TRAFFIC ACCIDENT RESEARCH IN GERMANY

AND

THE GERMAN IN-DEPTH ACCIDENT STUDY (GIDAS)

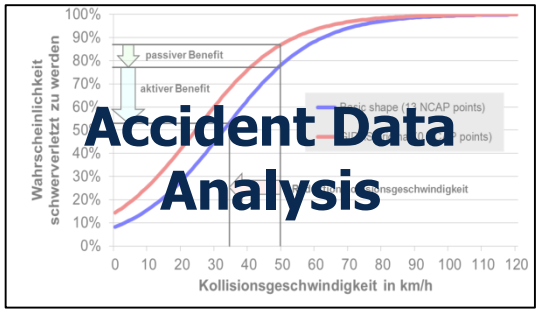
Agenda

Traffic accident research (in Germany)

The German In-Depth Accident Study (GIDAS)

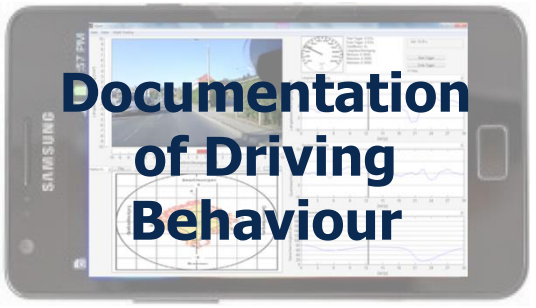
Achievements and future challenges

Summary



VUFO GmbH

TRAFFIC ACCIDENT RESEARCH INSTITUTE AT TU DRESDEN



Necessity of accident research

Road traffic accidents …

- are causing **fatalities** and injured persons
  - ≈ **3,200** in Germany[1] (+ 380,000 injured[1])
  - ≈ **148,000** in India[2] (+ 470,000 injured[2])
  - ≈ **1,250,000** worldwide[3] (+ 50,000,000 injured[3])
- are the **leading cause of death** for young people (aged 15 – 29 yrs)
- result in **injuries**, **disabilities**, **grief**, reduced **quality of life**
- lead to significant **socio-economic costs**
  (Germany: 34,3 bn. € → ≈ 1.2% of GDP[3] / India: ≈3.0% of GDP[3])

[1] DESTATIS, figures for 2017 [2] Road accidents in India 2017 [3] WHO report 2015, figures for 2013

Necessity of accident research

Goal: **Safe** (clean, sustainable) **transport** for all kind of road users.

Stakeholders: (selection)

- Authorities (Regulation, Legislation)
- Automotive industry (OEMs and suppliers)
- Infrastructure planners
- Road users / Society (education, behavior)
- Rescue forces and trauma surgery / medicine
- Police (enforcement)

Road/Vehicle safety is a **very interdisciplinary** issue.

Traffic accident research is required to address all the technical, medical, psychological, infrastructural, and legislative aspects.

Definition of traffic accident research

Accident research …

- aims to analyze the causes, procedures, and consequences of accidents
- is done retrospectively on the basis of historic data
- provides evidence for future regulations, approaches, and measures

