presented by VDI

Formula Student Germany

International Design Competition

Programme 2009

Hockenheim
August 5th – 9th 2009

Creating a future for engineers

We would particularly like to thank
the sponsors of Formula Student Germany 2009 for all their support

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presented by VDI in cooperation with SAE INTERNATIONAL

A special thanks goes to the numerous volunteers who contributed
significantly in the realisation of the fourth Formula Student Germany

Greetings

Ten years ago a small spark was ignited in Germany. Since a group of students from Stralsund began building the first German Formula Student race car in 1999 the idea has spread to other German universities, slowly at first but gaining momentum quickly. With the introduction of Formula Student Germany in the year 2006 the enthusiasm was no longer to be contained. Today, ten years after the first step was taken, students at 61 German universities invest much time and effort into their project of designing a race car. Worldwide the number of teams has reached more than 500.

In order to ensure a safe, transparent and fair competition at highest levels and to promote highly qualified young academics to industry we continuously improve Formula Student Germany. With the alterations concerning the Cost Event in 2007 we made the first step towards more realistic cost calculation. An interdisciplinary Business Executive Summary links the static disciplines and promotes a holistic approach. With reserved places of entry for international teams, the previous year's top ten and not least for the best teams from all over the world, determined by a world ranking, we ensure a challenging and international starting grid. With the reallocation of points in 2009 we have adjusted the ratios of the disciplines for a more adequate balance of points. Foremost, we thereby increase the weighting of fuel efficiency and accommodate the development of more efficient cars for which both industry and society in general require accordingly educated young engineers. In 2010 the next step will follow as we introduce a new event, Formula Student Electric, in which the cars will be powered by an electric motor with a correspondent storage unit – the optimal preparation for the designers of future electric vehicles.

We are looking forward to an exciting and fair event und would like to express our sincere thanks to our sponsors and patrons as well as the many volunteers. We also wish the participants good luck und the visitors an exciting glimpse of the world of motivated young engineers.

Dr. Ludwig Vollrath (VDI e.V.),
Tim Hannig (FSG e.V.)
and the Formula Student Germany Team

Grußwort

Vor nunmehr 10 Jahren ist der Funke auch nach Deutschland übergesprungen. Seit 1999 eine Gruppe von Studenten in Stralsund mit dem Bau des ersten deutschen Formula Student-Rennwagens begann, hat sich die Idee erst langsam, dann immer schneller an deutschen Hochschulen verbreitet. Mit der Einführung der Formula Student Germany im Jahr 2006 war der Enthusiasmus schließlich nicht mehr zu bremsen. Heute, 10 Jahre nach den ersten Gehversuchen, investieren 61 deutsche Teams Zeit und Herzblut in den Rennwagenbau. Weltweit sind es über 500.

Um den Teams einen sicheren, transparenten und fairen Wettbewerb auf hohem Niveau und den Unternehmen hochqualifizierten Nachwuchs bieten zu können, entwickeln wir die Formula Student Germany kontinuierlich weiter. Mit Änderungen beim Cost Event machten wir 2007 den ersten großen Schritt, um die Kostenüberlegungen realistischer zu gestalten. Eine disziplinübergreifende Business Executive Summary verknüpft die statischen Disziplinen und fördert damit eine ganzheitliche Herangehensweise. Mit bevorzugten Startplätzen für internationale Teams, die FSG-Vorjahres Top Ten und zuletzt auch die weltweit besten Teams über eine Weltrangliste sorgen wir für ein anspruchsvolles, internationales Starterfeld. Mit der Umverteilung der zu erreichenden Punkte justieren wir 2009 das Verhältnis der Disziplinen für eine adäquate Gewichtung neu. Vor allem aber verleihen wir damit der Treibstoffeffizienz ein stärkeres Gewicht und tragen damit Industrie und Gesellschaft Rechnung, die zur Entwicklung sparsamer Autos entsprechend ausgebildeten Nachwuchs benötigen. 2010 gehen wir noch einen Schritt weiter: Mit der Formula Student Electric führen wir einen neuen Wettbewerb ein, bei dem die Fahrzeuge von einem Elektromotor mit Energiespeicher angetrieben werden – die optimale Vorbereitung für die Entwickler der Elektroautos der Zukunft.

Wir freuen uns auf einen spannenden und fairen Wettbewerb und danken unseren Sponsoren und Förderern sowie den zahlreichen freiwilligen Helfern. Wir wünschen den Teilnehmern gutes Gelingen und den Besuchern einen spannenden Blick in die Welt motivierter, junger Ingenieure.

*Dr. Ludwig Vollrath (VDI e.V.),
Tim Hannig (FSG e.V.)
und das Formula Student Germany Team*

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Inhalt

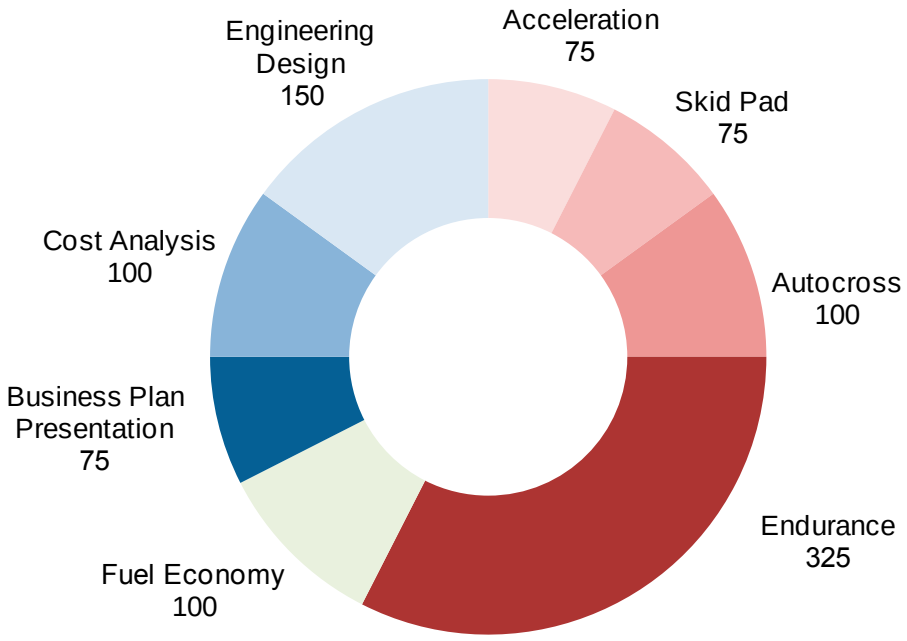
Formula Student Germany – an introduction

Students build a single seat formula race car with which they can compete against teams from all over the world. The competition is not simply won by the team with the fastest car, but rather by the team with the best overall package of construction, performance, and financial and sales planning. To succeed, interdisciplinary teamwork and an efficient team structure are very important.

Formula Student extends the education of the students by incorporating intensive experience in designing and manufacturing as well as considering the economic aspects of the automotive industry. Teams take on the assumption that they are a manufacturer developing a prototype to be evaluated for production. The target audience is the non-professional weekend-racer, for which the race car must offer very good driving characteristics regarding to acceleration, braking and handling. It should be offered at a very reasonable price and be reliable and dependable. Additionally, the car's market value increases due to other factors such as aesthetics, ergonomics and the use of readily available standard purchase components.

The competition

The challenge the teams face is to construct and build a prototype that best matches these given criteria. To figure out the best car a jury of experts from the motorsport, automotive and supplier industries judges every team's car and sales plan based on construction, cost planning and business plan presentation. The rest of the decision will be done out on the track, where the students demonstrate in a number of performance tests how well their self-built racecars stand the test in their true environment.



With different disciplines the competition reflects all aspects which have to be kept in mind while constructing and building a car.
Der Wettbewerb spiegelt mit seinen verschiedenen Disziplinen alle Aspekte wider, die bei Konstruktion und Bau eines Fahrzeugs bedacht werden müssen.

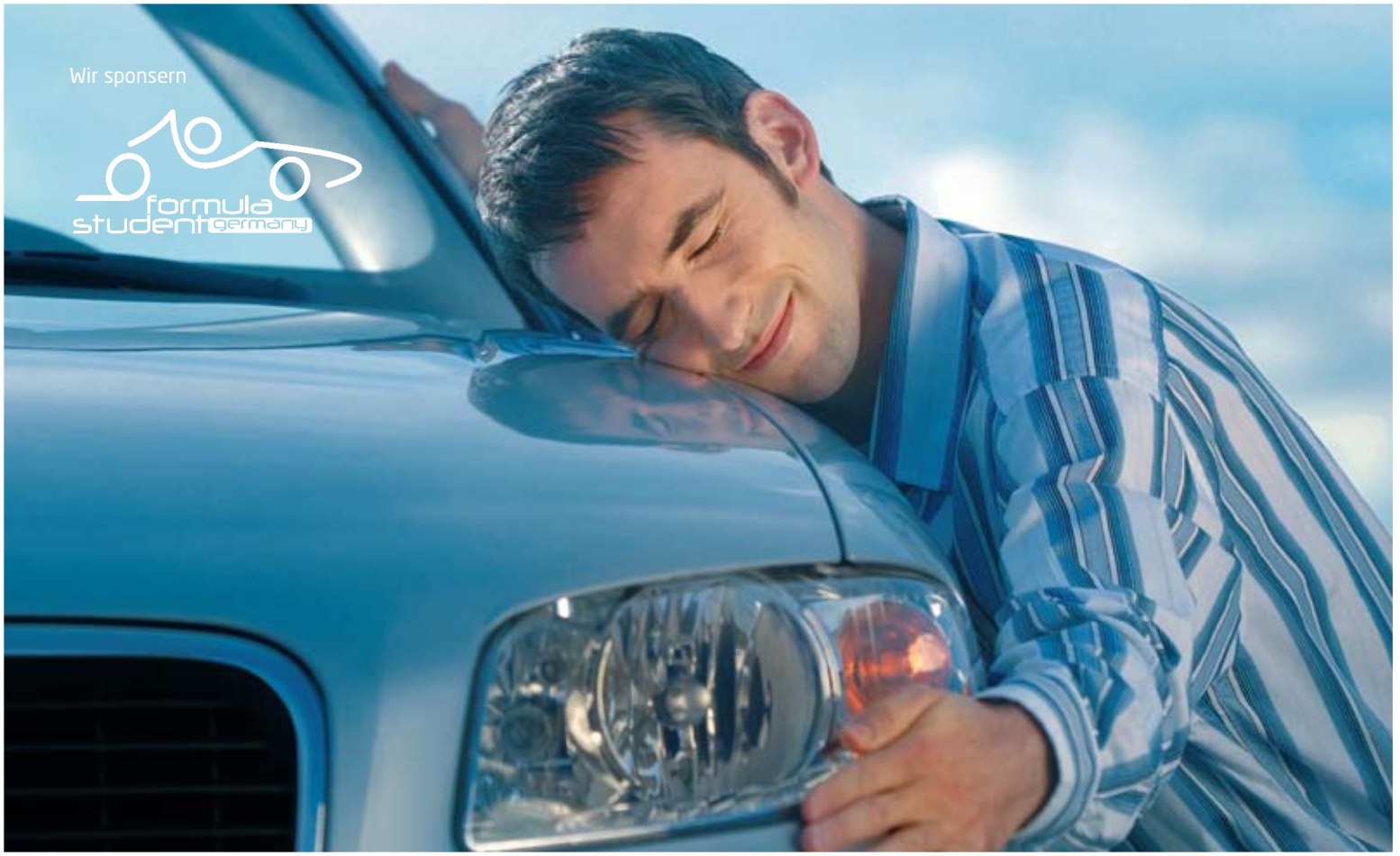
Formula Student Germany – eine Einführung

Studenten bauen in Teamarbeit einen einsitzigen Formelrennwagen und treten damit bei Wettbewerben wie der Formula Student Germany gegen Teams aus der ganzen Welt an. Es gewinnt aber nicht einfach das schnellste Auto, sondern das Team mit dem besten Gesamtpaket aus Konstruktion und Rennperformance, Finanzplanung und Verkaufsargumenten. Dazu sind interdisziplinäres Teamwork und eine effiziente Teamstruktur von besonderer Bedeutung.

Die Formula Student ergänzt das Studium um intensive Erfahrungen mit Konstruktion und Fertigung sowie mit den wirtschaftlichen Aspekten des Automobilbaus. Im Sinne dieser Zielsetzung sollen die Studenten annehmen, eine Produktionsfirma habe sie engagiert, um einen Prototypen zur Evaluation herzustellen. Zielgruppe ist der nicht-professionelle Wochenendrennfahrer. Dazu muss der Rennwagen beispielsweise sehr gute Fahreigenschaften hinsichtlich Beschleunigung, Bremskraft und Handling aufweisen. Der Monoposto soll wenig kosten, zuverlässig und einfach zu betreiben sein. Zusätzlich wird sein Marktwert durch andere Faktoren wie Ästhetik, Ergonomie und den Einsatz üblicher Serienteile gesteigert.

Der Wettbewerb

Die Herausforderung für die Teams besteht darin, einen Prototypen zu konstruieren und zu bauen, der diesen Anforderungen am besten entspricht. Zur Ermittlung des besten Fahrzeugs bewertet zum einen eine Jury aus Experten der Motorsport-, Automobil- und Zulieferindustrie jede Konstruktion, jeden Kostenplan und jede Verkaufspräsentation im Vergleich zu den konkurrierenden Teams. Zum anderen beweisen die Studenten auf der Rennstrecke in verschiedenen Disziplinen, wie sich ihre selbstgebauten Boliden in der Praxis bewähren.



Liebhaber gesucht!*

Wenn Sie darauf brennen, Ihre Leidenschaft zum Automobil endlich auszuleben, und damit sogar noch Karriere machen möchten, dann gibt es in der Automotivebranche keinen besseren Ansprechpartner als uns. Die Ingenieurgesellschaft Auto und Verkehr ist mit über 3.000 Mitarbeitern einer der führenden Engineering-Partner der Automobilindustrie. Mit unserer Expertise in der Elektronik-, Antriebsstrang- und Fahrzeugentwicklung erhalten unsere Kunden zukunftsweisende Lösungen für kommende Fahrzeuggenerationen. Zu unseren Auftraggebern gehören alle namhaften Automobilhersteller und Zulieferer.

Wir suchen Studenten, Diplomanden und Ingenieure mit Leidenschaft und Herzblut für spannende Projekte in der Automobilentwicklung. Konkrete Jobangebote und einen Online-Bewerbungsbogen finden Sie unter www.iav-inside.com

Fragen beantwortet Ihnen gerne unsere Karriere-Hotline unter +49 30 39978-9382

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The disciplines at a glance

Die Disziplinen im Überblick

Static disciplines

In the three static disciplines the students present their constructions, cost planning and business plan and discuss them with a jury of experts from the motorsport, automotive and supplier industries.

At the competition Cost and Design Judges take a closer look at the prototype and discuss with the students about the solutions. Both events are based on written reports.

Beim Wettbewerb betrachten die Cost und die Design Juroren die Prototypen genau und diskutieren die Lösungen mit den Studenten. Beide Events setzen auf schriftlichen Berichten als Basis auf.

Engineering Design: In the Design Report the students set their constructive solutions and their advantages out in writing. Eight pages of text and vehicle drawings are supposed to convince the judges of their construction and its qualities for the sales market of the non-professional weekend autocross racer. At the competition the judges examine the constructions and discuss them with the students. The scoring regards the Design Report, the answers in the discussion and the inspection of the car.

Cost Analysis: Costs are an important factor for building a race car. Hence, the students deal with cost estimations, manufacturing techniques and processes in the Cost Event. The discipline consists of a written report (the Cost Report) and a discussion with the judges around the manufactured prototype. The Cost Report contains a list of all components – from wheels to process labour costs for special tools. The judging comprises the organisation of the Cost Report, the comprehension of manufacturing processes and the price as well as the performance of a real case task for reducing costs.

Business Plan Presentation: The teams present their business plan for the built prototype to an assumed manufacturer – represented by the judges. With this business plan they want to convince them that their car meets the demands of the target group of the non-professional weekend autocross racer best and that it can be produced and marketed profitably. The teams give a talk for ten minutes. Afterwards, the students answer the questions of the judges for five minutes. Content, structure, organisation and performance of the talk are judged as well as the answers the students give.

The students present their business plan and answer the questions of the judges.

Die Studenten präsentieren ihren Geschäftsplan und beantworten die Fragen der Juroren.

Statische Disziplinen

In den drei statischen Disziplinen präsentieren die Studenten ihre Konstruktionen, ihre Kostenplanung und ihr Geschäftsmodell und diskutieren diese mit einer Jury aus Experten der Motorsport-, Automobil- und Zulieferindustrie.

Engineering Design: *Im Design Report halten die studentischen Konstrukteure ihre konstruktiven Lösungen und deren Vorteile fest. Acht Seiten Text und Fahrzeugzeichnungen sollen die Juroren von den Konstruktionen und ihren Vorzügen für die Zielgruppe des nicht-professionellen Wochenendrennfahrers überzeugen. Beim Wettbewerb werden die Konstruktionen von den Juroren am Fahrzeug begutachtet und mit den Studenten diskutiert. Die Bewertung erfolgt anhand des Design Reports, der Antworten in der Diskussion und der Begutachtung des Fahrzeugs.*

Cost Analysis: *Die Kosten sind für den Bau eines Rennwagens ein relevanter Faktor. Beim Cost Event beschäftigen sich die Studenten daher mit Kalkulation, Fertigungstechniken und -prozessen. Die Disziplin besteht aus einem schriftlichen Bericht (dem Cost Report) und einer Diskussion mit den Juroren am gebauten Prototypen. Der Cost Report enthält eine Auflistung aller Teile – vom Reifen bis zu den Herstellungskosten für Spezialwerkzeuge. Bewertet wird die Aufbereitung des Cost Reports, das Verstehen von Fertigungsverfahren zur Kostenoptimierung und der Preis sowie die Lösung einer Real Case Aufgabe zur Kostenreduktion.*

Business Plan Presentation: *Die Teams stellen einer fiktiven Herstellerfirma – vertreten durch die Juroren – ihren Geschäftsplan für den gebauten Prototypen vor. Damit wollen sie sie davon überzeugen, dass ihr Fahrzeug am besten die Anforderungen der Zielgruppe des nicht-professionellen Wochenendrennfahrers trifft und entsprechend gewinnbringend produziert und vermarktet werden kann. Die Teams tragen zehn Minuten vor und stellen sich anschließend fünf Minuten den Fragen der Juroren. Bewertet werden Inhalt, Aufbau, Aufbereitung und Darbietung des Vortrags sowie die Antworten des Teams auf Fragen.*

Dynamic disciplines

In the dynamic disciplines the cars have to prove the road capability of the students' constructions on the race track. The disciplines demand different qualities. In each discipline two drivers have two runs (except in the endurance). The best run will be counted as the optimum the car can achieve.

Acceleration: The race cars prove their accelerating abilities over a distance of 75 meters. The fastest need less than 4 seconds.

Skid Pad: The self-built cars drive on a parcours in shape of an 8. There are two consecutive laps on each circle with the second laps being timed. The cars demonstrate with a fast lap time how much lateral acceleration they can generate (up to 1.4g).

Autocross: The monoposti drive on a course of perhaps one kilometer through straights and curves. The lap time serves as indicator for driving dynamics and handling qualities. The results of the Autocross discipline determine the starting order of the Endurance.

Endurance: Providing the highest number of points, the Endurance is the main discipline. Over a distance of 22 kilometers the cars have to prove their durability under long-term conditions. Acceleration, speed, handling, dynamics, fuel economy, reliability – the cars have to prove it all. The Endurance also demands handling skills of the driver because there can be up to four cars on the track at the same time. Each team has only one attempt, the drivers change after 11 kilometers. Additionally, the fuel consumption is measured in the Endurance.

Dynamische Disziplinen

In den dynamischen Disziplinen müssen die Fahrzeuge die Praxistauglichkeit der studentischen Konstruktionen auf der Rennstrecke unter Beweis stellen. Die Disziplinen erfordern dabei unterschiedliche Eigenschaften. Bei jeder Disziplin starten zwei Fahrer mit je zwei Versuchen (bis auf den Endurance). Gewertet wird der beste Versuch als das Optimum, das das Fahrzeug erzielen kann.

Acceleration: *Auf einer 75 Meter langen Geraden müssen die Rennwagen beweisen, wie schnell sie aus dem Stand beschleunigen können. Die Besten bewältigen die Strecke in unter vier Sekunden.*

Skid Pad: *Die selbstgebauten Rennwagen durchfahren einen Parcours in Form einer Acht. Jeder Kreis wird zweimal nacheinander umrundet, gestoppt wird jeweils die zweite Runde. Eine gute Rundenzeit zeigt, welche Querbeschleunigung das Fahrzeug erreichen kann. Diese kann bis zu 1,4 g betragen.*

Autocross: *Über eine etwa 1 Kilometer lange Runde fahren die Monoposti durch Geraden, Kurven und Schikanen. Eine schnelle Rundenzeit ist Indikator für eine gute Fahrdynamik, gute Handling- und Beschleunigungseigenschaften. Die Platzierung im Autocross entscheidet zudem über die Startreihenfolge im Endurance.*

Endurance: *Der Endurance stellt mit der höchsten erreichbaren Punktzahl die Hauptdisziplin dar. Über eine Renndistanz von 22 Kilometern muss sich die Gesamtkonstruktion unter Dauerbelastung beweisen. Hier sind alle Eigenschaften von der Beschleunigung bis hin zu Handling und Fahrdynamik gefragt. Der Endurance erfordert auch Renngeschick des Fahrers, da bis zu vier Fahrzeuge gleichzeitig auf der Strecke sind. Jedes Team hat einen einzigen Versuch, die Fahrer wechseln nach 11 Kilometern. Beim Endurance wird zudem der Kraftstoffverbrauch gemessen.*

Flags

Pull into the penalty box for discussion concerning an incident that may cause a time penalty!

Fahr in die Kontrollzone zur Diskussion eines Vorfalls! Ggf. Zeitstrafe.

Pull into the penalty box for a mechanical inspection of your car!

Fahr in die Kontrollzone für eine Untersuchung des Fahrzeugs.

Pull into the passing zone to be passed by a faster competitor!

Lass dich in der Überholzone überholen!

Your session has been completed. Exit the course!

Deine Fahrt ist beendet. Verlass die Strecke.

Your session has started, enter the course!

Deine Fahrt beginnt. Fahr auf die Strecke!

Come to an immediate safe controlled stop on the course! Pull to the side of the course as much as possible.

Komm sofort kontrolliert zum Stehen. Halte die Strecke möglichst frei.

Something has happened beyond the flag station. No passing unless directed by the corner workers. *Stationary:* Danger! Slow down, be prepared to take evasive action. *Waved:* Great Danger! Slow down, evasive action is most likely required, be prepared to stop.

Etwas ist hinter der Flagge passiert.Fahr nicht vorbei ohne Anweisung der Streckenposten. Feststehend: Gefahr! Fahr langsam, sei bereit zum Ausweichen. Geschwenkt: Große Gefahr! Fahr langsam, Ausweichen wird erforderlich. Sei bereit anzuhalten.

Something is on the racing surface that should not be there. Be prepared for evasive maneuvers to avoid the situation!

Es ist etwas Unerwartetes auf der Strecke. Sei bereit zum Ausweichen!

There is a slow moving vehicle on the course. Be prepared to approach it at a cautious rate.

Es ist ein langsames Fahrzeug auf der Strecke. Nähere dich vorsichtig an.

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Bachelor und Master:
Herzlich willkommen!

Awards 2009

Preise 2009

Award	Team (note the result yourself)
Formula Student Germany Champion	
Formula Student Germany – 2nd place	
Formula Student Germany – 3rd place	
Engineering Design Award – 1st place	
Engineering Design Award – 2nd place	
Engineering Design Award – 3rd place	
Cost Analysis Award – 1st place	
Cost Analysis Award – 2nd place	
Cost Analysis Award – 3rd place	
Business Plan Presentation Award – 1st place	
Business Plan Presentation Award – 2nd place	
Business Plan Presentation Award – 3rd place	
Endurance Winner	
Acceleration Winner	
Skid Pad Winner	
Autocross Winner	
Most Fuel Efficient Car powered by Kautex Textron GmbH & Co.KG	
1st place Overall Dynamic Events powered by VDI e.V.	
Best Newcomer Award presented by Formula Student Germany Academy	
Formula Student Germany Sportsmanship Award presented by Formula Student Germany Steering Committee	
Style Award	
Best Use of Electronics Award powered by Bosch Engineering GmbH	
Best Use of Adhesives Award powered by Henkel	
Most Innovative Powertrain Award powered by BMW Group	
Best Suspension Design Award in memory of Allan Staniforth	
Best Lightweight Concept Award powered by AUDI AG	
Best Dynamometer Performance Award powered by Bosch Engineering GmbH	
Best Prepared Car for Scrutineering powered by DEKRA Automobil GmbH	

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Schedule 2009

Zeitplan 2009

Wednesday, 5th of August 2009

13:00 – 21:00	Ticket Center & Team Registration	1 Ticket Center
15:00 – 19:00	Scrutineering	9 Scrutineering
20:00	Team Welcome	5 Marquee above pits

Thursday, 6th of August 2009

07:30 – 19:00	Ticket Center	1 Ticket Center
08:00 – 08:30	Team Briefing	5 Marquee above pits
08:30 – 19:00	Scrutineering	9 Scrutineering
09:00 – 18:00	Tilt table, Break test, Noise test	10 Tilt table 11 Brake test 12 Noise test
09:00 – 18:00	Style Event	3 FSG forum
12:00 – 13:00	Staging for Panoramic Photograph of teams and cars	18 Test track (8th / 9th of August)
20:00 – 21:00	Reception for Faculty Advisors, Team Captains & Judges powered by Robert Bosch GmbH	3 FSG forum

Friday, 7th of August 2009

07:30 – 19:00	Ticket Center	1 Ticket Center
08:00 – 08:30	Team Briefing	5 Marquee above pits
08:30 – 19:00	Scrutineering	9 Scrutineering
09:00 – 18:00	Tilt table, Break test, Noise test	10 Tilt table 11 Brake test 12 Noise test
09:00 – 18:00	Engineering Design Event, Cost Analysis Event, Business Plan Presentation Event	6 Engineering Design & Cost Analysis 7 Business Plan Presentation Event
09:00 – 18:00	Test tracks open	17 Test track (7th of August)
19:00	Business Plan Presentation Finals	5 Marquee above pits
20:00	Awards Ceremony – Part I	5 Marquee above pits

Saturday, 8th of August 2009

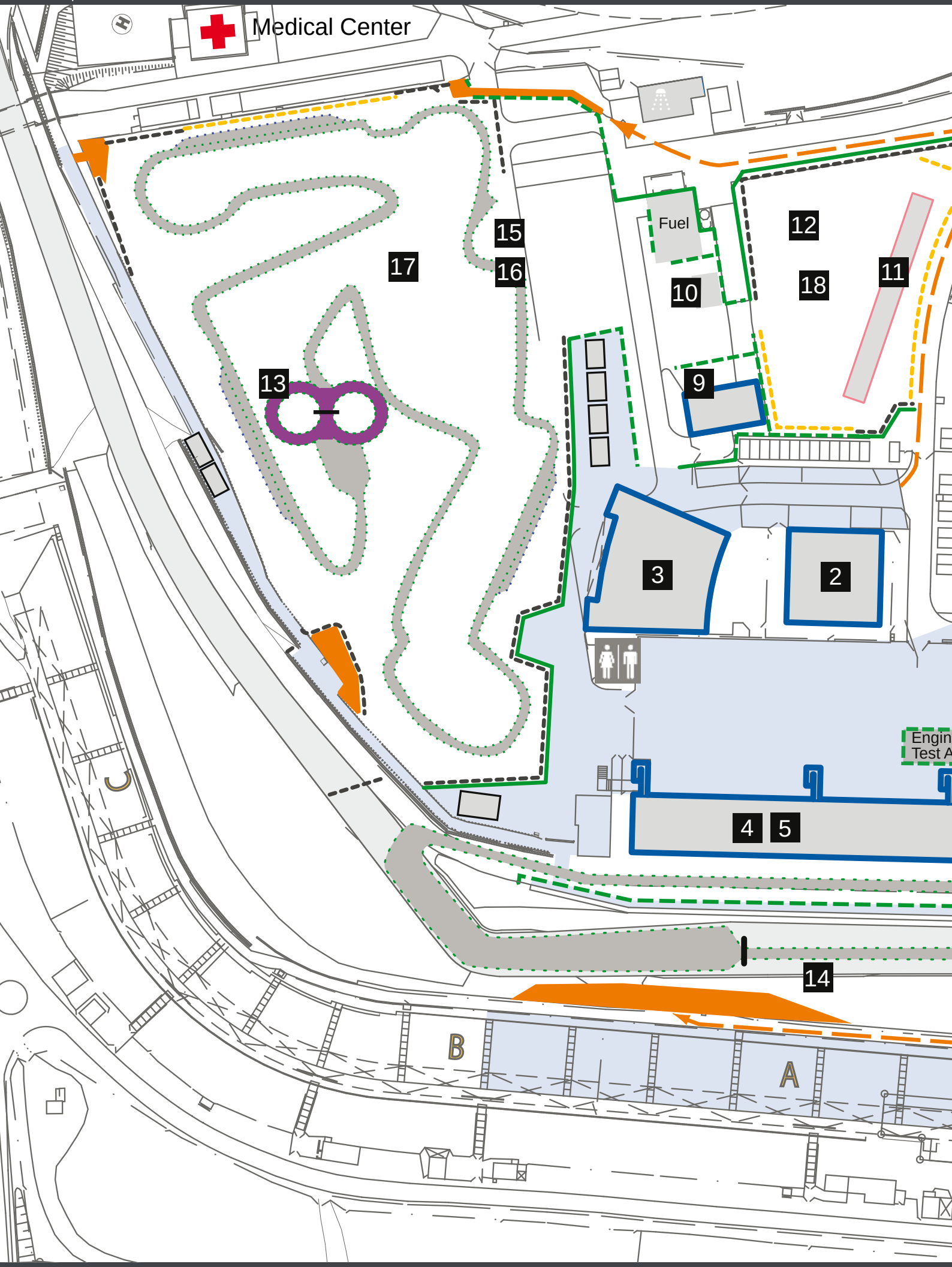
07:00 – 19:00	Ticket Center	1 Ticket Center
07:30 – 08:00	Team Briefing	5 Marquee above pits
08:30 – 13:00	Skid Pad and Acceleration	13 Skid Pad 14 Acceleration
08:30 – 18:00	Test tracks open	18 Test track (8th / 9th of August)
11:30 – 12:30	Press & VIP Reception with guided tour	8 FSG lounge
14:30 – 19:00	Autocross	15 Autocross
20:00 – 22:30	Engineering Design Finals (not public)	3 FSG forum

Sunday, 9th of August 2009

07:00 – 17:00	Ticket Center	1 Ticket Center
07:30 – 08:00	Team Briefing	5 Marquee above pits
08:30 – 18:00	Endurance	16 Endurance
08:30 – 18:00	Test track open	18 Test track (8th / 9th of August)
19:30 – 20:30	Design Review	3 FSG forum
21:00 – 22:00	Awards Ceremony – Part II	5 Marquee above pits
22:00 – 02:00	Party powered by MAHLE	5 Marquee above pits

Guided Tours will be offered from Friday to Sunday starting at the FSG forum. Information is available at the inquiry desk in the FSG forum.

Von Freitag bis Sonntag werden Führungen angeboten. Startpunkt ist das FSG forum. Informationen erhalten Sie am Info-Tresen im FSG forum.


Medical Center
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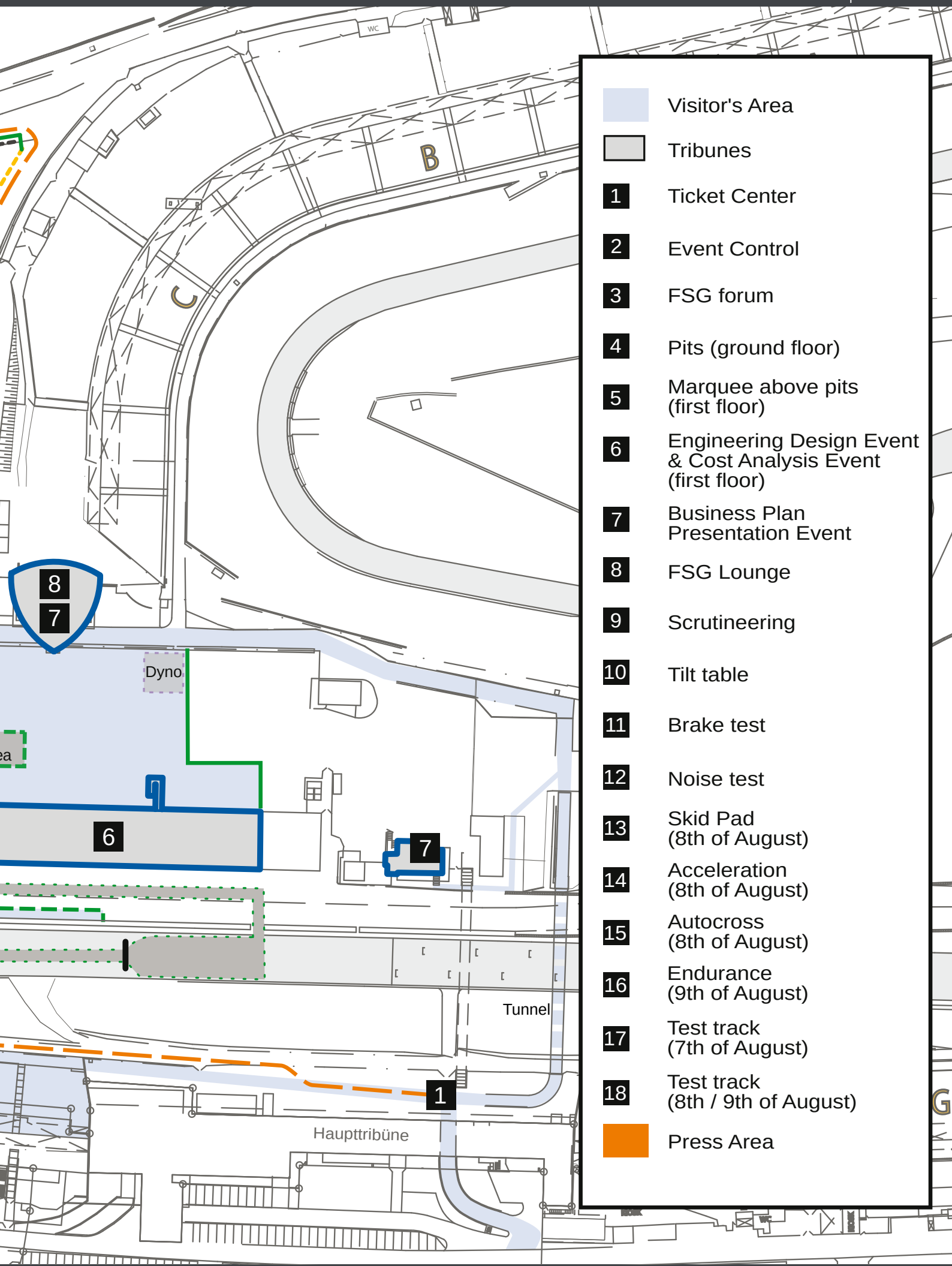


- Visitor's Area
- Tribunes
- 1 Ticket Center
- 2 Event Control
- 3 FSG forum
- 4 Pits (ground floor)
- 5 Marquee above pits (first floor)
- 6 Engineering Design Event & Cost Analysis Event (first floor)
- 7 Business Plan Presentation Event
- 8 FSG Lounge
- 9 Scrutineering
- 10 Tilt table
- 11 Brake test
- 12 Noise test
- 13 Skid Pad (8th of August)
- 14 Acceleration (8th of August)
- 15 Autocross (8th of August)
- 16 Endurance (9th of August)
- 17 Test track (7th of August)
- 18 Test track (8th / 9th of August)
- Press Area

Formula Student Germany Team

Formula Student Germany Team

Tim Hannig

Chairman
Board (Chair)
Steering Committee (Chair)

KION Group GmbH

Ludwig Vollrath

Board (President)
Steering Committee (Member)

VDI Society for Automotive and Traffic Systems Technology

Peter Jakowski

Scoring, Time Keeping
Steering Committee (Member)

2D Debus & Diebold Meßsysteme GmbH

Daniel Ahrens

Event Control (Front Desk)

Aegis Media

Leona Ehrenreich

Registration

Sassenberg Secondary Modern School

Günther Riedl

Dynamics

Stangl & Co. GmbH

Karsten Stammen

Dynamics

KLK Motorsport GmbH

Rainer Kötke

Dynamics
Board (Member)
Steering Committee (Member)

Brunel GmbH

Board

The Board is responsible for the Formula Student Germany and its cooperations as well as for sponsoring, finances and strategy.

Das Board trägt Verantwortung für die Formula Student Germany und ihre Kooperationen sowie für Sponsoring, Finanzen und Strategie.

Barbara Schlögl

Business Plan Presentation Event

CarboTech Composites GmbH

Matthias Brutschin

Event Support

reinisch AG

Wenke Friske

Communications (Marquee above pits)

KAISER+KRAFT Europa GmbH

André Schmidt

Scrutineering

Caterpillar Inc.

Karl Weinreich

Scrutineering

Bosch Engineering GmbH

Daniel Mazur

Chief Executive Event Manager
Board (Member)
Steering Committee (Guest)

mazur | events + media

Frank Röske

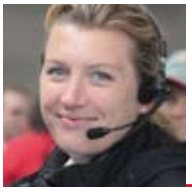
Engineering Design Event, Rules
Board (Member)
Steering Committee (Vice-chair)

Porsche Leipzig GmbH

Robert Fromholz

Cost Analysis Event
Steering Committee (prov. member)

Hönigsberg und Düvel IT Solutions GmbH



Christine Hannig

Communications (Press, Media)
Steering Committee (prov. member)

Ulf Steinfurth

Scrutineering
Steering Committee (Member)

University of Applied Sciences Stralsund

Steering Committee

The Steering Committee stands for the design of the competition and the rules. Each member is responsible for a field, its preparation and realisation.

Das Steering Committee veranwortet Ausgestaltung von Wettbewerb und Reglement. Jedes Mitglied ist für Vorbereitung und Durchführung eines Bereiches verantwortlich.

Matthäus Decker

Communications (Guided Tours)
Event Support

Siemens Transportation Systems GmbH & Co.KG

Daniel Deussen

Dynamics, Scrutineering

Weber Motor GmbH

Konrad Paule

Pit Marshal

Volkswagen Motorsport GmbH

Sven Renkel

Communications (Press)

Verein Deutscher Ingenieure e.V. (VDI)

Tim Schmidt

Event Control (Back Office)

Sebastian Seewaldt

Pit Marshal

University of Stuttgart

Michael Zottler

Engineering Design Event

Operative Team

The Operative Team completes the management team by bearing responsibility for preparations and smooth processes at the event and during the year.

Das Operative Team komplettiert das Management Team, indem es beim Event und übers Jahr Verantwortung für Vorbereitung und reibungslosen Ablauf übernimmt.

Judges 2009

Juroren 2009

Engineering Design Event

Design Judges 2008

Borchardt, Jan	*Caterpillar Motoren GmbH & Co. KG*
Böttcher, Karsten	*Daimler AG*
Brenner, Peter	*ZF Lenksysteme GmbH*
Clarke, Pat	*Hyundai Motor Company Australia*
Crosby, Paul	*Crosby Composites Ltd*
Daman, Paul	*BMW AG*
Daniel, Frank	*Team Rosberg Engineering*
Daniel, Marc	*Volkswagen AG*
Dittrich, Rudolf	*BMW AG*
Dölle, Norbert	*Daimler AG*
Enning, Norbert	*Audi AG*
Erb, Thiemo	*Dr. Ing. h.c. F. Porsche AG*
Esslinger, Hannes	*Daimler AG*
Euler, Magnus	*Bertrandt*
Folie, Lukas	*Toyota Motorsport GmbH*
Fox, Steven	*PowerTrain Technology, Inc.*
Fries, Benedikt	*Audi AG*
Funk , Christian	*Audi AG*
Gesele, Frank	*Audi AG*
Glose, Martin	*Daimler AG*
Goddard, Geoff	
Gould, David	*Gould Engineering*
Grams, Sebastian	*Audi AG*
Hickson, Alex	*INSYS Limited*
Himmler, Florian	*Carbo Tech Composites GmbH*
Höfflin, Florian	*HWA AG*
Hölzgen, André	*euro engineering AG*
Hulatsch, Johannes	*ZF Friedrichshafen AG*
Humler, Paul	*Dr. Ing. h.c. F. Porsche AG*
Huy, Sascha	*euro engineering AG*
Kerber, Michael	*Audi AG*
Kerschner, Alexander	*BMW AG*
Köhnle, Hans	*ZF Lenksysteme GmbH*
Kratzsch, Matthias	*IAV GmbH*
Krüger, Jan	*Daimler AG*
Krüger, Markus	*Caterpillar Motoren GmbH & Co. KG*
Kube, Oliver	*Kube GmbH Ingenieurbüro*
Maas, Gerhard	*IAV GmbH*
McLean, Brain	*BMW AG*
Meier, Thomas	*Dr. Ing. h.c. F. Porsche AG*
Missler, Christian	*Continental Automotive Systems Division*
Mitas, Stephen	*BMW Sauber AG*
Neidlein, Daniel	*Audi AG*
Neumann, Bernd	*IAV GmbH*
Nizzola, Corrado	*Daimler AG*
Nowicki, Daniel	*BMW AG*
Pälmer, Oliver	*Daimler AG*
Redszus, David	*Precision AutoResearch*
Reimann, Wolfgang	*IAV GmbH*
Riefstahl, Dominique	*BMW Sauber AG*
Rieke, Johannes	*TU Braunschweig*
Risch, Hendrik	*Audi AG*
Rouelle, Claude	*Optimum G*
Sander, Udo	*Tognum AG*
Schiberna, Peter	*Audi AG*
Schmidt, Ralf	*BMW Motorrad*
Schnaufer, Thomas	*BMW GmbH*
Schulz, Achim	*Dr. Ing. h.c. F. Porsche AG*
Seidler, Jürgen	*XENTiS Composite*
Speidel, Gerd	*ZF Friedrichshafen AG*
Stange, Michael	*ThyssenKrupp Presta AG*
Strycek, Volker	*Adam Opel GmbH*
Sturm, Michael	*Helmut-Schmidt-Universität Hamburg*
Underberg, Victor	*Audi AG*
Weiss, Johannes	*Daimler AG*
Wenkel, Mathias	*Dolmar GmbH*
Wunschheim, Lukas	*euro engineering AG*
Zanetti, Igor	*GM Powertrain Europe*

Obituary on Allan Staniforth

Our friend and mentor Allan Staniforth passed away peacefully on May 2nd after a short illness. He was 85 years of age and still driving competetively in Hillclimbs and Sprints. He was revered by students all over the world through his involvement in Formula Student and Formula SAE. He was a special friend of FSG and attended the event from its beginnings in 2006 as a design judge. We wish our friend and mentor Allan Staniforth a heartfelt "Thank you and Rest in Peace".

