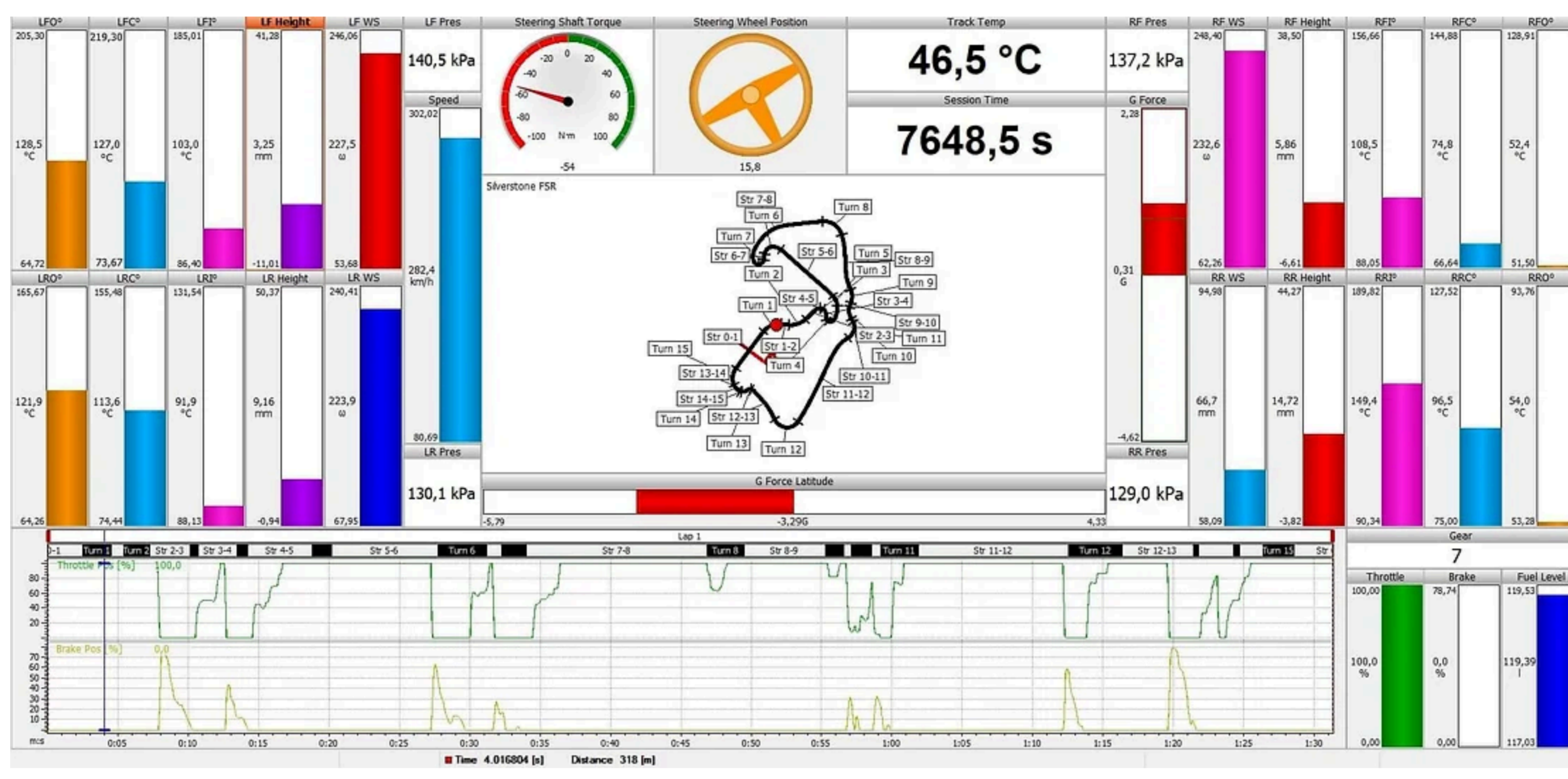
Performance engineers in motorsport are responsible for vehicle setup using inputs from the driver and other engineering departments to maximise performance. In sim racing, people often call them "setup makers" or "setup engineers".

#### Features

- The simulation determines everything about the car, so performance engineers must know the features of a simulator engine to exploit them in the setup. Therefore, many performance engineers in sim racing are drivers - active professionals or those who understand specific cars and simulators well.
- Simulators provide comprehensive data about the car, including some vehicle parameters that are impossible to measure in real racing. In addition, testing is unlimited, and conditions are perfectly repeatable. Thus, thorough testing and telemetry analysis primarily drive the setup process.