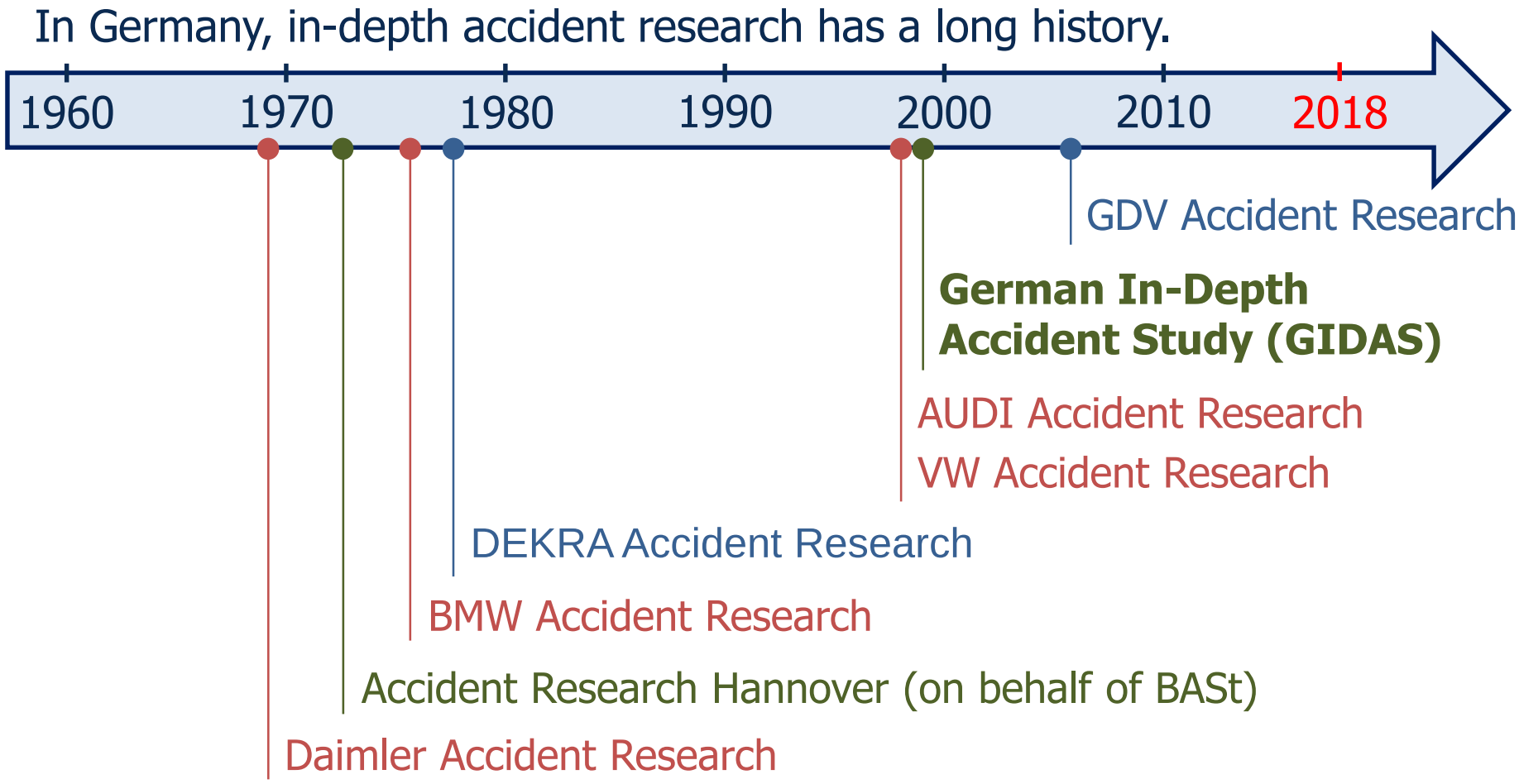
Types of traffic accident research (on public roads):

- National statistics / Police investigation (usually required by law)
- In-depth investigations
- Accident experts (usually single case investigations for legal issues)

National statistics provide macro-data (e.g. number of accidents, fatalities, persons & vehicles) **but** substantial information is missing.

In-depth accident investigations are essential for the effective reduction of road accidents, fatalities and socio-economic costs!

Traffic accident research in Germany



Traffic accident research in Germany

In Germany, in-depth accident research has a **very** long history.

Dresden (1920's)