Nachruf auf Allan Staniforth

Unser Freund und Mentor Allan Staniforth starb am 2. Mai 2009 nach kurzer Krankheit. Er war 85 Jahre alt und fuhr noch zuletzt Rennen Hillclimbs and Sprints. Er wurde von Studenten auf der ganzen Welt aufgrund seines Engagements bei Formula Student und Formula SAE verehrt. Er war ein besonderer Freund der Formula Student Germany und nahm seit den Anfängen 2006 als Design Juror am Event teil. Wir sagen unserem Freund und Mentor Allan Staniforth von Herzen "Danke und ruhe in Frieden".

Cost Analysis Event


Cost Judges 2008

Ankert, Detlef	*Kautex Textron GmbH & Co. KG*
Brendel, Sebastian	*Daimler AG*
Gensitz, Johannes	*D.O.K. GmbH*
Grundner, Harald	*InnoVAVE*
Hagl, Markus	*BMW Group*
Herth, Martin	*Continental AG*
Lobeck, Anneke	*Daimler AG*
Maier, Matthias	*Festo AG & Co. KG*
Metz, Simon	*Continental AG*
Möll, Winfried	*Continental AG*
Morel, Romain	*Continental Mechanical Components Germany GmbH*
Pälmer, Reinhard	*rp-plastics consulting services GmbH*
Sachse, Mick	*Donnersbergschmiede*
Scharff, Robert	*Daimler AG*
Schmidt, Timo	*LuK GmbH & Co. oHG*
Schnabel, Matthias	*D.O.K. GmbH*
Schoon, Jürgen	*TEC ´n ECO Consulting*
Steinmeier, Frank	*Continental AG*
Timm, Martin	*Faurecia Autositze GmbH*
Unger, Herbert	
Walzer, Regina	*Continental AG*
Werner, Sebastian	*Festo AG & Co. KG*
Wigger, Tobias	*Universität Siegen*
Wörz, Wolf	*Daimler AG*

Business Plan Presentation Event


Business Plan Presentation Judges 2008

Apking, Jan	*Price Waterhouse Coopers*
Bienert, Margo	*FH Nürnberg*
Bjekovic, Robert	*Daimler AG*
Bonk, Volker	*KION GROUP GmbH*
Dorfner, Barbara	*Daimler AG*
Esser, Klaus	*Kautex Textron*
Frank, Detlev	*BMW Group*
Gampfer, Michael	
Hannig, Peer	*DWP Bank*
Heinrich, Olaf	*DekaBank*
Herke, Sebastian	*BMW AG*
Herrmann, Jesko	*Bertrandt*
Hiltrop, Lena	*Siemens*
Hoyer, Helmut	*Ford*
Junger, Michael	*Consulting4Drive*
Käfer, Timo	*Togum*
Krüger, Jan	*Daimler AG*
Lange, Stefan	*Accenture GmbH*
Mende, Ulrich	*Mende Advisory Service*
Müller, Andreas	*Kautex Textron*
Nottbrock, Claus	*Yazaki*
Oswald, Björn	*Oswald Solutions LLC*
Piehler, Christian	*Deutsches Zentrum für Luft- und Raumfahrt*
Richter, Ralf	*IAV GmbH*
Senftleben, Daniela	*VDI*
Studener, Dieter	*Kautex Textron*
Tabatabai, Stefan	*Porsche Consulting*

Good reasons for supporting Formula Student Germany

Gute Gründe zur Unterstützung der Formula Student Germany

Audi

Michael Groß

Head of Personnel Marketing

AUDI AG

Audi stands for sporty cars, high-quality craftsmanship and progressive design – for „Vorsprung durch Technik“. Strong innovation skills are one of the reasons why the company is successful. We are therefore particularly keen to help creative, innovative and committed students to take part in the Formula Student project.

The teams that enter the Formula Student competition have already put in a great deal of work and effort – and have experienced success as well as suffering setbacks. It is obvious that everyone involved is enthusiastic about the cars and has „petrol in his veins“. Impressive technical know-how, team spirit and commitment are other outstanding features of the teams.

It is exactly these characteristics that we would like our staff to have. And anyone who succeeds in applying our brand values – sporty performance, progressive design and high quality – on the racing track is just what we are looking for at Audi.

Audi steht für sportliche Fahrzeuge, hochwertige Verarbeitung und progressives Design – für „Vorsprung durch Technik“. Die hohe Innovationskraft ist einer der Erfolgsfaktoren des Unternehmens. Daher freuen wir uns besonders, im Rahmen des Projekts Formula Student kreative, innovative und engagierte Nachwuchskräfte zu unterstützen.

Die Teams, die bei der Formula Student starten, haben einen langen Weg mit viel Arbeit, Leidenschaft, Etappenerfolgen – aber auch Rückschlägen hinter sich. Man spürt bei jedem einzelnen förmlich die Begeisterung für die Fahrzeuge und ihr „Benzin im Blut“. Darüber hinaus können die Teams mit ihrem Fachwissen, ihrem Teamgeist und ihrem Engagement überzeugen.

Genau diese Eigenschaften wünschen wir uns von unseren Mitarbeitern. Und wer es schafft, unsere Markenwerte – Sportlichkeit, Progressivität und Hochwertigkeit – auf die Rennstrecke zu bringen, passt auch gut zu Audi.

Martina Eissing

Head of HR Marketing International and Recruiting

BMW Group

It is with great pleasure that the BMW Group supports initiatives such as Formula Student which combine acquired theory with practical experience in an exemplary manner. The acquisition of skills and key expertise such as interdisciplinary thinking, problem-solving and business knowledge is realized in an exemplary fashion in this competition.

We are only too familiar with these requirements of teams from our own company. We therefore welcome applications from qualified Formula Student participants both from Germany and abroad for practical internships as well as job vacancies. We are looking for enthusiastic young engineers in various departments such as research and development who, like our own staff, enjoy being involved in innovative projects at the very highest level.

Mit großer Freude unterstützt die BMW Group die Formula Student Initiative, da sie Studenten auf einzigartige Weise die Möglichkeit gibt, theoretisches Wissen mit gelebter Praxis zu verbinden. Hier, in der praktischen Anwendung, werden mit Begeisterung Fähigkeiten und Schlüsselkompetenzen wie z.B. fächerübergreifendes Denken, Problemlösefähigkeit oder wirtschaftliche Kenntnisse erlernt und erweitert.

Diese Anforderungen an Teams kennen wir in der BMW Group nur zu gut. Daher freuen wir uns, wenn sich qualifizierte Teilnehmer aus dem In- und Ausland bei uns für Praxiseinsätze oder auf offene Stellen bewerben. Verschiedene Bereiche wie z. B. die Forschung und Entwicklung suchen begeisterte Nachwuchsingenieure, die genauso wie unsere Mitarbeiter Spaß daran haben, auf höchstem Niveau an innovativen Themen mitzuwirken.

BoschEngineering

BOSCH

Bernhard Bihr

President

Bosch Engineering GmbH

As an innovative engineering service provider we at Bosch Engineering GmbH implement complex development tasks for international vehicle and engine manufacturers worldwide.

Thus we know the importance of young talents with fresh ideas and extraordinary engagement for future mobility.

Formula Student gives students the chance to prove their abilities in different categories and cope with interdisciplinary challenges in a team. For these reasons we support the Formula Student.

Furthermore the Formula Student is a great opportunity to get in contact with highly motivated and well educated students.

We are looking forward to an exciting competition and wish all teams good luck!

Als innovatives Ingenieurdienstleistungsunternehmen realisieren wir von der Bosch Engineering GmbH komplexe Entwicklungsaufgaben für Fahrzeug- und Motorenhersteller im In- und Ausland. Daher wissen wir, wie wichtig junge Talente mit frischen Ideen und außerordentlichem Engagement für die Zukunft der Mobilität sind.

Formula Student bietet Studenten die Chance, ihre Fähigkeiten in verschiedenen Kategorien unter Beweis zu stellen und interdisziplinäre Herausforderungen im Team zu meistern. Dies zu unterstützen ist uns ein großes Anliegen.

Für uns ist die Formula Student zudem eine sehr gute Möglichkeit, mit hochmotivierten und qualifizierten Studenten ins Gespräch zu kommen.

Wir freuen uns auf einen spannenden Wettbewerb und wünschen allen Teams viel Glück!

Brunel

Dr. Ralf Napiwotzki

General Manager

Brunel GmbH

The Formula Student Germany offers young, enthusiastic engineers an excellent platform to present their extraordinary knowledge and engagement. In this construction competition students gain practical experiences and have to solve complex tasks as a team taking economic aspects into account. Brunel specialists work out detailed solutions in the same way based on our customer requirements. For our technologically sophisticated and exciting projects we are looking for engineers, who share our passion for challenges. Brunel offers qualified engineers and developers challenging tasks with prospects and several opportunities for their professional and personal future. As part of the FSG Brunel would like to introduce itself as an attractive employer and to get in contact with individual participants.

Die Formula Student Germany bietet jungen, engagierten Nachwuchsingenieuren eine exzellente Plattform, ihr außergewöhnliches Fachwissen und Engagement zu zeigen. Die Studenten sammeln bei diesem Konstruktionswettbewerb praktische Erfahrungen und müssen in Teamarbeit komplexe Aufgaben unter betriebswirtschaftlichen Maßgaben lösen. Die Spezialisten von Brunel erarbeiten exakt nach diesem System skalierte Lösungen auf Basis der vom Kunden gestellten Anforderungen. Für unsere technologisch anspruchsvollen Projekte suchen wir Ingenieure, die unsere Leidenschaft für Herausforderungen teilen. Brunel bietet qualifizierten Ingenieuren und Entwicklern ein spannendes Aufgabenfeld mit Perspektiven und breitem Raum für die eigene berufliche und persönliche Entwicklung. Im Rahmen der FSG möchte sich Brunel als attraktiver Arbeitgeber vorstellen und mit den einzelnen Teilnehmern ins Gespräch kommen.

Continental

Sehnaz Özden

Global Head of Corporate Employer Branding & Recruiting

Continental AG

We are aware that the future of cars depends largely on operation ability and the capability of innovation from the future generations of engineers. As a supplier of brake systems, systems and components for the powertrain and chassis, instrumentation, infotainment solutions, vehicle electronics, tires and technical elastomers, the corporation contributes towards enhanced driving safety and protection of the global climate.

Formula Student offers the participants the possibility to prove their interdisciplinary abilities. During the development of a single-seat formula racing car the new generation engineers can gain knowledge in construction as well as in economic management. Furthermore such a large international project also shapes the factors of social competence, which we are looking for among all of our newcomers.

We are proud of the worldwide success achieved by the teams under the sponsorship of Continental and look forward to the further cooperation with the engineer elite of tomorrow.

Good Luck for Hockenheim!

Uns ist bewusst, dass die Zukunft des Automobils sehr stark von der Einsatzbereitschaft und Innovationsfähigkeit der kommenden Ingenieurgenerationen abhängt. Als Anbieter von Bremssystemen, Systemen und Komponenten für Antrieb und Fahrwerk, Instrumentierung, Infotainment-Lösungen, Fahrzeugelektronik, Reifen und technischen Elastomerprodukten trägt die Continental AG zu mehr Fahrsicherheit und zum Klimaschutz bei.

Formula Student bietet den Teilnehmern die Möglichkeit, ihre interdisziplinären Fähigkeiten unter Beweis zu stellen. Die Nachwuchsingenieure eignen sich beim Bau eines einsitzigen Formelrennwagens sowohl Kenntnisse in Konstruktion als auch in Betriebswirtschaft an. Zudem schärft ein derartiges internationales Großprojekt die Sozialkompetenzfaktoren, die wir bei allen unseren Einsteigern suchen.

Wir sind daher stolz auf die weltweiten Erfolge der von Continental geförderten Teams und freuen uns auf die weitere Zusammenarbeit mit der Ingenieurelite von Morgen.

Viel Glück für Hockenheim!

DAIMLER

Martina Recha

HR Marketing, Global Talent Acquisition and Development

Daimler AG

Enthusiasm and passion for innovation and technology are the driving force of the Automotive Industry.

This eagerness is felt among the participants that show enormous engagement and endurance when working on their racing cars. Excellent knowledge of their field of activity, the comprehension of complex dependences and team work are decisive qualities shown in this competition. This exactly matches our requirements of gaining qualified junior staff.

With our engagement we wish to make a contribution to bring forward the innovation force and enhance the passion of young talents for the Automotive Industry. At the Formula Student event we are looking forward to interesting discussions with the participants in order to show them the possibilities of starting their career with Daimler.

We wish all participants a huge amount of energy and a successful event!

Begeisterung und Leidenschaft für Innovationen und Technik sind der Motor der Automobilindustrie. Diesen Enthusiasmus spüren wir bei den Teilnehmern, die mit viel Engagement und Ausdauer an ihren Rennwagen arbeiten. Exzellentes Fachwissen, das Erfassen komplexer Zusammenhänge und Teamwork sind entscheidende Qualitäten, die bei diesem Wettbewerb unter Beweis gestellt werden. Diese entsprechen genau unseren Anforderungen bei der Gewinnung qualifizierter Nachwuchskräfte.

Wir möchten mit unserem Engagement einen Beitrag dazu leisten, die Innovationskraft der jungen Talente und ihre Begeisterung für die Automobilindustrie zu fördern. Bei dem Formula Student Event freuen wir uns auf interessante Gespräche mit den Teilnehmern, um ihnen Möglichkeiten zum beruflichen Einstieg bei Daimler aufzuzeigen.

Wir wünschen den Teilnehmern eine ganze Ladung Energie und eine erfolgreiche Veranstaltung!

DEKRA supports Formula Student Germany from the outset as the technical partner. Our engineers have well grounded know how and expertise in professional motor racing, for example as technical supervisors in the German Touring Car Masters (DTM) championship.

In 2009 again the structure of all vehicles has been proven at the DEKRA Technology Centre regarding safety in rollover, side and frontal impacts. Approx. two dozen teams brought the frontal crash attenuators of their bolides for testing directly to the DEKRA Technology Center. This way Formula Student provides the students the opportunity to make their first personal contacts with DEKRA.

As Europe's largest organisation of technical experts, DEKRA is constantly on the lookout for highly motivated employees who have a high level of knowledge, teamwork skills and initiative - and, as we say in Germany, “who have petrol in the veins”.

Clemens Klinke

Chairman of the board of management

DEKRA Automobil GmbH

DEKRA unterstützt die Formula Student Germany seit ihrem Beginn als technischer Partner. Unsere Ingenieure verfügen über umfangreiches Know-how und Erfahrungen im professionellen Rennsport, unter anderem als Technische Kommissare der Deutschen Tourenwagen Masters (DTM).

Das DEKRA Technology Center hat auch im Jahr 2009 alle Fahrzeugstrukturen im Hinblick auf die Sicherheit beim Fahrzeugüberschlag, beim Seitenanprall und beim Frontalanprall überprüft. Rund zwei Dutzend Teams ließen die energieabsorbierenden Frontalaufprallstrukturen ihrer Boliden direkt im DEKRA Technology Center testen. So bietet die Formula Student den Studierenden die Möglichkeit, erste persönliche Kontakte zu DEKRA zu knüpfen.

Als Europas größte Sachverständigen-Organisation ist DEKRA ständig auf der Suche nach motivierten Mitarbeitern mit hohem Wissensstand, Teamfähigkeit und Eigeninitiative, die "Benzin im Blut" haben.

Overall in the world, Henkel shows big engagement in motorsport. Henkel has been a sponsor of this competition for several years and provides products and trains Formula Student teams. Last year, there were 28. In the first quarter of this year, there have already been 14 – a growing number. “Each year, approx. 1,600 to 1,800 students leave their schools heading for industries.” Understanding the degree to which modern adhesive technologies today are superior to conventional joining technologies and in what different areas they can ideally be used will be useful to tomorrow’s engineers in their future work. For us, this support represents a classic promotion of young talents. Henkel is a leader with brands and technologies that make people´s life easier, better and more beautiful. ”Henkel – a brand like a friend”

Jörg von Ameln

Business Director General Industry Germany/ Swiss Adhesive Technologies

Henkel AG & Co. KGAa

Überall auf der Welt zeigt Henkel großes Engagement im Motorsport. Seit Jahren schon beteiligt sich Henkel an diesem Wettbewerb als Sponsor, stellt Produkte zur Verfügung und schult die Formula-Student-Teams. Im vergangenen Jahr waren es 28, im ersten Quartal dieses Jahres bereits 14 – Tendenz weiter steigend. „Jedes Jahr verlassen etwa 1.600 bis 1.800 Studenten ihre Hochschulen in Richtung Industrie“. Zu wissen, in welch hohem Maße moderne Klebtechnologien heute konventionellen Fügetechnologien überlegen sind, und in welchen unterschiedlichen Bereichen sie sich idealerweise einsetzen lassen, wird den Ingenieuren von morgen in ihrer späteren Arbeit nützlich sein. Für uns ist diese Unterstützung eine klassische Nachwuchsförderung. Henkel ist führend mit Marken und Technologien, die das Leben der Menschen leichter, besser und schöner machen. “Henkel – a brand like a friend“

Christian Willenberg

Public Relations

IAV GmbH

With over 3,000 members of staff, IAV is one of the world's leading providers of engineering services to the automotive industry. The company can look back on 25 years of experience in developing innovative concepts and technologies for future vehicle generations. Core competencies include perfected, production-ready solutions in all fields of powertrain, electronics and vehicle development.

IAV supports Formula Student and individual teams to produce interest to take part in the engineering departments of the company. To name one example from the motorsport segment: IAV was involved in developing a 2-liter four-cylinder high-speed engine for mass production. Powered by this engine, the BMW 320si went into mass production as the base vehicle for touring-car racing. For further information about IAV, go to www.iav.com and our careers portal at www.iav-inside.com.

Die IAV ist mit über 3.000 Mitarbeitern weltweit einer der führenden Engineering-Partner der Automobilindustrie. Das Unternehmen entwickelt seit 25 Jahren innovative Konzepte und Technologien für zukünftige Fahrzeuggenerationen. Zu den Kernkompetenzen gehören perfekte, serientaugliche Lösungen in allen Bereichen der Antriebsstrang-, Elektronik-, und Fahrzeugentwicklung.

Die IAV unterstützt Formula Student und einzelne Teams – auch um das Interesse an einer Mitwirkung in den Fachabteilungen zu erwecken. Um ein Beispiel aus dem Bereich Motorsport zu nennen: Die IAV war bei der Serienentwicklung eines 2-Liter-Vierzylinder-Hochdrehzahlmotors beteiligt. Als Grundlage für den Tourenwagensport ging der BMW 320si mit diesem Motor in Serie. Weitere Infos zur IAV erhalten Sie über www.iav.com und unser Karriereportal www.iav-inside.com.

Christina Schulte

Head of Management and Organization Development / HR Marketing

MAHLE International GmbH

The MAHLE Group is among the top 30 automotive suppliers globally and is the world market leader for combustion engine components, systems and peripherals. MAHLE employs approximately 45,000 employees in over 100 production plants and eight research and development centers. In 2008, MAHLE generated sales in excess of EUR 5 billion (USD 7.3 billion).

For aspiring development engineers, Formula Student is a doorway to a fascinating world of opportunity – to realise a childhood dream. As our company has enjoyed close ties to motor sport since the early days, we support the racing series through close cooperation with a variety of universities. Not only do we have our own special motor – developed specifically for Formula Student – we also have what it takes to translate expertise into practice. And every now and again we stumble across budding engineers who are so captivated by our own products, they can't get enough of them – much to our delight.

Der MAHLE Konzern zählt zu den 30 größten Automobilzulieferern und ist der weltweit führende Hersteller von Komponenten und Systemen für den Verbrennungsmotor und dessen Peripherie. MAHLE beschäftigt rund 45.000 Mitarbeiter an über 100 Produktionsstandorten und in acht Forschungs- und Entwicklungszentren. 2008 erzielte MAHLE einen Umsatz von über 5 Mrd. EUR (7,3 Mrd. USD).

Die Formula Student ist für künftige Entwickler eine der faszinierenden Möglichkeiten, ihre Träume zu realisieren. Als ein von Anfang an dem Motorsport verbundenes Unternehmen unterstützen wir diese Rennserie durch eine intensive Kooperation mit mehreren Hochschulen, mit einem eigens für die Formula Student entwickelten Motor und umfangreichen Know-how-Transfer. Und wenn der eine oder andere Ingenieur nach dem ersten Kontakt mit unseren Produkten Lust auf mehr MAHLE hat – dann freut uns das natürlich ganz besonders.

Joe Willkie

Education Business Manager Europe

SolidWorks

We at SolidWorks are proud that so many of the teams have accepted our sponsorship and shared with us examples of how they used our software to develop their ideas faster and optimize their designs using analysis tools.

We see a tremendous demand for skilled designers and engineers who can develop solutions that achieve a balance among performance requirements, cost and environmental impact, while working well in teams and meeting deadlines. Formula Student Germany is important, because through participation in this event, students develop all of these skills and thus prepare themselves for successful careers.

We are always impressed with the talent, work ethic and sportsmanship of the teams. We would like to welcome all teams to learn more about SolidWorks and our SAE International sponsorships for next year.

Wir von SolidWorks sind sehr stolz, dass so viele Teams unsere Patenschaft angenommen haben und mit unserer Software ihre Ideen schneller umsetzen und ihre Konstruktionen mit den Analysewerkzeugen optimieren.

Wir sehen großen Bedarf an ausgebildeten Konstrukteuren und Ingenieuren, die Lösungen entwickeln, um ein Gleichgewicht zwischen Leistungsanforderungen, Kosten und Umweltverträglichkeit zu erreichen, während sie gleichzeitig gute Teamplayer sind und Abgabetermine einhalten. Die Formula Student Germany ist dabei sehr wichtig, weil Studenten hier diese Fähigkeiten entwickeln und sich so auf eine erfolgreiche Karriere vorbereiten.

Vom Talent, von der Arbeitsmoral und dem sportlichen Verhalten der Teams sind wir immer wieder beeindruckt. Wir heißen alle Teams herzlich willkommen, die mehr über SolidWorks und unsere „SAE International Sponsorships“ im kommenden Jahr erfahren möchten.

Matthias Jobmann

Vice President Human Resources

Tognum AG

A thirst for knowledge and an ardor for technology – that is what still drives us at Tognum in the year of our core company MTU’s 100th anniversary. And we see one central passion linking the participants of the present-day Formula Student Germany to our own founding fathers: the ambition to never cling to established convictions and always set the next technological benchmark.

It is for this reason that we take special pride and pleasure in facilitating once again the Formula Student event at the Hockenheim race circuit. No less than six teams, among them the official world champions from Stuttgart, Germany, are supported by Tognum this season. We are glad that within the framework of the Formula Student, we get to meet aspiring personalities sharing our passion for fascinating ideas and technology. This experience encourages us to keep investing in the support and development of young academics from the fields of engineering and business studies, inviting them to move the world with Tognum.

Neugier und Technikbegeisterung – das treibt uns bei Tognum auch 100 Jahre nach Entstehen unseres Ursprungsunternehmens MTU Friedrichshafen an. Eine zentrale Leidenschaft ist es, welche die Teilnehmer der Formula Student Germany in unseren Augen mit den damaligen Gründervätern verbindet: der Ehrgeiz, nie auf Bewährtem zu verharren und stets neue Technologie-Maßstäbe zu setzen.

Auch aus diesem Grund ist es uns eine Ehre, als Sponsor die Ausrichtung des FSG-Events am Hockenheimring zu ermöglichen. Insgesamt sechs Teams, darunter die amtierenden Weltmeister aus Stuttgart, unterstützen wir in dieser Saison. Wir freuen uns, dass wir im Rahmen der Formula Student auf ambitionierte Persönlichkeiten treffen, die unsere Leidenschaft für faszinierende Ideen und Technik teilen. Die Erfahrung bestärkt uns darin, auch künftig in die Förderung talentierter Nachwuchskräfte zu investieren. Willkommen bei Tognum – bewegen auch Sie mit uns die Welt!

Dr. Kord Lühr

Volkswagen Group Research, Vehicle Projects

Volkswagen AG

Developing mobility and technology means to couple theory and practise elements within given regulations with passion and innovative ideas and persist in a hard competition.

Volkswagen supports these activities because Formula Student combines these needs optimally for enthusiastic and passionate students. Key qualifications for a successful work in vehicle concepts and technical implementation of concepts are put across in a perfect learning environment where team work is as much part of the system as outstanding knowledge of each individual.

We are looking foreward to fascinating ideas, fascinating races and interesting discussions with the racing students. Maybe we can even welcome new colleagues.

We wish all participants great success and a lot of new inspirations and knowledge.

Mobilität und Technik zu entwickeln heißt Theorie und Praxis innerhalb eines bestehenden Reglements, mit Erfindergeist und Leidenschaft in fahrende Produkte zu bringen, und damit im Wettbewerb zu bestehen.

Volkswagen unterstützt diese Aktivitäten, weil Formula Student diese Anforderungen für äußerst engagierte Studenten auf ideale Weise verbindet. Für uns werden dabei die Schlüsselqualifikationen für eine erfolgreiche Arbeit an Mobilitätskonzepten und deren technischer Umsetzung in einer idealen Lernumgebung vermittelt.

Wir freuen uns auf spannende Entwicklungen, spannende Rennen und spannende Diskussionen mit den teilnehmenden Studenten. Vielleicht sogar auf den einen oder anderen neuen Kollegen.

Wir wünschen allen Teilnehmern viel Erfolg und viel neues Know-How.

Dr. Hans-Jörg Domian

Senior Manager Advanced Engineering Innovative Chassis and Driveline

ZF Friedrichshafen AG

As a leading worldwide automotive supplier for Driveline and Chassis Technology, ZF is permanently looking for highly qualified, creative and motivated junior staff. Team players with organizational skills as well as well-founded knowledge in project management and cost optimization are just what we need. It is exactly these key qualifications that can be found with the teams of Formula Student. For us, the event provides the ideal platform to engage in a dialog with the students and get them enthusiastic about our company and our products. The design engineering contest here in Hockenheim, is a kind of 'playground' for young engineers that have skills and qualifications going way beyond functional engineering training. Like no other student project, "Formula Student" sets an example in promoting young engineering talents – a target group that we urgently need as an innovation driver.

ZF als ein weltweit führender Automobilzulieferkonzern in der Antriebs- und Fahrwerktechnik ist permanent auf der Suche nach qualifizierten, kreativen und motivierten Nachwuchskräften. Gefragt sind Fähigkeiten wie Teamfähigkeit, Organisationstalent und solide Kenntnisse in Projektmanagement und Kostenoptimierung. Genau diese Schlüsselqualifikationen finden wir bei den Teams von „Formula Student“. Die Veranstaltung bietet uns eine ideale Plattform, um den Dialog mit Studierenden zu eröffnen und sie für unser Unternehmen und unsere Produkte zu begeistern. Der Konstruktionswettbewerb hier in Hockenheim ist ein Tummelplatz junger Menschen, die über Fähigkeiten verfügen, die weit über die fachbezogene Ingenieursausbildung hinausgehen. Wie kaum ein anderes studentisches Projekt fördert Formula Student den ingenieurwissenschaftlichen Nachwuchs – eine Zielgruppe, die wir als Innovationstreiber so dringend benötigen.

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10 years Formula Student in Germany

Once upon a time there was a small town near the Baltic Sea in Germany when some students and a professor heard about some students building race cars on an island. "Great idea!", they thought, "why shouldn't we make the same thing?!" This was – 10 years ago – the first step in Germany for Formula Student. What began with one competing team, today is a competition with 78 teams from all over the world.

Let us use 10 years Formula Student in Germany as an occasion for a brief review in some milestones of the history of the students' design competition in Germany.

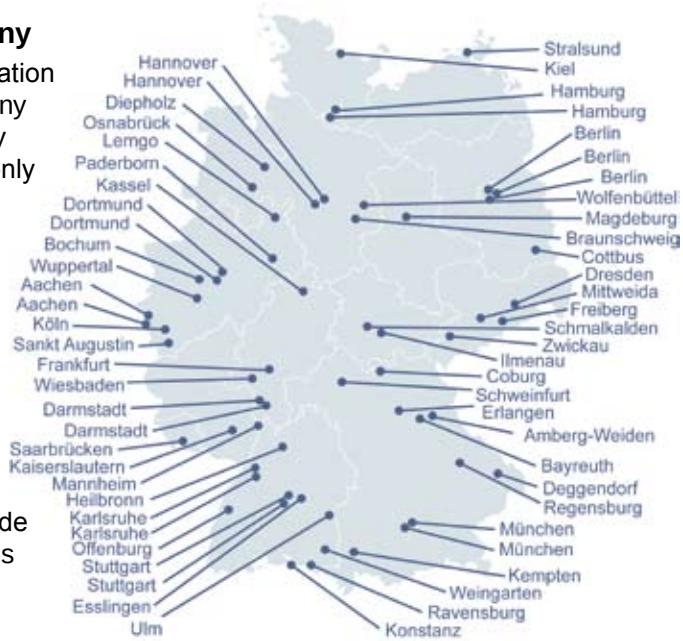
The first German Formula Student team

Frank Röske, first German team captain, remembers:

"15 people, no clue, 10 months time, no money but – ONE vision! These 5 facts describe our situation in September 1999 very well. The following 10 months we developed significant skills in convincing other people, designing and building parts, organizing money and – being creative whenever we failed using the other skills mentioned. And in the end: We were 1 team, had a kind of a clue, a lot of key skills, but still no money. And we built ONE car – the TY 2000, the first German FS car ever. 10 years later most of us have forgotten the results (15th, by the way), but these times welded us together – to one team, to friends."

Teams in Germany

After the first foundation of a team in Germany others followed only slowly: Until 2005 only 7 teams existed in Germany. The first competition in Germany in 2006 finally made the development unstoppable. Today students at 61 German universities are designing a race car. Worldwide the number of teams has reached more than 500.



Es war einmal eine kleine Stadt an der Ostsee in Deutschland, als ein paar Studenten und ein Professor von Studenten hörten, die auf einer Insel Rennautos bauen. "Tolle Idee!", dachten sie sich, "wieso sollten wir eigentlich nicht auch das Gleiche tun?!" Das war – 10 Jahre zuvor – der erste Schritt der Formula Student in Deutschland. Was mit einem teilnehmenden Team begann, ist heute ein Wettbewerb mit 78 Teams aus der ganzen Welt.

10 Jahre Formula Student in Deutschland nehmen wir zum Anlass für einen kleinen Rückblick auf ein paar Meilensteine der Geschichte des studentischen Konstruktionswettbewerbs in Deutschland.

Das erste deutsche Formula Student Team – Frank Röske, erster deutscher Team Captain, erinnert sich:

"15 Leute, keinen blassen Schimmer, 10 Monate Zeit, kein Geld, aber – EINE Vision! Diese 5 Dinge beschreiben ganz gut unsere Situation im September 1999. Die folgenden 10 Monate entwickelten wir wichtige Fähigkeiten wie andere Leute überzeugen, Teile entwickeln und bauen, Geld organisieren und – kreativ sein, wann immer eine der anderen Fähigkeiten nicht half. Und am Ende: Wir waren 1 Team, hatten eine grobe Ahnung, eine Menge wichtiger Fertigkeiten erlernt, aber immer noch kein Geld. Und wir bauten EIN Auto – den TY 2000, den ersten deutschen FS-Rennwagen. 10 Jahre später haben die meisten von uns die Ergebnisse vergessen (15. Platz übrigens), aber diese Zeiten schweißten uns zusammen – zu einem Team, zu Freunden."

Teams in Deutschland

Auf die erste Teamgründung in Deutschland folgten weitere erst langsam: Bis 2005 gab es gerade einmal 7 Teams in Deutschland. Mit dem ersten Wettbewerb in Deutschland 2006 war die Entwicklung schließlich unaufhaltsam. Heute bauen Studenten an 61 deutschen Hochschulen ihre eigenen Rennwagen. Weltweit gibt es heute über 500 Teams.

Formula Student Germany – competition in the automobile nation Germany

Since 2006 the Verein Deutscher Ingenieure (VDI) is holding the Formula Student Germany competition. Students from all over the world will meet every August for five days at Hockenheim to measure their designs and performance with each other in a Formula 1 atmosphere and to demonstrate their capabilities to industry.

After first concrete discussions of the idea to found a competition in Germany the basis was created in England 2005. In the pub "The Plough" seven students and a representative of the VDI founded the Formula Student Germany Steering Committee and agreed upon some basic principles. The foundation is recorded on beer mat and has been countersigned by the founder members. The principles agreed are still effective today, as – to mention only a few – to be neutral, international and to compete only with class 1 cars (in race condition).

Formula Student Germany – Wettbewerb in der Automobilnation Deutschland

Seit 2006 richtet der Verein Deutscher Ingenieure (VDI) die Formula Student Germany aus. Jedes Jahr im Spätsommer treffen sich seitdem Studenten aus aller Welt für fünf Tage am Hockenheimring, um in Formel 1-Atmosphäre ihre Konstruktionen miteinander zu messen und der Industrie ihr Können zu beweisen.

Nach ersten konkreten Überlegungen und Gesprächen zur Gründung eines Wettbewerbs in Deutschland wurde der Grundstein hierfür schließlich 2005 in England gelegt. Im Pub "The Plough" gründeten sieben Studenten und ein Vertreter des VDI das Formula Student Germany Steering Committee und verabredeten erste Grundsätze für einen Wettbewerb in Deutschland. Die Gründung wurde auf einem Bierdeckel dokumentiert und von den Gründungsmitgliedern gegengezeichnet. Die vereinbarten Grundsätze gelten noch heute, dazu gehören – um nur einige zu nennen – Neutralität, Internationalität und die Austragung nur in Class 1 (fahrfertige Fahrzeuge).

The first Formula Student Germany winner

Barbara Schlögl, team captain of TU Graz in 2006, remembers:

"TUG Racing Team – Winner over all at FSG 2006 – first we couldn't believe it! After the 1st Acceleration run the gear box of our Tankia2006 broke, so we were extremely dissappointed. But we didn't give up, we changed the gear box of our Yamaha R6 engine within 5 hours and did the Autocross runs. The whole team worked together perfectly to solve this problem – that made us strong. I will never forget this competition – it was amazing!"

Der erste Formula Student Germany Gewinner – Barbara Schlögl, Team Captain der TU Graz 2006, erinnert sich:

"TUG Racing Team – Gesamtsieger bei der FSG 2006 – wir konnten es erst gar nicht glauben! Nach dem ersten Versuch bei der Acceleration brach das Getriebe unseres Tankia2006, da war die Enttäuschung groß. Aber wir gaben nicht auf, wir tauschten das Getriebe unseres Yamaha R6 Motors innerhalb von 5 Stunden und fuhren die Autocross-Runden. Das ganze Team arbeitete perfekt zusammen, um das Problem zu lösen – das machte uns stark. Ich werde diesen Wettbewerb nie vergessen – es war einfach unglaublich!"

World ranking list for worldwide comparison and a high quality FSG

Weltrangliste sorgt für weltweiten Vergleich und hohe Qualität der FSG

All over the world, more and more students are founding teams and with it existing competitions expand and new events arise. Building these small formula cars has become very popular at universities worldwide. Some teams travel around the globe seeking competition against other teams to learn about their own quality and to enhance their knowledge and network. But most of the teams can't effort to compete in more than one or two events in their 'neighborhood'. The world ranking now offers a possibility to see the team's development and success in comparison with all teams – also with those that are out of any reach of direct competition due to financial or geographical reasons.

The world ranking list consolidates the results of all competitions carried out with respect to the official rules of FSAE/Formula Student. Including a significant history it allows to follow the development of any team over several years and thereby to identify consistency in working and progress in performance. Nevertheless, the list only reflects results and points – teams are placed, they do not win or lose in or through the list. After all, each team of students that has ever managed to build, assemble, test and race a race car among their studies is a clear winner.

14,847 results of 58 competitions with 519 teams have been assembled. The challenging question then was how to valuate these data. The discussions finally resulted is this formula:

$$WRP = \sum_{n=1}^{6} s_{n0} \times a_{n0} \times \mathrm{P}_n \times c_n$$

WRP = World Ranking Points
n = event index, 1 = latest event, 2 = second latest event, …
sn0 = normalized season factor for event n
an0 = normalized actuality factor for event n
Pn = overall Points from event n
cn = competitiveness of event n

Or, summarized in (a few) words: The world ranking is calculated after every single event, taking into account the overall results of the last 3 years and the last 6 events of each team at the maximum. These overall results are being rated according to three aspects: season, actuality and competitiveness of the event. 'Season' is an important factor because teams may change generations in the meantime. Therefore the current season is weighted more heavily than the preseason and the prepreseason. 'Actuality' is a relevant aspect for indicating the progress of a team throughout a season, thus the results of a current event count more than earlier ones. Finally, it depends on the excellence of the competitors if winning an event is really a great challenge or if a team is a clear favorite. To assess the competitors' excellence and with it the competitiveness of the event, the overall points of the world's top ten are being compared to the overall world ranking list points of the 10 best starters at the event, prior the event.

Formula Student Germany employs the world ranking list to offer early registration slots to the world's top ten teams. Along with slots for the top ten of the preceding FSG and slots for international teams this ensures a high quality competition.

Immer mehr Studenten gründen Teams, damit wachsen bestehende Wettbewerbe und neue entstehen. Einige Teams bereisen den ganzen Globus, um sich mit anderen zu messen. Doch die meisten Teams können sich nur ein oder zwei Wettbewerbe in der ‚Nachbarschaft' leisten. Die Weltrangliste ermöglicht nun, die Entwicklung eines Teams im Vergleich mit anderen zu sehen – auch mit denen, die außerhalb der finanziellen oder geografischen Reichweite für den direkten Wettbewerb liegen.

Die Weltrangliste bündelt die Ergebnisse aller offiziellen Wettbewerbe. Aber: Die Liste spiegelt nur Ergebnisse wider – Teams werden platziert, sie gewinnen oder verlieren nicht auf der oder durch die Liste. Schließlich ist jedes studentische Team, das jemals einen Rennwagen gebaut, getestet und ins Rennen geschickt hat, ein klarer Gewinner.

14.847 Ergebnisse von 58 Wettbewerben mit 519 Teams wurden zusammengetragen. Die Bewertung dieser Daten erfolgt nach nebenstehender Formel. Die Liste wird nach jedem Event neu berechnet, wobei maximal die Ergebnisse der letzten 3 Jahre und 6 Wettbewerbe jedes Teams einfließen. Diese werden nach drei Aspekten bewertet: Die aktuelle ‚Saison' wird stärker gewichtet als die Vorsaison und die Vorvorsaison. Der Faktor ‚Aktualität' gewichtet den Fortschritt eines Teams, indem das aktuelle Ergebnis mehr zählt als frühere. Auch die Stärke der Konkurrenten ist maßgeblich, daher werden zur Einschätzung des ‚Anspruchs des Wettbewerbs' die Punkte der Top Ten der Welt mit den Weltranglistenpunkten der 10 besten Starter des Events verglichen.

Die FSG nutzt die Weltrangliste, um den Top Ten der Welt Startplätze bei der frühen Registrierung anzubieten. Zusammen mit Slots für die Top Ten der vorigen FSG und für internationale Teams sorgt die Weltrangliste so für einen hochwertigen Wettbewerb.

Foto: Marco Hannibal

Fuel efficiency on the upswing – calculation and scoring of dynamic events changed

Treibstoffeffizienz im Aufwind – Berechnung und Punkteverteilung für Dynmics in Deutschland geändert

Low fuel consumption saves money as well resources and protects the environment. For this reason much research is being performed to develop more efficient engines and alternative powertrain concepts. With a higher weighting of fuel efficiency Formula Student Germany would like to support fuel consumption as a considerable factor in the development of future cars by future engineers.

Increased emphasis on Fuel Efficiency

Fuel Efficiency will receive a higher rating with 100 instead of 50 points. This discipline has also been renamed “Fuel Efficiency” as supposed to “Fuel Economy”. The points calculation now does not validate fuel consumption only but puts it in relation to speed. The new calculation is based on an average per completed lap which enables an evaluation of teams that did not finish as well. However, the driver change has to have been completed. Teams that are more than a third slower than the fastest team as well as teams that use more than 5.72 litres (~ 26l/100km) in Endurance will not receive any points.

Points allocation in dynamic disciplines

The allocation of points for dynamic events has been restructured. Fuel Efficiency is increased in value by 50 points while Endurance loses 25 points. Autocross is reduced by 50 points with Acceleration and SkidPad now equal at 75 points each.

Faster, lighter, greater efficiency

Weight reduction can cause greater cost and increased speed can mean higher fuel consumption. The teams will have to face up to the question: How much do we invest in one area without losing points in an other?