#### Current situation

- In recent years, many companies have started to sell setups and provide coaching for recreational sim racers. Working in this field can be a good starting point for aspiring performance engineers because of opportunities to work with many cars, simulators and drivers without pressure to perform in specific races.
- In professional sim racing teams, performance engineering is underdeveloped. Firstly, professional sim racing is an influencer- and engagement-driven business. Although winning matters, it is not the priority, and teams prefer to invest in something that gives them more reach than a few more positions on a virtual grid. Secondly, sharing setups and telemetry is a sensitive topic for teams and drivers, so an engineer has to establish good personal relationships to get access to the data.



The dreaded Motec logs - something that performance engineers often ask for.

### Strategy Engineering

Strategy engineers determine the optimal number of pit stops, fuel strategy, tyre compound selection and other parameters to complete a race as quickly as possible. They also develop race strategy tools required to find optimal solutions efficiently.

#### Features

- Races are more deterministic: tyres degrade the same as during practice, safety cars usually do not exist, rain is predictable, and the pit crew never makes mistakes. However, this doesn't make the job easier. Strategy engineers must be precise with their decisions because competition in sim racing is intense, and one wrong call often costs multiple positions in a race.
- Testing is unlimited, and strategy engineers can collect enough data to find the best solutions. At the highest level, wrong strategies usually come from the wrong inputs and assumptions, not uncertainty. For example, a team may create a fast setup with high tyre wear and incorrectly assume it is the only sensible approach.

#### Current situation

- In our experience, strategy engineering in sim racing is similar to real racing. The tasks of a strategy engineer are the same: figure out the fastest fuel and tyre strategy before a race and adjust it during a race depending on track position, traffic and actions of other drivers. With a few tweaks on the backend to accommodate different live timing feeds, our race strategy software worked fine and provided accurate recommendations.
- For a professional sim racing team, a strategy engineer primarily saves time. Experienced drivers can figure out a good strategy independently, but only after extensive testing. With an engineer's help, drivers can run only a few focused stints and spend more time on the setup. In addition, a strategy engineer can spot long-term problems with the setup and steer it in the right direction.
- Unfortunately, only a few series in professional sim racing have strategic elements. Many races are short, and some simulators do not have dynamic weather, safety cars and different tyre compounds for one series.



Open-wheel championships are a typical playground for strategy engineers in sim racing.

### Race Engineering

The race engineer is the main point of contact with the driver during races. They update the driver on what is going on in a race, evaluate the performance relative to predictions and coordinate pit stops.

#### Features

- Usually, race engineers connect to the server where a race takes place to access the live data. Nowadays, many sim racing series provide TV broadcasts and live timing feeds, but they tend to be delayed by 30-60 seconds relative to the server, so engineers should know how to work with the simulator.
- Drivers in sim racing have an incredible volume of information available for them thanks to head-up displays (HUDs) connected to a simulator's shared memory data. Drivers can personalise HUDs to access telemetry, tyre wear, fuel consumption, live timing, weather, and even some analytics based on this data. Because of this, race engineer in sim racing is more focused on the "big picture" (strategy, push or save, overtake or work together, etc.) than on telemetry, spotting or live timing updates.

#### Current situation

- Race engineering is in demand on all levels of sim racing. Teammates often help drivers with race engineering, but some drivers and teams have engineers working with them for several years.
- A race engineer must have a good working relationship with the driver, like in real motorsport. Most sim drivers are young, and some do not have a mature mindset for racing (after all, who cares if they crash a virtual racecar?). For these drivers, support from an experienced and level-headed engineer may often gain more positions in the race than hours of practice.
- On the technical side, race engineers do tasks that are not automated in HUDs and are too complicated for a driver during a race, such as calculating fuel consumption or tyre wear to meet a target.



An example of information available on the sim racing HUD.

### Perspectives

Engineering support in sim racing is valuable, and the demand for it continues to grow, although engineers will not be as important as in real racing, any time soon. Simulators are too simplistic in some technical and sporting aspects and leave only a few areas for engineers to create value - setup development, strategy optimisation and race engineering.

If you or your team already perform at a high level and need to find extra performance, check out our [sim racing page](#) and [contact us](#) via our website or social networks. We will be happy to discuss what we can do for you.

Sim racing

#### Comments

Commenting has been turned off.