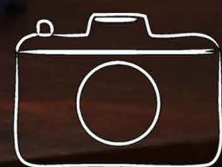




**NEWSLETTER**

**ROLL OUT CATTLE**



# CAT11e Roll Out

The new car it's finally here!

After eight months of hard work, the CAT11e was finally unveiled on the 24th of May in front of a full house at ETSEIB's conference room.

For the past eight months, the 39 students which form the team have been working hard to create the CAT11e. The first two months were dedicated to the design of this new prototype, the evolution of its predecessor, the CAT10e. After the design freeze, the work shifted towards manufacturing all the components previously designed. After many months of hard work, late nights and early mornings, the CAT11e was finally ready for its rollout.

On the day, the team was joined by friends and family, students, university representatives, other Formula Student teams and some of our sponsors, without whom this project would not have been possible.

From now onward the team will focus on the manufacturing stage of the CAT11e which has already started.



Federico Agripa



Federico Agripa

This new single-seater follows the same concept line as the CAT10e, a 100% electric rear-wheel-drive car propelled by a single motor.

New improvements have been introduced to bring this concept closer to the limit.

One of the main objectives has been to lower the weight of the car. as maximum as possible.

By redesigning some parts and using carbon fibre instead of aluminium or steel, we have been able to reduce the weight from 219 kg to 200 kg.

A lot of effort has also been put into optimising the powertrain in terms of efficiency and performance.

A better management of the accumulator together with a resized refrigeration allow for a better, more efficient use of the energy.

The aerodynamic package has been redesigned and brought to the limit together with a readjusted dynamic configuration.



The CAT11e powertrain is composed by three main elements, the first, a self-designed and self-manufactured accumulator, which feeds the motor-inverter set. Finally, the transmission which transfers the power from the motor to the drive wheels.

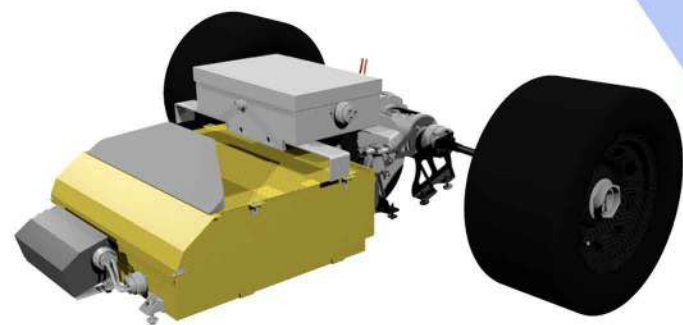
This year, the accumulator is one of the components which has lowered its weight the most with a total 8 kg thanks to the use of new materials and an optimised configuration.

The increase in voltage from 430 to 600V allows for better efficiency by decreasing the intensity.

The CAT11e's accumulator is composed of a total 276 cells in a configuration of 138 series and 2 parallel thus reaching 7.1 kWh.

Another aspect of innovation has been the accumulator container, which has lowered its weight by 1.5 kg, by introducing a new material, Kevlar.

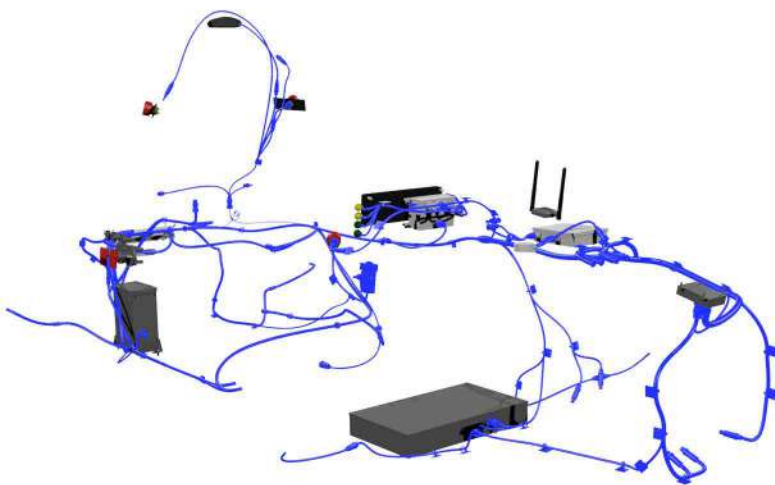
A self-developed and self-manufactured BMS composed of 6 electronic circuit boards, which are in charge of measuring the state of all the cells, in addition to another board which collects all the data and verifies that the system is safe at all times, allows to bring the accumulator concept more to the limit because it adjusts better to our needs.



The powertrain and aerodynamics departments have worked closely to improve the refrigeration by increasing the airflow which enters the accumulator. The CAT11e has two separate entrances one at each side of the car which guide the air to the accumulator with the help from a series of fans which extract this air at the back. The latter are controlled to assure an optimum temperature at all times based on the needs of the accumulator.

The CAT11e's motor is a high voltage motor of 100 kW. It is however limited to 80 kW by the rules. With this motor a maximum of 6500 revolutions per minute as well as a peak of 250 Nm have been achieved. This motor is connected to a two-stage transmission, also self-designed which is then connected to a limited slip differential. All of this gives 915 Nm at the wheel.