Changes in Dynamics Scoring
Änderungen in der Dynamics-Bewertung

	until 2008	since 2009	difference
Acceleration	75	75	none
SkidPad	50	75	↑25
Autocross	150	100	↓50
Endurance	350	325	↓25
Fuel efficiency	50	100	↑50

Ein geringer Treifstoffverbrauch schont den Geldbeutel, die knapper werdenden Ressourcen und die Umwelt. Daher wird verstärkt an energiesparenden Motoren und alternativen Antrieben geforscht. Mit einer höheren Bewertung fördert die Formula Student Germany die Treibstoffeffizienz als Faktor der Entwicklung zukünftiger Autos durch zukünftige Ingenieure.

Neuerungen in der Fuel Efficiency

Die Treibstoffeffizienz bekommt mit 100 statt bisher 50 Punkten ein stärkeres Gewicht. Zusätzlich wurde die Disziplin von "Fuel economy" in "Fuel efficiency" umbenannt. Denn mit einer neuen Formel zur Berechnung zählt nicht einfach nur der Verbrauch, sondern vielmehr der Verbrauch in Relation zur Geschwindigkeit. Neu ist dabei außerdem die Rechnung mit Durchschnittswerten pro gefahrener Runde, die auch die Bewertung von Teams ermöglicht, die nicht das Ziel erreichen. Den Fahrerwechsel muss man allerdings schon hinter sich gebracht haben. Teams, die ein Drittel langsamer sind als das schnellste, und Teams, die mehr als 5,72 Liter im Endurance verbrauchen (~ 26l/100km), gehen leer aus.

Punkteverteilung in den Dynamics

Die Punkte für die Dynamischen Events wurden umverteilt. Fuel efficiency kann 50 Punkte mehr einbringen, dafür gibt der Endurance 25 Punkte ab. Der starke Autocross wurden um 50 Punkte gemindert. Acceleration und SkidPad werden mit 75 Punkten jetzt gleichwertig behandelt.

Schneller, leichter, sparsamer

Mehr Leichtigkeit kann höhere Kosten und mehr Schnelligkeit höheren Verbrauch bedeuten usw. Die Teams müssen sich immer mehr der Frage stellen: Wieviel investieren wir an einer Stelle, ohne dadurch anderswo Punkte zu verlieren?

Pat's Corner: Cockpit templates provoke new design concepts

Spectators will notice that the cars running at FSG this year look significantly different from previous years. You may find that the frontal bodywork on some cars is not as sleek as in the past.

The Technical Rules for FSG are closely related to the rules for FSAE. These rules have remained relatively static for almost 20 years. This has had the effect of generating a certain 'sameness' between cars, but has also caused teams to hone their designs down to the very limit of the rules allowances.

More room for safety

The organisers have watched this carefully. As the cars got smaller and tighter some doubts were raised about the ability of an injured driver to be evacuated from the car in the unlikely event of an incident.

The rules require the car to accommodate a 95th% human male and for all drivers to demonstrate an ability to exit the car within 5 seconds. Despite this, there were still some doubts in the minds of the organisers. One particular area of concern was the commonplace design solution that placed the steering rack above the driver's ankles. An accident that damaged the driver's legs could prevent him or her exiting the car within the 5 second minimum.

Templates guarantee driver's safe free moving space

Several years ago a two dimensional template representing the 95th percentile male was introduced. This manikin is called 'Percy' and is used to check roll hoop compliance.

For 2009, a new set of rules for cockpit accommodation has been introduced. Based on the FIA rules for Formula One, minimum cockpit dimensions have been defined. These dimensions will be checked at Technical Inspection with two templates. One template must fit into the cockpit opening whilst the other must be capable of being passed down through the driver's foot well to within 100mm of the pedal face.

The era of building 'legacy' cars is over

These template rules had a side effect of causing many teams to radically redesign their cars. In one fell swoop, the common practice of some teams to bring 'legacy' cars (meaning designs that change incrementally from year to year) to the competition was over.

Pat's Corner: Cockpit-Schablonen animieren zu neuen Fahrzeugkonzepten

... ist technischer Berater und Juror beim Design Event für die Formula Student Germany. Er arbeitet für die Hyundai Motor Company Australia.

Sicher haben Sie es gemerkt: Die Autos sehen dieses Jahr erheblich anders aus als in den vergangenen Jahren. Und vielleicht finden Sie auch, dass manche Autos im Bereich der Frontverkleidung nicht mehr so geschmeidig aussehen wie früher.

Die technischen Regeln der Formula Student Germany (FSG) sind eng mit denen für die Formula SAE verwandt, die über beinahe 20 Jahre relativ unverändert geblieben sind. Das bewirkte zum einen den Effekt einer gewissen „Gleichheit" zwischen den Autos und brachte die Teams zum anderen auch dazu, ihre Konstruktionen über die Jahre bis an die äußersten Grenzen des Reglements auszufeilen.

Mehr Platz für Sicherheit

Die Organisatoren haben dieses Phänomen aufmerksam beobachtet. Als die Autos immer kleiner und kompakter wurden, machten sich Zweifel breit, ob ein verletzter Fahrer im unwahrscheinlichen Falle eines Unfalls noch aus dem Fahrzeug gerettet werden könnte.

Laut Regelwerk muss ein 95-Prozent-Mann in das Auto passen und alle Fahrer müssen zeigen, dass sie das Auto innerhalb von 5 Sekunden verlassen können. Die Zweifel konnte das aber nicht ausräumen. Besondere Besorgnis erregte die längst übliche Konstruktion mit der Lenkstange über den Fußgelenken des Fahrers. Ein Unfall, bei dem sich der Fahrer die Beine verletzt, könnte ihn daran hindern, das Auto innerhalb dieses 5-Sekunden-Zeitraums zu verlassen.

Schablonen garantieren dem Fahrer Bewegungsfreiheit

Vor einigen Jahren wurde zunächst eine zweidimensionale Schablone eingeführt, die den 95-Prozent-Mann repräsentiert. Dieses Männchen wird 'Percy' genannt und wird zur Überprüfung der Regelkonformität des Überrollbügels genutzt.

2009 wurden neue Regeln für die Cockpitgestaltung eingeführt. Auf Grundlage der FIA-Regeln für die Formel Eins wurden Mindestmaße für die Cockpitdimensi-

'Percy', the 95th percentile male manikin, is used to check roll hoop compliance.

'Percy', das Modell des 95-Prozent-Manns, wird zur Überprüfung der Regelkonformität des Überrollbügels eingesetzt.

Technically, the challenge for teams is to retain the short wheelbase needed to successfully navigate the cones whilst keeping steering and gear changing equipment out of the template area without making the front of the car huge and ugly. As you will see, some teams have been more successful than others.

The templates need to pass the cockpit opening and foot well

The cockpit opening template does not cause many problems. It is inserted vertically through the cockpit opening and lowered a short distance into the driver's area.

The foot well template is the one that causes the most compliance difficulty for teams. Only the steering wheel can be removed to permit the template to pass. The template must then pass freely down the foot well to the normal position of the driver's feet. Any obstruction other than the steering column will cause a template failure. We are seeing that many teams have constructed a chassis that will pass the template but they have forgotten about the brackets, wires and other additions inside the chassis.

The only concession is that during the insertion of the template, it can be raised or lowered by 50mm in order to clear small obstacles on the floor.

The cockpit opening template needs to pass vertically into the driver's area

Das Template für die Cockpit-Öffnung muss vertikal ins Cockpit abgesenkt werden können.

onierung festgelegt. Die Einhaltung dieser Maße wird bei der technischen Überprüfung der Fahrzeuge mithilfe von zwei Schablonen (Cockpit Templates) überprüft. Die eine Schablone muss durch die Cockpitöffnung passen, die andere muss durch den Fußbereich des Fahrers bis zum Pedal durchgeführt werden können.

Die Ära des ‚immer gleichen' Autobauens ist vorbei

Diese neuen Cockpit-Regeln haben einen Nebeneffekt: Viele Teams sind dazu gezwungen, ihre Autos radikal neu zu gestalten. Auf einen Schlag ist damit die gängige Praxis vorbei, mit ‚immer gleichen' Autos, die sich von Jahr zu Jahr nur geringfügig ändern, zum Wettbewerb anzutreten.

Technisch besteht die Herausforderung für die Teams darin, den kurzen Radstand für das erfolgreiche Navigieren um die Pylonen beizubehalten und dabei gleichzeitig Lenk- und Schaltvorrichtungen aus dem Template-Bereich herauszuhalten, ohne jedoch die Fahrzeugfront groß und hässlich werden zu lassen. Sie werden sehen, dass das einigen Teams besser gelungen ist als anderen.

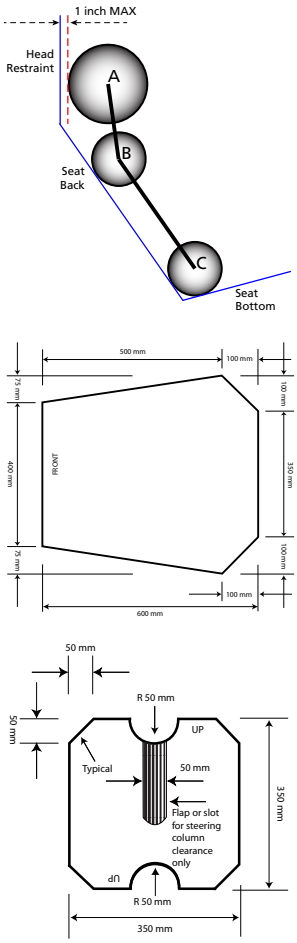
Die Schablonen müssen in Cockpitöffnung und Fußbereich passen

Die Schablone für die Cockpitöffnung bereitet keine größeren Probleme. Sie wird vertikal in die Cockpitöffnung eingeführt und ein kurzes Stück in den Fahrerbereich abgesenkt.

Die Schablone für den Fußbereich dagegen bereitet den Teams die meisten Schwierigkeiten. Um die Schablone durchzulassen, darf nur das Lenkrad abgenommen werden. Sie muss sich dann frei in den Fußraum bewegen lassen bis hin zur normalen Position des Fahrerfußes. Jedes Hindernis mit Ausnahme der Lenkstange führt zum Scheitern des Schablonen-Tests. Viele Teams, so haben wir bemerkt, haben ihr Chassis passend für die Schablonen gebaut, haben dabei aber Schellen, Drähte und anderes Zubehör innerhalb des Chassis nicht mit bedacht. Ein einziges Zugeständnis wird gemacht: Um kleinere Hindernisse auf dem Boden auszugleichen, darf die Schablone beim Einführen um 50mm gehoben oder gesenkt werden.

Dank einer Ausnahme können auch 2008 gebaute Autos teilnehmen

Autos, die den Schablonen-Test nicht bestehen, aber alle anderen Regeln erfüllen, werden dieses Jahr zum Wettbewerb



above: The foot well template needs to pass down to the driver's foot position. right: The measures of 'Percy', cockpit opening and foot well template are established in the rules.

oben: Das Fußraum-Schablone muss bis zur Fußposition des Fahrers durchgeführt werden können. rechts: Die Maße für 'Percy' und die Schablonen für Cockpitöffnung und Fußraum sind in den Regeln festgeschrieben.

Cars built for late 2008 competitions can compete due to an exception

For this year only, cars that do not pass the template rule but comply with all other rules will be permitted to compete, however a 35 point penalty will be applied. This exemption is effective for cars built to the 2008 rules for the Italian, Japanese and Australian competitions to permit them to compete. FSG cars have a one year lifespan from the event of their introduction. Cars built to legally compete at events dated after FSG 2008 are still 'live' and so must be permitted to compete, however, to ensure a fair competition, a points penalty is applied.

Safety and fairness require continual review

The rules for FSG as well as for all FS events are under continual review in order to ensure a safe and equitable competition for all teams involved. Not at least changes are necessary to make FS a naturalistic and fruitful experience for all these motivated students to prepare them for their professional lives.

Pat

zugelassen, müssen aber 35 Strafpunkte in Kauf nehmen. Diese Ausnahme gilt für Fahrzeuge, die nach den Regeln von 2008 für die Wettbewerbe in Italien, Japan und Australien gebaut wurden, um ihnen eine Teilnahme zu ermöglichen. FSG-Autos haben eine Lebensdauer von einem Jahr, vom ersten bis zum letzten Einsatz bei einem Wettbewerb. Fahrzeuge, die für eine erste Teilnahme an einem Event nach der FSG 2008 gebaut wurden, sind daher bei der FSG 2009 noch aktuell und müssen daher zur Teilnahme zugelassen werden. Damit es fair bleibt, müssen aber Strafpunkte vergeben werden.

Sicherheit und Fairness verlangen kontinuierlich kritische Überprüfung

Die Regeln für die FSG genauso wie für alle FS-Events werden ständig einer kritischen Überprüfung unterzogen, um einen sicheren und fairen Wettbewerb für alle teilnehmenden Teams sicherzustellen. Nicht zuletzt sind Änderungen auch wichtig, um die Formula Student zu einer lebensnahen und fruchtbaren Erfahrung für all diese motivierten Studenten zu machen – als Vorbereitung für ihren beruflichen Werdegang.

Pictures on the right (3): 2009 Formula SAE® Rules

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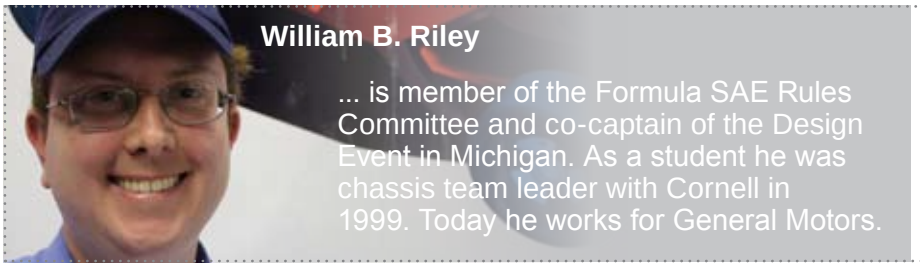
The cost of racing – a discussion of the 2009 Cost Rules

Die Kosten des Rennwagenbaus – eine Betrachtung der Cost Rules 2009



William B. Riley

... is member of the Formula SAE Rules Committee and co-captain of the Design Event in Michigan. As a student he was chassis team leader with Cornell in 1999. Today he works for General Motors.

... ist Mitglied im Formula SAE Rules Committee und Co-Captain beim Design Event in Michigan. Als Student war er 1999 Leiter der Fahrwerksgruppe von Cornell. Heute arbeitet er für General Motors.

What is the general aim of the Cost and Manufacturing Event?

Like the competition as a whole the Cost Event is designed to give students experience to prepare them for working in industry and to add breadth of experience to their academic studies. Putting together a bill of material, estimating costs, understanding manufacturing processes and tooling as well as providing engineering documentation for their designs are all valuable industry skills. The Cost Event also fosters a critical engineering skill: tradeoff analysis. Cost drives a lot of trade-offs in industry and the Cost Event is designed to mimic that phenomena. We want the students to do the systems engineering analysis to determine if their lap time and design points will outweigh the cost and complexity of a certain design.

What were the main changes in the Cost rules for 2009?

2009 saw a major rewrite in the cost rules. This included standardized costs for all materials, processes, fasteners and tooling. Standardized costs meant the elimination of receipts as the actual cost of an item to a team was not relevant. Standardized processes meant the elimination of time as a variable, so instead of stating 15 minutes of CNC machining students would list 5.6 cm^3 of aluminum removed. The new rules are designed to be 100% verifiable at the competition. For example, it is impossible for the judges to distinguish between different alloys of steel, so all alloy steel has the same cost per kilogram. Finally, tooling came back to the Cost Event, but in a relatively simplistic way, so students will have to again consider the tooling cost, which makes certain processes that would otherwise be unfairly low cost more realistic.

What has been the motivation to revise the rules for the Cost Event for all Formula SAE and Formula Student events in 2009?

Continuous improvement is an important part of the Formula SAE and Formula Student series. Lessons learned from each year drive changes throughout the event. We saw an opportunity to improve the education experience in several ways. For example, eliminating receipts puts less emphasis on internet searches for the lowest price for a certain part, and also removes the temptation to use Photoshop to alter receipts. Standardized costs also meant that wherever a team is located in the world the cost for the same design will be equal. This eliminates any bias to teams in countries where certain items may be more or less expensive.

How have the tables been generated?

Our guiding principle in the revised rules was while the cost of the cars can be arbitrary the relative cost of all the materials, processes, fasteners and tooling that go into the car cost must be proportionately correct. We chose to write the rules around a production run of 1000 vehicles per year. For parts which teams purchase and would be relatively low volume, such as dampers, we used one half the Manufacturer's Suggested Retail Price (MSRP) in the tables. The table development was a trade-off between cost accuracy and table complexity. For example, we originally intended to list ball bearings

Was ist das allgemeine Ziel des Cost and Manufacturing Events?

Wie beim gesamten Wettbewerb sollen die Studenten auch beim Cost Event vertiefende Erfahrungen als Vorbereitung für das Berufsleben sammeln. Das Erstellen einer Stückliste, Kostenabschätzungen, das Verstehen von Herstellungsprozessen und Werkzeugen sowie die Dokumentation sind allesamt wertvolle berufliche Qualifikationen. Der Cost Event fördert auch eine entscheidende Ingenieursfähigkeit, die in der Industrie oft notwendig ist: die Kosten-Nutzen-Abwägung. Die Studenten sollen mithilfe einer Systemanalyse herausfinden, ob Rundenzeit und Design-Punkte Kosten und Komplexität einer Konstruktion aufwiegen.

Was sind die Regeländerungen 2009?

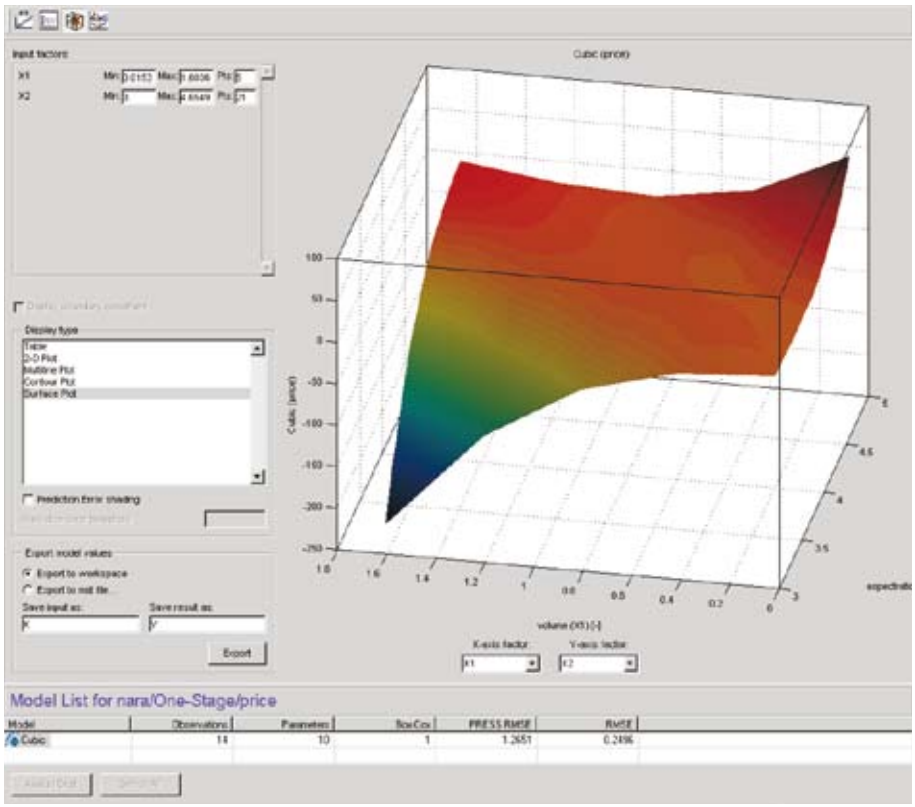
Wir haben die Regeln grundlegend überarbeitet. Zu den Neuerungen gehören standardisierte Kosten für Materialien, Prozesse, Verbindungen und Werkzeuge und damit der Wegfall von Belegen. Standardisierte Prozesse bedeuten den Wegfall von Zeit als Variable. So geben die Studenten jetzt statt 15 Minuten CNC-Einsatz 5,6cm^3 entferntes Aluminium an. Die Regeln wurden so gestaltet, dass sie zu 100% beim Wettbewerb nachprüfbar sind. Z.B. wäre es für die Juroren unmöglich, verschiedene Stahlgemische zu unterscheiden. Also kosten alle Stahlgemische das Gleiche. Schließlich werden auch die Fertigungskosten wieder im Cost Event berücksichtigt, damit bestimmte Prozesse realistischer abgebildet werden, die ansonsten ungerecht günstig wären.

Was war die Motivation?

Permanente Verbesserung ist unerlässlich. Hier sahen wir eine Gelegenheit, die Lernerfahrung auf verschiedenen Wegen zu verbessern. Zum Beispiel verliert die Internetrecherche nach dem günstigsten Preis mit dem Wegfall der Belege an Gewicht und macht die Versuchung unnötig, Belege mit Photoshop zu ändern. Standardisierte Kosten bedeuten auch, dass das gleiche Design immer gleich viel kostet, egal wo ein Team auf der Welt zu Hause ist.

Picture: William B. Riley

by make and model, but it quickly became unworkable, so we switched to a parametric model for bearing cost based on outer diameter and thickness. The Matlab calibration toolbox was useful for more complicated cost models.



Fitted surface describing the cost of a material by two parameters

Die Fläche beschreibt die Kosten eines Materials mit zwei Parametern

This idea of parameterizing costs to reduce the number of table entries existed from the beginning and was important in making the student work load easier. It created a lot of work for us in mathematically fitting equations to different items, such as bolts and plumbing parts. Processes were also parameterized. We wanted all entries in the Cost Report to be verifiable. I used published information on motion and time studies along with standard work formulas to create an assembly labor model that was only a function of mass and fit type. This seemed to strike a good balance between complexity and accuracy.

How do teams generate their cost reports from the tables?

I think that there will be variation from team to team. But I expect that most would start by creating a Bill of Material (BOM) that lists the systems, assemblies and parts that make up their vehicle. Then, as their design progresses at the beginning of their build cycle they would start to evaluate their initial designs using the cost tables. Possible iterations would follow making the trade-offs in design for performance, cost and assembly. The different raw materials such as aluminum, processes such as machining and labor, are all in the tables so they simply need to know the inputs into the cost equations which they can get by hand calculation or from their CAD models. The idea is that the students need only to know their design and the Cost Rules to derive the Cost Report information.

Wie wurden die Cost Tabellen erstellt?

Unser Leitprinzip war, dass die relativen Kosten aller Materialien, Prozesse, Verbindungen und Werkzeuge proportional richtig sein müssen, während die Kosten für das Auto beliebig sein können. Wir haben die Regeln für eine Serie von 1000 Fahrzeugen pro Jahr ausgelegt. Für gekaufte und wenig umfangreiche Teile wie Dämpfer verwenden wir in den Tabellen die Hälfte des vom Hersteller empfohlenen Preises. Die Entwicklung der Tabellen war ein Abwägen zwischen Exaktheit und Komplexität. Z.B. hatten wir ursprünglich vor, alle Kugellager nach Typ und Modell aufzulisten, aber das wurde schnell unrealisierbar, also schalteten wir um auf ein parametrisches Modell für Lager, bei dem die Kosten auf Umfang und Dicke basieren. Das Matlab Kalibrier-Tool war bei den komplexeren Kostenmodellen sehr hilfreich.

Die Idee des Parametrisierens von Kosten zur Reduzierung der Tabelleneinträge bestand von Anfang an und war wichtig, um die Arbeit der Studenten zu erleichtern. Es war eine Menge Arbeit, mathematische Gleichungen für verschiedene Teile zu finden, wie z.B. Bolzen und Leitungen. Prozesse wurden ebenfalls parametrisiert. Ich nutzte veröffentlichte Arbeitsablaufstudien und Standardarbeitsformeln zur Erstellung eines Gesamtarbeitsmodells, das nur eine Funktion aus Masse und Passform ist. Das ergibt eine gute Balance zwischen Komplexität und Genauigkeit.

Wie erstellen die Teams mit den Tabellen ihre Cost Reports?

Jedes Team macht das etwas anders. Wahrscheinlich fangen die meisten mit der Stückliste an. Wenn ihre Konstruktionen dann fortschreiten zu Beginn der Bauphase, bewerten sie sie anhand der Cost Tabellen. Dann folgen iterative Abwägungen zwischen Design und Performance, Kosten und Fertigung. Rohmaterialien wie Aluminium und Prozesse wie Verarbeitung sind alle in den Tabellen, so dass sie einfach nur die Eingaben in die Kostengleichungen kennen müssen, die sie aus ihren Berechnungen oder CAD-Modellen erhalten. Die Idee ist, dass die Studenten nur ihre Konstruktion und die Cost Regeln kennen müssen, um die Informationen für den Cost Report ableiten zu können.

Was passiert, wenn ein Team ein Material verwendet, das nicht in der Liste ist?

Manche Materialien oder Prozesse waren

Picture: William B. Riley

If a team uses a material that is not on the list how will that be handled?

Teams may want to use materials or processes that are not already listed in the tables, such as a damper that we weren't aware of at the start of the project or was not yet available. The team would then submit an Add Item Request (AIR) through the Cost website and we would add it to the table. Every team in the world would then use that standard cost for the same part. We had a lot of AIR's this year because of the new rules. I expect we will catch up over the summer and that the number required for 2010 will be greatly reduced.

Which parts need to be included in the BOM and which don't?

Generally, the car needs to be broken down in the BOM until all of the materials, processes, fasteners and tooling that make up that part or assembly can be found in the tables. So for example engines are listed by displacement. So the engine should be included in the material table under the part, presumably called 'Engine'. The engine cost includes the internal engine parts, such as block, cylinder head, crankshaft, etc., so no further detail is needed. For steering racks, which the students cost as if they made them, the students would need to include the aluminum and steel, the machining and labor to put it together since there are not steering racks listed in the material table.

Does it make a difference if a team buys a part or makes it themselves?

In some cases there can be a difference. Certain parts we designate all of them as made, such as steering racks. Whether the team made it or purchased it they cost it as if they made it. Engines are all 'cost as bought', so the teams simply list engines by displacement to calculate the cost regardless if they bought them or made them. Finally, some parts are 'cost as made' if the team made them and 'cost as bought' if the team bought them. This includes engine controllers for example. Most teams buy them but if they do make them we have the necessary entries in the materials table.

Do the real costs of the car brought to competition correlate better with the estimated costs in the report through the standardized Cost Tables?

The Cost Tables are setup to represent the cost to produce the cars in production rather than the prototype costs of the actual student vehicles. As stated earlier, the actual vehicle cost can be arbitrary as long as the relative cost, such as between steel frames and carbon fiber monocoques, are proportionally correct. Generally, the material costs will be about half the prototype cost but of course the student labor is free whereas labor is included in the Cost Report.

FSG introduced a real case scenario in 2007. What were the main reasons to adopt this in the Formula SAE rules?

The real case scenario is a task given to the students a few weeks before competition that makes them rethink their cost report in one of various ways, such as reducing cost by a certain percentage in one system. The educational benefit to the students of the real case seemed to better align with what would be useful to them in industry. I think all engineers are often faced with tasks that mirror the real case scenarios. For this reason we decided to implement the real case scenario in the official rules for Formula SAE. And so far all of the student feedback I have received has been positive.

uns zu Beginn des Projekts nicht bewusst oder noch nicht verfügbar. Das Team schickt uns dann einen Add Item Request über die Cost-Website und wir ergänzen den Punkt in der Tabelle. Dieses Jahr hatten wir wegen der neuen Regeln jede Menge Anfragen. Wir arbeiten das über den Sommer auf, so dass der Bedarf 2010 wesentlich geringer sein sollte.

Welche Teile müssen auf die Stückliste und welche nicht?

Das Auto muss so weit runter gebrochen werden, bis alle Materialien, Prozesse, Verbindungen und Werkzeuge in der Stückliste sind. Z.B. werden Motoren nach Hubraum in der Materialtabelle unter dem Teil ‚Motor' gelistet. Die Position schließt die enthaltenen Teile wie Motorblock, Zylinderköpfe, Kurbelwelle usw. ein, so dass kein weiteres Detail nötig ist. Für Lenkgetriebe dagegen müssten die Studenten Aluminium und Stahl, Verarbeitung und Arbeit auflisten, da Lenkgetriebe nicht in der Materialtabelle sind.

Macht es einen Unterschied, ob man Teile kauft oder selber macht?

In manchen Fällen kann es einen Unterschied machen. Bestimmte Teile haben wir als selbst gemacht festgelegt, z.B. Lenkstangen. Egal ob das Team sie gemacht oder gekauft hat, zählen die Kosten ‚als selbst gemacht'. Motoren kosten alle ‚wie gekauft', so dass die Teams einfach den Motor nach Hubraum auflisten, egal ob sie ihn gekauft oder gemacht haben. Schließlich kosten einige Teile ‚wie gemacht', wenn das Team sie gemacht hat, und ‚wie gekauft', wenn das Team sie gekauft hat. Das trifft z.B. auf Motorsteuerungen zu: Die meisten Teams kaufen sie. Machen sie sie aber selbst, finden sie die nötigen Angaben in den Materialtabellen.

Korrelieren die Kosten des teilnehmenden Autos durch die Standardisierung besser mit den Kosten im Report?

Die Cost Tabellen sollen die Kosten des Autos in der Produktion darstellen, nicht die Kosten des Prototyps. Wie gesagt kann das tatsächlich gebaute Auto beliebig kosten, solange die relativen Kosten, wie z.B. zwischen Gitterrohrrahmen und Kohlefaser-Monocoque, proportional richtig sind. Generell entsprechen die Materialkosten etwa der Hälfte der Prototypkosten, aber natürlich ist die Arbeit der Studenten umsonst, während Arbeit im Cost Report erfasst wird.

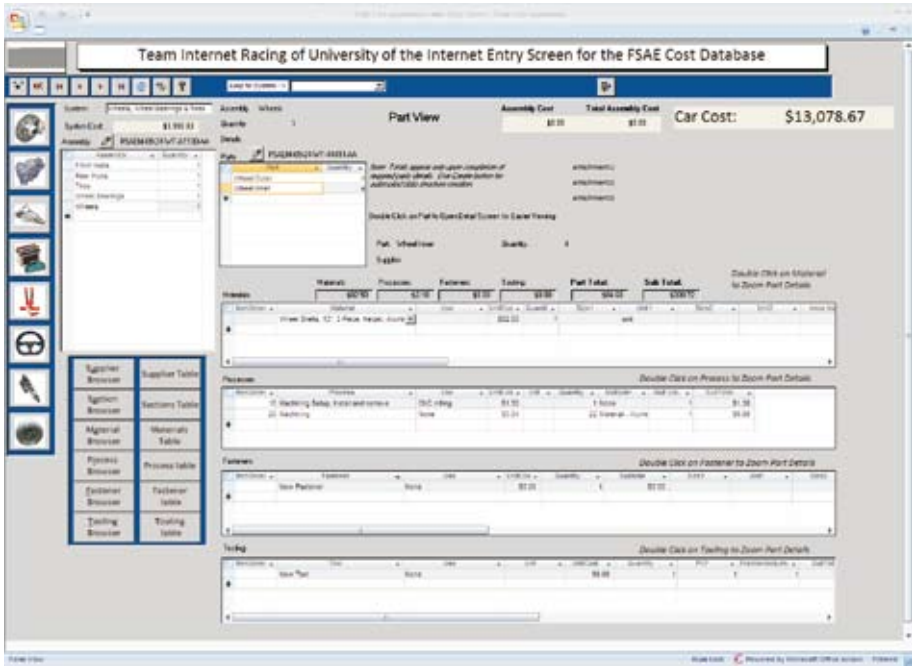
Die FSG hat 2007 bereits ein Real-Case-Szenario eingeführt. Was waren die Gründe, dies in die Formula SAE Regeln zu übernehmen?

What advice would you give teams working with the new rules?

The focus this year for the teams had to be on creating a Cost Report to the new rules and getting familiar with the Cost Tables. The thing that I've seen missing from the Cost Reports this year has been the engineering documentation to support the table items and the inputs into the cost equations. For example, when a team claims to machine away a certain amount of aluminum from their uprights the judges expect to see an engineering drawing or even a pictures with some dimensions hand written on it so they can see if the numbers in the report are correct. A 3-view drawing of every part on the car isn't required but many teams seem to have forgotten or not understood that they need supporting documentation.

How do you expect the Cost Event to develop in the future?

2009 was a year of big change. We expect it to be relatively stable going forward. There were many lessons learned and things we want to clarify and simplify, but I don't see any big changes for 2010. My big disappointment of 2009, and I am sure it was shared by the students, was that the Cost Software wasn't available and when it was, it wasn't reliable. We now have a stable student version and the web-based judging module is up and running. I think that will greatly help the teams next year. After that, the next steps will be to continue to drive for accuracy and detail in the Cost Reports and improve our inspection and auditing process to insure full compliance between the report and the actual vehicle. I think all the organizers share the desire to eliminate all incentives to the students to have discrepancies between their reports and the actual vehicle, so I expect we'll see the fixed point penalties for missing or incorrect items increase over the years as the process becomes more comfortable for everyone.



Screen image from the BOM screen of the Cost Software

Screenshot der Stücklisten-Eingabe in der Cost Software

Picture: William B. Riley

Für das Real-Case-Szenario erhalten die Studenten einige Wochen vor dem Wettbewerb die Aufgabe, ihren Cost Report unter einem bestimmten Blickwinkel zu überdenken, z.B. die Kosten eines Systems um einen bestimmten Prozentsatz zu senken. Der Lerneffekt für die Studenten durch den Real-Case passt gut zu dem, was sie in der Industrie brauchen werden. Ingenieure stehen immer wieder vor solchen Aufgaben, wie sie der Real-Case widerspiegelt. Daher haben wir das Real-Case-Szenario in die Formula SAE Regeln aufgenommen. Und bis jetzt war das Feedback der Studenten positiv.

Welchen Rat würden Sie den Teams für die Arbeit mit den neuen Regeln geben?

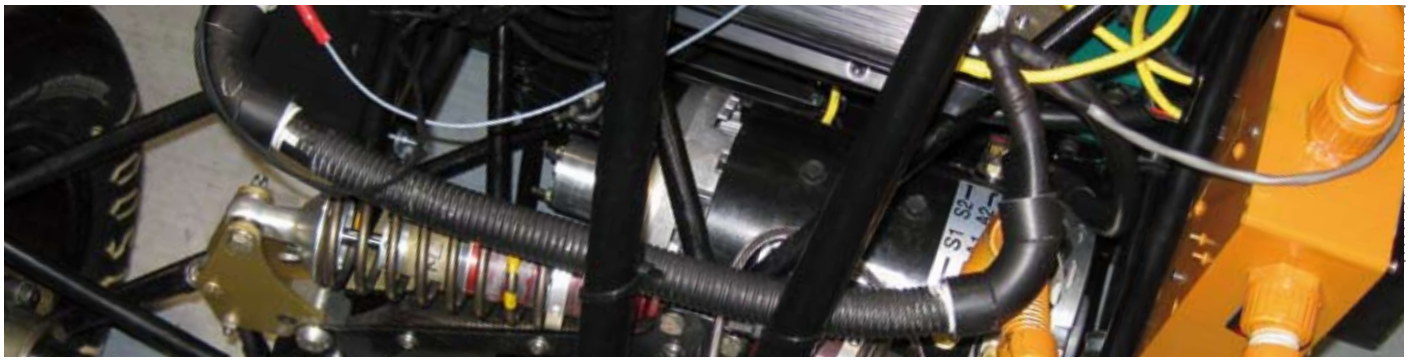
Dieses Jahr müssen die Teams den Cost Report erst mal nach den neuen Regeln erstellen und sich mit den Tabellen vertraut machen. Was ich vermisse, ist die technische Dokumentation, die die Einträge und Eingaben begleitet. Wenn ein Team z.B. angibt, dass es eine bestimmte Menge Aluminium von einem Teil gefräst hat, erwarten die Juroren eine Konstruktionszeichnung oder sogar bemaßte Bilder, damit sie sehen können, dass die Zahlen im Bericht richtig sind. A3-Zeichnungen von jedem Teil sind ja gar nicht notwendig, aber manche Teams scheinen vergessen oder nicht verstanden zu haben, wie wichtig Dokumentation ist.

Was erwarten Sie für die zukünftige Entwicklung des Cost Events?

Nach den großen Veränderungen 2009 erwarten wir, dass es relativ stabil weiter geht. Wir hatten unterwegs viel zu lernen, zu klären und zu vereinfachen, für 2010 sehe ich aber keine großen Änderungen. Meine große Enttäuschung 2009 war – und das teile ich sicher mit den Studenten – dass die Cost Software nicht verfügbar war, und wenn sie es war, dass sie nicht zuverlässig lief. Jetzt laufen eine stabile Studentenversion und das webbasierte Judging-Modul. Ich denke, dass den Teams das im nächsten Jahr sehr hilft. Danach werden wir Exaktheit und Detaillierung in den Cost Reports und unseren Bewertungsprozess verbessern, um eine volle Übereinstimmung zwischen Bericht und Auto sicherzustellen. Alle Organisatoren teilen den Wunsch, die Anreize für die Studenten auszulöschen, die zu Diskrepanzen zwischen Bericht und gebautem Auto führen. Daher erwarte ich über die Jahre eine Häufung der Punktestrafen für fehlende oder inkorrekte Angaben, wenn der Prozess allen vertraut geworden ist.

Formula Student Electric

Formula Student Electric



With increasing fuel prices and decreasing resources the demand for environmentally friendly mobility is steadily rising. Automotive companies are intensifying their research concerning electric vehicles, partly supported by government funding. Young engineers must be educated for this future technology in order to be innovative in general development. 2010 will see the dawn of a new competition for electric race cars – Formula Student Electric. We spoke to the three people who drafted the rules, Lukas Folie, Tobias Michaels and Florian Raffeiner, about what Formula Student Electric has to offer.

What was the motivation for a separate electric competition?

MICHAELS: Formula Student Electric would like to offer industry practically experienced students for the electric vehicle segment. And of course giving the students the possibility of gaining experience in an electrified version of motorsports.

FOLIE: An electric powered car has many advantages. Apart from robustness and simplicity of the powertrain, many aspects are worth investigating which are currently regarded as disadvantages. Our motivation is to allow the students to prove the potentials of this technology and for them to master the challenges concerning design and production – as well as presenting their results at a competition.

What will the task be for the students?

RAFFEINER: Quite simply: Build a car like in Formula Student but use an electric motor with an energy storage system as the source of power. And design it to be competitive with a normal FS car.

What will the students have to pay attention to building an electric vehicle?

FOLIE: Actually, the FS Electric and FSG rules aren't that different. Using an electric motor instead of conventional engines makes a different approach necessary and will pose challenges in some instances. But many things like designing the chassis or the kinematics will stay the same.

Benzinpreise steigen, Ressourcen werden knapper und der Ruf nach umweltschonender Mobilität wird immer lauter. So intensivieren die Automobilhersteller nun ihre Forschungen zum Elektrofahrzeug, unterstützt von politischen Fördermitteln. Der Ingenieursnachwuchs muss auch für diese Zukunftstechnologie gerüstet sein, um die Innovationen der Zukunft treiben zu können. Daher wird ab 2010 ein Wettbewerb für Elektrorennfahrzeuge ausgetragen – die Formula Student Electric. Wir haben die drei Entwickler des Reglements Lukas Folie, Tobias Michaels und Florian Raffeiner gefragt, was es mit der Formula Student Electric auf sich hat.

Was war die Motivation für einen separaten Elektro-Wettbewerb?

MICHAELS: Mit der Formula Student Electric wollen wir der Industrie auch für das Segment Elektrofahrzeuge praktisch erfahrene Studenten anbieten. Und natürlich wollen wir auch den Studenten die Erfahrung mit einer elektrifizierten Variante des Rennsports ermöglichen.

FOLIE: Ein elektrischer Antrieb in einem Fahrzeug bietet viele Vorteile. Neben der Robustheit und Einfachheit der Antriebe sind auch viele Dinge eine Betrachtung wert, die bis dato als Nachteil angesehen werden. Unsere Motivation dabei ist, die Studenten die Potentiale dieser Technologie beweisen und die Herausforderungen an Konstruktion und Realisierung meistern zu lassen – und das Ergebnis bei einem Wettbewerb zu präsentieren.

Wie lautet die Aufgabe für die Studenten?

RAFFEINER: Ganz einfach: Baut ein Auto wie für die Formula Student, aber nehmt als Antrieb einen Elektromotor mit Energiespeicher. Und macht es konkurrenzfähig zum klassischen FS-Fahrzeug.

Picture: RMIT racing electric

A prototype for an electric FS car already exists in Australia: RMIT racing electric has developed a prototype car with the idea of future competitions being developed from their work. Therefore the car is being restricted to comply with the FSAE regulations where appropriate. The 2008 RMIT electric car has been developed on the 2004 RMIT FSAE car.

Ein Prototyp eines FS Elektroautos existiert bereits in Australien: RMIT racing electric hat einen Prototypen als Vorlage für künftige Wettbewerbe entwickelt. Das Auto erfüllt daher, wo möglich, die FSAE-Regeln. Das 2008 RMIT Elektro-Auto wurde auf Basis des 2004 RMIT-Autos entwickelt.

RAFFEINER: The most important thing is that it is supposed to be a race car and not some type of 'eco racer'. Another main issue is safety. It is not more dangerous, but in comparison to ordinary cars, electrics comprise other dangers that need to be controlled. Also the car may only be powered by an electric motor and batteries. There will be no power limitation as the teams will have to find a compromise between power and weight anyway.

MICHAELS: Concerning safety, there will be additional rules for maximal voltage and maximal installed electric energy. Also, only certain types of energy storage will be allowed. A mechanical brake is mandatory as a failsafe component.

What disciplines will be held at FS Electric?

FOLIE: All static and dynamic disciplines are identical to Formula Student. That means a comparison will be possible to determine the strengths of the different technologies.