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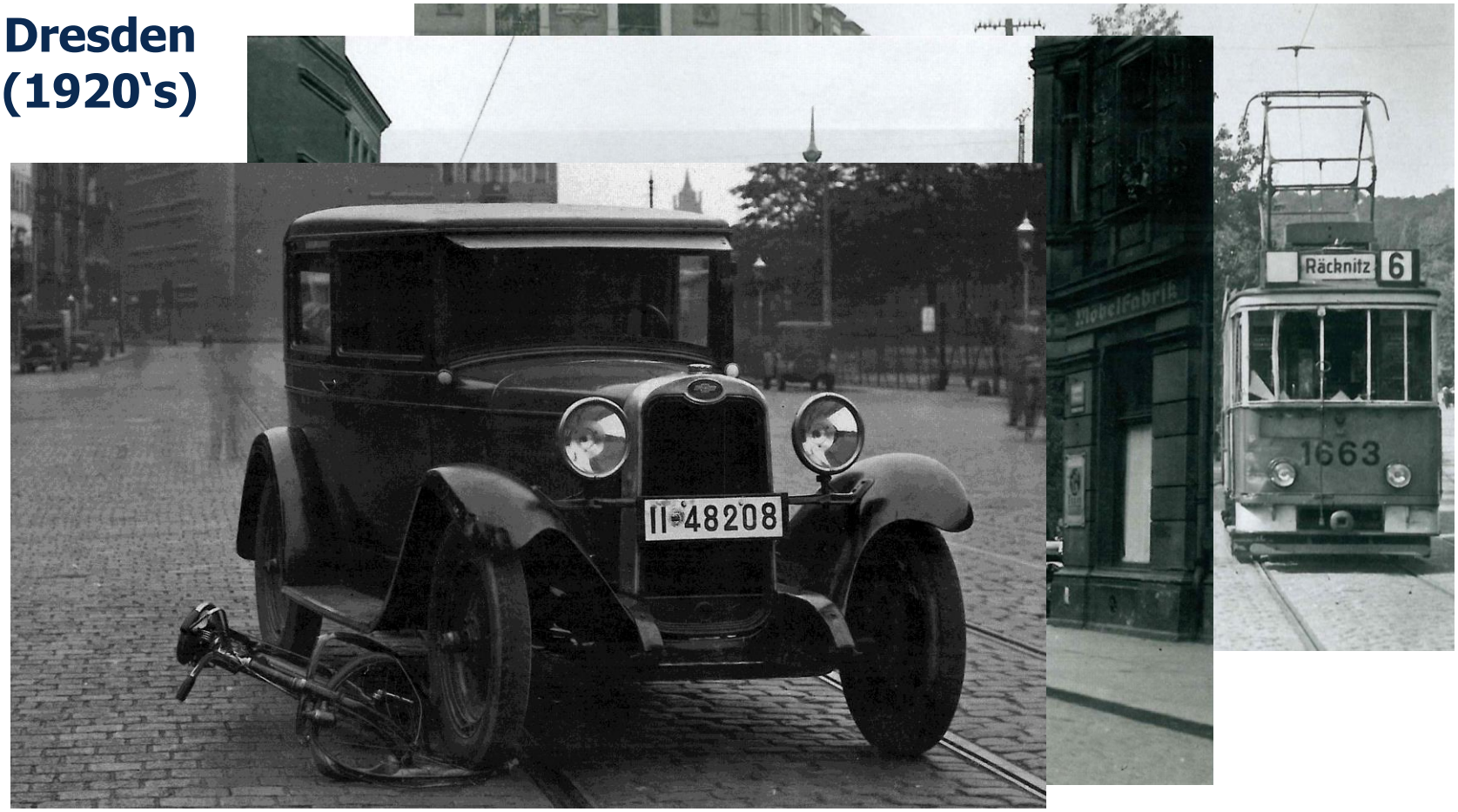

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German In-Depth Accident Study (GIDAS)

Road safety should not be a competition!
Accident research is predestinated for **pre-competitive research.**

FAT
Association for Research on Automobile Technique

VUFO GmbH
Traffic Accident Research Institute at TU Dresden

Current FAT partners:

