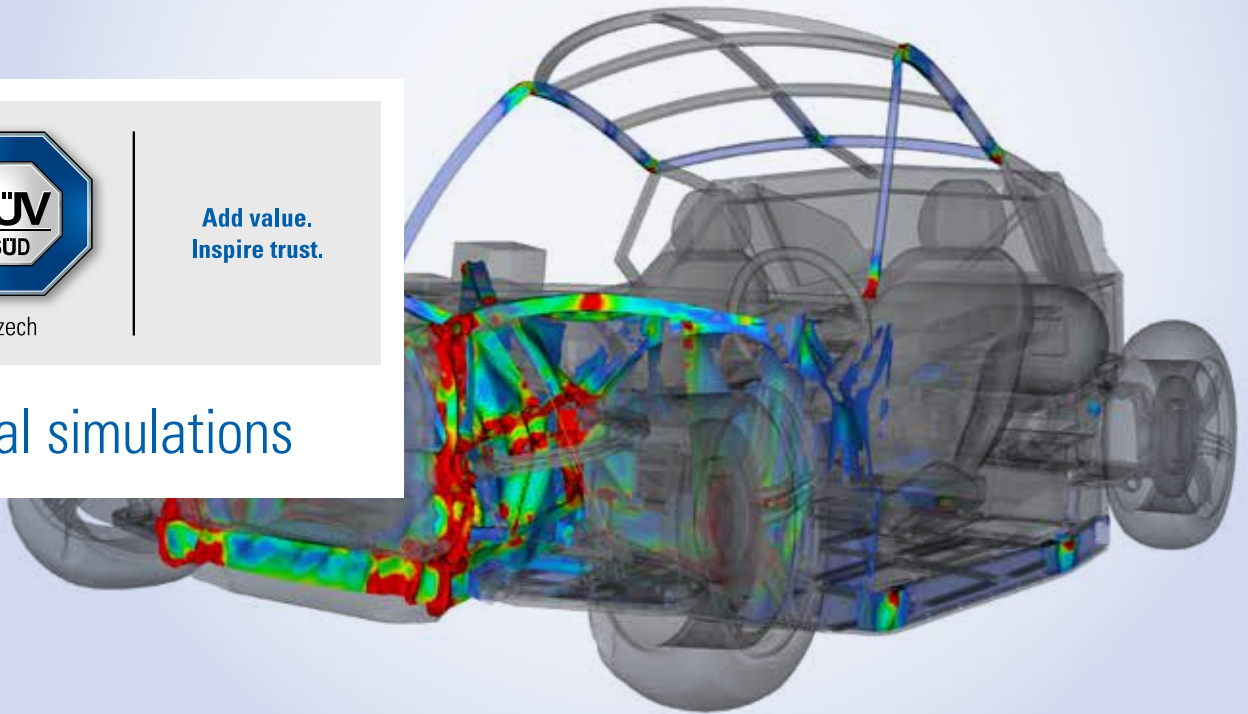




Czech

Add value.  
Inspire trust.

## Virtual simulations



## Virtual simulation of passenger car crash and restraint system tuning

### Your Challenges

As current market demands increase volume of work, while time and costs decrease, new approaches are sought. It is imperative to meet increasing safety requirements and customer expectation in both research & development (R&D) as well as certification testing sensitivity and robustness analyses lead to desired objective of having covered all possible scenarios and variants that comply to safety requirements. This does not have to be necessarily related only to crash simulations, but NVH, durability etc.

Using the virtual simulation results in development time reduction and often in identification of weak points yet before the prototype is made and hence significantly decrease associated costs. Virtual simulations are very often correlated with physical testing to ensure accuracy and reliability. This leads to overall acceptance of the virtual simulations as a suitable tool by customer and authorities.

### What is virtual simulation?

While physical test uses usually very expensive sample and prototypes, virtual simulation is based on mathematical reproduction of physical world. For virtual simulation it is sufficient to acquire from business partner only 3D CAD and material definition. Most of the analyses have got clearly stated initial and boundary conditions and which can be also easily changed. Once

the virtual model is built it is quick and simple to change any structure, material, thicknesses or just loading and boundary conditions to get an insight into sensitivity of the complete model behaviour to any input parameters. Nowadays are virtual simulations integral part of both R&D and certification areas and support the partner along the whole development in various industry sectors.