MICHAELS: FSG and FS Electric will be held jointly. The judging will be separate, though.

Electric vehicles haven't yet been broadly accepted in automotive industry. How can FS Electric influence development positively?

MICHAELS: By supporting the education of future engineers with the necessary know-how and encouraging students to develop new solutions industry hasn't thought of yet.

FOLIE: The new competition motivates students to be creative and to pursue innovative ideas. They have the possibility to prove the potential of electric vehicles and to promote the combination of the worlds of electric power and automobiles.

What challenges do the students face concerning energy storage?

RAFFEINER: Energy storage is definitely one of the main challenges as the energy density of gasoline is much higher than anything batteries can achieve. The system that operates the vehicle must be sophisticated and all components must harmonise. Battery management plays an important

Was müssen die Studenten beim Elektroautobau beachten?

FOLIE: Im Grunde unterscheiden sich die Regelwerke von FS Electric und FSG nicht großartig. Die Verwendung eines Elektromotors anstelle des herkömmlichen Antriebs erfordert natürlich ein Umdenken und birgt neue Herausforderungen in manchen Disziplinen. Aber viele Dinge wie beispielsweise Chassisbau oder Kinematik bleiben gleich.

RAFFEINER: Das Wichtigste, was zu beachten ist, ist dass das ein Rennauto werden soll und nicht eine Art ‚eco racing'. Ein Schwerpunkt liegt auch auf der Sicherheit. Das Ganze ist zwar nicht gefährlicher, für herkömmliche Autobauer birgt Elektro aber neue Gefahren, die eingedämmt werden müssen. Außerdem wird festgelegt, dass das Auto ausschließlich mit Batterien und Elektromotor betrieben werden darf. Eine Leistungsschranke gibt es aber nicht, da die Teams ohnehin einen Kompromiss zwischen Leistung und Gewicht finden müssen.

MICHAELS: In Sachen Sicherheit gibt es zusätzlich Regelungen zu maximalen Spannungen und zur maximal verbauten elektrischen Energie. Auch sind nur bestimmte Formen der Energiespeicherung zugelassen. Eine mechanische Bremse ist als Rückfallebene vorgeschrieben.

In welchen Disziplinen wird FS Electric ausgetragen?

FOLIE: Alle statischen und dynamischen Disziplinen sind identisch mit denen der Formula Student. Dadurch ist ein Vergleich möglich, der gezielt die Stärken der einzelnen Technologien aufzeigen kann.

MICHAELS: FSG und FS Electric werden vorerst gemeinsam ausgetragen. Die Wertungen sind aber voneinander unabhängig.

Elektrofahrzeuge haben in der Automobilindustrie noch nicht den Durchbruch geschafft. Wie kann FS Electric die Entwicklung positiv beeinflussen?

MICHAELS: Indem die Formula Student Electric zur Ausbildung der zukünftigen Ingenieure mit dem nötigen Know-how beiträgt und die Studenten animiert, neue Lösungen zu entwickeln, die von der Industrie noch nicht angedacht wurden.

FOLIE: Der Wettbewerb motiviert Studenten zu neuen, innovativen Ideen. Damit haben sie die Möglichkeit, das Potential von Elektrofahrzeugen und die sinnvolle Verknüpfung der beiden Welten Elektroantrieb und Automobil zu beweisen.

Picture: RMIT racing electric

role because the motor has to be supplied with power while the recuperated energy from braking has to be stored. Also, the batteries may not be overloaded.

What is allowed, what is not? Where are the problems?

MICHAELS: At the moment only electrochemical accumulators are allowed, later fuel cells and rotary energy storage may be permitted. When overloaded, accumulators can explode – not like in films with flash flames or suchlike – there is just a pop and the accumulator bursts. More risky accumulator technologies which can emphatically explode when punctured by sharp objects are forbidden.

The major problem is definitely the weight of the accumulator cells as well as their dimensions. Also, the costs are immense: an accumulator for a FSE car can cost up to 60,000€. Accumulators with high energy density are critical concerning charge management as every cell must be monitored separately. With sometimes more than 1,000 cells that is a very complex task.

How are the high voltages handled during racing?

MICHAELS: There are many safety precautions like external and easily accessible emergency stop switches, warning lamps and non-conducting gloves which are safe up to 1,000 V. Also, every car must pass a rain test at scrutineering to be allowed to drive in wet conditions.

FOLIE: The technical inspection of the cars is substantially different from Formula Student. The main focus here will be on the new technology and the compliance with safety requirements. One of the mandatory safety features, for example, is that it must be visible from the outside when the vehicle is in high voltage operation. Uniform shutdown mechanisms to end high voltage operation will enable deactivation by the marshals in case of an emergency. Other safety regulations during racing are the same as in Formula Student.

What will an FS Electric prototype cost in view of high prices concerning energy storage?

MICHAELS: Well, the costs will probably be similar to normal FS cars plus minus 30,000€ if the car is intended to be competitive.

RAFFEINER: Without support by sponsors it isn't possible. The teams will still be contacting the same companies when it comes to monocoques but instead of a sponsor for engine test benches they will now have to look for battery sponsors.

The 2008 RMIT electric car prototype

Der Prototyp des 2008 RMIT Elektroautos

Welchen Herausforderungen müssen sich die Studenten hinsichtlich der Energiespeicher stellen?

RAFFEINER: Der Energiespeicher stellt sicher eine der größten Herausforderungen dar, da eine Energiedichte, wie sie in Benzin vorkommt, mit Batterien bei weitem nicht erreicht werden kann. Elektrisch gesehen bedarf es einer ausgetüftelten Elektronik, die das gesamte Auto betreibt und bei der alle Komponenten gut zusammenspielen. Das Batteriemanagement spielt dabei eine wichtige Rolle, da es einerseits den Motoren die Leistung zur Verfügung stellen und andererseits die Bremsenergie in den Batterien wieder speichern muss. Gleichzeitig muss es darauf achten, dass die Batterien nicht überlastet sind.

Was ist erlaubt, was nicht? Wo sind die Probleme?

MICHAELS: Momentan sind nur elektrochemische Akkumulatoren erlaubt, später vielleicht auch Brennstoffzellen und rotatorische Energiespeicher. Bei Überlast besteht Explosionsgefahr – allerdings nicht so, wie man sich das im Film vorstellt, keine Riesenstichflammen oder Ähnliches – es macht puff, und der Akkupack platzt. Risikoträchtige Akku-Technologien, die bei Durchbohrung mit spitzen Gegenständen ernsthaft explodieren können, sind nicht erlaubt.

Das größte Problem ist definitiv das Gewicht der Zellen, ebenso deren Ausmaße. Die Kosten sind sehr hoch: Ein Akkupack für ein FSE Auto kann über 60.000€ kosten. Bei Akkumulatoren mit sehr hohen Energiedichten ist das Ladungsmanagement sehr kritisch, da jede einzelne Zelle überwacht werden muss. So ein Akku kann aus über 1000 Zellen bestehen, entsprechend aufwändig sind Überwachung und Ladungsmanagement.

Wie wird mit hohen Spannungen im Rennbetrieb umgegangen?

MICHAELS: Es gibt zahlreiche Sicherheitsvorkehrungen, wie externe und leicht zugängliche Not-Aus-Schalter, Warnlampen und isolierende Handschuhe, die bis zu 1000V sicher sind. Außerdem muss jedes Fahrzeug beim Scrutineering einen Regentest durchlaufen, um auch bei Regen fahren zu dürfen

FOLIE: Die technische Abnahme der Fahrzeuge unterscheidet sich wesentlich von der Formula Student. Auf die neue Technologie und die Einhaltung der Sicherheit wird großes Augenmerk gelegt. Zu den vorgeschriebenen Sicherheits-

Pictures: RMIT racing electric

FOLIE: The question actually shouldn't be 'how expensive will it be' but 'what possibilities do the teams have?'. The best has to made of the means one can access. Formula Student isn't a matter of cost but a matter of worth. And in FS Electric, that is primarily linked to the utilised technology for energy storage. Just as in industry, the matter of cost must be an integral part of the concept which the teams simply have to consider.

When, where and with how many teams will the first FS Electric take place?

MICHAELS: FS Electric will be first held in 2010 together with FSG. A limit to the number of teams hasn't been defined as yet because we are not awaiting more than ten teams. Some universities have already signalled their interest, however.

When will the rules be published and when will registration begin?

FOLIE: The rules will be presented at FSG 2009. A few minor changes may still occur but the rules will be fixed at the same time as the FS rules for 2010. Registration will take place at the same time as registration for FSG.

The designers of Formula Student Electric

To every good idea there belong some people who develope the idea and bring it to life. The idea of an electric design competition for students has been pursued by three former Formula Student participants. Since September 2008 they have been working on regulations for Formula Student Electric. Lukas Folie studied Telematics at the TU Graz and was head of vehicle electronics in the FS team there. Tobias Michaels is currently concluding his studies with a diploma thesis at IAV GmbH. In the team from Braunschweig he was head of electronic development until 2008. Florian Raffeiner is studying electrical engineering and process automation at the TU Graz where he participated at TUG Racing as head of electronics until 2008.

Die Entwickler der Formula Student Electric

Zu jeder guten Idee gehören gute Leute, die die Idee ausgestalten und zum Leben erwecken. Die Idee eines studentischen Elektrowettbewerbs bringt ein Team von drei ehemaligen Formula Student Teilnehmern voran. Seit September 2008 tüfteln sie gemeinsam an einem Reglement für die Formula Student Electric. Lukas Folie studierte an der TU Graz Telematik und engagierte sich im dortigen Team als Leiter für Fahrzeugelektronik. Tobias Michaels beendet derzeit sein Studium der Elektrotechnik an der TU Braunschweig mit einer Diplomarbeit bei der IAV GmbH. Im Braunschweiger Team war er bis 2008 Leiter der Elektronikentwicklung. Florian Raffeiner studiert Elektrotechnik/Prozessautomatisierung an der TU Graz, wo er sich bis 2008 bei TUG Racing für die Elektronik engagierte und das Elektronik-Modul leitete.

maßnahmen gehört zum Beispiel auch, dass von außen ersichtlich ist, wenn sich das Fahrzeug im Hochvoltbetrieb befindet. Einheitliche Abschaltmechanismen, um den Hochvoltbetrieb zu verlassen, ermöglichen das Abschalten im Notfall auch durch das Streckenpersonal. Darüber hinaus gelten dieselben Sicherheitsrichtlinien für den Rennbetrieb wie bei der Formula Student.

Was wird ein FS Electric Prototyp kosten, insbesondere angesichts hoher Kosten für Energiespeicher?

MICHAELS: Hm, die Kosten werden sich wohl so etwa auf die eines normalen FS-Autos plus minus 30.000€ belaufen, wenn es konkurrenzfähig sein soll.

RAFFEINER: Ohne die Unterstützung von Sponsoren geht das nicht. Nur dass die Teams zwar für ein Monocoque noch den gleichen Sponsor ansprechen, anstelle eines Sponsors für einen Motorprüfstand müssen sie jetzt aber nach Sponsoren für Batterien suchen.

FOLIE: Die Frage sollte nicht lauten ‚was kostet es', sondern ‚welche Möglichkeiten haben die Teams?'. Es gilt immer, das Beste aus dem zu machen, was einem zur Verfügung steht. Formula Student ist nie eine Frage des Preises, sondern immer eine Frage des Wertes. Und die hängt bei der FS Electric primär von der verwendeten Technologie des Energiespeichers ab. Wie in der Industrie muss die Kostenfrage auch hier ein wichtiger Punkt bereits in der Konzeptionierung sein, der sich die Teams einfach stellen müssen.

Wann, wo und mit wie vielen Teams findet die erste FS Electric statt?

MICHAELS: FS Electric wird erstmals 2010 zusammen mit der FSG ausgetragen. Ein Limit haben wir noch nicht explizit festgelegt, da wir kaum mit mehr als 10 Teams rechnen. Einige Interessenten gibt es aber schon.

Wann werden die Regeln veröffentlicht und wann kann man sich anmelden?

FOLIE: Die Regeln werden bei der FSG 2009 vorgestellt. Danach kann es noch leichte Änderungen geben, die Regeln sollen aber zum gleichen Zeitpunkt endgültig sein wie die FS Rules für 2010. Die Anmeldung läuft voraussichtlich etwa im gleichen Zeitfenster wie die FSG-Anmeldung.

Formula Student Germany 2008 – Impressions

Formula Student Germany 2008 – Impressionen



AUDI
Patria







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Uni Patras

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Team profiles
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Participating teams 2009 at a glance

Teilnehmende Teams 2009 auf einen Blick

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6	Montréal ETS	Canada	49	73
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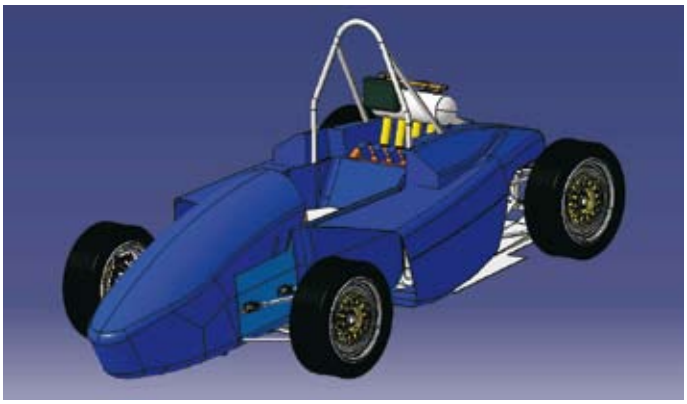
8	Helsinki PT	Finland	7	67
10	Toronto U	Canada	59	90
12	Loughborough U	United Kingdom	12	71
13	Berlin UAS	Germany	46	54
14	Birmingham U	United Kingdom	22	55
15	Corvallis OSU	United States	43	58
16	Perth UWA	Australia	24	79
17	Ann Arbor U MI	United States	65	51
19	Stralsund UAS	Germany	36	88
21	Budapest TU	Hungary	1	56
22	Cambridge U	United Kingdom	53	57
23	Bundoora RMIT	Australia	42	57
24	Amberg UAS	Germany	60	51
25	Ravensburg UCE	Germany	48	82
27	Dortmund UAS	Germany	51	60
28	Bayreuth U	Germany	5	52
29	Stuttgart U	Germany	37	88
30	Prague CTU	Czech Republic	78	82
31	München TU	Germany	23	74
32	Mittweida UAS	Germany	40	72
33	Wolfenbüttel UAS	Germany	4	94
34	Konstanz UAS	Germany	20	71
38	Karlsruhe UAS	Germany	9	70
39	Pisa U	Italy	52	80
40	Eindhoven TU	Netherlands	47	62
41	Ulm UAS	Germany	29	91
42	Aachen RWTH	Germany	16	50
43	Uxbridge U Brunel	United Kingdom	15	43
45	Sankt Augustin UAS	Germany	3	85
46	Turin PT	Italy	30	91
47	Paderborn U	Germany	14	78
48	Zürich ETH	Switzerland	18	95
49	München UAS	Germany	62	74

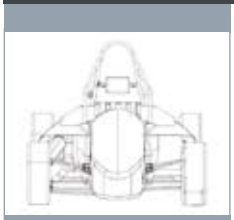
Car no.	City	Country	Pit no.	Page
50	Saarbrücken UAS	Germany	50	84
52	Moscow MAMI	Russia	70	73
53	Siegen U	Germany	76	86
54	Barcelona UPC	Spain	13	52
55	Pomona CSU	United States	38	80
57	Tallinn CE	Estonia	6	89
58	Nevers ISAT	France	34	76
60	Köln UAS	Germany	41	70
61	Braunschweig TU	Germany	61	56
62	Regensburg UAS	Germany	8	83
63	Aachen UAS	Germany	10	50
64	Kaiserslautern TU	Germany	57	68
65	Wiesbaden UAS	Germany	28	94
66	Rochester IT	United States	66	83
67	Osnabrück UAS	Germany	77	77
69	Hamburg UAS	Germany	32	65
70	Karlsruhe U	Germany	73	68
71	Stockholm KTH	Sweden	72	86
72	Hamburg HSU	Germany	39	65
73	Deggendorf UAS	Germany	17	59
74	Erlangen U	Germany	58	62
76	Freiberg TU	Germany	11	63
78	Tampere UAS	Finland	35	90
80	Berlin TU	Germany	68	54
81	Graz UAS	Austria	71	64
84	Hannover UAS	Germany	75	66
85	Padova U	Italy	45	78
86	Patras U	Greece	19	79
87	Mumbai Somaiya	India	74	76
89	Bratislava TU	Slovakia	67	55
90	Milano PT	Italy	63	72
91	Roma U Sapienza	Italy	2	84
92	Oxford Brookes U	United Kingdom	55	77
94	Esslingen UAS	Germany	64	63
95	Hannover U	Germany	33	66
96	Zwickau UAS	Germany	27	95
97	Schweinfurt UAS	Germany	56	85
98	Coburg UAS	Germany	69	58
99	Stuttgart UCE	Germany	21	89

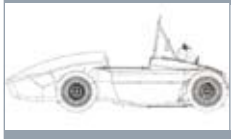
Aachen
RWTH Aachen University

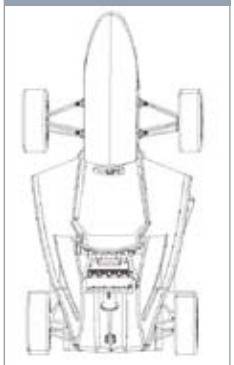


Ecurie Aix – Innovation and PassionThe team Ecurie Aix was founded as one of the first European teams in the Formula Student. Since the founding of the team in 1999, each year about 35 members pursue the goal to build a formula student racecar. In this spirit, the Formula Student Team of RWTH Aachen is the first team which voluntarily ran crash tests during vehicle development and in three cars (EAC02-EAC04) adopted a CVT (Continously Variable Transmission), which was worldwide unique in the Formula Student. EAC06This year, the students of the RWTH Aachen designed and constructed their sixth race car. Like in last year a Suzuki GSX-R 600 engine, running on E85, provides the required performance. Shift paddles behind the steering wheel actuate the hydraulic-valves for clutch and shifter. Furthermore, Ecurie Aix uses a hybrid construction of a carbon fiber monocoque and a tubular steel rearframe. At the multi-link-front axle, the EAC06 features mono-shock-absorbers.

Car 42







FRAME CONSTRUCTION Hybrid-Design, front: mono-coque, rear: tubular space frame

MATERIAL front: carbon fiber, rear: steel

OVERALL L / W / H (mm) 2755 / 1479 / 1083

WHEELBASE (mm) 1638

TRACK (Fr / Rr) (mm) 1288 / 1212

WEIGHT WITH 68kg DRIVER (Fr / Rr) 140 / 178

SUSPENSION Front: Multilink Suspension. Push rod actuated horizontally oriented monoshock and roll-spring Rear: Double Unequal length A-Arms. Push rod actuated horizontally oriented Springs

TYRES (Fr / Rr) 175/505 R13 Dunlop SP Sport

WHEELS (Fr / Rr) BBS, 3 pc Al Rim 7,5x13 -20mm offset

ENGINE Suzuki GSX-R 600 SRAD (1997-2000)

BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 600cc

COMPRESSION RATIO 12:1

FUEL SYSTEM Student designed fuel injection system using Motec M800 ECU

FUEL E85

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 7500

DRIVE TYPE Chain #520

DIFFERENTIAL GKN Visco Lok, speed sensitive LSD

COOLING Student designed 290x250 water radiator mounted in the left sidepod

BRAKE SYSTEM Floating, Stainless Steel, hub mounted, front: 240 mm dia rear: 230mm dia., vent holes, Student Built

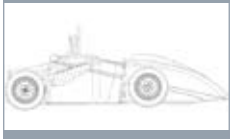
ELECTRONICS multifunctional driver interface on steering wheel, CAN-Bus System, WLAN-Data-Transfer

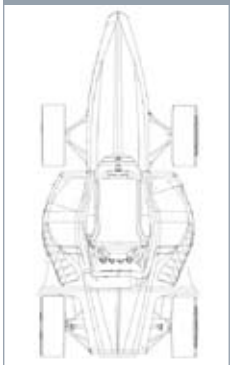
Germany

Aachen
University of Applied Sciences Aachen

AixTreme Racing is the Formula Student Team of the University of Applied Science. Founded in 2007 we take part at the Formula Student Event in Hockenheim in 2008 for the first time. Now we are nearly 40 Students who design a race car with an great appearance, an economic produktion, an easy operability, and which is lightwight and reliable. Rule compliance is one of our main aims and important for a successful car. The new Car, the AIX FS 609, impresses with its great finish and a powerful engine, which make everyone have the itch to drive it at once. Technical highlights are for example the self designed dry sump system with its aluminium casted oilpan or the modified and optimated cylinder head. Many parts are upgraded like the steel space frame whith 18% more stiffnes according to last years` because of better material and optimized position of the tubes. With our self developed data logger we are able to use the test phase to present a unfailing and fast race car in Hockenheim.

Car 63





FRAME CONSTRUCTION steel space frame

MATERIAL S355 steel tubes: outer dia. 12-25mm, thickness: 1-2,5mm,

OVERALL L / W / H (mm) 2940 / 1380 / 1092

WHEELBASE (mm) 1650

TRACK (Fr / Rr) (mm) 1200 / 1190

WEIGHT WITH 68kg DRIVER (Fr / Rr) 147 / 178

SUSPENSION Double unequal length A-Arm. front: pull rod actuated horizontally oriented spring and damper, rear: pushrod actuated spring and damper, fully adjust-able compression and rebound.

TYRES (Fr / Rr) 20.5 x 7.0-13 R25B Hoosier

WHEELS (Fr / Rr) 190,5 mm wide, 2 pc Lightwight Al Rim / Braid Formrace

ENGINE modified Honda CBR 600RR (PC37)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67,0mm / 43,0mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,0:1

FUEL SYSTEM fuel injection, sequential

FUEL 98- 100 octane

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE Single chain

DIFFERENTIAL Drexler limited slip differential V1

COOLING single radiator mounted in left sidepod with thermostatic controlled electric fan

BRAKE SYSTEM 4-Disk system, 220mm rotors at front, 205mm rotors at rear, caliper: Pretech P400, 4 Piston, 25mm dia

ELECTRONICS CAN-Bus-system, self developed datalogger and shift actuator, electromechanic shifting, live telemetry system

Germany

Amberg
University of Applied Sciences Amberg-Weiden

The Running Snail Racing Team was established in August 2004. Since then we participated with sustained success at the Formula Student Events in England, Germany and Italy. And we take the challenge in 2009 also. The RS09-LC4 is our 5th car, the result of the tests and competitions of our first four cars.This year we have completly revolutionised our race car : A-Arms made of carbon tubes, new suspension concept, C/SiC rotors, self made carbon rims and last but not least a new engine. Our goal was again to reduce the weight to now 190 kg (wet), to keep our high quality standards, give the car a good drivability, and reach better ergonomics for the drivers. Beside the racetracks we were active as well. Our four race cars were shown in different exhibitions, company presentations, or the „Partner Cup“. This is an event we originated in 2006 to thank our sponsors. They had the chance to drive one of our cars in a SAE level track and to feel what it means to be a race driver.

Car 24

FRAME CONSTRUCTION Steel tube space frame

MATERIAL Steel

OVERALL L / W / H (mm) 2744 / 1445 / 1200

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1230 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 121 / 137

SUSPENSION Double unequal A-Arm. Pull rod actuated horizontally oriented Cane Cane Creek FSAE spring/damper units. Adjustable in compression / rebound range and in High- / Lowspeed.

TYRES (Fr / Rr) 16/53-13 radial ply tyre Michelin S6B / slick

WHEELS (Fr / Rr) 8 inch wide, 2 pc. Al/CFK Rim, 10mm pos. offset

ENGINE 2008 / KTM LC4-690 single cylinder

BORE / STROKE / CYLINDERS / DISPLACEMENT 102mm / 74.6mm / 1 cylinders / 609cc

COMPRESSION RATIO 11.25:1

FUEL SYSTEM Student designed and built, fuel injection, sequential

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 7000

MAX TORQUE DESIGN (rpm) 5000

DRIVE TYPE D.I.D. double o-sealing-ring chain

DIFFERENTIAL Drexler limited slip differential

COOLING Single side pod mounted radiator with controlled electric waterpump and fan

BRAKE SYSTEM 4-Disk system, self developed C/SiC rotors with 220mm outer and 160mm inner diameter, Hub mounted

ELECTRONICS Multifunctional Steering Wheel, ECU diagnostics via OBD2, Data exchange betw ECU, steering wheel, shifting control and data logger

Germany

Ann Arbor
University of Michigan

The 09 MRacing Wolverine is a 186kg spaceframe car with 10” wheels powered by a 600cc naturally aspirated engine using E85 fuel. With this platform, the team hopes to meet its goal of scoring 800 points or more at FSG 2009. The main design objectives for the vehicle were high levels of vehicle dynamics performance and powertrain calibration supported by reliable subsystems. On the powertrain side, the car features a BOSCH Motorsport electronics system with wireless data acquisition, a laser-sintered intake manifold with adjustable runner geometry, a Salisbury differential with in-house casing and ramps, and a dry-sump oiling system. Chassis highlights include custom Penske dampers, CV joints internal to the spindle, in-house radially mounted calipers, fully adjustable inboard and outboard kinematics, and a Watt’s-link anti-roll device. The team is very excited for the competition after placing 7th at the 2009 FSAE Michigan competition, and wishes the best of luck to all teams.

Car 17

FRAME CONSTRUCTION 2-piece spaceframe

MATERIAL 4130N steel w/ Carbon/Nomex reinforcement panels

OVERALL L / W / H (mm) 2590 / 1422 / 1050

WHEELBASE (mm) 1575

TRACK (Fr / Rr) (mm) 1219 / 1194

WEIGHT WITH 68kg DRIVER (Fr / Rr) 109 / 144

SUSPENSION Indirectly actuated SLA w/ toe control, anti-roll springs F/R. Custom Penske dampers, fully adjustable kinematics

TYRES (Fr / Rr) 18x6-10 Hoosier

WHEELS (Fr / Rr) 6.0x10 3 pc, 50,8 mm offset

ENGINE Honda CBR600f4i

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12:1

FUEL SYSTEM Bosch MS4.4Sport ECU, sequential fuel injection, closed loop, 5 bar

FUEL E85

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 8100

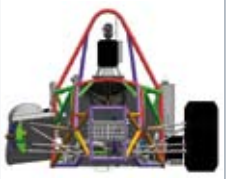
DRIVE TYPE 520 roller chain, single reduction

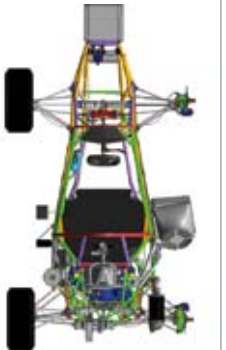
DIFFERENTIAL Salisbury/clutch-pack, 25Nm differential breakaway torque

COOLING Side pod-mounted radiator (305mm x 250mm) w/ thermostatic controlled electric fan (228mm dia)

BRAKE SYSTEM 4 outboard discs, 2-piston custom radial mounted calipers (F), 2-piston axial mounted calipers (R), driver-adjustable bias

ELECTRONICS BOSCH MS4.4 ECU w/ C40 logging, wireless telemetry, traction and launch control, no-lift shifting





United States

Barcelona

PT University of Catalonia – Engineering School of Barcelona

This is the second year for ETSEIB Motorsport in Formula Student. The experience acquired the last year and the motivation of the current team augur better perspectives. Presently, the team contains 17 members specialized in different fields who have hardly worked to turn their different ideas into a real new car, the CAT02. It has been taken the decision to start from the scratch and design a new vehicle that could adjust to the specific characteristics of the FS tests. Keeping a similar structure to its predecessor, the main efforts of the team for the new prototype have been focus in saving 70 kg of weight compared to the CAT01, deleting superfluous pieces and optimizing both performance and behavior of every single component. Maximize the engine and achieve versatility to have a modifiable vehicle behavior and introducing telemetry have been important targets. The team really relies on all the work made and it is confident that it will ensure better results in the current year.

Car 54

Spain

FRAME CONSTRUCTION Square aluminium profile frame, honeycomb pannels sticked

MATERIAL 6082-T6 Al profile, Aluminium Honeycomb

OVERALL L / W / H (mm) 2715 / 1427 / 1041

WHEELBASE (mm) 1583

TRACK (Fr / Rr) (mm) 1232 / 1205

WEIGHT WITH 68kg DRIVER (Fr / Rr) 135 / 187

SUSPENSION Front: Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper. Adjustable ARB. Rear: Same but Pull rod actuated vertically oriented

TYRES (Fr / Rr) 20.5x7.0-13 R25A Hoosier / 20.5x7.0-13 R25A Hoosier

WHEELS (Fr / Rr) 7x13, 2 pc Al Rim, 31mm neg. offset / 7x13, 2 pc Al Rim, 31mm neg. offset

ENGINE Honda CBR 600cc. RR 2007

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.2:1

FUEL SYSTEM Student des/built ,fuel injection, sequential

FUEL Gasoline 98-RON

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Chain, #520

DIFFERENTIAL Torsen university special 3:1 bias ratio

COOLING Single radiator, fan ECU controlled

BRAKE SYSTEM 4 rotors (230mm/190mm), Fuel piston GALFER calipers, AP Racing Master cylinders, adjustable brake balance

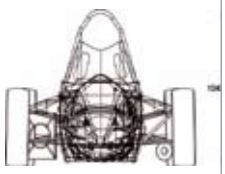
ELECTRONICS CAN BUS, telemetry system with data acquisition

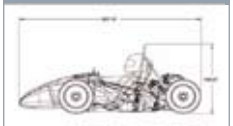
Bayreuth

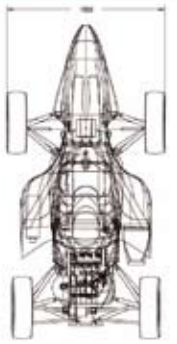
University of Bayreuth

The team`s name is derived from the Faculty of Applied Sciences` abreviation FAN which shares its letter string with the clever and powerful animal. Founded in 2004, Elefant Racing took part in the 3 European competitions in 2006,2007 and 2008 where it mostly gained places in the upper midfield as wll as some special awards. One central aim has been to not only craete a competetive racecar but also a highly desirable product. With the 2009 FR9 „Fantom“ the team wants to tie to the good design results of 2008 and wants to transfer this to the dynamic results. All major structural components are realised advanced composites, electronics offer maximum flexibility and freedom of solution design, drivetrain by many modifications has become light and compact, suspension was developed without any negative influence caused by arbitrary chassis design.

Car 28







Germany

FRAME CONSTRUCTION One piece CFRP Monocoque

MATERIAL CFRP/ Al-honeycomb composite

OVERALL L / W / H (mm) 2621 / 1500 / 1040

WHEELBASE (mm) 1550

TRACK (Fr / Rr) (mm) 1300 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 131 / 142

SUSPENSION Double unequal length CFRP composite A-Arm. Pullrod actuated vertically at the front and Pushrod actuated longitudinal at the rear with Oehlins DB shocks, Al die-cast uprights

TYRES (Fr / Rr) 20.5x7/13 Hoosier

WHEELS (Fr / Rr) 6x13, single piece CFRP/Aluminium honeycomb rim

ENGINE Modified Honda CBR600F (PC35)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13:1

FUEL SYSTEM Proprietary design sequential injection using Bosch Motorsport MS3 Sport ECU

FUEL 100 Octane

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 9500

DRIVE TYPE Self developed seondary gearbox

DIFFERENTIAL Torsen Differential

COOLING 2 Right mounted radiators with an electric fan

BRAKE SYSTEM 4-Disk system, self developed rotors with 108mm diameter, adjustable brake balance, Magura 908.208, 4x24mm bore calipers

ELECTRONICS Embedded PC integrated in multifuncional Steering wheel, Electropneumatic Clutch and Shifting System, selfdeveloped Live-Telemetry

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Good luck to all of the teams participating in the Formula Student Germany 2009 event! We are confident that you will once again demonstrate outstanding performance with your remarkable racecars. It is always rewarding to see students share the same passion that we as inventors of the automobile devote to shaping the future of mobility.
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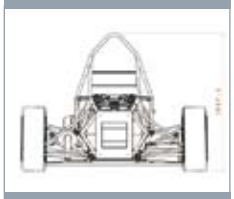
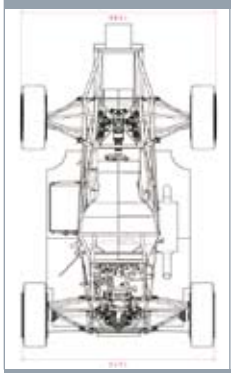
DAIMLER

Berlin
Technical University of Berlin

This year, FaSTTUBe – the Formula Student Team of the Technical University Berlin – participates in the Formula Student Germany for the fourth time. Ever since we started designing a racing car, our team enhanced constantly its knowledge and the number of contributing students. Within the world economic crisis, we had to handle a lot of new challenges, especially while finding new partners and convincing old ones to support us again in 2009. As all the other Formula Student Teams, FaSTTUBe is dependent on the commitment of interested companies, allocating us material, tools, capacities in manufacturing and other important services. FaSTTUBe is proud of being a part of Formula Student Germany 2009 and very thankful for the generous support of all of its sponsors. Without this mutual cooperation the ongoing work on this project would not have been possible: The FT2009 racecar – build out of experience, knowledge, passion and dedication.

Car 80





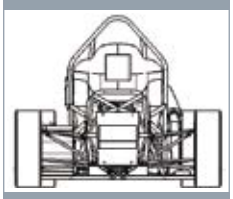
FRAME CONSTRUCTION Tubular space frame
MATERIAL 25CrMo4 steel round tubing
OVERALL L / W / H (mm) 2673 / 1478 / 1088
WHEELBASE (mm) 1575
TRACK (Fr / Rr) (mm) 1300 / 1280
WEIGHT WITH 68kg DRIVER (Fr / Rr) 145 / 153
SUSPENSION Double unequal length CRP A-Arms. Pushrod actuated 4-way-adjustable Cane Creek Double Barrel dampers on front & rear
TYRES (Fr / Rr) Goodyear D2692 20.0x7.0-13 R075
WHEELS (Fr / Rr) 7 inch OZ Racing Aluminium rims
ENGINE 2003 Suzuki GSX-R 600
BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 13.3:1
FUEL SYSTEM Trijekt injektion and ignition system, adhesive bonded fuel tank
FUEL 100 octane unleaded gasoline
MAX POWER DESIGN (rpm) 11000
MAX TORQUE DESIGN (rpm) 9000
DRIVE TYPE Chain drive, flank pitch: 520
DIFFERENTIAL Drexler differential, limited slip
COOLING Left side mounted radiator with thermostatic controlled electric fan
BRAKE SYSTEM Floating discs, cast iron, 230mm & 185 mm dia. Front: 4 piston ISR caliper. Rear: 4 piston Frank Industries caliper
ELECTRONICS Multifunctional steeringwheel developed with TAKATA-Petri AG, electric shifting system, team radio and telemetry via GSM

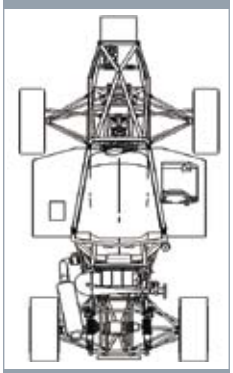
Germany

Berlin
University of Applied Sciences Berlin

FHTW Motorsport Team - The Formula Student racing team of the Berlin University of Applied Sciences was founded four years ago in June 2005. In this time all team members pursued one ultimate ambition: the participation in the Formula Student championship at Hockenheimring in August 2006, 2007, 2008 and 2009. Starting from scratch, all departments like engine/electronics, chassis/brakes, frame/covering and of course the marketing and PR department which amongst others is responsible for sponsoring, aimed high. The result of this year of full commitment is a vehicle, which is highly competitive: The “Berlin Race Car” (BRC09). The Team is made up of members with different academic backgrounds. There are automotive, mechanical and industrial engineers as well as computer scientists and business communication students. According to the name change process of our university, we are renaming our self into HTW-Motorsport in September 2009.

Car 13





FRAME CONSTRUCTION tubular space frame
MATERIAL S235JR mild steel tube cold drawn seamless
OVERALL L / W / H (mm) 2868 / 1387 / 1163
WHEELBASE (mm) 1650
TRACK (Fr / Rr) (mm) 1219 / 1038
WEIGHT WITH 68kg DRIVER (Fr / Rr) 157 / 139
SUSPENSION Double unequal length A-Arm. In front pull rod actuated horizontally oriented spring and damper. In rear Push rod actuated horizontally oriented spring and damper.
TYRES (Fr / Rr) 20.5x6.0 R13 Hoosier R25B / 20.5x7.0 R13 Hoosier R25B
WHEELS (Fr / Rr) 6.0x13, 18 mm offset, 2 pc Al-Mg Rim / 7.0x13, 5.0 mm offset, 2 pc Al-Mg Rim
ENGINE Modifieed Yamaha YZF R6
BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 600cc
COMPRESSION RATIO 13:1
FUEL SYSTEM Yamaha Fuel injection sequential
FUEL 100 octane unleaded gasoline
MAX POWER DESIGN (rpm) 13100
MAX TORQUE DESIGN (rpm) 7000
DRIVE TYPE chain
DIFFERENTIAL clutch pack limited slip, drexler motorsport
COOLING one site pot mounted radiator with fan
BRAKE SYSTEM 4-Disk System, self developed disks with 222mm diameter in front 202mm in rear, driver adjustable balance beam, Brembo calipers
ELECTRONICS Multifunctional Steering Wheel, C-Control servo motors, Electromechanic Shifting System

Germany

Birmingham
University of Birmingham

2009 sees UBRacing compete in Germany for the 3rd time, with a team of 12 undergraduate students. We have joined forces with several new sponsors, including McLaren Electronic Systems, and strengthened our relationships with Perkins Engines and Dunlop Motorsport in our efforts to produce our most successful car yet.Our aim for 2009 is to finish as the top UK University. We have paid particular attention to improving our score in the design event, through development of our design processes and justification. Key progress has been made in vehicle dynamics, electronics and engine development. Our tyres have been developed in partnership with Dunlop Motorsport, representing a significant performance gain over last year. The use of a TAG-400 ECU has allowed us to consolidate our engine control and data logging into one compact, lightweight unit while rapid prototyping sponsorship has allowed us to develop the unique central air intake seen on the car.

Car 14

FRAME CONSTRUCTION One piece tubular spaceframe
MATERIAL T45 and CFS360NBk Steel
OVERALL L / W / H (mm) 2650 / 1380 / 1170
WHEELBASE (mm) 1600
TRACK (Fr / Rr) (mm) 1200 / 1130
WEIGHT WITH 68kg DRIVER (Fr / Rr) 127 / 158
SUSPENSION Double unequal length A-Arm. Front Pullrod / Rear Pushrod actuated spring and damper. Preload adjustable anti-roll bar system front and rear.
TYRES (Fr / Rr) 175/505 R13 Dunlop Motorsport / 175/505 R13 Dunlop Motorsport
WHEELS (Fr / Rr) 7.0x13, 3pc Al/Mg Keizer rim
ENGINE Yamaha YZF R6 5SL
BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 12.4:1
FUEL SYSTEM Bespoke sequential fuel injection, McLaren TAG400 ECU
FUEL 100 RON Unleaded
MAX POWER DESIGN (rpm) 12500
MAX TORQUE DESIGN (rpm) 9000
DRIVE TYPE Single 520 Chain
DIFFERENTIAL Yamaha ATV based, pre-load adjustable plate LSD
COOLING Sidepod mounted bespoke aluminium radiator and 175mm electric fan
BRAKE SYSTEM 4 disc system, floating hub-mounted stainless steel discs 220mm/186.5mm diameter. Adjustable brake balance, AP Racing Calipers.
ELECTRONICS McLaren TAG-400 ECU, bespoke wiring harness, steering-wheel controlled pneumatic gearshift system.

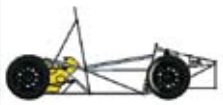
United Kingdom

Bratislava
Slovak University of Technology in Bratislava

In October 2007 we finally decided to match our strength with the best designers of student formula racing cars. The team from the country producing the highest number of cars per head, wants to prove that we have creative strength and development potential. That is why we are looking forward to the meeting in August at the Hockenheim ring. The team has been composed with a view to the future. In the first year we want to raise interest with the trendy design of the bodywork and the overworked suspension kinematics. Thanks to support from the faculty, university and the team's pedagogical advisors we succeeded in overcoming the most difficult problem – meeting the team budget at a time of financial crisis.Catia,ANSYS and Adams helped us to design the first car, balanced in all its units. It has great potential for optimizing the weight, cost, manufacturing process and driving properties. We hope for a successful start and hospitable weather for all the teams during the competition!

Car 89

FRAME CONSTRUCTION Tubular space frame
MATERIAL steel 11 373
OVERALL L / W / H (mm) 3050 / 1440 / 1100
WHEELBASE (mm) 1655
TRACK (Fr / Rr) (mm) 1262 / 1238
WEIGHT WITH 68kg DRIVER (Fr / Rr) 157 / 192
SUSPENSION Double unequal length A-Arm with Push rod
TYRES (Fr / Rr) 20x7-13 D 2692, R075 / 20x7-13 D 2692, R075
WHEELS (Fr / Rr) 13x7 inch, 31mm posit. offset / 13x7 inch, 31mm posit. offset
ENGINE Yamaha YZF R6
BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 12,4:1
FUEL SYSTEM Student design/built ,fuel injection, sequential
FUEL gasoline
MAX POWER DESIGN (rpm) 13000
MAX TORQUE DESIGN (rpm) 10000
DRIVE TYPE Roller Chain, 530 SDZ ČZ
DIFFERENTIAL Drexler Limited Slip Differential
COOLING Twin side pod mounted radiators with thermostatic controlled electric fans
BRAKE SYSTEM AP racing brake set
ELECTRONICS Electropneumatic Shifting System



Slovakia

Braunschweig
Technical University of Braunschweig

The Lions Racing Team was the second German team to enter the world of Formula Student and the first team worldwide, with a working Race-ABS. Ever since our first entry in 2002 we have been consequently developing the technical and economic knowledge of the team members. Results of these developments are increasingly innovative and fast cars with a high quality finish. Our new car, the LR09, is once again equipped with an ABS system. The aggressive suspension concept, a very compact and highly sophisticated package and supporting Continental AG for the tyre development, make the LR09 the fastest car built by our team to date. The LR09 and its drivers have been running through well planned and documented test procedures consisting of functional and setup tests to improve both, the vehicle's reliability and speed. Because of the above mentioned reasons we hope to reach a Top 10 position in the FSG 2009 event. If we sparked your interest, feel free to visit us in our pit.