10 OEMs
8 Tier1 suppliers
1 veh. inspection company

bast
Federal Highway Research Institute

MHH
Medical University of Hannover

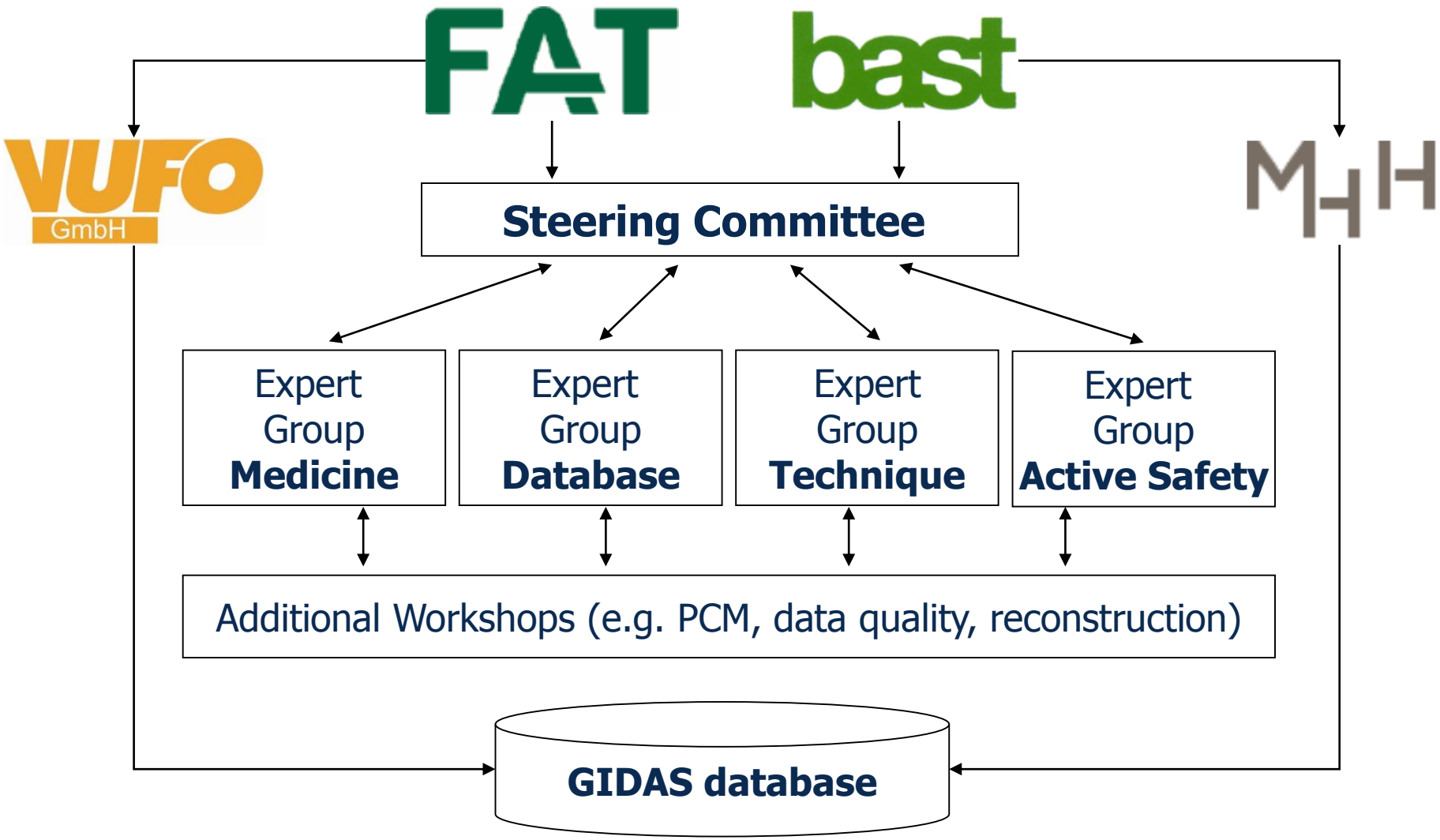
GIDAS GERMAN IN-DEPTH ACCIDENT STUDY

≈ 2.000 accidents w/ personal damage/year since July 1999

Current and previous partners – OEMs (Selection)

Current and previous partners – Suppliers (Selection)

GIDAS – Organisation and committees



GIDAS – Aim of the project

Aim of the project: **Collect comprehensive real-world accident data**

Data requirements:

Representative	→ allow statements for the national accident scenario
Highly detailed	→ answer (nearly) all questions related to traffic safety
Up-to-date	→ address new safety systems and trends
Interdisciplinary	→ cover all aspects of road safety
Highly qualitative	→ enable researchers to do valuable analyses
Precise	→ base all studies on reconstructed data
Anonymous	→ comply with all Data Protection Regulations

GIDAS – Investigation process

- Information / Alarming by police or fire fighter operators
- Team immediately drives to the accident scene (arrival after ca. 15min)
- Medical investigation on the spot and later in the hospital
- Detailed documentation of 3,500 parameters per accident on average
- Creation of a digital accident file incl. 150-170 pictures, police report
- Complete anonymous data processing (e.g. names, faces, VIN)

GIDAS – Statistical sampling scheme

The selection of accidents is done on the basis of a strict sampling plan.
All following **SELECTION CRITERIA** have to be fulfilled:

☑ at least one injured person

☑ within the shift time (two 6-hour-shifts per day)

☑ within the investigation area

☑ the most current accident

⇩

Every accident has the same chance to be investigated.

