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Every gram counts – lightweight design strategy defines I.D. R Pikes Peak concept

- Fully-electric car for the most famous hill climb in the world weighs less than 1,100 kilograms, including driver
- Comprehensive computer simulations accelerated development
- Battery weight reduced by restricting system performance to 500 kW (680 PS)

Wolfsburg (D) – It started with simulations. “Before we actually assembled the I.D. R Pikes Peak, we used computers to analyse a multitude of different configurations,” says Willy Rampf, technical advisor to the project and a man with a wealth of Formula 1 experience, recalling the start of the development of the car for the Pikes Peak International Hill Climb. “It was clear to us that we would not have time to build multiple test vehicles. We had to get it right at the first attempt.”



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The trials focussed on finding the optimal compromise between performance and weight. Both factors are even more dependent on each other in an electric car like the I.D. R Pikes Peak than in a racing car with a conventional combustion engine. The simple rule of thumb is: The greater the performance, the heavier the batteries required. However, every

single gram is unwanted weight – particularly at a hill climb. On Pikes Peak, the cars must overcome a difference in altitude of more than 1,400 metres – from the start at 2,862 to the finish line at 4,302 metres above sea level. Romain Dumas, at the wheel of the I.D. R Pikes Peak, will also be faced with a series of hairpin turns, where a heavy car would be a disadvantage when braking and accelerating out of corners.

As such, the Volkswagen Motorsport engineers decided on the following strategy: The I.D. R Pikes Peak was to be as light as possible, while still maintaining a very high level of performance. The framework for this strategy was provided by the regulations for the most famous hill climb in

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the world, which literally offer virtually limitless freedom in the "Unlimited" class.

Being given the proverbial blank sheet of paper and told to develop a new racing car from scratch is a dream for any engineer. "To develop a car solely for this 20-kilometre hill climb is a very special task. There were virtually no bounds to the innovation shown by the engineers," says François-Xavier Demaison, Technical Director at Volkswagen Motorsport.

"Simulation played a major role in achieving the low weight of the car," explains Rampf. For example, computers were used to design chassis parts in such a way that they are able to cope with the anticipated loads without any problems, and without appearing oversized – or overweight. However, the development team almost completely dispensed with the standard but extremely expensive materials commonly used in top-class motor racing, such as titanium. "The chassis, wheel suspensions and safety structure of the I.D. R Pikes Peak are almost completely made of steel and aluminium," says Demaison.

Despite this, and whilst still generating a top performance of 500 kW (680 PS), the car, complete with driver, weighs less than 1,100 kilograms – a lightweight compared to previous record-breaking cars in the Pikes Peak category for electric cars. The relatively low performance allowed the battery blocks for the I.D. R Pikes Peak to be made so compact that they could be positioned next to and behind the driver, thus ensuring perfect weight distribution. They provide the energy for an electric engine on both the front and rear axles, while torque distribution is managed electronically.

The I.D. R Pikes Peak's chassis and aerodynamic components are made of an extremely light carbon fibre/Kevlar composite. One of the tasks faced during the design phase was to integrate design elements from the I.D. family – Volkswagen's future range of fully-electric vehicles – in the exterior of the Pikes Peak racing car. "During this phase of development, we worked particularly closely with our Volkswagen colleagues in Wolfsburg," recalls Willy Rampf.

The cockpit of the I.D. R Pikes Peak, a monocoque structure, is also made of ultra-light carbon fibre. The extent to which the engineers were willing to go to reduce weight is exemplified by the driver's equipment. Technology partner OMP made driver Dumas' fire-resistant race overall, as well as the seat padding and six-point harness, from particularly light



material. Even the sponsors' logos are printed onto the overall, to save the weight of conventional patches.

However, the lightweight perfectionists at Volkswagen Motorsport did have to give in on one point: The regulations of the Pikes Peak International Hill Climb stipulate that each driver must wear a large event emblem, roughly 40 cm² in size, on their race overall. The plan was to have this logo printed on Dumas' overall too. "That was rejected. According to the regulations, it has to be sewn on. The thread used for that weighs almost as much as the entire overall," says Technical Director Demaison with a wink.

Movie of I.D. R Pikes Peak:

<https://youtu.be/oMIkrO-okUM>

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