Car 61

Germany

FRAME CONSTRUCTION Tubular space frame with supporting frame and hollow nodes

MATERIAL 25CrMo4 steel round tubing 10mm to 25mm dia

OVERALL L / W / H (mm) 2602 / 1318 / 1072

WHEELBASE (mm) 1525

TRACK (Fr / Rr) (mm) 1140 / 1072

WEIGHT WITH 68kg DRIVER (Fr / Rr) 135 / 158

SUSPENSION Double unequal length A-Arm, push rod actuated spring and damper (19°/15° inclined plane)

TYRES (Fr / Rr) 205/510 R13 Continental / 205/510 R13 Continental

WHEELS (Fr / Rr) 7.0x13, 0 mm offset, 3 pc Al/Mg Rim / 7.0x13, 0 mm offset, 3 pc Al/Mg Rim

ENGINE Suzuki GSXR-600 K4

BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,5:1

FUEL SYSTEM Student designed/built fuel injection system using MoTeC M4 ECU, sequential

FUEL 100 octane petrol

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain #520

DIFFERENTIAL Torsen University Special modified. Bias ratio 2.6:1

COOLING Single side pod mounted radiator with two electronically controlled electric fans (water)

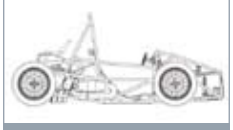
BRAKE SYSTEM Race-ABS, 4-Disk system, self developed rotors, adjustable bias bar, Brembo and AP-Racing calipers

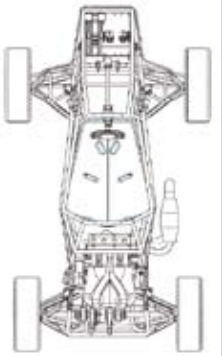
ELECTRONICS Self-Developed Gearbox Controlling Unit, Self-Developed Data Acquisition System, Live Car Data Stream, Diagnostic System, Race-ABS

Budapest
Budapest University of Technology and Economics

BME Formula Racing Team – Budapest University of Technology and Economics – The BME Formula Racing Team is a second year competitor in 2009. Due to our last year experiences we defined higher requirements to the car and the team's performance too. The main goals were to increase the technical parameters in more ways and to get better prepared for the static events. We would like to achieve better performance on the racetrack and keep the car's reliability, because we have to finish first if we would like to win. Our new car has more sophisticated technical solutions thanks to the more deliberate and careful design. Most of the team members remained with us, but we have some newcomers too. So the konowledge does not disappear, the new members can learn a lot from the experienced ones. We hope that we can achieve our aims and we can show a memorable performance in Hockenheim!

Car 21





Hungary

FRAME CONSTRUCTION welded tubular frame

MATERIAL St 35 mild steel

OVERALL L / W / H (mm) 2400 / 1380 / 1055

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1200 / 1080

WEIGHT WITH 68kg DRIVER (Fr / Rr) 159 / 159

SUSPENSION Double unequal length A-arms, push rods

TYRES (Fr / Rr) 13", Hoosier R25B

WHEELS (Fr / Rr) Keizer Magnesium 7x13"

ENGINE 2005 Yamaha R6

BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 600cc

COMPRESSION RATIO 12.4:1

FUEL SYSTEM Yamaha fuel injection system using Whistler ECU

FUEL 100 octane petrol

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE Chain #520

DIFFERENTIAL Quaife ATB Helical LSD

COOLING Yamaha R6 radiator mounted to sidepod

BRAKE SYSTEM 4-Disk system, floating rotors with 200 mm diameter

ELECTRONICS Student designed data acquisition system

Bundoora
RMIT University

RMIT Racing was formed to compete in the very first Australasian event held in 2000 and is based in Melbourne, Australia. The team has had a very successful history placing 1st in the UK in 2004 and 2007, 1st the US in 2006 and 5th in 2007 and 1st in Australia in 2006 and 2nd in 2007. With this successful history there is a lot of experience in the team and expectation for it to perform well. The team is competing for its first time at Formula Student Germany in 2009 and brings its R08 challenger. R08 is designed around a Yamaha WR450 engine that has been fuel injected. It is RMIT's first car to comply with the new template rules yet still holding the team's compact and light concept. With major emphasis on packaging and reducing weight despite the bigger carbon monocoque chassis the car features a smaller exhaust than seen on previous cars as well as structural sidepods to increase safety and increase chassis torsional rigidity.

Car 23

FRAME CONSTRUCTION Carbon Fibre/Aluminium sandwich panel monocoque

MATERIAL Carbon fibre prepreg with 1/2 inch aluminium honeycomb core

OVERALL L / W / H (mm) 2652 / 1300 / 1073

WHEELBASE (mm) 1630

TRACK (Fr / Rr) (mm) 1110 / 1060

WEIGHT WITH 68kg DRIVER (Fr / Rr) 107 / 116

SUSPENSION Unequal length A-Arms. Push rod actuated spring/damper unit.

TYRES (Fr / Rr) 18x6-10 Hoosier Tyres

WHEELS (Fr / Rr) RMIT designed carbon fibre rim with aluminium centre

ENGINE Fuel Inected Yamaha WR450

BORE / STROKE / CYLINDERS / DISPLACEMENT 95.0mm / 63.4mm / 1 cylinders / 450cc

COMPRESSION RATIO 12.5:1

FUEL SYSTEM Student designed fuel injection system using MoTeC M400 ECU

FUEL 98 Octane unleaded

MAX POWER DESIGN (rpm) 9500

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE Chain drive

DIFFERENTIAL Kaaz 1.5 limited slip differential with custom aluminium housing

COOLING Side Pod mounted radiator

BRAKE SYSTEM 2 front brakes using Wilwood PS-1 calipers with 1 rear differential mounted PS-1 caliper

ELECTRONICS Motec M400 ECU with removable ADL2+ data acquistion loom

Australia

Cambridge
University of Cambridge

Full Blue Racing is delighted to be attending FSG for the 3rd time, with its 3rd car – the Sealub Alliance FBR09. This year the team has undergone significant expansion in order to establish itself as a serious contender in the Formula Student competition. Hard work from the whole team has produced a vehicle that meets the aim for 2009 of ‚reliability without sacrificing performance'. This is acheived through the design of a simple, low maintenance vehicle with exceptional handling and acceleration performance. The team feels that this offers the ideal package for the weekend racer whilst making the most of the facilities available to it. The SAFBR09 would not have been possible without the help and support of all the sponsors and supporters who have offered advice, facilities and vital encouragement – thank you to all those involved!

Car 22

FRAME CONSTRUCTION Steel Spaceframe

MATERIAL Mild Steel

OVERALL L / W / H (mm) 2950 / 1422 / 1150

WHEELBASE (mm) 1650

TRACK (Fr / Rr) (mm) 1250 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 161 / 182

SUSPENSION Double unequal length A-Arm, pushrod & bell-crank actuated voild over springs & dampers

TYRES (Fr / Rr) 20

WHEELS (Fr / Rr) 20

ENGINE Yamaha YZF-R6 2005

BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.4:1

FUEL SYSTEM Open-source MegaSquirt system with semi-sequential injection and wasted-spark ignition

FUEL 95 RON Unleaded

MAX POWER DESIGN (rpm) 9500

MAX TORQUE DESIGN (rpm) 8500

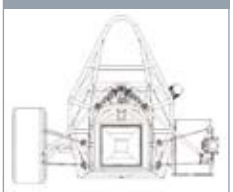
DRIVE TYPE Single 520 chain

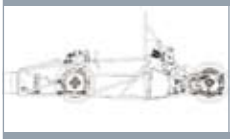
DIFFERENTIAL fixed 7075T6 spool with EN24T tripod housings

COOLING Side mounted custom Aluminium radiator & 10

BRAKE SYSTEM outboard front, inboard rear, Brembo calipers with EBC pads and AP cylinders

ELECTRONICS Cosworth Electronics data acquisition system





United Kingdom

Coburg
University of Applied Sciences Coburg

CAT-Racing (UAS Coburg) just finished the second race car, the C09. After a successful first season 2008, we set ambitious goals for the new season:One of our main goals was the weight reduction. We achieved that by increased application of carbon fibre, aluminium and by FEM-calculated styling of the components. This results in a weight reduction of 100kg (34,5%).The engine will put its optimum torque on a broader speed range which is reached by changed engine management system and an optimised air intake system. CAT-Racing emphasizes a very high portion of in-house production. This implies e.g. milling, turning, welding, manufacturing of the complete electrical system, all programming work and the production of all carbon fibre parts.The events in 2009 are coming up very soon and we are looking forward to participate in Silverstone (GB), Melk (AT), and Varano de Melegari(IT). I hope I speak in the name of everybody when I say: “Let the race begin!” Martin Knobloch – CEO

Car 98

Germany

FRAME CONSTRUCTION Frt and rear Tubular space frame

MATERIAL 25CrMo4 steel round tubing, 18*1mm, 25*1,5-2-2,5mm

OVERALL L / W / H (mm) 2650 / 1430 / 1300

WHEELBASE (mm) 1570

TRACK (Fr / Rr) (mm) 1315 / 1240

WEIGHT WITH 68kg DRIVER (Fr / Rr) 150 / 170

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 13/53-16 Michelin S6B / 13/53-16 Michelin S6B

WHEELS (Fr / Rr) 7.0x13, 5mm offset, 3 pc Al/Mg Rim / 7.0x13, 5mm offset, 3 pc Al/Mg Rim

ENGINE 2005 Yamaha YZF R6 RJ09

BORE / STROKE / CYLINDERS / DISPLACEMENT 65,5mm / 22,5mm / 4 cylinders / 600cc

COMPRESSION RATIO 12,4:1

FUEL SYSTEM Student designed/built fuel injection, full sequential

FUEL RON 95 petrol

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 10000

DRIVE TYPE Chain pitch 520

DIFFERENTIAL Drexler Torsen University Special modified. Bias ratio 3.76 (factory-set)

COOLING Single Go-Kart radiator mounted in right sidepod, ECU controlled electric fan

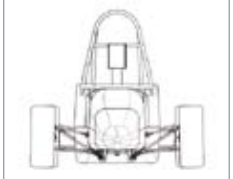
BRAKE SYSTEM Floating, Cast Iron, hub mounted, 218mm outer diam., 135mm inner diam.,

ELECTRONICS Electromagnetic shifter. CAN- and Shifter-Control Module with graphical user interface via Touch Screen in the Steering Wheel

Corvallis
Oregon State University

Our 2009 entry is a large step forward from last year, including a composite monocoque chassis and a single cylinder engine. We removed over 30 kg (70 lbs) compared to our previous entry, achieving a vehicle mass of 150 kg (330 lb)! Large diameter aluminum spindles and CNC machined uprights increase the stiffness and reduce the weight of our outboard package. The custom limited slip differential further reduces weight and allows us a wide range of tuning. We look forward to the 2009 competition series and invite you all to visit our pit for further information about Beaver Racing.

Car 15



United States

FRAME CONSTRUCTION Monocoque with Rear Subframe

MATERIAL Carbon/Steel

OVERALL L / W / H (mm) 2527 / 1299 / 1172

WHEELBASE (mm) 1575

TRACK (Fr / Rr) (mm) 1120 / 1065

WEIGHT WITH 68kg DRIVER (Fr / Rr) 102 / 116

SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 18.0x6.0-10 R25B Hoosier

WHEELS (Fr / Rr) 6 inch wide, 3 pc Al Rim, 2 inch neg. offset

ENGINE CRF 450x

BORE / STROKE / CYLINDERS / DISPLACEMENT 96mm / 62mm / 1 cylinders / 449cc

COMPRESSION RATIO 12.0:1

FUEL SYSTEM Honda fuel pump, Bosch 945 injector, custom rail, full sequential

FUEL 95 Octane unleaded gasoline

MAX POWER DESIGN (rpm) 9400

MAX TORQUE DESIGN (rpm) 7500

DRIVE TYPE 520 non-O-ring chain

DIFFERENTIAL Custom clutch pack limited slip, bias ratio adjustable from 1.2 to 3.3

COOLING Single side pod mounted radiator

BRAKE SYSTEM Front: Brembo calipers with custom rotors. Rear: Hope moto caliper with Diff. mounted disk

ELECTRONICS Motec ECU and data data acquisition

Darmstadt
Technical University of Darmstadt

DART Racing is proud to present its new racecar: the delta2009. The 2009 team consists of 50 students from different fields of study. Most of them attend DART Racing parallel to their regular courses. Due to the new chassis regulations the team had to design a new CFRP-monocoque which will offer modularity for different engine types in the future.Nevertheless the engine department focused on improving the performance of the powerful 2008-engine by simulations and bench tests. After a research on the gamma2008 suspension the kinematics were enhanced regarding performance and variability. The development of our custom-built Pirelli tires focused on an improvement of better grip in damp or wet conditions.Comparing delta2009 and gamma2008 nearly all components were redesigned due to reliability and the teams approach to design a new car.We would like to thank the TU Darmstadt and all our sponsors for their support. For more information visit our homepage www.dart-racing.de

Car 7

FRAME CONSTRUCTION CFRP monocoque

MATERIAL carbon fibre / epoxy composite, aluminium honeycomb, front roll hoop of Al 5083

OVERALL L / W / H (mm) 2803 / 1415 / 1211

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1220 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 127 / 156

SUSPENSION Double unequal length CFRP-wish-bones. Pull rod actuated Cane Creek Double Barrel spring and damper units

TYRES (Fr / Rr) 190/40 R-15 Pirelli student designed

WHEELS (Fr / Rr) 7 inch wide, 1 pc Al Rims student designed, 10mm neg. offset

ENGINE 2002 Suzuki GSX-R 600

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 14:1

FUEL SYSTEM Student designed and built; fully sequential, cylinder-selective dual stage fuel injection

FUEL 100 RON

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 9500

DRIVE TYPE Chain

DIFFERENTIAL Drexler Formula SAE special, limited slip

COOLING water cooled with ECU-controlled electric water pumps, 1.3 bar system pressure

BRAKE SYSTEM 4-Disk system, student designed floating rotors with 200mm diameter, adjustable brake balance, PVM calipers

ELECTRONICS Multifunctional steering wheel, electric actuated shifting system and clutch, CAN bus com-munication

Germany

Deggendorf
University of Applied Sciences Deggendorf

Team fast forest represents the UAS Deggendorf in Formula Student events. Our team was founded in June 2008 and is made up of 66 students from four faculties who contribute their mechanical/electrical engineering, business and media skills to a common objective: engineering a Formula Student race car.Working passionately during the summer and winter term, we developed, engineered and finally built our first car which was completed in June 2009. Team members fondly call it „Jenny“ whereas its official name is FF01. Driven by a Yamaha R6 motorcycle engine powered by a self-engineered fuel system, the FF01 comes up with a peak 75 HP at a weight of about 300 kg. The carbon-fibre bodyshell was designed and shaped by students and weighs as low as 5,7 kg. Fast forest aims to be the best newcomer team of this year‘s Formula Student challenge in Hockenheim. We are looking for-ward to share our experiences with the fellow teams in order to develop and present an improved, daring FF02 in 2010.

Car 73

FRAME CONSTRUCTION Steel front and rear tubular space frame

MATERIAL P 235 GH

OVERALL L / W / H (mm) 2928 / 1476 / 1404

WHEELBASE (mm) 1676

TRACK (Fr / Rr) (mm) 1220 / 1192

WEIGHT WITH 68kg DRIVER (Fr / Rr) 152 / 188

SUSPENSION Double unequal length A-Arm. Push rod actuated across the driving direction, horizontally oriented spring/damper unit KW competition, 3-way adjustable

TYRES (Fr / Rr) 205/510 R13 34M Continental

WHEELS (Fr / Rr) 7JXx13 FH2, 22 offset, one-piece AL rim

ENGINE Yamaha YZR R6 4 zylinders

BORE / STROKE / CYLINDERS / DISPLACEMENT 65,5mm / 44,5mm / 4 cylinders / 600cc

COMPRESSION RATIO 12,4:1

FUEL SYSTEM MBE 992 with CAN-Bus from MTO Engineering, fuel injection

FUEL 100 octane unleaded gasonline

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Chain Drive

DIFFERENTIAL Drexler limited slip differential

COOLING Twin side pod mounted thermostatic controlled radiators

BRAKE SYSTEM 4-Disk system, wave disc, hub mounted, vented, 240mm OD, 180 ID

ELECTRONICS multifunctional steering wheel with display, automatic ME shifter F1, free programmable ECU, data-logging subsystem

Germany

Delft

Technical University of Delft

For the 2009 Formula Student season, the Delft University of Technology has designed the DUT09. Being the ninth car from the DUT Racing Team, with it's predecessor scoring a second place overall last year in Silverstone and winning the FSG event, the car is up for the challenge! With a completely new chassis, a student built data-acquisition system, a suspension with large setup range and a 10% more fuel-efficient powertrain the DUT09 is up for the challenge!Centered around the end-user, the amateur weekend racer, the design focuses on the needs, wants and limitations of this particular driver. The design is a compromise between Ergonomics, Performance, Safety and Fuel Efficiency. The car is very easy to drive, because of a flat and broad torque curve and a good feel with throttle, brakes and tyres. Also, the ergonomics and safety are improved, with more space for the driver and a better steering wheel angle.

Car 1

Netherlands

FRAME CONSTRUCTION Vacuum infused two-piece full monocoque

MATERIAL Carbon and aramid fibres, corecell foam and epoxy resin

OVERALL L / W / H (mm) 2507 / 1375 / 1083

WHEELBASE (mm) 1540

TRACK (Fr / Rr) (mm) 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 101 / 122

SUSPENSION Unequal length A-Arms. Pull rod actuated 4-way adjustable Cane Creek Double Barrel damper with custom springs

TYRES (Fr / Rr) 18x6,0-10 LC0 Hoosier / 18x6,0-10 LC0 Hoosier

WHEELS (Fr / Rr) 6"x10", -30mm offset, single piece carbon rim

ENGINE 2008 Yamaha WR450F

BORE / STROKE / CYLINDERS / DISPLACEMENT 95mm / 63mm / 1 cylinders / 449cc

COMPRESSION RATIO 13,5:1

FUEL SYSTEM Student designed/built dual injector sequential fuel injection system based on VEMS

FUEL E85 Bio-Ethanol

MAX POWER DESIGN (rpm) 9000

MAX TORQUE DESIGN (rpm) 6500

DRIVE TYPE Chain

DIFFERENTIAL Student built/designed adjustable Salisbury clutch type differential

COOLING Chassis mounted Yamaha Grizzly quad radiator in sidepod with ecu controlled electric fan

BRAKE SYSTEM 4-Disk system, Full-floating custom steel rotors with 191mm diameter, adjustable brake balance, AP4226 Calipers,

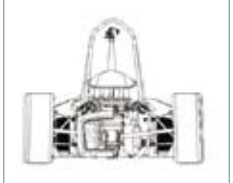
ELECTRONICS Steering Wheel with dash and shifter controls, Electropneumatic shifting system, student designed Data-Acquisition system

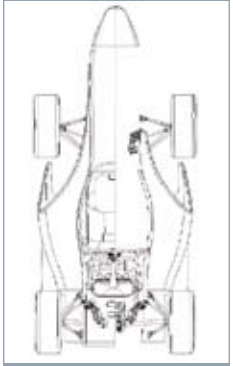
Dortmund

University of Applied Sciences Dortmund

With the experiences of the last two seasons the Race-Ing Team developed a rootedly new race car. The chassis of the RI09 is a one-piece carbon monocoque to offer high chassis-stiffness for best suspension performances.In comparison to last years vehicles the concept for the RI09 is specially focused on light weight constructions. All major structure components, casings and intake-system parts are made with advanced composites. A high range of adjustment options for the suspension in conjunction with the chassis-stiffness as well as the self-designed µC-controlled electronic system permit the great peformance of the RI09.Goal for the 2009 season is to present a highly competitive vehicle to get closer to the european top teams. For FSG 2009 the Race-Ing Team want to achieve a place in the top third of the ranking. We wish all teams god luck, success and of course a lot of fun for the done hard work!

Car 27





Germany

FRAME CONSTRUCTION hand laminated carbon composite monocoque with honeycomb core

MATERIAL carbon fibre weave 410g/m² and 65g/m², Hexion Resine, Schütz Honeycomb

OVERALL L / W / H (mm) 2835 / 1405 / 1059

WHEELBASE (mm) 1640

TRACK (Fr / Rr) (mm) 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 148 / 181

SUSPENSION Double unequal length A-Arm. Front: Pull rod actuated vertically oriented spring and damper. Rear: Pull rod actuated vertically oriented spring and damper.

TYRES (Fr / Rr) 205x55 R13, Hoosier R25B / 205x55 R13, Hoosier R25B

WHEELS (Fr / Rr) 6.5x13, 0mm offset, 3 pc Al Rim with Mg center / 6.5x13, 0mm offset, 3 pc Al Rim

ENGINE HONDA CBR600 modified with dry sump

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,0:1

FUEL SYSTEM Trijekt ECU ,Student designed ,fuel injection, sequential injection and ignition timing

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 9800

DRIVE TYPE chain drive

DIFFERENTIAL Drexler limited slip differential, max. torque: 1200Nm, preload: 10Nm

COOLING Twin side pod mounted radiators with thermostatic controlled fans and µC controlled waterpump.

BRAKE SYSTEM 4-Disk system, self developed rotors with 244mm diameter, adjustable brake balance, Brembo calipers with 2 opposing pistons,

ELECTRONICS selfdesigned Steering Wheel with multifunctional Display, selfdesigned µC-Board with CAN Bus , Electrohydraulic Shifting System

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Eindhoven
Technical University of Eindhoven

University Racing Eindhoven is proud to present their fourth operational race car that competes in the Formula Student competition, the URE05. The team has worked hard on the development of the award winning design in Class 3 of Formula Student last year (1st price Class 3 overall, 1st price Class 3 Design Event) and turned them into reality. This year, extra attention was paid to the reliability of the car together with improved vehicle dynamics.Our self developed data acquisition system enables us to verify our vehicle and tire models with infrared sensors on the tires and strain gauges on the suspension rods. This not only improved our knowledge of our innovative multilink suspension but also resulted in faster lap times. Other features of the URE05 are the 95bhp strong engine, improved driver ergonomics and lighter unsprung mass. We would like to thank our supporters in the industry and at the university – their engagement has been crucial to the success of the URE05.

Car 40

Netherlands

FRAME CONSTRUCTION Carbon fiber monocoque with steel tubular rear frame

MATERIAL Prepreg carbon fibre/epoxy monocoque, cold-drawn seamless st.37

OVERALL L / W / H (mm) 2745 / 1334 / 1062

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1225 / 1175

WEIGHT WITH 68kg DRIVER (Fr / Rr) 145 / 145

SUSPENSION Full multilink. Push/pull rod actuated vertically oriented Koni 2612 dampers, fully adjustable. Merwede springs

TYRES (Fr / Rr) 20.5X7-13 R25B

WHEELS (Fr / Rr) 6 inch wide, full carbon fiber rims

ENGINE 2002 Suzuki GSX-R 600

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13.3 :1

FUEL SYSTEM Multipoint fuel injection system using Motec M400 ECU

FUEL 98 octane petrol

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Chain #520

DIFFERENTIAL Limited slip differential. Bias ratio adjustable

COOLING Single radiator mounted in sidepod, electric waterpump and fan, thermostatic controlled

BRAKE SYSTEM 230mm/185mm rotors, Brembo P32/ Grimeca, adjustable brake balance

ELECTRONICS Multifunctional Steering Wheel, Pneumatic shift, electron fuse box, self developed data acquisition and telemetry system

Erlangen
University of Erlangen-Nuremberg

High-Octane Motorsports from the University of Erlangen is competing the second time in Hockenheim. Building on the experiences from our first year car, we developed a new concept for the “FAUmax beta”. Our proposition was to design a light weight and good accelerating race car, which is competitive, but still easy to drive, handle and maintain, based on a new E85 fuelled two cylinder engine. We improved and exchanged several parts because of inappropriate complexity, impracticality or excessive weight. Every single part was reviewed and improved – from the alloy steel frame to the electronic gearshift assembly. Design for an easy assembly and installation, based on the acquired knowledge from our first car, in combination with much more simulation and tests for a high reliability were our guiding theme for engineering. In fine: “light weight, fail-safe, powerful and cost-effective”. We are really looking forward to match other teams and meet many like-minded students.

Car 74

Germany

FRAME CONSTRUCTION Tubular space frame with various thickness & a carbon fibre body

MATERIAL 25CrMo4

OVERALL L / W / H (mm) 2785 / 1375 / 1065

WHEELBASE (mm) 1630

TRACK (Fr / Rr) (mm) 1216 / 1176

WEIGHT WITH 68kg DRIVER (Fr / Rr) 147 / 141

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally, oriented spring and damper

TYRES (Fr / Rr) Goodyear 20.0 x 7.0 – 13

WHEELS (Fr / Rr) 7.0x13, 11.3mm offset, 3 pc Al Rim

ENGINE Aprilia SXV 550 V2

BORE / STROKE / CYLINDERS / DISPLACEMENT 80mm / 55mm / 2 cylinders / 553cc

COMPRESSION RATIO 13,0:1

FUEL SYSTEM Student modified Aprilia stock fuel injection system using Microsquirt ECU

FUEL E-85 ethanol (104 octane (ROZ))

MAX POWER DESIGN (rpm) 10050

MAX TORQUE DESIGN (rpm) 7350

DRIVE TYPE Chain #520

DIFFERENTIAL Drexler Formula Student 2008-2009 differential

COOLING Single KTM 990 Duke radiator omounted in the right sidepod

BRAKE SYSTEM Student desigend 4-Disk CSiC 220mm (Fr) / 210mm (Rr), brake balance adjustable with servo-motor and AP calipers

ELECTRONICS Electrical driven centrifugal supercharger, Brushless DC Shift Actuator, Bluetooth-Telemetry System and Traction Control

Esslingen
University of Applied Sciences Esslingen

The Rennstall Esslingen was founded in 2006 when 4 students had a dream of building their own race car. This dream has led to one of the largest projects at the University of Applied Sciences Esslingen. Around 60 students from nearly every department of the university have been working together to fulfill their own dream now, the Stallardo 09. The 3rd race car out of the hands of the Rennstall is the next evolution step in the tradition of high quality manufactured, technical unique and stunning race cars from Esslingen. So it is obvious that every system of the car was reengineered to satisfy the high demands of Formula Student, the University Esslingen and of course of all members of the Rennstall-Team. The Stallardo 09 is the consequence of hard work, experience, smart ideas, reducing weight, passion for beautiful racecars, inter-disciplinary cooperation and an unique team spirit combined with a plenty of „Gute Laune“ („good mood“)!

Car 94

FRAME CONSTRUCTION Tubular Frame with removable Rearframe

MATERIAL Frontframe: S355 / A572 Gr 50; Rearframe: 25CrMo4 / SAE 4130

OVERALL L / W / H (mm) 2390 / 1410 / 1010

WHEELBASE (mm) 1700

TRACK (Fr / Rr) (mm) 1260 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 132 / 162

SUSPENSION Double unequal length A-Arm, Push rod, Increasing Ackermann-steering, CaneCreek Double Barrel damper: Adjustable in compression and in rebound range

TYRES (Fr / Rr) 178x50 R13, Hoosier R25B / 178x50 R13, Hoosier R25B

WHEELS (Fr / Rr) Custom made hybrid carbon fibre/ Mg rims 6

ENGINE Mahle SAE Engine V3

BORE / STROKE / CYLINDERS / DISPLACEMENT 74.0mm / 47.0mm / 4 cylinders / 608cc

COMPRESSION RATIO 13,0:1

FUEL SYSTEM Intake tube injection, 60.1mm from valves, Bosch injectors

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 9000

MAX TORQUE DESIGN (rpm) 7000

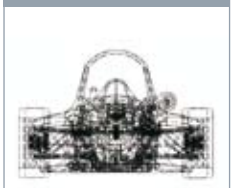
DRIVE TYPE longitudinal MAHLE 3 cylinder, no chain

DIFFERENTIAL Torsen type rear differntial, bias ratio 4:1

COOLING designed aluminium wet, radiator: Student designed, left/ right side

BRAKE SYSTEM 4-Disk system, rotor: Student designed, hub mounted, caliper: fr: Magura 4 piston, 26mm dia. rr: AP single alu billet, 25,4mm dia.

ELECTRONICS Bosch DDU display. 8STA connectors, Raychem spec 44 strands. Electro mechanical shifting system. LabVIEW based telemetry system.



Germany

Freiberg
Technical University of Freiberg

RT03 is the latest achievement of the Racetech Racing Team TU Bergakademie Freiberg – our new racecar surrounded by the one and only magnesium body shell worldwide. The actual development status is a merit of 3 teams' efforts with lots of challenges: At the beginning there was only a union of students to build the idea of a driving-ready racer. After 1 year of hard work we managed to push our roadworthy RT01 in start position at FSG2007. Next step was to evaluate the experiences of the first racecar and to improve the master plan. The result became the RT02, our second bolide, with which we did a really better job at FSG2008 in many aspects. Additionally the award for the best prepared car for scrutineering approved the good manufacturing of all its parts. Today our team counts 45 motivated students. Our main focus lies more and more on the intelligent use of a materials mixture consisting of high end aluminium- and steel-alloys besides composite materials and especially magnesium.

Car 76

FRAME CONSTRUCTION Tubular steel frame

MATERIAL Steel 25CrMo4

OVERALL L / W / H (mm) 2600 / 1420 / 1005

WHEELBASE (mm) 1652

TRACK (Fr / Rr) (mm) 1240 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 143 / 175

SUSPENSION Double unequal length a-arms, pull rod actuated vertically oriented CaneCreek Double Barrel spring and damper

TYRES (Fr / Rr) 20.5x7.0x13 Hoosier R25B C2500

WHEELS (Fr / Rr) 7.0x13 self-made one piece carbon rim

ENGINE Honda CBR600RR (PC37)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.0:1

FUEL SYSTEM Student designed fuel injection, sequential

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 10000

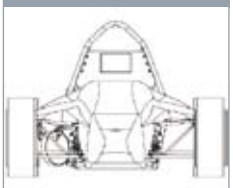
DRIVE TYPE DID 520 chaindrive

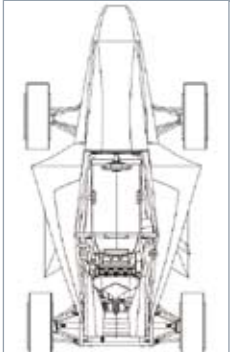
DIFFERENTIAL Drexler Formula Student, 25Nm preload

COOLING Single side pod mounted radiators with electric fans

BRAKE SYSTEM 4 disk, floating, self-designed hub mounted rotors, 220mm diameter, adjustable brake balance

ELECTRONICS Multifunctional steering wheel with touch-display, electropneumatic shifting system, selfdesigned live-telemetry system



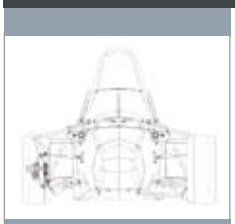


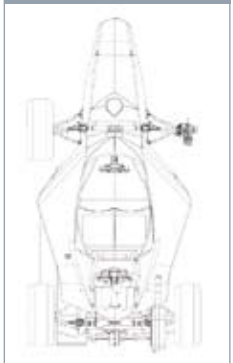
Germany

Graz
Technical University of Graz

This season we built our 6th car, the „Tankia 2009“. We had to handle the biggest chassis changes in the whole FS because of the new rules. Main aspects were “powerful”, “innovative”, “driveability” and “light-weight”. Tankia 2009 is powered by a Yamaha R6 four-cylinder engine with custom intake, cams, head and exhaust which delivers 72,5kW and 71 Nm with smooth, wide-band torque. By using carbon fiber composites and lightweight metals such as Aluminium and Titanium, the weights about 198 kg (ready to race) and is thanks to its 5th generation monocoque structure yet very stiff and sturdy. Using Simulation Software such as OptimumK and VeDyna and lots of acquired data we were able to better adapt the Tankia 2009s suspension to the nature of FSAE tracks. To help the driver as well as the engineers, the car has advanced electronic systems for data acquisition and driver assistance. New features we developed are an anti-blocking-system and a rear-wheel-steering system.

Car 3





FRAME CONSTRUCTION carbon fibre monocoque, carbon fibre two part rearend

MATERIAL CRP sandwich structure with nomex honeycomb core

OVERALL L / W / H (mm) 2832 / 1410 / 1189

WHEELBASE (mm) 1575

TRACK (Fr / Rr) (mm) 1200 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 127 / 139

SUSPENSION Unequal length A-Arms. Push rod and bell crank actuated ZF Sachs damper units, in bell crank axis mountet torsionbar spring

TYRES (Fr / Rr) 20,5x7-13 Hoosier R25B

WHEELS (Fr / Rr) 20,5x7-13 Hoosier R25B

ENGINE 2006 Yamaha R6 4 cylinder, 600ccm

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 600cc

COMPRESSION RATIO 13.7:1

FUEL SYSTEM student designed and built ,fuel injection, sequential

FUEL ROZ 98

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 7500

DRIVE TYPE Chain #520

DIFFERENTIAL multiplate limited slip differential

COOLING twin side pod mounted radiators with thermostatic controlled electric fans

BRAKE SYSTEM 4-Disk system, self designed rotors , adjustable brake balance,

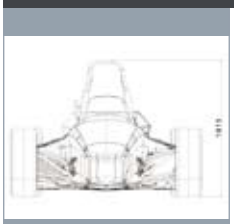
ELECTRONICS Multifunctional Steering Wheel, electronical Shift & Clutch System, Live-Telemetry System, CAN-Bus, adj. setup via Bluetooth

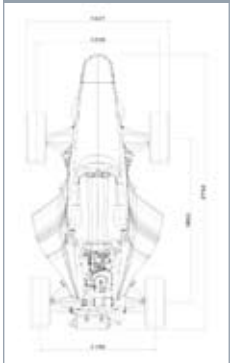
Austria

Graz
University of Applied Sciences Joanneum Graz

joanneum racing graz has been known for their lightweight vehicles with their powerful, supercharged single cylinder engines. The core team consists of about 25 students of automotive engineering and changes every year. Nevertheless every new racecar sets new standards in performance.The jr06 was the first „jr“ to overall win a competition in Italy 2006. Three years and six top-ten finishes later the jr09 – the sixth Formula Student race car in the team’s history – enters the arena. For the first time the team made use of a CFRP monocoque structure for the front part of the car. So despite the changes in the rules the jr09 is the lightest „jr“ ever. Other weight-saving and performance-boosting high-lights are the titanium wheelhubs, Sachs Formula3 dampers, CFRP Wheels, CFRP tubes integrated into the frame, a full-CFRP intake system, the full-titanium exhaust system and the extremely sophisticated suspension design.

Car 81





FRAME CONSTRUCTION Monocoque/tubular frame hybrid design

MATERIAL CFRP/aramid honeycomb (front); steel tubes (hoops & rear) / CFRP tubes (rear)

OVERALL L / W / H (mm) 2752 / 1428 / 1015

WHEELBASE (mm) 1650

TRACK (Fr / Rr) (mm) 1230 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 119 / 123

SUSPENSION Double unequal length CFRP A-Arm. Pull rod actuated spring and damper; adjustable in compression/rebound, high-speed/low-speed each

TYRES (Fr / Rr) 6.2 - 20.0 - 13 AVON A45

WHEELS (Fr / Rr) student-designed and buit 6x13 CFRP wheels, 12.3mm offset

ENGINE BRP Rotax Type 449

BORE / STROKE / CYLINDERS / DISPLACEMENT 97mm / 60.8mm / 1 cylinders / 449cc

COMPRESSION RATIO 12.5:1

FUEL SYSTEM Student designed/built, double fuel injection, sequential using MoTeC M800

FUEL E-85 ethanol

MAX POWER DESIGN (rpm) 8500

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain #520

DIFFERENTIAL Clutch pack limited slip, adjustable locking rate

COOLING Radiators (water and oil) with ECU-controlled electric fan; tailor-made intercooler

BRAKE SYSTEM 4-Disk system, self-developed rotors (220mm/210mm dia.) adjustable balance, 4/2 cylinder calipers

ELECTRONICS electro-pneumatic shifting and clutch actuation; student-designed gearbox ECU; engine and suspension data acquisition system

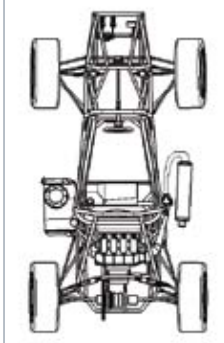
Austria

Hamburg
Helmut Schmidt University of Federal Armed Forces Hamburg

The Eleven-O-Six Racing Team of the HSU Hamburg was founded in 2006 and now proudly presents its 2nd Formula Student racing car: the R.U.S.H.09! In comparison to the last year's car, the R.U.S.H. 09 was completely new designed. Of course, the various experiences, insights and impressions gained at the Hockenheimring last year sustainably influenced its total construction. High engine performance and lightweight construction generate optimal acceleration figures and its appearance based on aerodynamic efficiency make it a well cornering and road-holding racing car. Lightweight design and improvement of the chassis and of the production engineering of the casing were one of the most important points the team reconsidered. The result of barely one year of work is the R.U.S.H. 09 – Robust, Unique, Sporty and High-performance.

Car 72

FRAME CONSTRUCTION Tubular Space Frame
MATERIAL S235 and E355
OVERALL L / W / H (mm) 2719 / 1335 / 974
WHEELBASE (mm) 1684
TRACK (Fr / Rr) (mm) 1126 / 1137
WEIGHT WITH 68kg DRIVER (Fr / Rr) 144 / 155
SUSPENSION Double unequal lenght A-Arm., Push rod actuated spring and damper, adjustable in compression
TYRES (Fr / Rr) 175/505 R13 Dunlop/ Michelin
WHEELS (Fr / Rr) 7.0x13, BBS 3 pc Al rim
ENGINE Modified Honda CBR600FS4i (PC35)
BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 12,0:1
FUEL SYSTEM student designed injection and spark ignition
FUEL 100 octane unleaded gasoline
MAX POWER DESIGN (rpm) 11000
MAX TORQUE DESIGN (rpm) 10000
DRIVE TYPE Enuma 520 UVX chain
DIFFERENTIAL GKN Driveline bevel gear differtial
COOLING Single radiator with thermostatic controlled electric fan
BRAKE SYSTEM Floating, Cast iron, Hub mounted, Front: 220mm dia vented, Rear: 200 dia. vented
ELECTRONICS Multifunctional Sterring Wheel, Electronic Shifting System



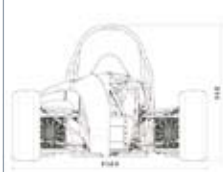
Germany

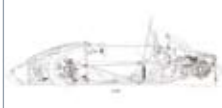
Hamburg
University of Applied Sciences Hamburg

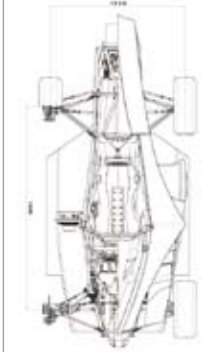
The HAWKS Racing Team was founded in 2003 and participated in Formula Student the first time in 2004. We are currently 40 students from different specialisations, working in interdisciplinary groups on the car and its related businesses. In the year 2009, we compete the 5th year in FSAE. After 4 race cars, it took ten month of planning, development and construction to build another fascinating Hawk! Our new H05 is the next evolutionary step: A self designed carbon rim, a multifunctional 3.5" TFT panel for the steering-wheel and the extraordinary styling are some of the highlights. Less weight, half the unsprung mass, new dampers, more engine performance and more overall perfection will enrich the race experience. We look forward to the competition in Hockenheim!

Car 69

FRAME CONSTRUCTION Tubular steel space frame with carbon honeycomb elements
MATERIAL Mild steel round tubing 25 mm dia, various thickness
OVERALL L / W / H (mm) 2940 / 1380 / 969
WHEELBASE (mm) 1800
TRACK (Fr / Rr) (mm) 1200 / 1200
WEIGHT WITH 68kg DRIVER (Fr / Rr) 144 / 156
SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper
TYRES (Fr / Rr) 20x7 R13, Goodyear D26965
WHEELS (Fr / Rr) 7x13, 20 mm offset, 1 pc Al Rim
ENGINE 2000 Kawasaki ZX-6R 4 cylinder
BORE / STROKE / CYLINDERS / DISPLACEMENT 66mm / 43.8mm / 4 cylinders / 599cc
COMPRESSION RATIO 12.8:1
FUEL SYSTEM MPI sequential, fuel injector Bosch EV14 dual spray, fuel pump Bosch 254911,
FUEL Gasoline 100 RON
MAX POWER DESIGN (rpm) 11500
MAX TORQUE DESIGN (rpm) 9500
DRIVE TYPE Chain drive, chain type 520
DIFFERENTIAL Drexler Formula Student limited slip multi-disk differential
COOLING Twin side pod mounted radiators with dynamically PWM controlled electric fans
BRAKE SYSTEM 4-disk system, floating hub mounted 250 mm rotors, adjustable brake balance, student designed Fr 6 piston, Rr 2 piston calipers
ELECTRONICS Self designed DAQ, live telemetry, steering wheel display, electronic shifting, traction control, electronical fuses, TTCAN





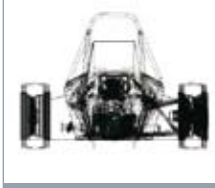


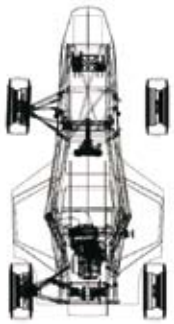
Germany

Hannover
University of Hannover

With the Formula Student Team ‘HorsePower Hannover’ the Leibniz University shows the first racing team from the fair city Hanover. The Team was founded in 2007 from selfinitiative of the students. Now the team starts the first time against the competitors of the whole world with the racecar RP09.Our team has a high request of technology. In our first Event the special attention lays in the durability of the components to get to success. After a lot of hard work and some gone through nights our team grew together and we will fight to make the impossible possible.