Thereby it is possible to **extrapolate** to the entire German accident situation and to enable **representative statements!**

GIDAS – Investigation areas

Source: www.openstreetmaps.de

The investigation is done within **two defined investigations areas.**

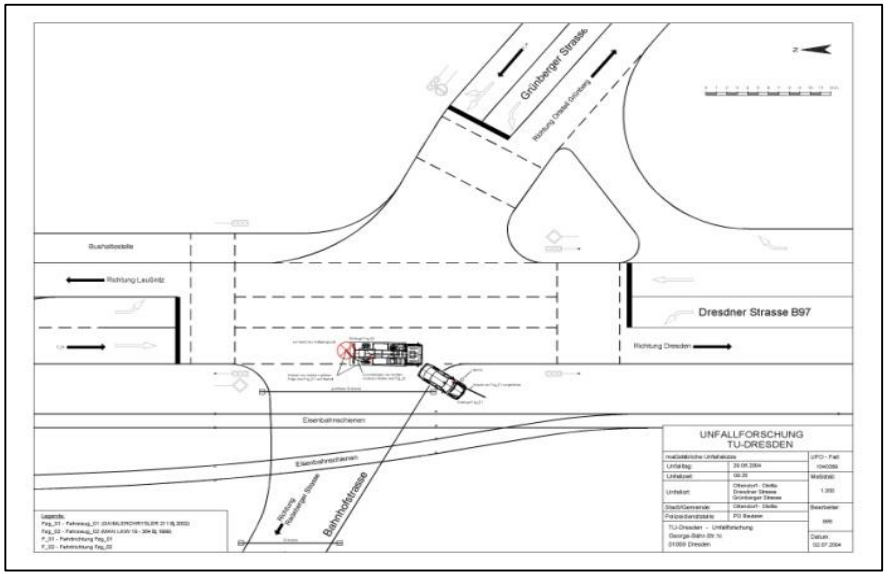
Each consist of a **large city** and approx. 45 km **surroundings** (ca. 3.500 m²).

Investigations areas should be **as representative as possible** for the entire country in terms of infrastructure, population, vehicle fleet, traffic volume, weather and geography.

GIDAS – General information

General information

- Kind, type and place of accident
- Involved participants
- Weather, environment
- Accident description, police report



Accident sketch

- Driving trajectories
- Collision and final positions
- Braking and skidding marks
- Road markings, road edge
- Objects
- View obstructions

GIDAS – Technical Investigation

Vehicle Parameters

- Deformation depths, damages
- Collision marks
- Intrusion to the interior
- Tire data
- Loading, condition of doors

- Vehicle data (registration papers)
- Measures and masses
- Existence and activation of active and passive safety systems

GIDAS – Technical Investigation

Road and infrastructure

- Type of road
- Geometry (width, curve radius, …)
- Traffic regulation
- Road surface and condition
- Road / Lane markings

- Inclination
- Road temperature
- Visibility conditions
- Traffic lights and signs

…

GIDAS – Medical Investigation

Personal Data

- Age, gender
- Height, weight
- Pre-existing illness
- Type of driving license(s)
- Driving experience
- Stress, Distraction

…

IMPORTANT:

