

SIMPACK Supports Formula Student Racing Series

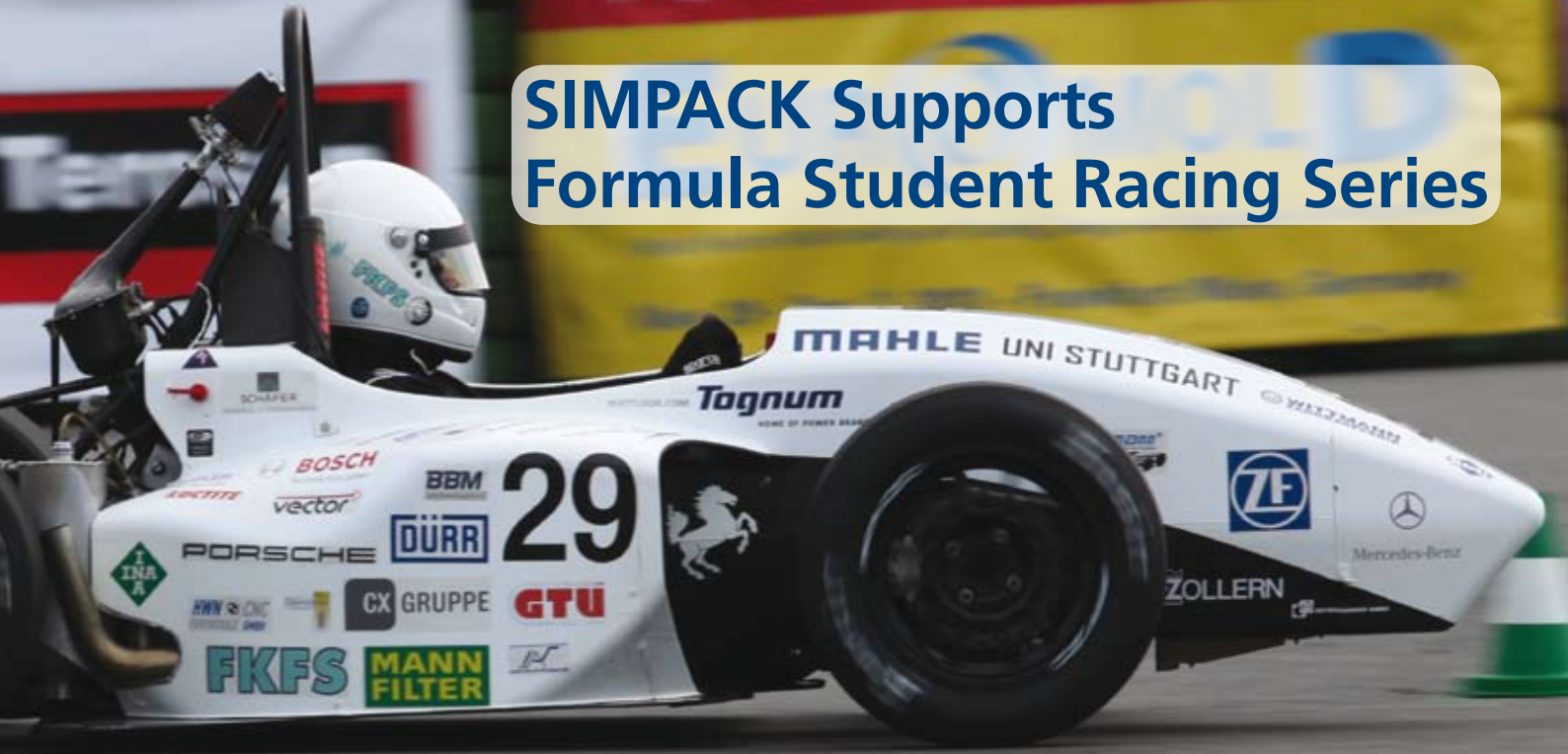


Fig. 1: Racing car Uni Stuttgart F0711-6

source: www.campushunter.de



Renowned as one of the leading global multi-body simulation software packages, SIMPACK has earned a first-rate reputation within the automotive engineering sector. SIMPACK is dedicated to supporting Rennteam Uni Stuttgart in the Formula Student Series.

WHAT IS FORMULA STUDENT?

Formula Student is a competition for students to conceive, design and fabricate small formula style racing cars. It is an autonomous racing series just for students, giving them the opportunity to combine several abilities and experiences in designing their own race car. More than 500 teams worldwide participate in the nine official competitions. Since the regulations of the event are mostly for safety reasons, a wide variety of cars are constructed. Only a few regulations concerning the power and basic setup of the car are given. The four-stroke combustion

engine is limited by 610 ccm engine displacement and a 20 mm air-restrictor. Furthermore, a minimum wheelbase has to be held as well as a certain ratio between front and rear track width. SIMPACK provides a simple and easily adaptable system for the different variations of the cars. But it is not only about creating a race car within a very short time. The students should not focus solely on the design of the race cars. Issues like cost awareness and creating a substantiated business plan to get financial investors for production of

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the race car prototype are as much a part of the competition as the profound knowledge of the technical aspects of their race car. Therefore, the competition is a conglomeration of various static and dynamic events challenging both the performance of the racing car as well as the team itself. Only the team that succeeds in every single aspect of the competition is able to be competitive and to win — Rennteam Uni Stuttgart has won in several Formula Student racings in 2006, 2007, 2008, 2009, 2010 and 2011 with this year's racing car F0711-6: 1st place at the Formula SAE (Society of Automotive Engineers) in the UK, 3rd place at the

RENNTTEAM UNI STUTTGART

Formula Student VDI in Germany and 1st place at the Formula ATA (Associazione Tecnica dell'Automobile) in Italy. Rennteam Uni Stuttgart was founded in 2005 by a group of motorsport enthusiasts and soon became a registered association. Each year about 35 students have the opportunity to apply the theoretical knowledge of their field of study to a real project. Here it is not only about construction skills but also about teamwork.