Car 95





FRAME CONSTRUCTION Steel tube space frame with glued carbon fibre floor panels

MATERIAL 25CrMo4 alloy steel tubes - cold drawn seamless

OVERALL L / W / H (mm) 2730 / 1406 / 1017

WHEELBASE (mm) 1610

TRACK (Fr / Rr) (mm) 1208 / 1162

WEIGHT WITH 68kg DRIVER (Fr / Rr) 118 / 177

SUSPENSION Unparallel, unequal length A-Arms. Push rod actuated horizontally oriented spring and damper units. Adjustable in compression and in rebound range.

TYRES (Fr / Rr) 205/510 R13 Continental C09

WHEELS (Fr / Rr) 7in wide, 3 pc Al-Mg Rim, central locking

ENGINE Modified and supercharged KTM LC4

BORE / STROKE / CYLINDERS / DISPLACEMENT 101mm / 76mm / 1 cylinders / 609cc

COMPRESSION RATIO 10,4:1

FUEL SYSTEM 2 multi point fuel injectors

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 7500

MAX TORQUE DESIGN (rpm) 5500

DRIVE TYPE Chain #520

DIFFERENTIAL Limited Slip Differential

COOLING One radiator mounted in sidepod

BRAKE SYSTEM 4-Disc system, self developed, laser cut rotors with 230 mm front and 210 mm rear diameter, adjustable brake balance

ELECTRONICS Data logger with 8MB internal memory and integrated GPS receiver, multifunctional steering wheel

Germany

Hannover
University of Applied Sciences Hannover

In autumn 2007, a group of students at the University of Applied Sciences and Arts (UAS) in Hanover founded the Formula Student-team FHH Motorsport. Today, the team consists of about 30 motivated and eager college members from almost all faculties, which study engineering, business informatics, product design and many other subjects. Now – after almost two years of hard work – the team will take part in the 2009 Formula Student Germany-competition in Hockenheim. This will be the first big challenge for their car, which is called “Pegasus09”. The main aim of the team is to finish the 2009 FSG-competition without big problems. A successful participation in this year’s competition will mark the first step for the team FHH-Motorsport to establish itself in the Formula Student-competitions and at the UAS in Hanover during the next years.

Car 84

FRAME CONSTRUCTION Tubular steel frame

MATERIAL S 355

OVERALL L / W / H (mm) 2850 / 1400 / 1130

WHEELBASE (mm) 1700

TRACK (Fr / Rr) (mm) 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 125 / 195

SUSPENSION Double unequal length A-Arm. Pullrod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 205/510 R13 Continental / 205/510 R13 Continental

WHEELS (Fr / Rr) 7x13 BBS Racewheels/ 8x13 BBS Racewheels

ENGINE 2003 Kawasaki ZX-6R 4 cylinder

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,3:1

FUEL 100 octane

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 10000

DRIVE TYPE Chain, Teilung 520

DIFFERENTIAL Drexler Lamellensperrdifferential, 10Nm preload, max. torque: 1200 Nm

COOLING 2

BRAKE SYSTEM 4-Disk system, rotors with 220 diameter

Germany

Hatfield
University of Hertfordshire

In a never ending pursuit for the winner‘s podium, the University of Hertfordshire are returning from their 5th place in Formula Student Germany last year. The implementation of a new cohesive team structure encompassing both class 1 and class 1(A) teams, has enabled a vast improvement in productivity from both parties and a great learning experience to new members of the team. Having consistently ranked as one of the top UK teams the past few years, the team are desperate to take home the trophy this time around! UH12, the team‘s latest and greatest, was born on paper two years ago and follows the teams core design principle of producing low cost high performance race cars. Incorporating large advances in chassis frame design with the results of extensive tuning in the mapping laboratories, the university‘s first full camber compensation car is looking to leave quite the impact this summer! www.racing.herts.ac.uk

Car 5

FRAME CONSTRUCTION Two piece tubular steel space frame with bonded floor panel

MATERIAL Cold drawn seamless C350 mild steel tube, Clubman 500 roll hoops, Fibrelam floor

OVERALL L / W / H (mm) 2585 / 1357 / 1246

WHEELBASE (mm) 1530

TRACK (Fr / Rr) (mm) 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 129 / 141

SUSPENSION Double unequal length wishbones. Push rod actuated vertically orientated spring and damper units.

TYRES (Fr / Rr) 508x157.5-330.2 A45 Avon / 508x157.5-330.2 A45 Avon

WHEELS (Fr / Rr) 3-piece Al rim, machined centre, 330.2mm x 165mm, 40.5 offset Fr+Rr

ENGINE Modified 2006/07 Yamaha YZR-R6

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.8:1

FUEL SYSTEM Modified Yamaha fuel rail, fuel injection, sequential, coil on plug ignition

FUEL 100 octance unleaded gasoline

MAX POWER DESIGN (rpm) 13500

MAX TORQUE DESIGN (rpm) 9000

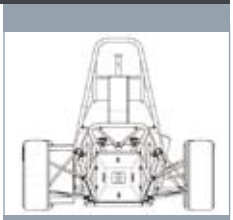
DRIVE TYPE Chain #520

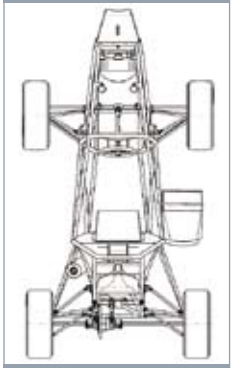
DIFFERENTIAL Limited slip differential

COOLING Single side pod mounted radiator 340x230x25mm core, 190.5mm temp controlled electric fan

BRAKE SYSTEM 4-Disk system, self developed rotors with 220mm diameter, adjustable brake balance, AP Racing calipers

ELECTRONICS Sealed wiring harness, self designed live-telemetry system, stain gauge shift





United Kingdom

Helsinki
Helsinki Metropolia University of Applied Sciences

HPF009 is the 7th Formula Student Car designed and engineered by Metropolia Motorsport (formely known as Helsinki Polytechnic). The newest car contains several top of the line components and solutions. Power is produced by modified Yamaha R6 engine. Our engine team has been working hard on simulations and getting to know our new Motec engine management system since last autumn. Variable length intake system provides wide powerband and great torque. Dry sump system guarantees optimum lubrication even in hard corners. Increased power and torque are transferred to a Drexler LSD via modified 4-speed pneumatically operated gearbox. Steel tube Space frame is reinforced with a carbon fibre floor panel. Composite materials can also be found in components like the drivers seat, steering wheel and driveshafts. Design of the bodywork was as challenging as always. The theme of the bodywork is man and motoring so hopefully people sence pure racing spirit by just looking at the car.

Car 8

FRAME CONSTRUCTION Steel Tube Space frame

MATERIAL Ruukki FORM 600

OVERALL L / W / H (mm) 2750 / 1340 / 1175

WHEELBASE (mm) 1630

TRACK (Fr / Rr) (mm) 1165 / 1130

WEIGHT WITH 68kg DRIVER (Fr / Rr) 126 / 142

SUSPENSION Double unequal length A-Arm. Push rod actuated spring and damper

TYRES (Fr / Rr) Hoosier 20.5 x 7.0 - 13 R25B

WHEELS (Fr / Rr) 3 pc Mg, 6,5x13“

ENGINE 2008 Yamaha YZF-R6

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13.1

FUEL SYSTEM Motec M880

FUEL 101 RON unleaded

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 9500

DRIVE TYPE Chain

DIFFERENTIAL Drexler LSD

COOLING Side mounted, electric fan

BRAKE SYSTEM Lasercut, hub in front. 4 Piston calipers, push type master cylinders.

ELECTRONICS Multifunctional Steering Wheel, Electropneumatic Shifting system

Finland

Kaiserslautern
Technical University of Kaiserslautern

Carbonyte 09 is the second vehicle of the Kaiserslautern Racing Team to compete in Formula Student Germany. Committed to the idea of light weight construction, a CFRP monocoque was designed and manufactured. A key feature of this frame is the highly ergonomic seat that offers superior comfort and driver safety. The light weight concept is rounded off by the suspension system that utilizes extruded aluminum. In order to boost the car's performance the intake and exhaust system are CFD optimized.The new electronics concept of Carbonyte 09 includes a self-designed integrated fuse box that offers PWM output as well as digital control of all on-board power electronics. Furthermore, real time data transmission via GSM was realized. Finally, we would like to express our gratitude to all our sponsors and supports that helped us to make our visions come true.

Car 64

Germany

FRAME CONSTRUCTION monocoque and rear tubular space frame

MATERIAL CFRP, foam core, steel rear frame

OVERALL L / W / H (mm) 2834 / 1412 / 1120

WHEELBASE (mm) 1700

TRACK (Fr / Rr) (mm) 1266 / 1165

WEIGHT WITH 68kg DRIVER (Fr / Rr) 120 / 184

SUSPENSION Double unequal length A-Arm. Pull-rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) Hoosier 20.5x7.5-13 R25B

WHEELS (Fr / Rr) 8x13, 47mm offset, 3 piece of aluminium rim

ENGINE Suzuki GSX-R 600 K4

BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.5:1

FUEL SYSTEM VEMS full sequential injection and ignition;

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 13000

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE chain drive

DIFFERENTIAL GKN Visco Lok limited slip

COOLING side pod mounted radiator with thermostatic controlled electric fan; eletrical water pump

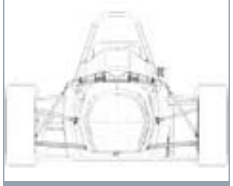
BRAKE SYSTEM Floating, Cast Iron, hub mounted, 220mm outer diam., 172mm inner diam.

ELECTRONICS automotive standard wiring harness, CAN-Network, Electropneumatic shifting system, selfdesigned Live-Telemetry System, el.Fusebox

Karlsruhe
University of Karlsruhe

KA-RaceIng – the formula student team from the University of Karlsruhe (TH) – took part in their first formula student event in 2007. The team consists of 55 students from different fields of study, mainly mechanical, electrical and industrial engineering. Organised into technical or organisational sub teams, every team member has a task for which he is fully responsible. The main design change on the KIT09 is a modular CFRP-monocoque instead of a tubular steel frame chassis. Further innovations were introduced on individual components to reduce weight, improve serviceability and allow efficient and repeatable setup adjustments. By the start of May the KIT09 was ready to race and the team's focus turned to testing and training, in order to optimise the car's and driver's performance. KA-RaceIng would like to thank all its supporters which made it possible to build this race car. The team is looking forward to another exciting and successful competition at Hockenheim.

Car 70



Germany

FRAME CONSTRUCTION Modular CFRP Monocoque

MATERIAL HT fibre, 5mm - 15mm Airex core

OVERALL L / W / H (mm) 2760 / 1400 / 970

WHEELBASE (mm) 1650

TRACK (Fr / Rr) (mm) 1220 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 133 / 146

SUSPENSION Pushrod-actuated unequal length A-Arms with adjustable horizontally-oriented springs and dampers(CCDB) with semi-active torsion-type anti-roll bar

TYRES (Fr / Rr) 20.5x7-13 Hoosier R25B / 20.5x7-13 Hoosier R25B

WHEELS (Fr / Rr) OZ Superlegg. 7x13, 22mm offset, 1 pc Al Rim / OZ Superlegg. 7x13, 22mm offs

ENGINE 2003 Honda CBR600F (PC35)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 57mm / 4 cylinders / 599cc

COMPRESSION RATIO 13:1

FUEL SYSTEM fuel injection system using BOSCH MS 4 Sport ECU

FUEL 95 octane

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE 520 chain, 5/8

DIFFERENTIAL Drexler clutch pack limited slip differential, adjustable bias ratios (30%, 50%,

COOLING One side pod mounted radiator, electric fan and water pump

BRAKE SYSTEM Floating, lasercut steel, hub mounted rotors with 220mm diameter, 2 x ISR Six piston and 2 x ISR Four piston calibers

ELECTRONICS Multifunctional Steering Wheel, Electropneumatic Shifting System, Live-Telemetry via WLAN, BOSCH ABS M4

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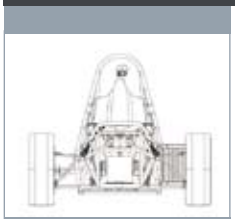
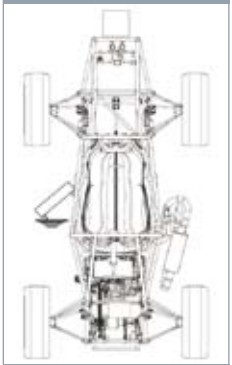
SCHAEFFLER GRUPPE

Karlsruhe
University of Applied Sciences Karlsruhe

Founded in 2006, High Speed Karlsruhe is entering its third year of competition in Formula Student Germany. About 40 students from different departments worked together to develop the team's new car, the F103. The design of the F103 is focused on retaining and optimizing the strengths of last year's F102, whilst improving its weaker points. In order to achieve this goal, attention was paid to weight reduction, without compromising the car's excellent reliability which allowed us to finish in every event we have taken part in. The enhanced engine concept is combined with a redesigned frame and several new features to increase driver safety, drivability and ease of use. Student made CFRP rims are a new highlight of the car, whereas the attractive body styling can already be called a trademark of the team. We would like to thank all our sponsors and supporters, whose efforts are greatly appreciated, and are looking forward to a great competition in Hockenheim!

Car 38





FRAME CONSTRUCTION Steel tubular space frame

MATERIAL S355 from 20mm to 30mm in diameter thickness 1.5mm and 2.0mm

OVERALL L / W / H (mm) 2794 / 1424 / 1163

WHEELBASE (mm) 1625

TRACK (Fr / Rr) (mm) 1200 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 134 / 195

SUSPENSION Double unequal lenghth A-Arm. Push rod actuated spring and damper. Adjustable in compression and in rebound range

TYRES (Fr / Rr) 195x55 R13, Avon

WHEELS (Fr / Rr) 7.0x13, 10mm offset, Student made 1 pc Carbon Fibre

ENGINE Modified Honda CBR600RR (PC37)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13:1

FUEL SYSTEM Trijekt with sequential injection and quad coil single spark ignition

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE Chain 520VM with x-Ring, max. load 3650

DIFFERENTIAL Drexler formula student

COOLING Left sidepod mounted radiator with one fan, electric waterpump

BRAKE SYSTEM 4-Disk system, 190mm outer diameter, adjustable branke balance

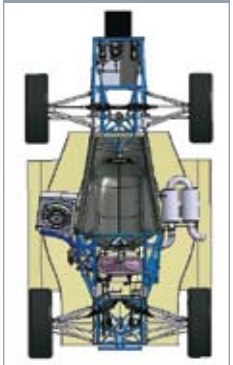
ELECTRONICS Student design and build Multi-functional Steering Wheel, Electropneumatic Shifting System

Germany

Köln
University of Applied Sciences Köln

Formula Racing Cologne is proud to present their next Formula Student car, the CC09. Having started at Formula Student competition in Hockenheim 2007 and 2008, we gathered a lot of experience to improve our design for the new car. In 2008, the CC08 showed a good performance in the dynamic events but unfortunately we did not finish the endurance race. So the main goal for 2009 was clear: To built a reliable but light weight car! The new CC09 is a straight evolution of our car from 2008. All important load cases were rechecked and trough redesigning a lot of parts we were able to achieve a loss of weight. In addition to that the usage of approved components kept the costs low. All in all we think we are good prepared for the event and archive our most important goal: ending up on a place among the "Top 10" teams. We would like to thank our supporters and sponsors for sticking with us and without whom this new car would not have been possible.

Car 60



FRAME CONSTRUCTION Tubular space frame

MATERIAL 15CDV6, 12mm to 30mm dia., 1mm to 2,5mm wallthickness

OVERALL L / W / H (mm) 2696 / 1435 / 1027

WHEELBASE (mm) 1650

TRACK (Fr / Rr) (mm) 1200 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 143 / 161

SUSPENSION Double unequal length A-Arm. Push rod actuated adjustable Student designed KW Damper. Adjustable in compression and in rebound range

TYRES (Fr / Rr) 20.5x7.0-13, Hoosier R25B

WHEELS (Fr / Rr) 7x13, -1,9mm offset, BBS 3 piece Al-Mg rim

ENGINE modified Yamaha R6 (2005)

BORE / STROKE / CYLINDERS / DISPLACEMENT 66mmmm / 45mmmm / 4 cylinders / 599cc

COMPRESSION RATIO 12.4:1

FUEL SYSTEM sequential fuel injection, Bosch MS4 ECU

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 11800

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE chain 428

DIFFERENTIAL Drexler Formula SAE special, limited slip

COOLING one side pot mounted radiator with thermostatic controlled electric fan

BRAKE SYSTEM 4-disk system, dia: 200mm, front: 4 piston; rear: 2 piston AP Racing calipers, adjustable brake balance

ELECTRONICS multifunctional steering wheel, electronic shifting system, traction control

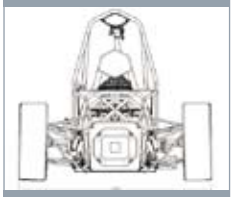
Germany

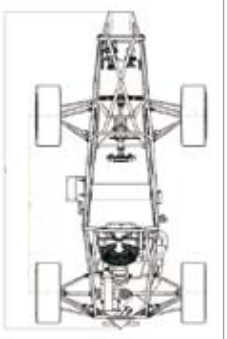
Konstanz
University of Applied Sciences Konstanz

The Bodensee Racing Team started in 2006 and is ready to present its fourth Formula Student racecar. After ups and downs in the first two years we were happy to build a car in 2008 which made it through Scrutineering in the first run and could finish the Endurance competition. This means we had a good base to build on for the current Iltis09. But as in the real world you should never be too satisfied and continue to be critical with your solutions. With this in mind nearly 60 students started to develop and manufacture our new racecar. Improvements include a stiffer frame, better chassis, fully adjustable steering and more power. All these improvements are responsible for the better handling, acceleration and dynamic behavior of the Iltis09. We are ready to race! Are you?For more information and details visit us in our pit in Hockenheim or Fiorano this year. Thanks to all our Sponsors and Patrons for your enthusiasm and support. Good luck to all other teams.

Car 34

FRAME CONSTRUCTION Tubular space frame / CNC rear section Al 7075
MATERIAL ST52
OVERALL L / W / H (mm) 2875 / 1390 / 1175
WHEELBASE (mm) 1570
TRACK (Fr / Rr) (mm) 1210 / 1210
WEIGHT WITH 68kg DRIVER (Fr / Rr) 150 / 180
SUSPENSION Double unequal length A-Arm. Pull rod actuated diagonally oriented airdamper
TYRES (Fr / Rr) front and rear: 20x6x13, Hoosier R25A
WHEELS (Fr / Rr) 7x13, 30mm offset, 1 pc Al Rim
ENGINE Suzuki GSX-R 600 K1-K3
BORE / STROKE / CYLINDERS / DISPLACEMENT 67,0mm / 42.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 12,5:1
FUEL SYSTEM Student des/built ,fuel injection, sequential
FUEL 100 octane
MAX POWER DESIGN (rpm) 11000
MAX TORQUE DESIGN (rpm) 8500
DRIVE TYPE 06B-03 Triple chain
DIFFERENTIAL GKN ViscoLok
COOLING Single side pod mounted radiators with thermostatic controlled electric fan
BRAKE SYSTEM Floating, steel, hub mounted, 246mm outer diam., 170mm inner diam., Ap Racing 14mm bore front-14mm bore rear adjustable by bar
ELECTRONICS Walbro ECU-A1/FSAE Application, fully programmable, 3-D map, RPM and Throttle position, 40 deg BTDC max advance





Germany

Loughborough
Loughborough University

LUM is entering its 7th year of competition and is now established as a front running team within FSUK and FS Germany competitions. The LUM team consist of 15 key members, who complete the design and manufacturing of the race vehicle, outside the boundaries of their academic studies. LUM exists entirely through financial sponsorship attained by the team's partnerships with industry.LFS09 is a radically new design which has been built upon the principles of LFS08's excellent reliability. The car gains a significant improvement in engine power and driveability; the other main improvements are from the new drivetrain and suspension kinematics with the focus on developments in vehicle dynamics.LUM has initiated research projects, which can be implemented on future cars with particular regard to composite components, launch and traction control. The team aims to become the UK's top formula student team, to coincide with Loughborough University's excellent engineering reputation.

Car 12

FRAME CONSTRUCTION T45 Tubular steel space frame with bonded stressed carbon panels
MATERIAL T45 Tubular steel, carbon panels
OVERALL L / W / H (mm) 2875 / 1520 / 1045
WHEELBASE (mm) 1530
TRACK (Fr / Rr) (mm) 1300 / 1130
WEIGHT WITH 68kg DRIVER (Fr / Rr) 129 / 154
SUSPENSION Double unequal length A-Arm. Pull rod actuated spring and damper
TYRES (Fr / Rr) 20.0x7.0-13 Goodyear D2692
WHEELS (Fr / Rr) Braid 2-piece alloy 13" x 8J 45mm negative offset
ENGINE 2005 Honda CBR600RR 4 cylinder inli
BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 12:1
FUEL SYSTEM 4 fittings used, bespoke 4 point sequential injection, MoTeC M800 ECU
FUEL 98 octane petrol
MAX POWER DESIGN (rpm) 10000
MAX TORQUE DESIGN (rpm) 7500
DRIVE TYPE Single Chain
DIFFERENTIAL Drexler Formula Student Multi-disk Differential
COOLING side mounted radiator with glass fibre front and rear duct with fan
BRAKE SYSTEM x2 outboard Brembo 2-pot calipers for front, x2 outboard AP racing CP4266 calipers for rear, floating bell mounted laser cut discs
ELECTRONICS MoTeC M800 ECU, driver display steering wheel

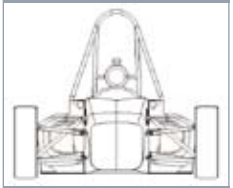
United Kingdom

Milano

Polytechnic University of Milano

After a two year absence from the competitions, the small team has worked hard to set a new standard design method for optimizing each subsection throughout all the car: an extreme detailed CAD model and many hours spent on FEA and CFD simulations helped us to reach our objectives. The aim is to produce a lightweight, powerful and reliable carThe heart of the car is the completely new engine Aprilia 550 V-Twin which allows to have high torque from the lower RPM's till redline, the suspension system, totally based on the old and improved one, coupled with an innovative modular standalone data aquisition which guarantees a simple and rapid set-up of the car, the strong reductions of weight and inertias complete the most competitive and aggressive car ever designed by the team. After the confirmation on the test track of the excellent performances of our small engineering jewel, team Dynamis proudly presents its third car, the new DPRC XVO.

Car 90



Italy

FRAME CONSTRUCTION Carbon fibre monocoque and rear end: carbon fiber, aluminum-honeycombs

MATERIAL Hexcel aluminium honeycomb sandwich panel (12.5 mm core, sides 0.6mm)

OVERALL L / W / H (mm) 2655 / 1440 / 1195

WHEELBASE (mm) 1650

TRACK (Fr / Rr) (mm) 1280 / 1280

WEIGHT WITH 68kg DRIVER (Fr / Rr) 109 / 114

SUSPENSION Unequal length A-Arms. Push rod actuated. Ohlins spring/damper linear units. Anti roll bar with blade bars. Ohlins steering damper unit. Adjustable in compression and in rebound.

TYRES (Fr / Rr) 20" x 7.0" - 13" R075 D2692 Goodyear

WHEELS (Fr / Rr) 20" x 7.0" - 13" R075 D2692 Goodyear

ENGINE Aprilia/ 2007 RXV 550

BORE / STROKE / CYLINDERS / DISPLACEMENT 80mm / 55mm / 2 cylinders / 549cc

COMPRESSION RATIO 12,5:1

FUEL SYSTEM Student designed/built fuel injection system using original ECU

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE Chain #520

DIFFERENTIAL Bacci Romano LSD Differential, University Special modified.

COOLING Two aluminum radiators, one at each side of the car; water temp switched single fan.

BRAKE SYSTEM 4-Disk system, self developed rotors with 190mm diameter, adjustable brake balance, Motorquality mono-block calipers

ELECTRONICS Wiring harness sealed to IP67, Multifunctional steering wheel, Electropneumatic shifting system, self designed TCS

Mittweida

University of Applied Sciences Mittweida

Getting forward together – learning from each other – aiding one another. That's just the strength of our team: Around 50 people of various study courses with so many different mindsets and approaches give the team as a whole the opportunities for new and unusual solutions and ways. TMM – a young dynamic team with capability. With the building of a racing car we tie in with the tradition and with famous graduates of our university such as August Horch, the founder of AUDI. At this year's FSG it's our second attendance and we have used the huge experience of the first time. And now it's a new year, a new car, a new chance! We proudly present Touro our "little black bull with golden horns"!>>> Propulsion made in Mittweida.

Car 32

Germany

FRAME CONSTRUCTION space frame. Seat is part of the frame

MATERIAL Steel Tubes, S235

OVERALL L / W / H (mm) 2792 / 1616 / 1148

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1355 / 1265

WEIGHT WITH 68kg DRIVER (Fr / Rr) 148 / 200

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper,compression damping ,rebound damping,spring preload, hight oft the car are ajustable

TYRES (Fr / Rr) Michelin 16/53 R13

WHEELS (Fr / Rr) ATS 7,0x13 Al Rim, bolt fixed

ENGINE Honda CBR 600RR (PC37)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,0:1

FUEL SYSTEM fuel injection, sequential, student built

FUEL 95

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 8000

DIFFERENTIAL limited slip differnzial, GKN

COOLING Left mounted radiator

BRAKE SYSTEM 4-Disk system modifes by students

ELECTRONICS Electromagnetical shifter

Montréal

University of Québec – ETS

ETS Motorsports followed in the footsteps of legendary teams TU Delft & RMIT with the lightweight single cylinder vehicle design concept. Since 2005 we have been reducing the mass of the overall vehicle (155 kg) and increasing our power output (55 Hp). These evolutions have allowed our vehicle to win the endurance / economy event FSAE East 09 & Autocross event FStudent 07. Our ambitious goal in FSG is to win the event, in a field of competitors that is with a doubt the best in the history of any formula student event worldwide. The future of ETS Motorsports is prosperous; we have team members from 1-5 years experience to ensure we will be a top competitor for years to come. We enjoy the strength of international teams as it brings innovation and ensures this great engineering competition is so challenging. We would like to thank all the teams present in FSG 2009 for their trust ,'we will take good care of the CUP and bring it back for FSG 2010 ,' & allow others the chance to win it !

Car 6

FRAME CONSTRUCTION Infused Monocoque mated to a tubular rear frame & back plate structure

MATERIAL T700 carbon fiber/epoxy // 4130 steel // 7475-T6 aluminium

OVERALL L / W / H (mm) 2542 / 1372 / 1143

WHEELBASE (mm) 1530

TRACK (Fr / Rr) (mm) 1219 / 1219

WEIGHT WITH 68kg DRIVER (Fr / Rr) 106 / 115

SUSPENSION Anti-roll blade system. Double unequal length A-Arm. Front Pull-rod and Rear Push-rod.

TYRES (Fr / Rr) 6/18-10 Hoosier LCO

WHEELS (Fr / Rr) 6/18-10 Hoosier LCO

ENGINE 2008 YAMAHA WR450F

BORE / STROKE / CYLINDERS / DISPLACEMENT 95mm / 63mm / 1 cylinders / 450cc

COMPRESSION RATIO 12,5:1

FUEL SYSTEM Motec M800 ECU, Non Lost spark system.

FUEL 98 Octane

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 8000

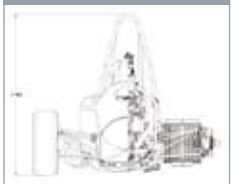
DRIVE TYPE 3 Speed Sequential

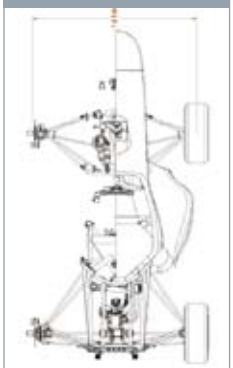
DIFFERENTIAL ETS Limited slip differential Salisbury (Adjustable Bias)

COOLING Side pod mounted dual radiators.

BRAKE SYSTEM AP 4226-2SO Calipers, Floating discs, Bias bar and proportioning valve.

ELECTRONICS Electropneumatic shifting system, In-House telemetry system & dash.





Canada

Moscow

Moscow State Technical University (MAMI)

FS-MAMI Team presents its second car. Designing Iguana Evo we tried to apply all experience achieved with the first car - we tried to realize new ideas and avoid old problems.In 2009 we have new friends – our sponsors – who helped us to build the car. Comparison of two years in Formula Student demonstrates us a big role of all people who support the team and greatest value and necessity of the work with sponsors.

Car 52

FRAME CONSTRUCTION Tubular space frame

MATERIAL 30 XГCA steel round tubing, 20 to 30 mm

OVERALL L / W / H (mm) 2607 / 1316 / 1099

WHEELBASE (mm) 1575

TRACK (Fr / Rr) (mm) 1146 / 1117

WEIGHT WITH 68kg DRIVER (Fr / Rr) 160 / 160

SUSPENSION Double unequal length A-Arm. Front: Push rod actuated horizontally oriented springs and dampers. Rear: Push rod actuated horizontally oriented single spring and damper

TYRES (Fr / Rr) 205/510 R13, Continental

WHEELS (Fr / Rr) 7Jx13

ENGINE 2006 Honda CBR600F6 4 cylinder

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12:1

FUEL SYSTEM High pressure fuel injection

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 9000

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE 30mm x 10mm chain

DIFFERENTIAL Torque sensitive limited slip, Quaife

COOLING One side pod mounted radiator with thermostatic controlled electric fan

BRAKE SYSTEM 4-Disk system, Honda CBR600 rear disk, 220 mm outer diameter, drilled

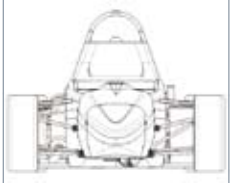
ELECTRONICS Electropneumatic Shifting System, Power Commander Engine Control, ignition module

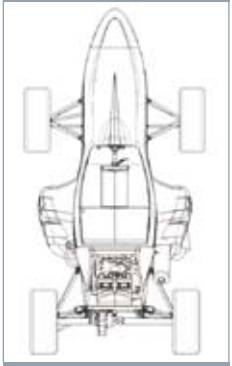
Russia

München
Technical University of München

The TUfast racing team exists since 2002. It was founded by a group of dauntless students, who want more then readings and exams. After the great performance in the first events the project was continued until this date and will go on as long students have the passion building cars on their own. This year we are celebrating 7 years of TUfast and the sixth Formula student race car.The main difference of this year is the combination of a carbon fibre monocoque with an tubular space frame in the rear. The exceptional handling characteristics will be adjusted by a long and extensive testing time with simulating data assistance. Understanding the real vehicle dynamics is one of our main targets this year.
30 students developed and built this car, our nb09, within 7 months.
A very short period which is essential for intensive testing time. We are glad to present our work, feel free to visit us at our pit. Enjoy your time.
The thrill of racing is the fuel that keeps us all going.

Car 31





Germany

FRAME CONSTRUCTION Carbon fibre monocoque with an tubular space frame in the rear

MATERIAL Sandwich constuction: Six layers of 200g/m² HT-fibre clutch embedding Airex core

OVERALL L / W / H (mm) 2823 / 1465 / 1088

WHEELBASE (mm) 1650

TRACK (Fr / Rr) (mm) 1260 / 1160

WEIGHT WITH 68kg DRIVER (Fr / Rr) 125 / 138

SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontal./vertical. oriented spring and damper.

TYRES (Fr / Rr) 521 x 178-330 R25B Hoosier

WHEELS (Fr / Rr) 152mm/178 mm wide, Self designed 1pc CFRP Rim

ENGINE 2007/Kawasaki ZX-6R

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 14,3:1

FUEL SYSTEM Denso injection-valves, two-stage sequential fuel injection

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 10000

DRIVE TYPE Single 520 chain

DIFFERENTIAL GKN Visco Lok with adjustable preload

COOLING Side mounted custom build radiator and a 8inch GnC electric fan

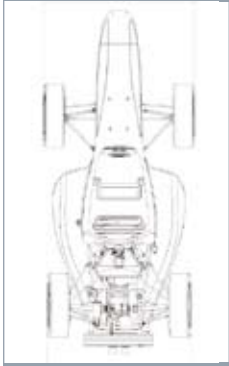
BRAKE SYSTEM Steel, hub mounted, 235mm/220mm dia. Drilled. ISR 4-piston calipers

ELECTRONICS Modular wiring harness Multifunctional steering wheel, electropneumatic shifting, Data aquisition with over 30 different sensors

München
University of Applied Sciences München

The municHMotorsport Racing Team of the Munich University of Applied Sciences was founded in summer 2005 as FHM Racing Team. We renamed our Team after the last years season because of the new name of our University. This year we participate at the Formula Student Event in Silverstone/UK, Hockenheim/GER and in Melk/AUT. At the moment we have about 100 motivated team members and a well tested car. We had about 20 real testing days with the new PW4.09 and that should be a big step for a successful competition. Therefore the setup is optimized for all the dynamic events and the drivers are in shape. This car is an evolution of our old cars with some special details, for example our new engine setup. Thereby we raise the engines efficiency about 20%. If you would like to see more of our car we are looking forward to meet you at the competition.

Car 49



Germany

FRAME CONSTRUCTION Hybrid design: Monocoque with steel tube space frame rear car section

MATERIAL MC: CRP with 10mm Nomex HC core / RCS: steel tubes

OVERALL L / W / H (mm) 2764 / 1400 / 1050

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 130 / 160

SUSPENSION Double unequal length A-Arm. Front: Pull rod actuated horizontally oriented spring/damper Rear: Push rod actuated spring/damper

TYRES (Fr / Rr) 20.0x7.0-13 Goodyear R075

WHEELS (Fr / Rr) 6.5x13, 10.8 mm offset, Al wheel center

ENGINE Modified Honda CBR600RR (PC40)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 47.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 15,5:1

FUEL SYSTEM Student designed/built fuel injection system with original rail/valves using AME ECU

FUEL E85

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE Chain #520

DIFFERENTIAL Drexler Limited slip differential with clutch pack

COOLING self-designed Radiator mounted in the sidebox with electric fan

BRAKE SYSTEM 4 Disc system, stainless steel rotors 220mm/200mm,adjustable brake balance, 2 x BREMBO P4/24 4-piston aluminum,2x CNC milled Fran

ELECTRONICS Completely heat shrinked, fire/fuel resistant wiring harness (self built), Power MOSFETs + uController replace relays and fuses

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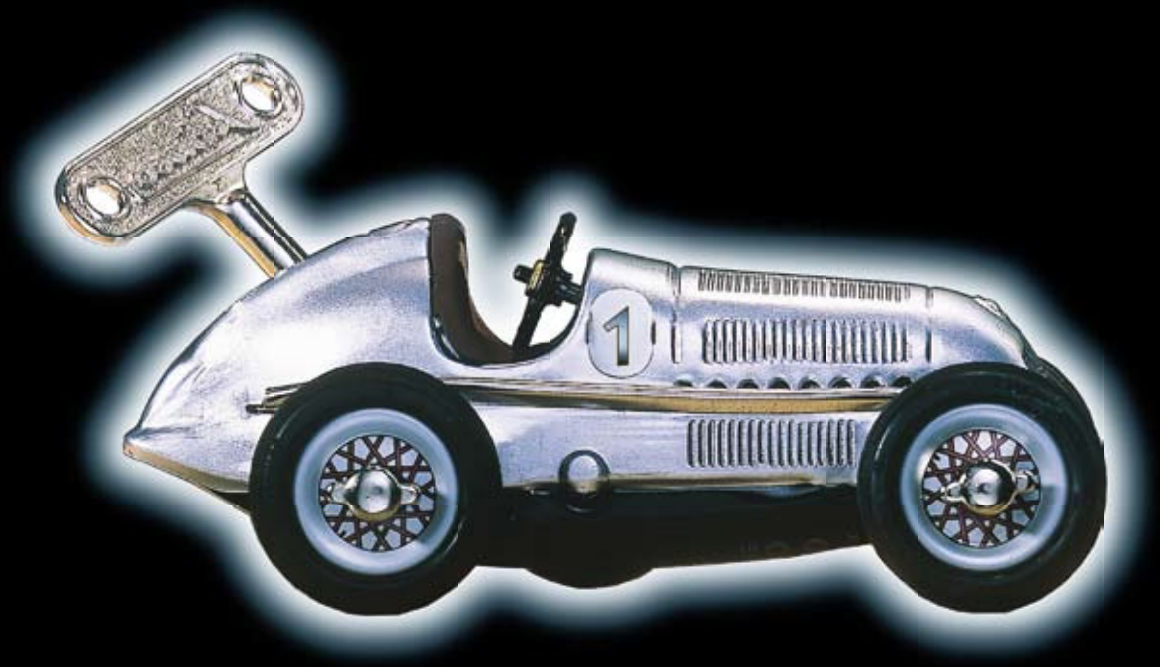

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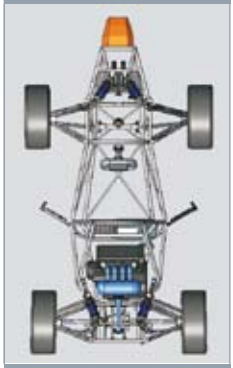
Continental

Mumbai
K. J. Somaiya College of Engineering

Orion Racing India is participating in FSG for the the thrid consecutive year holding the prestigious Indian tag. Our latest creation, “The Titan”, is geared up to race through the tarmac setting newer standards of innovation and creativity. Built with passion, the Titan is an eclectic fusion of power, maneuverability and robustness. The Titan is developed with a unique design philosophy that focuses on designing the car as a product for the market. Displaying the stupendous effort and passion of budding engineers, the car is designed to suit various driving conditions. Composed of several sensors, the team has the car in par with the electronics of the world. The Titan also boasts of a self-developed CAN module and live telemetry. The team has used CAD approach to build the car on the computer to help understand the dynamics and packaging of the car for optimum results. With all this incorporated, Orion Racing and The Titan are sure to redefine the image of an Indian Race car.

Car 87



India

FRAME CONSTRUCTION Tubular space frame and Alternative tubing

MATERIAL ASTM A108 steel round tubing 25.4mm OD and 2mm & 2.65mm wall thickness

OVERALL L / W / H (mm) 2450 / 1550 / 1200

WHEELBASE (mm) 1650

TRACK (Fr / Rr) (mm) 1350 / 1250

WEIGHT WITH 68kg DRIVER (Fr / Rr) 144 / 216

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper. Adjustable in compression and in rebound range

TYRES (Fr / Rr) 180x60 R13, Ultima XT Tubeless, JK Tyre

WHEELS (Fr / Rr) 7x13, +25mm offset, 3 pc Mag Rim

ENGINE 2001 Honda CBR 600 F4i

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12:1

FUEL SYSTEM Stock Fuel Rail, Injectors. Batch Injection

FUEL Octane 95 Unleaded Gasoline

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 10500

DRIVE TYPE DID 525 HV pitch 15.875mm Chain drive

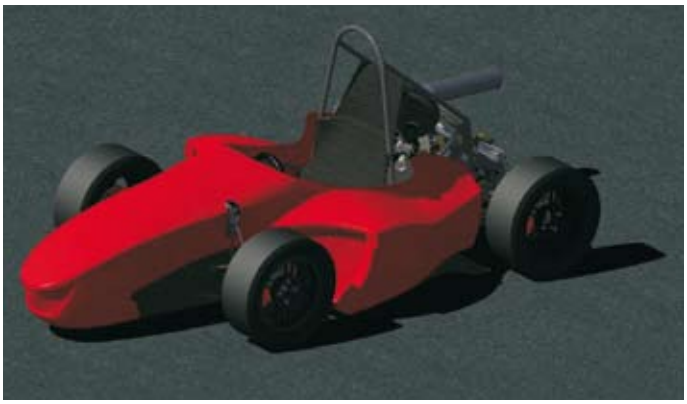
DIFFERENTIAL Zexel Torsen Limited Slip differential TBR: 4:1

COOLING Twin Parallel Radiators mounted in side pod with electric water pump and smart controller

BRAKE SYSTEM 4-Disk System, Cast iron,Hub mounted rotors with 240mm dia, 2 piston floating calipers with piston diameter 25.4 mm

ELECTRONICS Self-developed CAN Module, Electro-Mechanical Shifter, Buitton actuated (On Steering Wheel), LED shift indicator,

Nevers
Institute of Automotive and Transport Engineering



The Institute of Automotive and Transport Engineering (ISAT) in Nevers (France) is a state-run school committed to the comprehensive training of engineers, with a particular interest in the automotive sector. With the F1 circuit „Magny-Cours“ nearby, ISAT students are able to experience first-hand leading automotive technology, that serves an educational purpose and also a recreational one. The Formula Student project was founded in 2003, and is composed by 15 students in mechanical engineering split up into five main areas: Frame, Vehicule dynamics, Engine, Electronics and Drivetrain. The Formula Student Challenge at ISAT University is taken up by the 3rd year engineering students and takes a big importance in their evaluation. This year, a big effort was done in suspension design based in several kinematics and simulation softwares. The setup was made with a new National Instruments data acquisition sytem with damper positions, tires temperature sensors and potentiometers.