Personal data is only documented if the person signs a **consent form!**

GIDAS – Medical Investigation

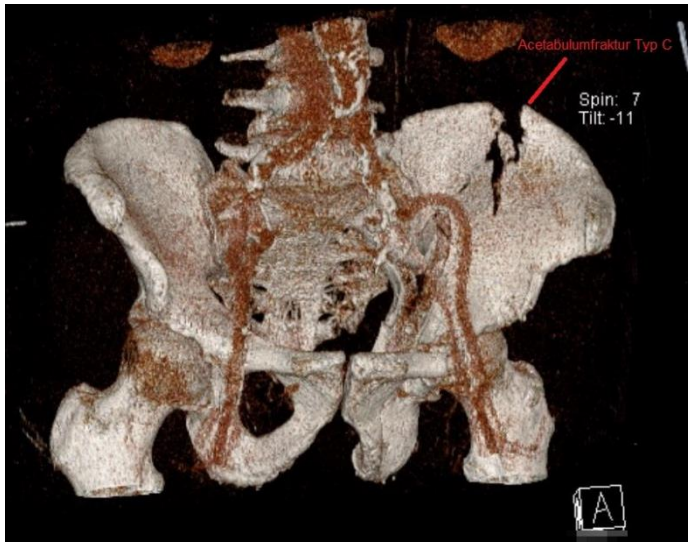
Psychological Interview

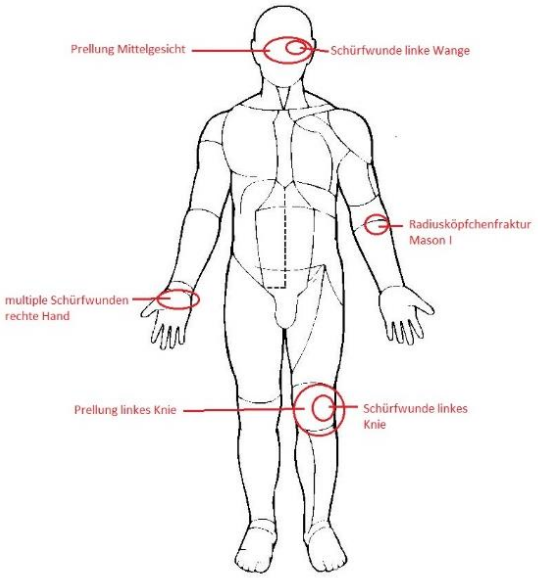
- How did the crash occur?
- How did the participant perceive the situation/accident?

GIDAS – Medical Investigation

Injury Data

- Medical reports (rescue forces, doctors)
- X-ray pictures, CT/MRT scans



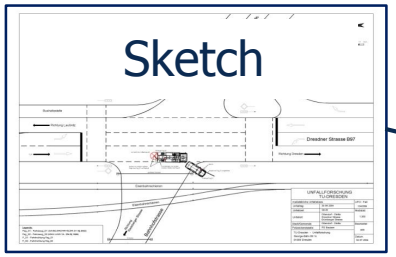


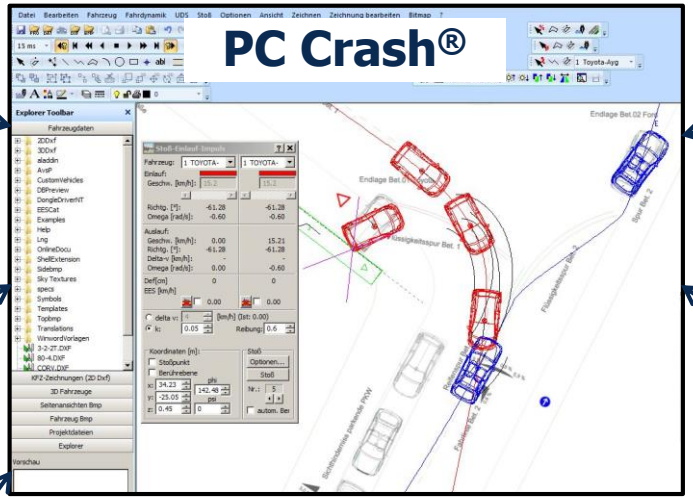
Coding of **every single injury** according to the **AIS** (Abbreviated Injury Scale)

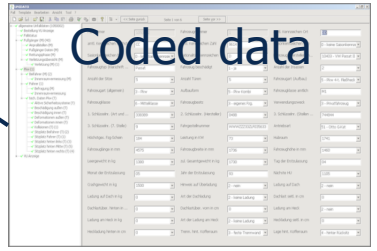
[1990 Revision 1998, 2005 Update 2008, 2015]

GIDAS – Accident Reconstruction

Every GIDAS accident is reconstructed by reconstruction engineers.