### How can we help you?

The TÜV SÜD department of computer aided services (CAS), an integral part of the testing laboratory, uses cutting-edge technology and software and is able to support any partner around the globe. All services are provided virtually and therefore no physical specimen is required. Our experts are able to simulate and identify any potential weak points in the structure and suggest improvement. Together with DYCOT (DYNAMIC COmponent Testing lab) we are able to fine-tune restraint systems such as seatbelts and airbags that are highly sought for both frontal and side crash tests via Design of Experiment (DoE). We are mainly focused on sled test simulations which enable us to determine biomechanical loads on dummy quicker and cheaper. This often indicates performance necessary for NCAP (or any other consumers testing) and mandatory testing. The department of CAS also provide partners with weight-to-stiffness/strength optimization and whole variety of analyses ranging from single point loading to complex crash simulations.

## Software available

ANSA/μETA, MSCNastran/Epilysis, LSTC LS-Dyna, LS-OPT, PAM-CRASH, ABAQUS/Standard, Altair Radioss, Madymo, CarMaker, SIMPACK, MatLAB/Simulink, SolidWorks

## Our services

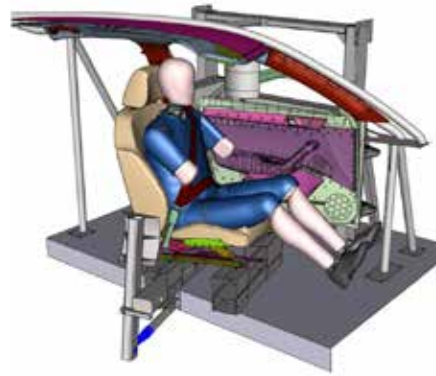
- All types of crash simulations (front, side, rear, roof, e.g. FMVSS/ENCAP/KNCAP/ECE...) – may be coupled with physical sled test facility DYCOT.
- Unique approach of side crash sled combines simulation and testing options via ALIS (Advanced Lateral Impact System) – designed for sled testing of side impact.
- Development support – modal, stiffness, strength, NVH and crash analyses of components and/or whole structure.
- Fine tuning of restraint systems (airbags, seatbelts) – may be coupled with physical sled test facility DYCOT and evaluated through biomechanical loads on dummies.
- Linear/non-linear, static/quasistatic and dynamic simulations, implicit and explicit methods.
- Weight-to-stiffness/strength optimization (linear, crash, DoE,...).
- Performing sensitivity and robustness analyses and studies based on complex vehicle model in terms of safety performance and structural behaviour.

The laboratory is ISO/IEC 17 025:2005 accredited and can perform tests against following standards:

- UN ECE R14, R17, R21, R29, R55, R58, R66, R67, R73, R93, R100 (structural integrity), R107, R110, R111, R129.
- Other standards e.g. FMVSS, FIA, xNCAP, ISO (3449, 3471,...), EN (1317,1789,12642, 12767,...), VDI 2700.

## Your business benefits

- **Save time and money** – our approach of virtual testing increases the safety of your products, while avoiding costly and time-consuming redesign.
- **Increase efficiency and profitability** – through highly efficient and repeatable tests that enable you to develop high quality products. In short time you can understand the sensitivity of your product to various input parameters.
- **Enhance product marketability** – through our unique tailor-made services which are driven by partner satisfaction.
- **Work with a competent partner** – our one-stop solution combines virtual simulation with physical testing (DYCOT), supported by global experts who can provide additional support in structure development.



## Why choose TÜV SÜD?

TÜV SÜD has more than a century-long experience in vehicle safety, testing and certification. Our extensive knowledge and international recognition enables us to work as a partner with our global customers, including top OEMs and automotive suppliers. Our state-of-the-art testing facilities, combined with our global network of technical experts, can provide your company with a single source solution for achieving compliance with all applicable regulatory requirements, standards and voluntary industry schemes. As an innovative solutions provider, we are directly involved in the development of safety regulations, standards and efficient automotive testing solutions to drive the future of mobility. Besides, our test approach for the simulation of dynamic events can also be extended to support other industries, including aviation, military and rail.

## Add value. Inspire trust.

TÜV SÜD is a premium quality, safety and sustainability solutions provider that specialises in testing, inspection, auditing, certification, training and knowledge services. Represented in over 1000 locations worldwide, we hold accreditations in Europe, the Americas, the Middle East, Asia and Africa. By delivering objective solutions to our customers, we add tangible value to businesses, consumers and the environment.

## Related services

TÜV SÜD provides the following related passive safety testing services:

- DYCOT – DYnamic COmponent Testing (latest technology sled test facility)
- Static and quasi-static strength tests
- Airbag testing
- Climatic testing (e.g. extreme temperature, humidity, solar simulation)