Car 58

France

FRAME CONSTRUCTION Tubular spaceframe with carbonfibre sandwich floor panels.

MATERIAL steel alloy E235,

OVERALL L / W / H (mm) 2888 / 1401 / 1125

WHEELBASE (mm) 1550

TRACK (Fr / Rr) (mm) 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 135 / 135

SUSPENSION Double unequal length A-Arms. Push rod actuated horizontally oriented Cane Creek double barrel-2 spring / damper units.Adjustable in compression and rebound range

TYRES (Fr / Rr) R25A Hoosier 20.5x6.0-13

WHEELS (Fr / Rr) R25A Hoosier 20.5x6.0-13

ENGINE 2003 Yamaha WR450 single

BORE / STROKE / CYLINDERS / DISPLACEMENT 95mm / 63.4mm / 1 cylinders / 449cc

COMPRESSION RATIO 13.5:1

FUEL SYSTEM Student designed/built fuel injection system using Sodemo ECU EV11, single injector

FUEL 98 octane unleaded gasoline (Sell)

MAX POWER DESIGN (rpm) 9500

MAX TORQUE DESIGN (rpm) 6500

DRIVE TYPE Chain #520

DIFFERENTIAL Zexel Torsen University Special modified. Bias ratio 2.6:1

COOLING LIGIER radiator mounted in right sidepod, with automatic fan.

BRAKE SYSTEM Beringer 4-Disk system, self developed with 208mm diameter, self designed adjustable brake balance, 4 single aluminium calipers

ELECTRONICS Self designed wiring harness, electro-pneumatic shifting system, Sodemo ECU, National Instruments data acquisition system.

Osnabrück
University of Applied Sciences Osnabrück

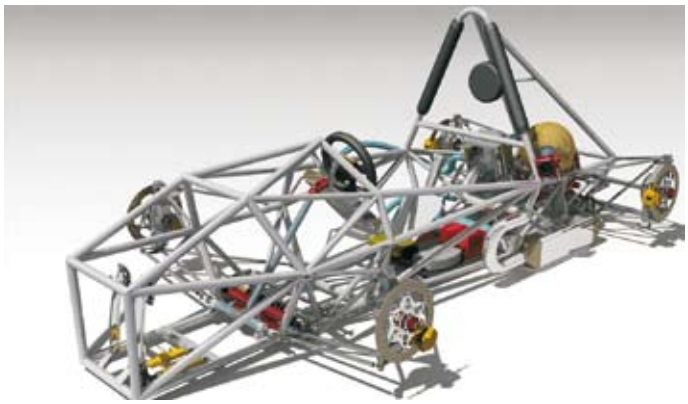
We, the Ignition Racing Team, are about 50 students of different fields of studies, for example engineering, electrical engineering or business administration. We are positioned in a classic project structure. It's our third year in the Formula student competition but the first time in Silverstone for us. Our aim for the 2009 car was to reduce weight and to improve the carbon fibre monocoque of our IR08 Black Onyx. We engineered a derivative gearing to solve the problem of mechanical transmission at the rear shaft. Changes in chassis and damper will help to enhance the perfomance of our 2009 race car. The overall design concept was „Evolution instead of Revolution".

Car 67

FRAME CONSTRUCTION Monocoque with a rear subframe as an hybrid construction.
MATERIAL Carbon fibre, subframe steel
OVERALL L / W / H (mm) 2770 / 1390 / 960
WHEELBASE (mm) 1650
TRACK (Fr / Rr) (mm) 1195 / 1220
WEIGHT WITH 68kg DRIVER (Fr / Rr) 143 / 174
SUSPENSION Push rod actuated horizontally oriented spring and damper
TYRES (Fr / Rr) Hoosier 20.5 x 6.0 - 13 / Hoosier 20.5 x 7.0 - 13
WHEELS (Fr / Rr) Braid Formrace16 6J x 13 / Braid Formrace16 7J x 13
ENGINE 2007 / Suzuki GSX-R 600 K7 four str
BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 12,5:1
FUEL SYSTEM cfd opt. intacesystem, full variable sunction pipes, 2 injection per cylinder
FUEL 98 RON unleaded
MAX POWER DESIGN (rpm) 12500
MAX TORQUE DESIGN (rpm) 9000
DRIVE TYPE self manufactured derivative gearing
DIFFERENTIAL Drexler / clutch pack lim. slip differential
COOLING Twin side pod mounted radiators with electric fans, additional electric water pump
BRAKE SYSTEM 220 mm, four piston caliper/ 220mm, two piston caliper
ELECTRONICS self manufactured derivative gearing

Germany

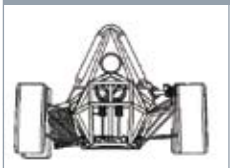
Oxford
Oxford Brookes University

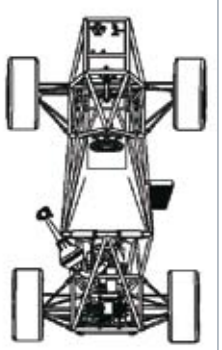


In 2009 Oxford Brookes Racing has expanded to a higher level of competition. With the highest level of student interest ever and the support of new partner companies, OBR is determined to make of 2009 a milestone in its history. With team members joining from over ten nationalities and a variety of disciplines, OBR 2009 joined its inherited experience with this fresh international perspective to generate a technically unique knowledge base. Managed by a brand new team spirit and structure, OBR is proud to present the ISIS09 "Roxanne".

Car 92

FRAME CONSTRUCTION Tubular Spaceframe
MATERIAL Steel 4130; various sizes
OVERALL L / W / H (mm) 2585 / 1278 / 953
WHEELBASE (mm) 1525
TRACK (Fr / Rr) (mm) 1140 / 1100
WEIGHT WITH 68kg DRIVER (Fr / Rr) 114 / 123
SUSPENSION Unequal Length, non parallel A-arms. Pull rod actuated cane creek DB, decoupled heave/ roll springs.
TYRES (Fr / Rr) 20x7-13
WHEELS (Fr / Rr) 13x6
ENGINE 2008 KTM 530 EXC-R
BORE / STROKE / CYLINDERS / DISPLACEMENT 95.0mm / 72.0mm / 1 cylinders / 449cc
COMPRESSION RATIO 11.8:1
FUEL SYSTEM Student design/built fuel injection system
FUEL 98 Octane Petrol
MAX POWER DESIGN (rpm) 9000
MAX TORQUE DESIGN (rpm) 5800
DRIVE TYPE Chain
DIFFERENTIAL -
COOLING Student design/Build LH mounted single radiator.
BRAKE SYSTEM 4 Disk System
ELECTRONICS MoTec M800 and Aim MXL Pista with custom CAN-telemetry and expansion. Controls systems to limit voltage draw.





United Kingdom

Paderborn
University of Paderborn

Starting into the 3rd season the UPBracingTeam aims for success. With its 2nd appearance in Silverstone we present not only an evolution but rather a revolution of last year's concept.The Px 209 is lighter and more powerful than its predecessor. Due to new highlights we are sure to play a role in this year's event. Further improvements are achieved through the CFRP wishbones an optimized airbox and an optimized exhaust system. The wheel bearings are even lighter and stiffer than in the last season. An also new feature is our self-made steering gear which has no slackness and weights lot less than comparable solutions. Next to weight reduction our focus was on new production methods. The airbox and fuel tank were made through selective-laser-sintering which gave us a bigger freedom regarding special design features. All parts together form a even more well-engineered car which will show its abilities on the track. Finally we would like to thank all our supporters for this season.

Car 47

Germany

FRAME CONSTRUCTION tubular space frame chassis

MATERIAL Premium steel; 1.7734.5 / 15CDV6 aerospace material

OVERALL L / W / H (mm) 2583 / 1350 / 1090

WHEELBASE (mm) 1650

TRACK (Fr / Rr) (mm) 1250 / 1125

WEIGHT WITH 68kg DRIVER (Fr / Rr) 133 / 162

SUSPENSION Double unequal length A-Arm; pullrod/ pushrod linked actuated horizontally; Koni Dampers

TYRES (Fr / Rr) 20.5 x 7.0 - 13“ Hoosier

WHEELS (Fr / Rr) 13“, 3 pc aluminium rim with selfmade rim centre and central locking

ENGINE Modified Suzuki GSR600

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mmmm / 45mmmm / 4 cylinders / 599cc

COMPRESSION RATIO 14:1

FUEL SYSTEM MegaSquirt system with injection

FUEL E85 bio ethanol

MAX POWER DESIGN (rpm) 7500

MAX TORQUE DESIGN (rpm) 6500

DRIVE TYPE selfmade 2-step transmission gearbox

DIFFERENTIAL Drexler motorsport differential

COOLING side mounted selfmade cooling system with 2 radiators and one electric fan

BRAKE SYSTEM AP Racing Brakesystem with self developed rotors, adjustable brake balance;

ELECTRONICS wiring harness w. motorsport connectors, multifunctional steering wheel, electric shifter/ clutch system, CanBUS, Telemetry sys.

Padova
University of Padova

Ciao! We are the Race Up Team, from Padova, Italy! We are a team at its forth year of experience at the second time here in the Hockenheimring! Our car MG0308 (number 85) is a brand new one, with a new frame complying to the rules, new brake system with floating discs and light solutions in every part of the vehicle. In designing it a particular importance has been given to a data acquisition campaign to pertain loads in multiple stress conditions for better dimensioning the suspension system, and the ergonomic design of the cockpit has been carefully studied. In our team we are about 40 people, with different skills, working everyday together with one heart and one goal! Our secret: trust in each other and, above all, PASSION! Thanks to our sponsor and supporter, without them our work would be pointless and impossible! Race UP team is looking forward to meet new friends: our car is the number 85! Come and visit us in our box or at our website: www.raceup.net! MIND THE SHARK!!!

Car 85

Italy

FRAME CONSTRUCTION tubular space frame

MATERIAL 25CrMo4 steel round tubing 16mm to 25mm dia, Carbon-Epoxy tubes

OVERALL L / W / H (mm) 2700 / 1408 / 990

WHEELBASE (mm) 1630

TRACK (Fr / Rr) (mm) 1260 / 1250

WEIGHT WITH 68kg DRIVER (Fr / Rr) 156 / 156

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper (coil-over). Adjustable in compression and in rebound range

TYRES (Fr / Rr) 20.5x6 R13, Hoosier R25B / 20.5x7 R13, Hoosier R25B

WHEELS (Fr / Rr) 7x13, 1 Aluminum Piece, O-Z Racing / 7x13, 1 Aluminum Piece, O-Z Racing

ENGINE 2006 Kawasaki ZX-6RR 4 cylinder

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 14:1

FUEL SYSTEM Walbro electronic injection, multipoint fuel injection, semi sequential

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE DID 520 chain

DIFFERENTIAL Quaife QDF-7ZR Automatic Torque Biasing Helical LSD

COOLING Twin side pod mounted radiators with thermostatic controlled electric fans

BRAKE SYSTEM 4-Disk system, floating, AISI 420, hub mounted, 220mm outer diam., 169mm inner diam., driver adjustable proportioning valve

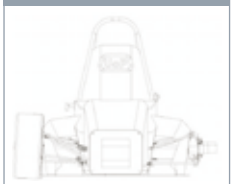
ELECTRONICS Dash mounted (MoTec), Multifunctional Steering Wheel, Electropneumatic Shifting System

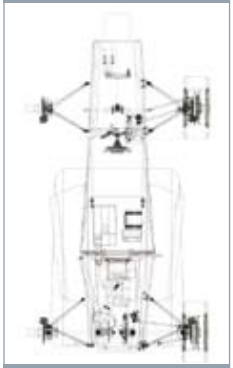
Patras
University of Patras

This is second participation of University of Patras Racing team to FSG competition. Retaining the best features and optimizing them, as well as investigating new solutions led to the birth of our third competitor, UoP3. The main goal for our new car was to reduce overall weight while maintaining high reliability. That was achieved by using composite materials and aluminium in almost every part of the car. Successful features of the UoP2 car have been retained, such as the custom made injection system controlled by a Haltech ECU and the use of a Yamaha single cylinder engine. However, most of the sub-systems have been improved upon and optimized, while others, such as the suspension geometry and chassis, have been thoroughly revised. University of Patras Racing team wants to thank all of it's' sponsors for their valuable support and is looking forward to this year's competition.

Car 86

FRAME CONSTRUCTION Two piece monocoque
MATERIAL Carbon fiber
OVERALL L / W / H (mm) 2537 / 1431 / 1146
WHEELBASE (mm) 1650
TRACK (Fr / Rr) (mm) 1240 / 1220
WEIGHT WITH 68kg DRIVER (Fr / Rr) 84 / 96
SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper
TYRES (Fr / Rr) 18.0 x 7.5-10 Hoosier R25B
WHEELS (Fr / Rr) 10 x 7.5 in, 3pc Al rim with custom center
ENGINE Yamaha WR450F ,08
BORE / STROKE / CYLINDERS / DISPLACEMENT 95mm / 63.4mm / 1 cylinders / 449cc
COMPRESSION RATIO 12.5:1
FUEL SYSTEM Custom designed fuel injection system
FUEL 100 RON unleaded
MAX POWER DESIGN (rpm) 9000
MAX TORQUE DESIGN (rpm) 7500
DRIVE TYPE 5 speed sequential gearbox
DIFFERENTIAL Drexler FSAE LSD
COOLING Liquid-cooled
BRAKE SYSTEM Cast Iron, hub mounted, 180 mm dia. Drilled rotors with ISR 4 piston calipers
ELECTRONICS Haltech E6X ECU, Electromagnetic shfting system





Greece

Perth
University of Western Australia

UWA Motorsport hails from Perth, Western Australia, a small city with a predominantly mining and agriculture based economy. The University of Western Australia generously supports the FSAE project as part of its well regarded undergraduate engineering program and the team has competed in FSAE events since 2001. UWAM is proud to present its 8th car for this FS Germany competition, the team's first foray to Europe. The travelling team of 10 consists mostly of final year undergraduate students studying Mechanical Engineering. It is also the first visit to Europe for many of the team members and some will be staying on after the comp as tourists, with some plans to visit some of Germany's finest motorsport venues and museums, as well as sampling local food and beverages as we are led believe is required by local customs. The team would like to thank our platinum sponsors, UWA, Orbital, Kinetic Suspension, and Goodyear, as well as all our other supporters for making this project possible.

Car 16

FRAME CONSTRUCTION Carbon Fibre Monocoque, with a Composite Sandwich Construction
MATERIAL Aluminium Honeycomb Core, optimised carbon fibre laminate
OVERALL L / W / H (mm) 2682 / 1337 / 1012
WHEELBASE (mm) 1576
TRACK (Fr / Rr) (mm) 1150 / 1100
WEIGHT WITH 68kg DRIVER (Fr / Rr) 117 / 150
SUSPENSION Double unequal length A-Arm. Pullrod actuated, four way adjustable pull type dampers, torsion bar corner springs. Features carbon fibre third spring flexures and H2 Kinetic system.
TYRES (Fr / Rr) Goodyear D2696
WHEELS (Fr / Rr) 7x13, Student designed 2 piece aluminium rims, 10mm offset.
ENGINE 2005 Honda CBR600RR
BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 13.4:1
FUEL SYSTEM Motec M800 sequential injection, Denso injectors
FUEL 98 octane unleaded
MAX POWER DESIGN (rpm) 12000
MAX TORQUE DESIGN (rpm) 8000
DRIVE TYPE Chain drive with custom rear sprocket.
DIFFERENTIAL Student made Clutch-plate LSD, externally adjustable preload
COOLING Side Mounted radiator with 305mm electric fan
BRAKE SYSTEM Custom designed rotors, rotor hats, master cylinders and bias bar with Brembo P32F calipers. Adjustable carbon fibre pedal box.
ELECTRONICS Ultra-light batteries with fuse-less power distribution, Networked multifunction steering wheel, Comprehensive DAQ/telemetry

Australia

Pisa
University of Pisa

This is the first time the E-Team Squadra Corse from the Università di Pisa (Italy) takes part at the Formula Student Germany.The E-Team was founded in the late 2007. The first Formula SAE race our team competed for was at Fiorano (Italy) in 2008. Despite of the very short developing time, E-Team gained the very important goal of reliability completing the selective endurance race.“In my knowledge it’s the first time a rookie team finishes the endurance test“, said Andrea Toso, head of Dallara R&D, „a very good result“ added Luca Marmorini, former member of the Toyota Formula1 team.ET2ev is the E-Team car for the 2009 season. The basic guideline we followed when designing ET2ev was to improve the solutions of the previous car, named ET1, without revolutions. The ET2ev is thus designed to confirm ET1 reliability and to be lighter, faster, and with a better handling than its predecessor. The team also focused on aerodynamics and appeal of the car appearance (www.eteamsquadracorse.it).

Car 39

Italy

FRAME CONSTRUCTION Tubular space frame

MATERIAL ST37-4 steel round tubing 25 mm dia. / 16 mm dia., various thickness - Square

OVERALL L / W / H (mm) 2885 / 1427 / 1279

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1248 / 1182

WEIGHT WITH 68kg DRIVER (Fr / Rr) 176 / 144

SUSPENSION Double unequal length A-Arm. Push rod actuated longitudinally oriented spring-dampers (adjustable in compression and rebound)); tunable anti-roll bar

TYRES (Fr / Rr) 165/505 R13, Dunlop A8D 404

WHEELS (Fr / Rr) 7x13, 40 mm offset, 1 pc Al Rim + spacer / 7x13, 43.25 mm offset, 1 pc Al Rim

ENGINE 2009 Aprilia 550 RX

BORE / STROKE / CYLINDERS / DISPLACEMENT 80mm / 55mm / 2 cylinders / 549cc

COMPRESSION RATIO 12:1

FUEL SYSTEM Original injectors, Original intake manifold modified, Port Injection

FUEL 100 octane, unleaded gasoline

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 7500

DRIVE TYPE EK 520MVXZ chain

DIFFERENTIAL Clutch pack limited slip, 5.66 TBR (drive), 3.00 TBR (coast)

COOLING Twin side pod mounted radiators with thermostatic controlled electric fans

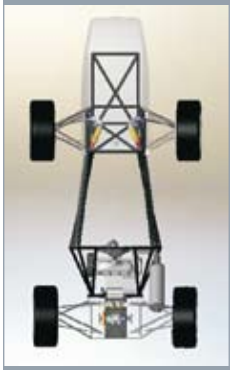
BRAKE SYSTEM Front disks: hub mounted, 230 mm dia., rear disk: differential mounted, 250 mm dia.; brake balance bar with remote adjustment

ELECTRONICS Semi-automatic pneumatically-actuated gearbox, custom made dashboard, CAN and RS232 communication, wiring harness sealed to IP67

Pomona
California State Polytechnic University

Cal Poly Pomona Formula SAE has been around since 1988. We are a school from Pomona, CA USA. Since 2000, we will have travelled to 3 international competitions held in England, Italy, and Germany. The cars we design and build are simple, lightweight, and powerful. For the 2009 car, we weighed in at competition at 192kg (424lbs) and produced 107 horsepower. We are extremely proud of our car and our school, and are excited to be able to run with some of the best teams in the world! www.csupomona.edu/~fsae Members: Angeles Arellano, Jeff Bergh, Kevin Castelo, Christopher Chock, Luis Farias, Carlos Gonzalez, Cody Gonzalez, Omar Gonzalez, Chris Gumbleton, Daniel Mercado, Frank Mestemacher, Charles Reeves, Christopher Rini, Piotr Slusarz, Ross Stringham, Andrew Tan, Warren Van Ryzin, Gino Villanueva, Cameron Walters, Raven Weng, David Whitaker, Faculty Advisor: Professor Clifford Stover

Car 55



United States

FRAME CONSTRUCTION Front tubular space frame with aluminum rear box and stressed engine

MATERIAL 4130 chromoly and 7075 Al

OVERALL L / W / H (mm) 2800 / 1460 / 1156

WHEELBASE (mm) 1569

TRACK (Fr / Rr) (mm) 1226 / 1204

WEIGHT WITH 68kg DRIVER (Fr / Rr) 124 / 134

SUSPENSION Double unequal length A-Arm. Push rod actuated vertically oriented spring and damper

TYRES (Fr / Rr) 20.5x7 R13, Hoosier R25B/ 20.5x7 R13, Hoosier R25B

WHEELS (Fr / Rr) 8.0x13, 3 pc Al Rim/ 8.0x13, 3 pc Al Rim

ENGINE Suzuki 2001-2003 GSX-R 600cc

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.2:1

FUEL SYSTEM Student des/built, fuel injection, sequential

FUEL 91 Octane Gasoline

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE 520 Chain Driven

DIFFERENTIAL Torsen, 4:1 Forward Bias, 2.5:1 Braking Bias

COOLING Side mounted radiator with thermostat controlled electric fan

BRAKE SYSTEM Floating, laser cut 1018, hub mounted, 205mm dia. Vented, adjustable bias bar, Brembo calipers

ELECTRONICS Electro-pneumatic Shifter (carbon kevlar paddles mounted behind sterring wheel), mounted next to shift lever, LED shift lights

Tognum

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c) Weltverbesserer

d) Weltbürger

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Prague
Czech Technical University in Prague

The CTU CarTech team was found in 2007 at Czech Technical University in Prague, Faculty of Mechanical Engineering with goal to develop and build formula car suitable with Formula Student/SAE rules. The team has about 30 members. Under the name FS.01, the first Czech FS/SAE car was build for competition in Germany. It is based on classic steel tubular space frame chassis, independent suspension and 4-disc brake system. It's powered by 4-cylinder 599ccm Yamaha YZF-R6 (2007) engine with maximum power of 58kW and max. torque of 48Nm. Rear wheels are drived by chain drive and Torsen differential. Electronics of the car consists of electropneumatic shifting system, diagnostic system and optional traction control.

Car 30

Czech Republic

FRAME CONSTRUCTION steel space tubular frame

MATERIAL St 35 NBK (1.0308)

OVERALL L / W / H (mm) 2873 / 1437 / 1195

WHEELBASE (mm) 1700

TRACK (Fr / Rr) (mm) 1240 / 1240

WEIGHT WITH 68kg DRIVER (Fr / Rr) 124 / 184

SUSPENSION Double unequal length A-A arm, Push rod actuated longitudinally oriented spring and damper. Fully adjustable.

TYRES (Fr / Rr) Michelin 16/53 R13

WHEELS (Fr / Rr) 7x13, OZ wheels

ENGINE Yamaha YZF-R6 (2007)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,8:1

FUEL SYSTEM Student built manifold, original injectors, sequential

FUEL Unleaded gasoline RON 98

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 11500

DRIVE TYPE Chain

DIFFERENTIAL Torsen traction 012000 university special, TBR 3:1

COOLING 2 heat exchangers with fans, electric water pump

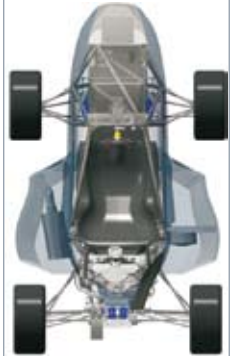
BRAKE SYSTEM 4-Disc system, 251mm dia. front, 220mm dia. rear. Adjustable brake balance. Wilwood (front) and AP Racing (rear) calipers

ELECTRONICS Multifunctional steering wheel (student built), electropneumatic shifting system (student built)

Ravensburg
University of Cooperative Education Ravensburg

"Early October 08, 57 students of the BA Racing Team began to develop the 'Bart09', the fourth racing car designed and manufactured by the team. With the students' manpower and enthusiasm combined with the support of the sponsors, we were able to finish our car early. With the experience and established work routine of the last 3 years we were able to concentrate our schedule even further, so that our car is finished long before the events. That allows us to make full use of a long testing phase to prepare our car. This year we placed our main focus on weight reduction. We achieved this by shortening the frame length and optimizing all vital parts of the car. The carbon bodywork with its dynamic appearance and the aluminum rear module are the cars' eye catching features. The new ECU design combined with our exhaust and intake system is intended to enhance the car's performance over a large rpm range and reduce fuel consumption. We consider this as a basis for a successful racing season.

Car 25



Germany

FRAME CONSTRUCTION One piece tubular spaceframe with a one plate aluminum rear structure

MATERIAL powdercoated E235 tubes and a ultra compact EN AW-7075 rear structure

OVERALL L / W / H (mm) 2330 / 1350 / 1110

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1150 / 1100

WEIGHT WITH 68kg DRIVER (Fr / Rr) 137 / 154

SUSPENSION Double A-Arms/Y-Arms, Pull rod/ Push rod, horizontally/vertically oriented springs and dampers

TYRES (Fr / Rr) Hoosier 20.5x7.0 - 13.0x7.0 inch rim / Hoosier 20.5x7.0 - 13.0x7.0 inch rim

WHEELS (Fr / Rr) 13

ENGINE 2003 Yamaha YZF R6

BORE / STROKE / CYLINDERS / DISPLACEMENT 65,5mm / 44,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13.7 :1

FUEL SYSTEM Motec M400, full sequential fuel injection

FUEL 100 octane petrol

MAX POWER DESIGN (rpm) 12750

MAX TORQUE DESIGN (rpm) 9250

DRIVE TYPE Chain Drive

DIFFERENTIAL Multi-Disc-Differential, Drexler Motorsports

COOLING heat exchange radiators mounted in right sidepods

BRAKE SYSTEM TRW Lucas MST266 brake discs with 220mm/220mm diameter, hub mounted, Bremo Calipers (front) and AP Racing calipers (rear)

ELECTRONICS Multifunctional SteeringWheel, CAN, SmartSwitches recoup relays/fuses, Live telemetry, Extended sensor package, Automatic shifting

Regensburg
University of Applied Sciences Regensburg

"Inanimate objects are classified scientifically into three categories – those that do not work, those that break down, and those that get lost." (Alfred North Whitehead)The Dynamics racing team of the University of Applied Sciences Regensburg spent much time and effort in our current object, the RP09, for not making it suffer from one of the quoted disasters. With the second car at all, our history is short! But we accomplished to implement many new features that are based on the experiences we made during the FSG competition from last year! Only with the kind support by our university and our sponsors our goals were able to be achieved. As a result, newly designed features for 2009 are for example: An adjustable self made limited slip differential, which allows a maximum in flexibility in the several dynamic events. In addition, a belt drive replaces the common chain drive as this enables higher shock absorbance, a lower weight and is a cost efficient solution. Let's rock!

Car 62

FRAME CONSTRUCTION Steel tube space frame with carbonfibre sandwich floor panels
MATERIAL S235JR TIG welded
OVERALL L / W / H (mm) 2767 / 1465 / 997
WHEELBASE (mm) 1575
TRACK (Fr / Rr) (mm) 1250 / 1220
WEIGHT WITH 68kg DRIVER (Fr / Rr) 137 / 180
SUSPENSION Double unequal length A-Arm. Push rod actuated. KW spring/damper units
TYRES (Fr / Rr) 205/510 R13 , Continental
WHEELS (Fr / Rr) 7x13
ENGINE HONDA CBR 600 RR (PC37)
BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 43.0mm / 4 cylinders / 599cc
COMPRESSION RATIO 12,1:1
FUEL SYSTEM Student built fuel injection, BOSCH MS4 Sport
FUEL 98 octane unleaded gasoline
MAX POWER DESIGN (rpm) 11000
MAX TORQUE DESIGN (rpm) 8400
DRIVE TYPE Synchronous belt, pitch 8mm
DIFFERENTIAL UAS Regensburg limited slip differential
COOLING Single radiator with ECU controlled electric fan, left sidepod mounted
BRAKE SYSTEM 4-Disc system, four piston caliper, floating brake discs, 220mm dia.
ELECTRONICS electromechanic clutch actuation and shifting system, self-designed control units for gearbox, dashboard and telemetry, WLAN

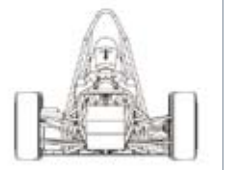
Germany

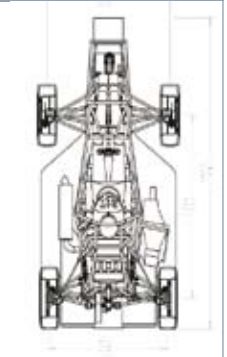
Rochester
Rochester Institute of Technology

The design of RIT's 2009 Formula SAE car focused on building a fast, lightweight, and reliable vehicle. The car is powered by a Honda CBR600 powerplant, with a custom developed differential for maximum tractive effort. To aid the driver, an enhanced traction control and paddle shift system has been designed into the vehicle. The vehicle sports an RIT designed and manufactured custom braking system, and the suspension utilizes an Ohlins adjustable damper setup. To enhance cornering and braking capabilities, an undertray was designed for the vehicle and is capable of producing significant aerodynamic loads. The vehicle underwent more than 2 months of testing and tuning, utilizing an extensive and removable data acquisition system, to optimize performance.

Car 66

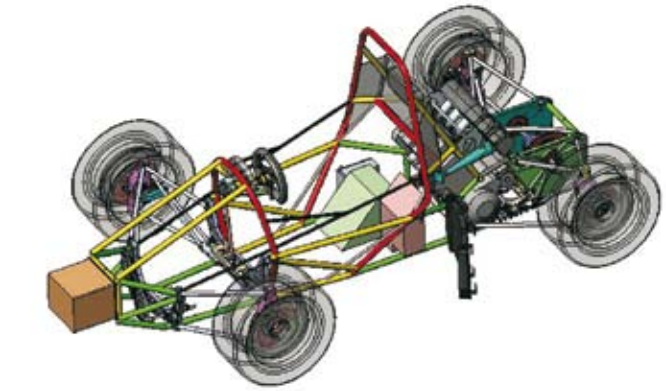
FRAME CONSTRUCTION Space frame with structurcal composite skins
MATERIAL 4130 Chromoly
OVERALL L / W / H (mm) 2642 / 1448 / 1168
WHEELBASE (mm) 1550
TRACK (Fr / Rr) (mm) 1270 / 1220
WEIGHT WITH 68kg DRIVER (Fr / Rr) 112 / 155
SUSPENSION Double unequal length nonparallel a-arm, pullrod actuated coil-over Ohlins damper
TYRES (Fr / Rr) 20.0x7.0-13 D2696 Goodyear
WHEELS (Fr / Rr) 7.0x13, 25mm backspace, 3 pc Al Rim / 7.0x13, 75mm backspace, 3 pc Al Rim
ENGINE Honda CBR 600 F3
BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 45.2mm / 4 cylinders / 609cc
COMPRESSION RATIO 14:1
FUEL SYSTEM RIT designed/built, multiport sequential injection, Motec ECU engine management
FUEL 100 Octane
MAX POWER DESIGN (rpm) 11500
MAX TORQUE DESIGN (rpm) 9000
DRIVE TYPE 5 speed sequential
DIFFERENTIAL Torvec IsoTorque
COOLING Single pass radiator mounted on side of car
BRAKE SYSTEM 4-Disk system, outboard rotors with 222mm diameter, adjustable brake balance, RIT designed mono-block calipers
ELECTRONICS Motec M400 ECU





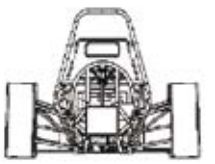
United States

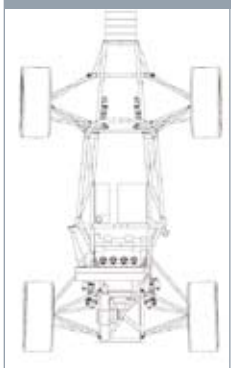
Roma
Sapienza University of Rome



„Sapienza Corse“ Racing Team has been established in late 2007 within the University of Rome „La Sapienza“ with the aim of developing racing cars suitable to compete in Formula SAE and Formula Student events.In 2008 the prototype “Gajarda” was built, completely conceived and manufactured within the research laboratories of the Mechanics and Aeronautics Department.In September 2008, “Gajarda” competed profitably in Formula SAE Italy competition held on Fioriano racetrack, gaining respect and appreciation for its innovative design and construction. This year Gajarda will take part to FSG09 in Hockenheim and in FSAE Italy in Varano. First most outstanding feature of Gajarda is a framespace designed as a merging of planar structures, each one welded independently and then assembled in the final three-dimensional shape. A second main aspect is an originally developed dry-sump oil system, that let us replace the native oil pan with a only 8 mm thick aluminium plate.

Car 91





Italy

FRAME CONSTRUCTION mild-steel round tube spaceframe,carbon fibre panels,aluminium plates

MATERIAL aluminium, mild-steel, aluminium honeycomb, carbon fibre,

OVERALL L / W / H (mm) 2475 / 1350 / 995

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 139 / 170

SUSPENSION Double unequal length A-Arm. Pull rod actuated longitudintally oriented spring and damper

TYRES (Fr / Rr) 19.5x7.0 R13 Hoosier soft compund (Fr/Rr)

WHEELS (Fr / Rr) 6.5x13 Magnesium Rim (Fr/Rr)

ENGINE Modified 2002 Honda F4i

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12:1

FUEL SYSTEM Original equipment fuel injection, sequential

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE 520 Regina chain drive

DIFFERENTIAL Torsen T1 limited slip differential

COOLING single radiator, electric water pump, thermostaic controlled fan

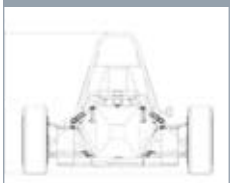
BRAKE SYSTEM stainless steel hub mounted rotors (220/190 mm Fr/Rr outer diameter), CRG dual opposing piston caliper 26 mm diameter

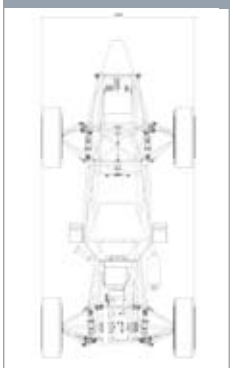
ELECTRONICS electroactueted shifting system, electronic water pump flow control, wiring harness sealed to IP67,Multifunctional steering wheel

Saarbrücken
University of Applied Sciences Saarbrücken

Saar Racing Team (Saar Racing Car 03 - SRC03)Our team, the Saar Racing Team consists of 14 Students. We designed and built our 3rd car, the SRC03 (Saar Racing Car 03). The goal of the 3rd season was to design a car, which is faster, lighter and easier to maintain than the previous car. Using the same engine as last year we could increase the power output by improving the exhaust and intake system. In general, the previous car has been the base for the new one. We tried to improve most of the parts and to keep as many parts as possible.This year we reorganized and improved our project management. We managed to reduce the manufacturing costs. Our this year’s racing car was built more manufacturing friendly. Fortunately we were able to complete the car very early, so that we had enough time to test and tune our carThis season, we are trying to get better placing in dynamic events, but we also concentrate on the static events, to reach a better overall placing.

Car 50





Germany

FRAME CONSTRUCTION Steel tube space frame with carbon fibre floor panels and firewall

MATERIAL 25CrMo4 alloyed steel tube - cold drawn seamless

OVERALL L / W / H (mm) 2600 / 1430 / 1058

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1250 / 1250

WEIGHT WITH 68kg DRIVER (Fr / Rr) 133 / 145

SUSPENSION Unequal length A-Arms. Push rod actuated Sachs/ZF RD36-2 spring/damper units

TYRES (Fr / Rr) Dunlop SP Sport 175/505 R13 / Dunlop SP Sport 175/505 R13

WHEELS (Fr / Rr) Braid Formrace 13“x7“, -18mm offset / Braid Formrace 13“x7“, -18mm offset

ENGINE 2007 Aprilia SXV 550

BORE / STROKE / CYLINDERS / DISPLACEMENT 80mm / 55mm / 2 cylinders / 553cc

COMPRESSION RATIO 12.5 :1

FUEL SYSTEM EFI Technology ECU, semi sequential

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 10100

MAX TORQUE DESIGN (rpm) 9400

DRIVE TYPE Chain drive

DIFFERENTIAL Drexler Motorsport Formula Student Limited Slip Differential, adjustable

COOLING Twin side pod mounted radiators with thermostatic controlled electric fans

BRAKE SYSTEM 4-Disk system, floating, hub mounted, 220mm dia.,2 x Pretech P440, two piece, four pistons, fixed mount

Sankt Augustin
University of Applied Sciences Bonn-Rhein-Sieg

In 2007, a small group of students at the Bonn-Rhein-Sieg University of Applied Sciences in St. Augustin, had the idea of entering a self-designed and self-built racing car in the Formula Student Germany competition. Soon after BRS Motorsport e.V., the official team, was founded. In the beginning BRS Motorsport e.V. had a variety of challenges to take on in order to get the project established and recognised by our University as well as finding motivated and trustworthy partners from local industry and amongst our professors. The highly-motivated group never gave up and soon the team grew to its current number of 20 students. An important goal of the team, as well as participating in the Formula Student championship, was, and still is, that no student should neglect his or her academic studies.Finally, BRS Motorsport e.V. has succeeded in getting to the Hockenheim Ring and the whole team is delighted to present to you the first Formula Student racing car from St. Augustin.

Car 45

FRAME CONSTRUCTION Tubular steel space frame
MATERIAL 25CrMo4
OVERALL L / W / H (mm) 2700 / 1425 / 1200
WHEELBASE (mm) 1635
TRACK (Fr / Rr) (mm) 1250 / 1150
WEIGHT WITH 68kg DRIVER (Fr / Rr) 134 / 186
SUSPENSION Double unequal length A-Arm. Push rod actuated spring and damper.
TYRES (Fr / Rr) 200x50 R13 Yokohama
WHEELS (Fr / Rr) 7.5x13, 18mm offset, 1 pc student designed Al-Rim
ENGINE Modified Yahama YZF R6 (2003)
BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 600cc
COMPRESSION RATIO 12.4:1
FUEL SYSTEM Lambda controlled sequential injection
FUEL 98 octane unleaded gasoline
MAX POWER DESIGN (rpm) 10000
MAX TORQUE DESIGN (rpm) 8500
DRIVE TYPE Chain drive
DIFFERENTIAL Torque sensitive multiplate limited slip differential
COOLING One side pod mounted radiator with thermostatic controlled electric fan
BRAKE SYSTEM 4-Disk system, adjustable crake balance
ELECTRONICS Electropneumatic Shiftig System, Engine Data Loging

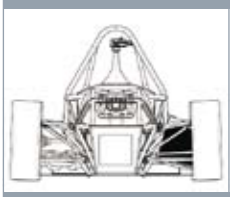
Germany

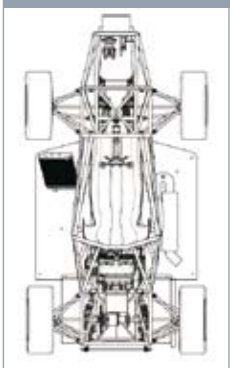
Schweinfurt
University of Applied Sciences Würzburg-Schweinfurt

Mainfranken Racing e.V. was founded in September 2006, born out of the idea of some motor sports enthusiastc students. The Team has about 32 active members at the moment and is a third year competitor in Formula Student Germany.Driven by ambition and through ingenious transformation of creativity in the individual project-sections the team succeeded in upgrading on the performance of the vehicle. Next to the additional power of the engine the fuel consumption and the overall weight could be reduced by a substantial value.The rising know-how in dealing with fiber-reinforced plastic enabled us to build a streaming-optimized and eminently light-weight paneling.Through the increasing application of the rapid-prototyping process we were able to manufacture remarkably fast and economically. Therefore we can also participate under delicate economic-conditions in the contest competitively. Furthermore we want to provide a basis for future FSG-seasons at our university.

Car 97

FRAME CONSTRUCTION Tubular space frame with carbonfibre sandwich floor panels
MATERIAL S235/S355, carbon fibre, armid fibre, glas fibre
OVERALL L / W / H (mm) 2788 / 1400 / 1016
WHEELBASE (mm) 1650
TRACK (Fr / Rr) (mm) 1210 / 1180
WEIGHT WITH 68kg DRIVER (Fr / Rr) 139 / 156
SUSPENSION Double unequal length A-Arm, Pullrod actuated horizontally oriented spring and damper
TYRES (Fr / Rr) Goodyear D2692 20.0x7.0-13 R075
WHEELS (Fr / Rr) Goodyear D2692 20.0x7.0-13 R075
ENGINE Modified Yamaha YZF-R6
BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 14:1
FUEL SYSTEM Bosch fuel pump, injection and valves from yamaha, self made rail, fuel injection
FUEL 100 octane unleaded gasoline
MAX POWER DESIGN (rpm) 11000
MAX TORQUE DESIGN (rpm) 9000
DRIVE TYPE Modified sequential gearbox
DIFFERENTIAL Limited slip differental
COOLING Single, left side pod mounted radiator with regulated electric fan
BRAKE SYSTEM 4-disc system, self designed rotors 240/200mm (fr/rr), cockpit adjustable brake balance, Pretech/AP-Racing calipers (fr/rr)
ELECTRONICS Semiconductor supply system, multifunctional steering wheel, can-bus, electro-mechanic shifting system, data acquisition system





Germany

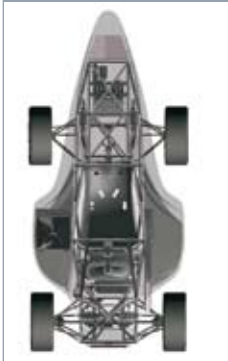
Siegen
University of Siegen

In 2009 it is the first time that the Speeding Scientists Siegen team participates in the FSG. Founded in early 2008 we are looking forward to the upcoming event and are very proud to present you our vehicle, the S3-09. Our team consists of 31 students from various courses of studies. The main target of the team was to finish the car to be ready to race as early as possible so that teething troubles could be eliminated prior to the competition. The frame of the S3-09 was built of tubular steel. It`s powered by a Yamaha R6 engine of 2005 and has a double a-arms suspension with unequal lengths at the front and rear. We would like to thank our partners for their trust in our team and their engagement. For further information take a look at www.s3racing.de

Stockholm
KTH Royal Institute of Technology

KTH Racing presents its 6th Formula Student car – KTHR6. After 3rd overall place 2005 and “Most Innovative use of electronics”-award 2008 at Silverstone, the team has large expectations this year. Compared to forerunners, the car is lighter and more reliable. The focus was also placed on the driver’s comfort and safety, which includes such details as electro-pneumatic shifting and multifunctional steering wheel. This, together with improved steering allows good handling and drivability on the track and good results in the competition!