To solve last year's thermal problems, the refrigeration system has been redesigned with new self-designed elements such as a new tailor-made radiator which integrates better with the aerodynamics or a more efficient coldplate for the inverte



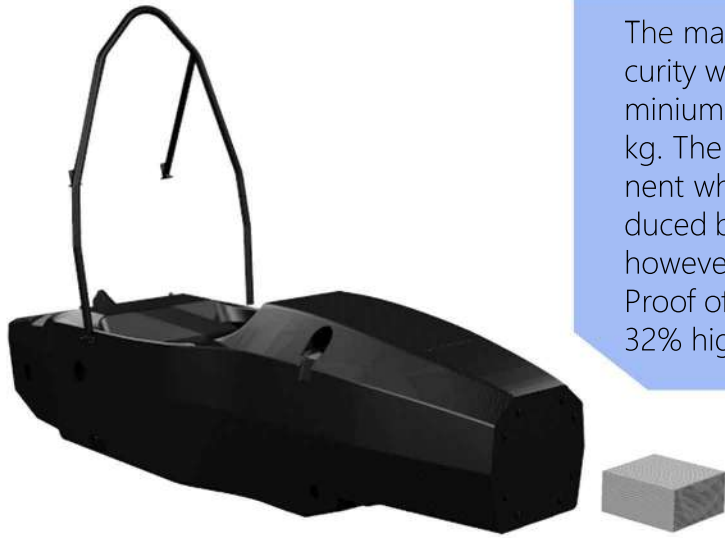
To control these systems we have designed several ECUs which form a more decentralised system compared to previous seasons. Each one is in charge of a part of the car, reading the sensors and controlling the different actuators, thus allowing a significant reduction in wiring weight.

Some examples are the data acquisition, which in addition to storing all the car's data for posterior analysis, allows us to receive live data about the state of the car during the events at a distance of up to 2 km.

The low voltage board is in charge of the management of the low voltage battery among other functions such as the control of the DRS and the refrigeration. A clever use of this system has allowed us to reduce the energy consumption by a 40%.

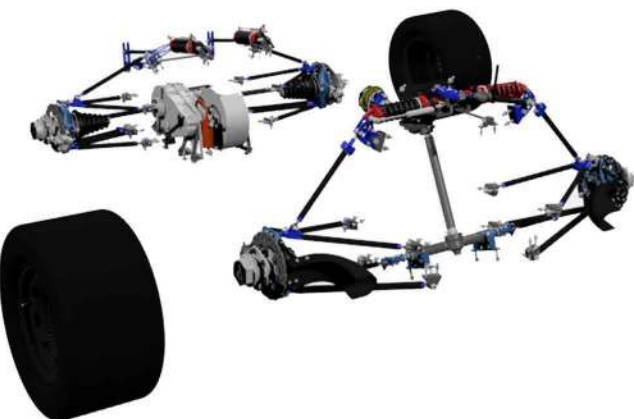
All of these systems, together with the previously mentioned BMS and other electrical systems make the car safer while allowing us to extract the maximum of its potential.

As for the aerodynamic design a significant improvement has been made when it comes to the performance, increasing the lift coefficient to 4.08. This means that the CAT11e generates enough downforce so that it would be capable of running upside-down at just 102 km/h. These numbers are even more impressive considering that the entire aerodynamic package weights just 10.7 kg. One of the fields with the most innovation this year has been the undertray



The main objectives for the chassis this year were to maintain the security while reducing the weight. Our self-made carbon fibre with aluminium core monocoque has reduced its weight by 5 kg to just 21.6 kg. The monocoque, however, has not been the only chassis component which has reduced its weight. The main hoop has also been reduced by 7% and the impact attenuator by 12%. This weight reduction however, has not affected the rigidity nor the security of the chassis. Proof of this is the new seatbelt configuration which can bear stresses 32% higher than last year.

The CAT11e includes also redesigned ergonomics specially designed to ease the drivers' tasks. A new carbon fibre seat designed to fit the drivers, together with new easily adjusted pedals which offer a new level of comfort while keeping the weight to a minimum.



Finally, the vehicle dynamics have been optimised and small improvements have been introduced to make it even more competitive. The CAT11e includes a gear steering system which reduces the steering wheel free play while reducing the weight at the same time. New slimmer and lighter brake discs have also been introduced along with an air inlet to cool them. The position of the suspension triangles and the spring strength have also been modified to achieve better behaviour on the track.



Principal



Platinum



Gold



Silver

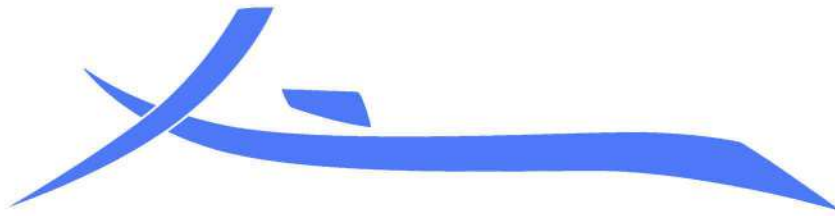


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