Coordinating 35 different individuals adds to the challenge of designing the race car within only eight months. Every aspect of the financial concerns has to be managed completely on their own. Sponsorship, taxation, project and time management are only some of the topics the students have to deal with. In the end, the students are well prepared to enter professional life. In 2006, the first year of the team's entry into the competition, the success story of Rennteam Uni Stuttgart began. With their first race car, the F0711-1, they were able to win the award for best newcomer. Since then, five cars and many awards have fol-

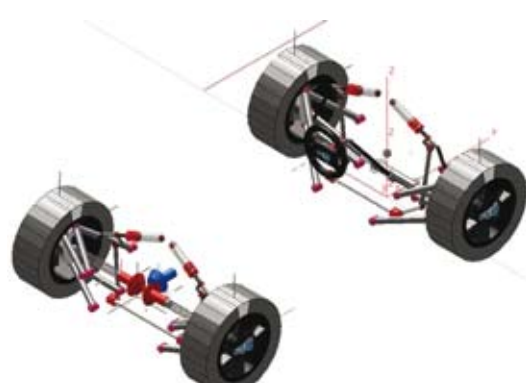


Fig. 2: Multi-body simulation of the suspension



Fig. 4: Multi-body simulation of the busstop

lowed. The hard work of the students was rewarded not only by winning the world champion title in 2008 but also by leading the world ranking list in 2009 and 2011. The "Most Friendly Team Award" and the "Award for the lowest Fuel Consumption" are other examples of the team's success as a whole. Being able to rely on great support from university and industry is crucial for the Rennteam Uni Stuttgart to be part of the top teams worldwide. This is why SIMPACK has been one of the valuable partners for several years. By offering a wide range of support, SIMPACK is in direct contact with the students. Qualified professionals provide special workshops and ensure the students learn the basics of multi-body simulation and are able to apply their knowledge to their technical challenges. Year round, Rennteam profits from the knowledge of direct contact with SIMPACK personnel who offer help whenever needed.

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HOW IS SIMPACK INTEGRATED INTO THE DEVELOPMENT OF THE RACE CAR?

One of the most important tasks in developing a fast and agile racing car is the design of the suspension system. Smooth handling around corners, short response times to drivers' actions, and the ability to quickly adjust the suspension to suit different road

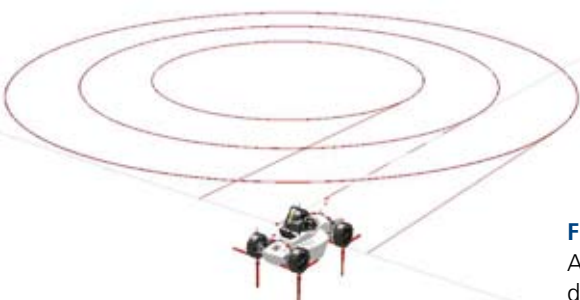


Fig. 5: Multi-body simulation of the skidpad

conditions are all very important. It is essential that the suspension is optimized for the car to be competitive. Before the incorporation of the SIMPACK software, this optimization was achieved with a tremendous amount of set up work and manual work. Performance was raised for subsequent models with an investigation of every single part of the suspension. This was necessary to avoid problems which would arise from lack of experience. It was almost impossible to investigate the effects of several changes simultaneously. Validation was done with a physical test on the race track. This was inefficient both in terms of cost and time.

The incorporation of SIMPACK into the design process has allowed the students to do "virtual prototyping". The effect of changes and adaptations to the car can be analyzed long before the car is manufactured. Multi-body simulations of the entire suspension system as well as single component simulations such as the wheel bearings, steering system and drive train have been performed. Several loops of iterations have improved results and helped ensure optimization.

SIMPACK supports Rennteam Uni Stuttgart with multi-body simulations and helps them to validate their chosen suspension kinematics. Different parameters for track, wheelbase, forces and kinematic points can be implemented to investigate and optimize the vehicle behavior. This ability guarantees an enormous time savings within the design process and minimizes potential troubles after the manufacturing and assembly of the race car. The quicker the design process is completed, the more time is left for track testing and for finding and eliminating possible failure sources. Fine tuning of the suspension system can be done more accurately and training of the drivers will not be compromised. Saving time is essential to keep up with the world's top teams and to repeat Rennteam Uni Stuttgart's success. SIMPACK plays an indispensable role in this endeavor.

FUTURE PROSPECTS

After this year's successful racing series, the design development of the new racing car for 2012 has started. After finishing the



Fig. 6: Winners: Rennteam Uni Stuttgart at Silverstone in 2011



source: www.campuhunter.de



source: www.campuhunter.de



Fig. 7: Racing car Uni Stuttgart F0711-6

design, suspension kinematics and chassis concept, the students will set the focus on assembling the new car for 2012. There is still a lot of work to be done. However, the new design of the car is very promising and expectations are high.

In the future, SIMPACK will remain an invaluable partner of the Formula Student Racing Series and especially of Rennteam Uni Stuttgart.