Car 53



FRAME CONSTRUCTION tubular space frame

MATERIAL S355, 20-25mm OD, 1.0-2.5mm wall thickness

OVERALL L / W / H (mm) 2850 / 1405 / 1270

WHEELBASE (mm) 1630

TRACK (Fr / Rr) (mm) 1180 / 1175

WEIGHT WITH 68kg DRIVER (Fr / Rr) 163 / 170

SUSPENSION Double unequal length A-Arm, Push rod actuated spring and dampers (Coil-over). Adjustable in compression and in rebound range. Adjustable Anti roll bar in rear and front

TYRES (Fr / Rr) undetermined

WHEELS (Fr / Rr) 7.0x13, -7.4mm offset, 3 pc Al Rim / 7.0x13, 5mm offset, 3 pc Al Rim

ENGINE Modified Yamaha YZF-R6 (2005)

BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.6:1

FUEL SYSTEM Student designed & built, sequential multipoint fuel injection

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 9500

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE chain 520

DIFFERENTIAL limited slip differential

COOLING radiator and electric fan mounted in left side pot

BRAKE SYSTEM 4-disk system, modified rotors with 254/220mm diamater, adjustable brake balance, Wilwood calipers

ELECTRONICS electric shifting system, selfdesigned data aquisition

Germany

Car 71

FRAME CONSTRUCTION Tubular steel frame

MATERIAL DOM mild steel 25x2.5, 25x1.8, 25x1.5, 25x1, 18x1

OVERALL L / W / H (mm) 2805 / 1367 / 1115

WHEELBASE (mm) 1600

TRACK (Fr / Rr) (mm) 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 121 / 147

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 178x50 R13, GoodYear D2692 R075

WHEELS (Fr / Rr) 6.0x13, 14 mm offset, 1 pc Mg Rim

ENGINE 2005 Suzuki GSX-R600

BORE / STROKE / CYLINDERS / DISPLACEMENT 67 mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13.5:1

FUEL SYSTEM Student des/built, fuel injection, sequential, fuel pressure gauge on rail

FUEL E-85 Ethanol

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE Chain drive, 520 size chain

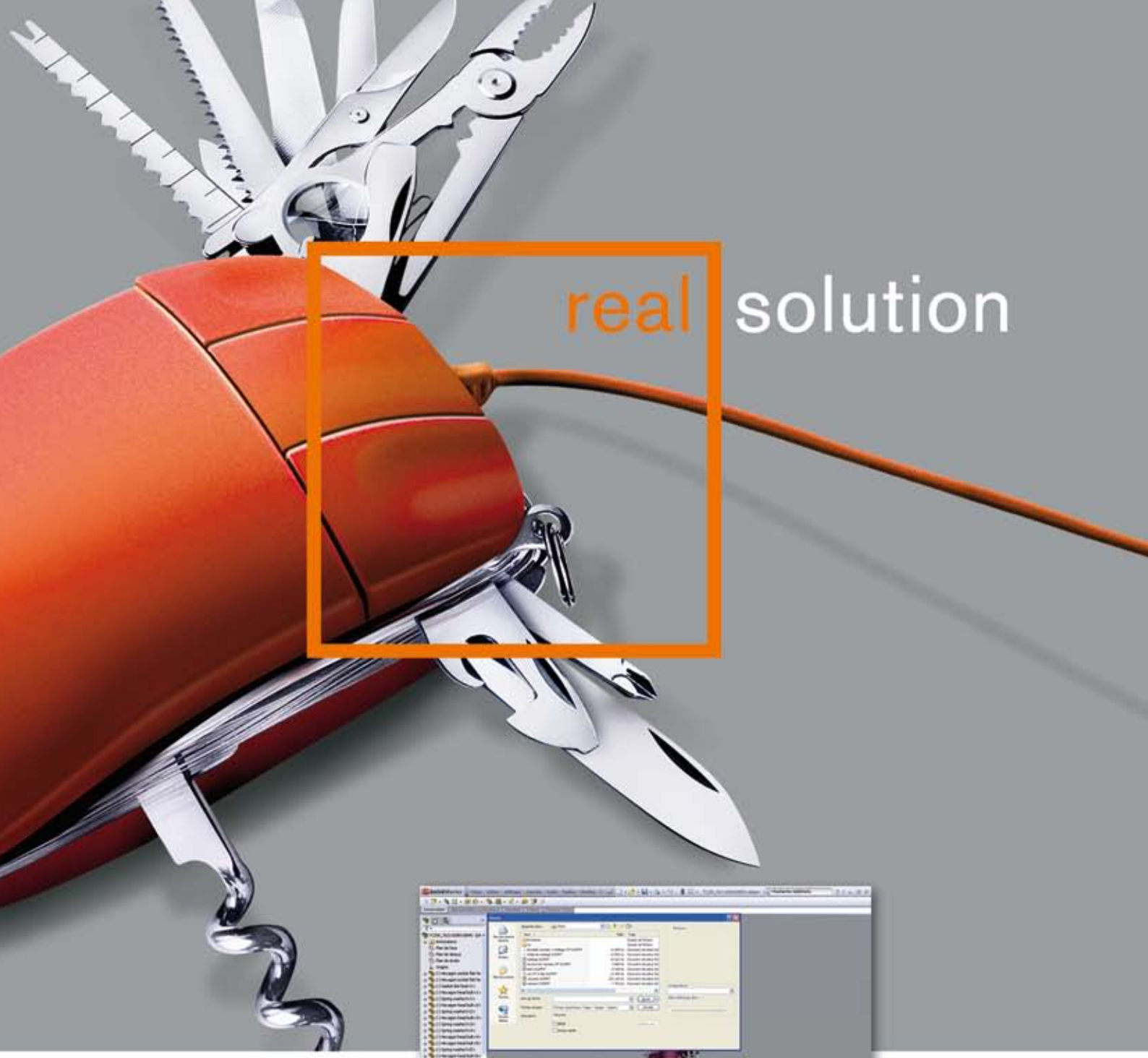
DIFFERENTIAL Torsen diff with tufram coated aluminum housing

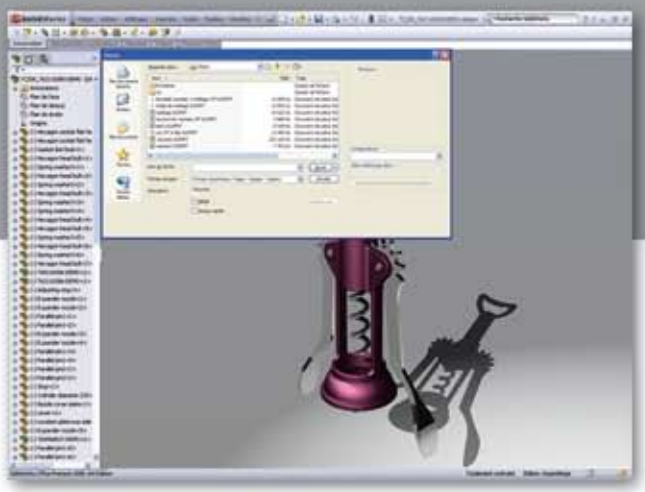
COOLING Single, side pod mounted radiator with electronically controlled electric water pump and fan

BRAKE SYSTEM 3-disc system, self developed rotors with 220mm diameter, adjustable brake bias, ISR 4 piston monoblock calipers

ELECTRONICS Electro-pneumatical shifting, launch and traction control; data logging of engine, suspension, tire temperature, steering etc.

Sweden





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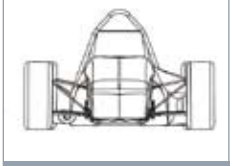
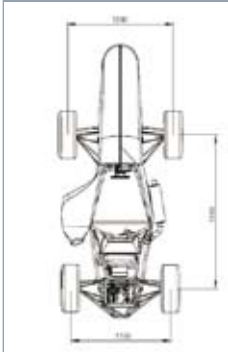
Stralsund
University of Applied Sciences Stralsund

The Baltic Racing Team of the University of Applied Sciences Stralsund was the first Formula Student team founded in Germany in 1999. Since then we designed and constructed ten cars and experienced a lot in the field of automotive engineering. Our team consists of students from many different study courses so there is a diversity of ideas and imaginations existing in our everyday work. The overwhelming creativity which is produced in our offices and garages motivates us to put all our energy into this project. To build the TY2009 we took several facts into consideration. These are, the positive experience with the TY2008 just as extensive discussions based on data records and test results. We set our focus on the simplicity of maintenance and the cheap and high-quality production attributes. According to our maxim „One Team - One Mission“ the entire team is standing together to create the TY2009.

Car 19





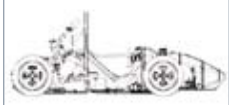
FRAME CONSTRUCTION tubular steel space frame
MATERIAL SAE 4030
OVERALL L / W / H (mm) 2900 / 1415 / 890
WHEELBASE (mm) 1650
TRACK (Fr / Rr) (mm) 1240 / 1180
WEIGHT WITH 68kg DRIVER (Fr / Rr) 126 / 137
SUSPENSION Double unequal length A-Arms. Pull rod actuated X-Fusion Dampers
TYRES (Fr / Rr) 20.5x7.0-13 Hoosier R25B, front and rear
WHEELS (Fr / Rr) 7.0x13, BBS AlMg, 12.5mm offset
ENGINE Modified Honda CBR600 F4i
BORE / STROKE / CYLINDERS / DISPLACEMENT 67mmmm / 43mmmm / 4 cylinders / 600cc
COMPRESSION RATIO 12:1
FUEL 98 octane unleaded gasoline
MAX POWER DESIGN (rpm) 10000
MAX TORQUE DESIGN (rpm) 9000
DRIVE TYPE sequential gear box
DIFFERENTIAL Quaiffe differential, internal preload adjustment
COOLING radiator with 240mm electric fan
BRAKE SYSTEM 4-Disk system, AP racing cylinders, adjustable brake balance, ISR brake callipers
ELECTRONICS Multifunctional steering wheel

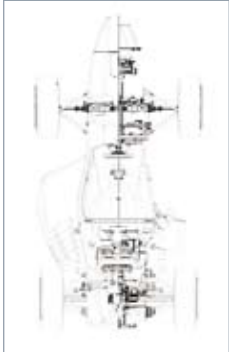
Germany

Stuttgart
University of Stuttgart

From the beginning of the existence of our team we worked according to some basic principles. One of them is that we set clear goals at the beginning of a season. Our goals for this year are: get the car done in time - finish - win. Especially the first point is important to be able to have a competitive car at the competitions. The first test run of our 2009-car, the F0711-4, was at the end of April. So we could test it for more than two months before we took it to the first competition. The biggest change this year is that we built a CFRP-Monocoque instead of a spaceframe. The monocoque gave us more freedom in designing the suspension kinematics and higher stiffness. We also optimized our engine design to save fuel and to have higher torque at low rpms. Of course we also tried to optimize every detail of the car to be very competitive again and to have a good chance to win this year.

Car 29





FRAME CONSTRUCTION Monocoque
MATERIAL carbon fibre
OVERALL L / W / H (mm) 2697 / 1420 / 1055
WHEELBASE (mm) 1635
TRACK (Fr / Rr) (mm) 1214 / 1142
WEIGHT WITH 68kg DRIVER (Fr / Rr) 132 / 148
SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented ZF Sachs Formula 3 Damper
TYRES (Fr / Rr) Hoosier, R25B, 13
WHEELS (Fr / Rr) Carbon Fibre Rim 13
ENGINE 2005 / Honda CBR 600RR four stroke
BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 13,5:1
FUEL SYSTEM Dual sequential fuel injection system
FUEL 98 ROZ unleaded
MAX POWER DESIGN (rpm) 10500
MAX TORQUE DESIGN (rpm) 9000
DRIVE TYPE Chain #520
DIFFERENTIAL Drexler clutch pack differential
COOLING Custommade single radiator, mounted in left sidebox, ECU and thermostatic controlled fan
BRAKE SYSTEM X46Cr13 steel floating disc, hub mounted, 220/190 mm dia., laser cut
ELECTRONICS Electropneumatic Shifting System, self-designed Data Acquisition System, Adjustable ARB

Germany

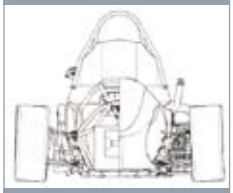
Stuttgart

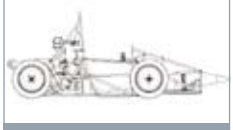
University of Cooperativ Education Stuttgart

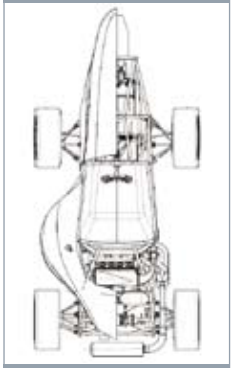
BA Engineering is the newly established Formula Student team of the University of Cooperative Education Stuttgart. In line with the concept of cooperative education all our members are pursuing theoretical studies and at the same time working for a company of the region. In numerous hours we constructed and built SLEEK, our first contender for Formula Student series. SLEEK is the manifestation of our enthusiasm for racing and the result of the remarkable support from our partners.Although being a first year car, SLEEK features sophisticated solutions like a basalt fiber body shell or a knock control, both being shown for the first time at FSG. At the heart of our car a heavily modified Honda CBR600RR engine is beating, embedded into a tubular space frame. We extensively tested SLEEK and optimized the suspension set-up. Now, we are ready to take on our goal: To finish all dynamic events in Hockenheim successfully.

Car 99

FRAME CONSTRUCTION Tubular space frame
MATERIAL Steel 25CrMo4 round tubing 25mm diameter
OVERALL L / W / H (mm) 2820 / 1378 / 1151
WHEELBASE (mm) 1551
TRACK (Fr / Rr) (mm) 1200 / 1200
WEIGHT WITH 68kg DRIVER (Fr / Rr) 163 / 181
SUSPENSION Double wishbone
TYRES (Fr / Rr) 205x75 - 13 Hoosier R25B
WHEELS (Fr / Rr) Braid Formrace 7.0x13
ENGINE Modified Honda CBR600RR (PC37)
BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 43.0mm / 4 cylinders / 599cc
COMPRESSION RATIO 13.5:1
FUEL SYSTEM Student built
FUEL 100 octane unleaded gasoline
MAX POWER DESIGN (rpm) 10500
MAX TORQUE DESIGN (rpm) 7500
DRIVE TYPE Chain and sprocket wheel drive
DIFFERENTIAL Clutch pack limited slip
COOLING Single side pod mounted radiator with thermostatic controlled electric fan and water pump
BRAKE SYSTEM 4-Disk system, rotors with 245mm diameter, adjustable brake balance
ELECTRONICS Wiring harness (IP65), multifunctional steering wheel, electropneumatic shifting system with transmission control, GSM telemetry







Germany

Tallinn

Tallinn College of Engineering

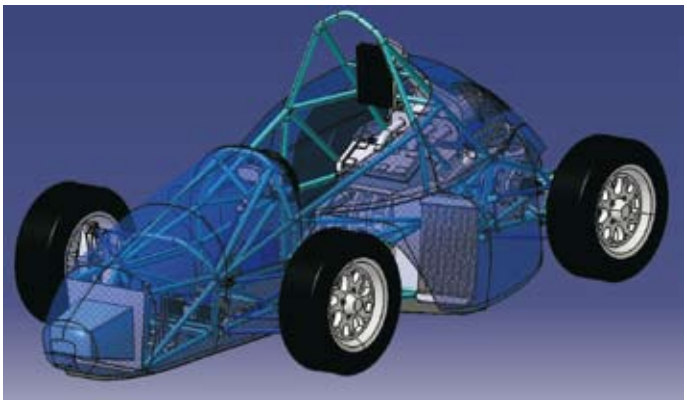
The combined Formula Student team of Tallinn University of Technology and Tallinn University of Applied Sciences, FS Team Tallinn continued from where they left on their debut season of 2008 and went to design their second racecar, the FEST09. While continuing to improve their basic concept of a reliable and widely adjustable car, the team will also introduce some more advanced technologies to the new formula, such as electropneumatical gearshift, 3D-printed parts and extensive use of carbon fiber. Weight optimisation by the means of thorough FEM analysis and lighter materials together with more precise engine setup were the main objectives for the team. Attention has also been given to improving the appearance of the car. A completely new carbon fiber bodywork with more aggressive and modern look was penned by the students of the Estonian Academy of Arts. FS Team Tallinn will enter two events in 2009, besides Formula Student Germany, Baltic Open is also included to the season calendar.

Car 57

FRAME CONSTRUCTION Steel tube space frame with bonded carbon sheet reinforcement
MATERIAL 25CrMo4
OVERALL L / W / H (mm) 2525 / 1378 / 1000
WHEELBASE (mm) 1550
TRACK (Fr / Rr) (mm) 1200 / 1150
WEIGHT WITH 68kg DRIVER (Fr / Rr) 125 / 153
SUSPENSION Double A-Arms. Push rod actuated. Crane Creek Double Barrel dampers with coil springs
TYRES (Fr / Rr) GoodYear 7,0/20.0 - 13 D2692 (dry), D2691 (intermediate), 6,5/20.0 - 13 D1883 (w
WHEELS (Fr / Rr) Keizer Formula SAE Racing Wheels 6,0x13
ENGINE Modified Yamaha R6
BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 12,8:1
FUEL SYSTEM Student designed and built fuel injection system using EFI Euro4 ECU
FUEL 98 octane unleaded gasoline
MAX POWER DESIGN (rpm) 10000
MAX TORQUE DESIGN (rpm) 7000
DRIVE TYPE O-ring steel chain (530)
DIFFERENTIAL TorSen
COOLING Student designed coolant radiator with electric fan mounted in sidepod, oil cooler added
BRAKE SYSTEM Ventilated disc brakes, student developed floating rotors with 220 mm diameter, ISR calipers
ELECTRONICS Electropneumatic shifting system, MoTeC dashboard, launch control, traction control

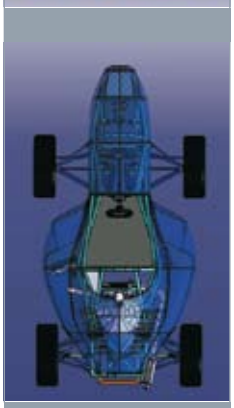
Estonia

Tampere
TAMK University of Applied Sciences



Tampere UAS Motorsport was founded in late 2006. Our history includes involving in Formula Student 2008 in class 1 and 2007 in class 3. Our team consist about 20 mechanical engineer students from all grades in our University. For this year we are about to introduce a completely new Formula Student race car and compete it in Formula Student Germany.When designing the FS009 named race car, we mainly concentrated in improving three basic things: less weight, better handling and improved reliability. These goals are archived by more extensive FEM calculations, better dynamics and running longer test season. To gain more benefit from tests, our car is equipped with comprehensive data acquisition system.In addition to above, we have paid attention to ease of manufacturing processes and lower installation costs. Material choices and fabrication methods are reconsidered in every detail of the car. In overall we have a very competitive line-up to present in Formula Student Germany 2009.

Car 78



Finland

FRAME CONSTRUCTION Steel tube frame

MATERIAL Ruukki high strenght steel

OVERALL L / W / H (mm) 2685 / 1455 / 1085

WHEELBASE (mm) 1580

TRACK (Fr / Rr) (mm) 1250 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 150 / 163

SUSPENSION Double unequal length A-Arm. Pull/ push rod actuated spring and damper. Adjustable low and high speed damping in compression and rebound.

TYRES (Fr / Rr) 20.5 X 7-13 R25B Hoosier / 20.5 X 7-13 R25B Hoosier

WHEELS (Fr / Rr) 6.2x13, 18mm offset, Compomotive CXR wheels

ENGINE Yamaha FZ6

BORE / STROKE / CYLINDERS / DISPLACEMENT 66mmmm / 45mmmm / 4 cylinders / 600cc

COMPRESSION RATIO 13,0:1

FUEL SYSTEM Student des/built fuel injection, Tatech engine management system

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain driven, 520 D.I.D

DIFFERENTIAL Limited slip differential, plate-type, no preload

COOLING Student des/built radiator mounted in side-pod, electric fan

BRAKE SYSTEM 4-Disk system, self designed rotors with 240/220mm diameter, AP Racing calipers and main cylinders

ELECTRONICS Tatech fully adjustable engine management system, Race Technology data acquisition system

Toronto
University of Toronto

The University of Toronto Formula SAE Racing Team is comprised of a dozen engineering students. In a rapidly changing FSAE series, the UT09 team was able to adapt designs to accommodate new regulations, but also delved forward with higher-level initiatives. While making accommodations for the cross-section template, the front suspension system was also redesigned to maintain simplicity, ease of adjustability and linear kinematics for tuning. A switch from the previously used F4i to a light-weight single cylinder engine is one of several efforts to improve fuel economy. UT09 also features the second iteration of a CFRP monocoque frame, expanded DAq capabilities, along with continued development with a custom externally adjustable Salisbury-type differential; and 95% of it all is built by the students. The UofT team looks forward to a challenging 2009 race season with its competitors from around the world and is prepared to defend its top Canadian ranking.

Car 10

Canada

FRAME CONSTRUCTION Composite monocoque ahead of roll hoop; Spaceframe engine bay

MATERIAL CFRP laminate with 0.25“-1“ Nomex and foam cores; 4130 thin-walled steel tubing

OVERALL L / W / H (mm) 2766 / 1400 / 1058

WHEELBASE (mm) 1536

TRACK (Fr / Rr) (mm) 1193 / 1168

WEIGHT WITH 68kg DRIVER (Fr / Rr) 114 / 125

SUSPENSION Double unequal length A-Arm. Pull rod actuated on front, push rod actuated on rear, horizontally oriented spring and damper.

TYRES (Fr / Rr) 20.0 X 7.0-13 Goodyear D2696

WHEELS (Fr / Rr) 20.0 X 7.0-13 Goodyear D2696

ENGINE Honda TRX450ER 2006

BORE / STROKE / CYLINDERS / DISPLACEMENT 96mm / 62.1mm / 1 cylinders / 449cc

COMPRESSION RATIO 12.0:1

FUEL SYSTEM Student designed, EFI 450cc/min injector. DTA Fast control unit employing TPS, WBO2, EGT.

FUEL 94 octane unleaded gasoline

MAX POWER DESIGN (rpm) 9500

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE Chain drive (520 chain)

DIFFERENTIAL Custom designed Salisbury-type diff with externally adjustable TBRs of 2, 3 & 4

COOLING Single side-mounted radiator with a shroud sealing to fan, ECU-controlled fan for 90°C target

BRAKE SYSTEM 4 floating steel rotors, 240/165mm F/R dia, student designed, laser cut, ground. 15.875/19mm F/R Wilwood MCs. Brembo P32G Calipers

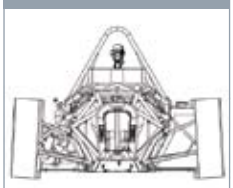
ELECTRONICS Two Evo 2 Aim data aquisition units. DTA Fast engine control unit.

Turin
Polytechnic University of Turin

The SC team is going to celebrate its 5th year of competitions in Formula Student and that's why the new car wants to represent a joint between the past and the future. On the one hand the typical tubular space frame which characterizes all SC's cars, on the other hand a complete carbon fibre body and a larger use of composites material, which allows a weight reduction. This year the attention was focused on the dynamic analysis of the vehicle, for which a good telemetry system software is very important. That's why a new can bus system able to communicate with all electronic units was entirely developed by the team's control division. Wireless real time system acquisition is one of the key-point to increase speeding of reading data. On engine system, actuated intake system allows to increase torque and to power performances. 30 Members, 1 goal: SC09 is ready to land among the stars!!

Car 46

FRAME CONSTRUCTION Tubular space frame, carbon fibre floor panels and aluminium rear box
MATERIAL 25CrMo4 tubes
OVERALL L / W / H (mm) 2840 / 1368 / 980
WHEELBASE (mm) 1590
TRACK (Fr / Rr) (mm) 1200 / 1190
WEIGHT WITH 68kg DRIVER (Fr / Rr) 137 / 156
SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper. Adjustable in compression and in rebound range
TYRES (Fr / Rr) 152x62 R13, Hoosier R25B / 178x48 R13, Hoosier R25B
WHEELS (Fr / Rr) Magnesium alloy 13
ENGINE 2005 Honda CBR600RR
BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc
COMPRESSION RATIO 13,1:1
FUEL SYSTEM Magneti marell multi point fuel injection
FUEL 100 RON unleaded
MAX POWER DESIGN (rpm) 12000
MAX TORQUE DESIGN (rpm) 8000
DRIVE TYPE Chain transmission
DIFFERENTIAL Quaife automatic torque biasing differential
COOLING Rear mounted single-side radiator, electric fan
BRAKE SYSTEM 4 disk system, 218 mm OD, 158mm ID, mild steel thickness 4 mm, adjustable brake balance
ELECTRONICS Multifunctional steering wheel, Live telemetry System



Italy

Ulm
University of Applied Sciences Ulm

Now that we as Einstein Motorsport can look back on four years of experience and four cargenerations, we are already able to bring in distinct innovations, new design features and knowledge not exclusively based on theoretical studies but on on-the-job-training and fieldtesting. In our newest car Al09 almost everything was revised, restructured and reconstructed. With many students from our university we started research projects concerning framereconstruction, chassis and drive train as well as studies on improvement of the use of our Bosch ECU. Our tyres, the steering gear and wheel also bettered as a result of dedicated studies. Besides developing a safer car the main goals for us to accomplish are a lowering of the retailcost and a decrease in weight. In addition we lowered the gravity center, bettered the enginepower, relocated and improved the cars cooling system.

Car 41

FRAME CONSTRUCTION Front and rear Tubular space frame
MATERIAL 25CrMo4 Steel
OVERALL L / W / H (mm) 2850 / 1450 / 1050
WHEELBASE (mm) 1670
TRACK (Fr / Rr) (mm) 1220 / 1200
WEIGHT WITH 68kg DRIVER (Fr / Rr) 128 / 150
SUSPENSION Double unequal length A-Arm. Pull rod actuated, horizontally oriented spring and damper
TYRES (Fr / Rr) 175x50 R13, Goodyear
WHEELS (Fr / Rr) student made 6.5x13
ENGINE Aprila SXV/RXV 550
BORE / STROKE / CYLINDERS / DISPLACEMENT 80mm / 55mm / 2 cylinders / 550cc
COMPRESSION RATIO 12.5:1
FUEL SYSTEM Student des/built, fuel injection, sequential
FUEL unleaded Fuel, 98 ROZ
MAX POWER DESIGN (rpm) 11000
MAX TORQUE DESIGN (rpm) 10000
DRIVE TYPE 20mm x 15mm Chain
DIFFERENTIAL limited slip,80% lock impact
COOLING side pod mounted radiator with thermostatic controlled electric fan
BRAKE SYSTEM 4-Piston, 22,6 mm dia., Opposing piston, fixed, Floating, steel, hub mounted, 205mm outer diam.,145mm inner diam., vented
ELECTRONICS Wireless Tyre Temp./Press. Sensors, Steering wheel integrated Display, Bosch MS3.1 Sport Engine ECU

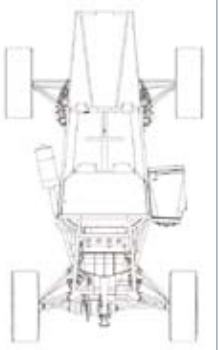


Germany

Uxbridge
Brunel University

Brunel Racing has been competing in Formula Student since 1999 and is an integral part of Brunel University's Motorsport Engineering degree course. The 2009 car, BR-X, aims to take large steps forward in terms of design and performance. BR-X uses an aluminium honeycomb monocoque, manufactured in-house, for the front section of the chassis and the rear of the car uses a compact spaceframe, making the chassis lighter than the 2008 car and providing a fresh challenge for the team. Engine development has involved many hours on the dyno and thorough analysis using Ricardo WAVE. The intake and exhaust systems have been iteratively improved and new cam profiles and mapping provide over 85bhp and 60Nm of power and torque. Further advances include the use of an electronic gear shifter, traction control and a custom lightweight differential housing. For more information please visit us at www.brunelracing.co.uk

Car 43



FRAME CONSTRUCTION Aluminium Honeycomb Monocoque / Steel Spaceframe Hybrid

MATERIAL 20mm Al honeycomb (6982T6 skins, 3.7-3 /6-3003 core); 25.4mm 4130 steel tube

OVERALL L / W / H (mm) 2650 / 1425 / 1130

WHEELBASE (mm) 1610

TRACK (Fr / Rr) (mm) 1225 / 1140

WEIGHT WITH 68kg DRIVER (Fr / Rr) 134 / 164

SUSPENSION Unequal length A-Arms. Pull rod actuated Fox Vanilla RC spring/damper units

TYRES (Fr / Rr) 7.5/20.0-13 Avon A91 / 7.5/20.0-13 Avon A91

WHEELS (Fr / Rr) Braid steel one piece, 13" x 7" / Braid steel one piece, 13" x 7"

ENGINE 2003 Yamaha R6

BORE / STROKE / CYLINDERS / DISPLACEMENT 66.5mm / 44.5mm / 4 cylinders / 600cc

COMPRESSION RATIO 12.4:1

FUEL SYSTEM Student designed/built, 4 injectors, sequential

FUEL 99 RON Unleaded gasoline

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE Chain #520

DIFFERENTIAL Quaife ATB with custom aluminium housing

COOLING Student designed radiator, right sidepod, ducted, angled 40° into flow

BRAKE SYSTEM Floating hub-mounted student designed 220mm discs all round, AP Racing calipers

ELECTRONICS Custom wiring loom, Electronic gear shifter with steering wheel-mounted controls, Traction control using ignition cut

United Kingdom

Wien
Technical University of Wien

Here we are again, from the city of waltz and borque architecture. We have awaken this old city with the characteristic uproar of our first car the „edge". Now the beating 1-cylinder sound of „edge Mk2" echos through the streets of Vienna, as the 2nd car of TUW-Racing is coming up on the test tracks.From one of the best newcomer teams last year comes a stunning new car with amazing design and outstanding technical solutions: Exotic chassis design featuring a carbon fibre tubular space frame with integrated steering gear and rear torsional springs matches with a sophisticated suspension system, a fully modified single cylinder engine and an own-designed differential housing. The last year held it's ups and downs for us with two DNF's and a 4th overall in Hockenheim. No one (including us) has thought that a newcomer like TUW Racing can establish amongst the top teams of europe. But as the car is more sophisticated our goals are also higher. Beware of „edge Mk2"!

Car 4

FRAME CONSTRUCTION Carbon Fibre Tubular Space Frame

MATERIAL CFRP and steel hoops

OVERALL L / W / H (mm) 2800 / 1430 / 1000

WHEELBASE (mm) 1650

TRACK (Fr / Rr) (mm) 1240 / 1160

WEIGHT WITH 68kg DRIVER (Fr / Rr) 115 / 141

SUSPENSION Double unequal A-Arms with carbon fibre flex blades, pullrod actuated with CaneCreek spring-damper units

TYRES (Fr / Rr) Continental 205/510-13

WHEELS (Fr / Rr) CFRP Rims 8J13

ENGINE KTM LC4 Evo2

BORE / STROKE / CYLINDERS / DISPLACEMENT 70mm / 105mm / 1 cylinders / 609cc

COMPRESSION RATIO 12,5:1

FUEL SYSTEM Double injection at two points in intake system

FUEL E85

MAX POWER DESIGN (rpm) 8800

MAX TORQUE DESIGN (rpm) 6000

DRIVE TYPE Chain drive

DIFFERENTIAL Disk-plate LSD

COOLING Two water-air coolers mounted in side pods, charged air intercooler

BRAKE SYSTEM Four disks (240mm frong, 200mm rear), adjustable by balance bar

ELECTRONICS OLED-Display on wheel, CAN Interface and Data Logging

Austria

Aus Käufersicht ein schmuckes Auto. Aus Ingenieursicht nur das Drumherum!

Jedes Fahrzeug verliert seinen Glanz, wenn die Antriebs- und Fahrwerktechnik nicht nach dem Geschmack des Fahrers ist. Und die stammt bei vielen namhaften Marken von ZF, einem der weltweit größten Zulieferer der Branche. Was das für Sie als Ingenieur/-in bedeutet? Sie werden die neuesten Modelle unserer Kunden mit vorzüglichen Innovationen versüßen. Denn bei ZF bilden Sie mit 60.000 Kolleginnen und Kollegen ein Team, das als Innovationspartner und Problemlöser anspruchsvoller Kunden den Ruf eines Technologieführers genießt. Erleben Sie ein erfolgreiches Stiftungsunternehmen, das Ihre Leistung anerkennt und in dem interessante Aufgaben und Eigenverantwortung zum Tagesgeschäft gehören.

Welche Bonbons wir noch für Sie bereithalten, erfahren Sie auf:

www.zf.com/karriere

Antriebs- und Fahrwerktechnik

Wiesbaden

University of Applied Sciences Wiesbaden

This is our second season participating in FS. With most of our team being new „recruits“, we still managed to use last year´s experiences to develop and fabricate a more sophisticated car. Emphasize was on weight reduction, driveability and a clean technical design. And with our new Corporate Identity, we plan to present ourselves in a more professional way.

Car 65

FRAME CONSTRUCTION One piece tubular spaceframe
MATERIAL 15CDV6
OVERALL L / W / H (mm) 2759 / 1434 / 1080
WHEELBASE (mm) 1650
TRACK (Fr / Rr) (mm) 1230 / 1180
WEIGHT WITH 68kg DRIVER (Fr / Rr) 138 / 158
SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper
TYRES (Fr / Rr) 175/505 R13 Dunlop
WHEELS (Fr / Rr) 8
ENGINE Suzuki GSXR 600 2001
BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc
COMPRESSION RATIO 13,5:1
FUEL SYSTEM Suzuki multi point fuel injection
FUEL 100 RON unleaded
MAX POWER DESIGN (rpm) 10000
MAX TORQUE DESIGN (rpm) 8250
DRIVE TYPE Single 520 chain
DIFFERENTIAL Drexler Motorsport limited slip differential
COOLING Left side mounted aluminium radiator with 230mm electric fan
BRAKE SYSTEM stainless steel, hub mounted, 220mm dia., drilled, flaoting disc, AP-Racing Caliper

Germany

Wolfenbüttel

University of Applied Sciences Braunschweig/Wolfenbüttel

After a very successful season 2007/2008 with the WR04, Team wob-racing presented the brand-new car WR05 on 20th May in Wolfsburg. The WR05 is, as the name implies, the fifth car of the team after foundation in 2003, what by the way makes us to one of the pioneer teams in Germany. During the years lots of changes happened but one thing had outlasted all the time: Our engine, the Honda PC35, originally from the CBR. In 2009 we broke this mold and decided to use the Honda engine PC40, which was one of the most significant changes within the WR05. Beside we optimized, among other things, our variable air-intake-system and for the first time we applied an electronic power management. Furthermore our team rose up to 50 members and the number of our industrial partners increased up to 70. With the WR05 Team wob-racing has the opportunity to improve the last years' results and after lots of months on the waiting list for FSG, we are very glad to attend in Hockenheim in 2009!

Car 33

FRAME CONSTRUCTION tubular space frame
MATERIAL E355, E275
OVERALL L / W / H (mm) 2725 / 1380 / 1226
WHEELBASE (mm) 1650
TRACK (Fr / Rr) (mm) 1250 / 1185
WEIGHT WITH 68kg DRIVER (Fr / Rr) 144 / 158
SUSPENSION Double unequal length A-Arm. Pull/Push rod actuated horizontally oriented spring and damper
TYRES (Fr / Rr) Hoosier 20.5 x 6.0-13 R25A/Hoosier 20.5 x 7.0-13 R25A
WHEELS (Fr / Rr) 6.0x13, 25mm offset, 2pc, Al rim/7.0x13, 0mm offset, 2pc, Al rim
ENGINE Honda CBR600RR (PC40)
BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc
COMPRESSION RATIO 12,8:1
FUEL SYSTEM MPI, twin spray, spray angle: 15°, student des/build rail
FUEL gasoline 100 octane
MAX POWER DESIGN (rpm) 12000
MAX TORQUE DESIGN (rpm) 7000
DRIVE TYPE chain drive
DIFFERENTIAL Drexler Formula Student limited slip differential
COOLING twin side pod mounted radioators with oil radiator on the right side, electronical waterpump
BRAKE SYSTEM 4-disk system, self developed rotors with 220/200 mm diameter, adjustable brake balance, Beringer/AP racing calipers
ELECTRONICS electronical Power-Management, electro mechanical shifting, Live-telemetry over WLAN, logging system, all student des./build

Germany

Zürich
Swiss Federal Institute of Technology Zurich

The swiss Formula Student Team „AMZ Racing“ presents in his third season the new racecar „simplon“. Traditionally named after a swiss alpine pass, „simplon“ is a further development of its predecessor. The prominent features are the CFRP monocoque chassis with removable rear section which comes along with an integrated CFRP crash box, a refined suspension-packaging with CFRP A-Arms, an internal development of a modular CAN-Bus system for peripheral data processing and the changeover of the four cylinder engine to E85 fuel. During the development the „AMZ Racing“-Team put the focus on further reducing the curb weight, simplifying the construction, enabling an efficient data acquisition as well as on more convenient service and maintenance possibilites. www.amzracing.ch

Car 48

FRAME CONSTRUCTION Two piece monocoque with demountable rear part.

MATERIAL Nomex honeycomb core with cf face sheets (10 mm and30 mm core, faces 0.8mm)

OVERALL L / W / H (mm) 2716 / 1416 / 1003

WHEELBASE (mm) 1625

TRACK (Fr / Rr) (mm) 1200 / 1160

WEIGHT WITH 68kg DRIVER (Fr / Rr) 125 / 142

SUSPENSION CF A-Arms with pullrods (f) and push-rods (r); horizontally oriented Cane Creek dampers; rear anti-roll bar driver adjustable;

TYRES (Fr / Rr) tbd

WHEELS (Fr / Rr) 7.0x13 3pc Al Keizer-rim with self developed centers

ENGINE Suzuki GSX-R 600 K4/K5

BORE / STROKE / CYLINDERS / DISPLACEMENT 67.0mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 15:1

FUEL SYSTEM Motec M400; one injector per cylinder

FUEL E-85

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 8100

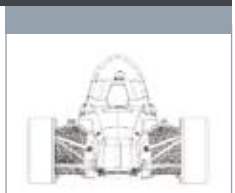
DRIVE TYPE Sequential gearbox (5 gears used)

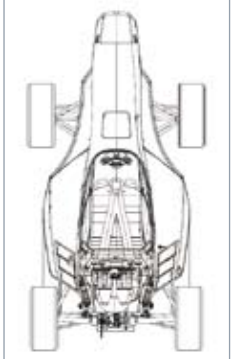
DIFFERENTIAL Drexler Formula Student

COOLING Electric water pump; left mounted radiator with single 7 inch electric fan

BRAKE SYSTEM 4-Disc system with 220 mm (f) and 212 mm (r) diameter; 4 piston Magura (f) and 2 piston AP Racing (r); adjustable brake balance

ELECTRONICS Self-developed CAN Modules, prints for fuses, steering wheel and supply; SuperSeal connectors; Data Logging using Motec M400





Switzerland

Zwickau
University of Applied Sciences Zwickau

Innovation meets Tradition – if you look at Zwickaus automotive history you can easily find out why we picked out this slogan for our team. Zwickau is the birth place of Horch and Audi, and furthermore in the 1930s, it was the domicile of the Auto Union race cars which dominated the race tracks in Europe. 70 years later, our WHZ Racing Team was founded.Now in 2009, we bring our third car, the FP309 to the tracks. Learning a lesson from the last two cars, concentrating on weight reduction and chassis dynamics we created a fast and reliable car for the Formula Student. The FP309 has innovative technology like carbon-magnesium hybrid rims, fast removable shaft drives and traction control. All these technical aspects, combined with friendly and motivated people result in a team. This team has worked hard and efficiently to upgrade its results for 2009. Zwickau has waited long to regaining race-car strength. Now its time to transfer tradition into reality: FP 309 – it`s coming!

Car 96

FRAME CONSTRUCTION Steel tube space frame with aluminium rear assembly

MATERIAL 25MnCr4, outer diameter 25mm, wallthickness 2,5/2,0/1,5/1,0mm

OVERALL L / W / H (mm) 2785 / 1402 / 1165

WHEELBASE (mm) 1625

TRACK (Fr / Rr) (mm) 1200 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 142 / 142

SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 20.5 x 7.0-13 Hoosier R25B

WHEELS (Fr / Rr) 20.5 x 7.0-13 Hoosier R25B

ENGINE Modified Honda CBR600F (PC35)

BORE / STROKE / CYLINDERS / DISPLACEMENT 60.0mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,5:1

FUEL SYSTEM stud. des./build with quickconnectors in pressure lines

FUEL 100 octane unleaded

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 10000

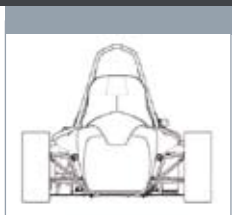
DRIVE TYPE GATES PolyChain GT2 belt, width 30mm

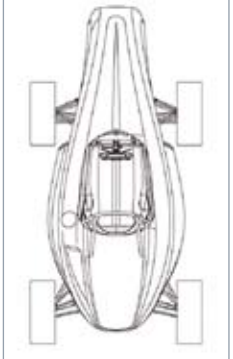
DIFFERENTIAL Drexler limited slip diffential, 3 adjustable ratios

COOLING 210mm powerful SPAL fan, Davies Craig electrical water pump, restricted water outlet

BRAKE SYSTEM 4-Disk system, self developed brake discs and floaters, adjusable brake balance, AP designed calipers

ELECTRONICS Self designed driver information system, data aquisition (sensors), transmission control unit and electrical central unit in one





Germany

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