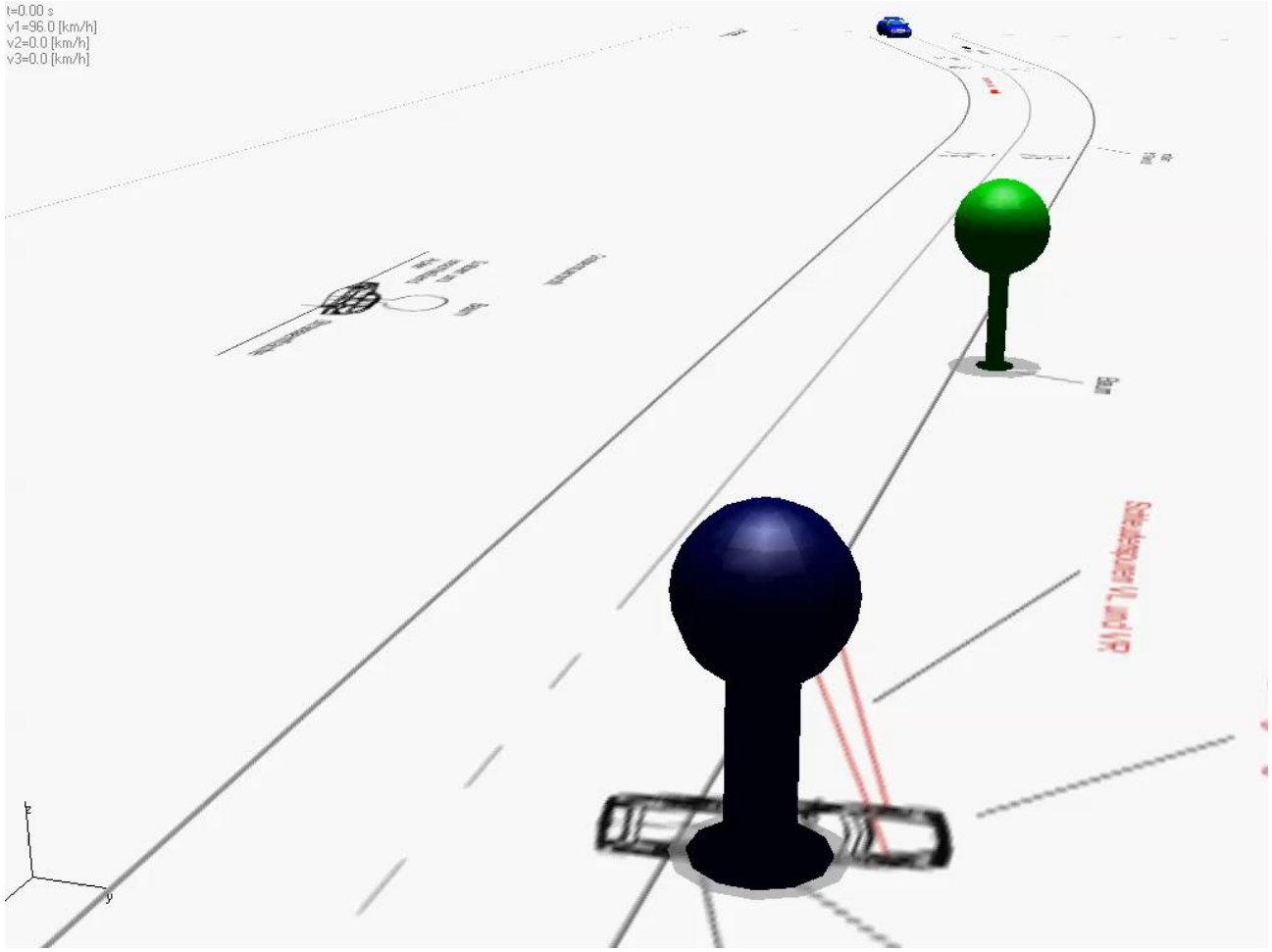




- complete reconstruction from the critical situation to the final position of all participants
- since 2017 all reconstructions start at (at least) 5 seconds prior to the crash (PCM creation)

GIDAS – Accident Reconstruction

Example case (ESC relevant accident)



GIDAS – Database

- Consists of **43 records, 2.450 parameters, 21.600 codes**
- Average number of single information: **3,500 per case**
- Export into **several formats** possible (MS Access, SIR, SPSS, SAS, …)
- Database is constantly evolving (in 1999: < 2.000 parameters, mainly focused on **passive safety** & injury mechanisms)
- Since 2005: yearly ca. 100-200 changes to address current aspects of **active safety** and topics like ADAS, accident avoidance and mitigation, accident initiation, causing factors etc.

GIDAS as pre-competitive project

- When OEMs / suppliers meet, they may face some problems (e.g. compliance requirements, secrecy issues etc.).
- However, in the GIDAS project there is **no competition** but **joint forces** towards safer vehicles and safer transportation on our roads.
- **How to achieve this:**
  - no comparisons between different OEMs or suppliers in analyses
  - manufacturer-independent coding (e.g. "driver front airbag = yes/no")
  - transparent discussions and protocols, common workshops
  - focus on general data and conclusions
  - common studies (e.g. done by VUFO as independent research institute)

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GIDAS – Case numbers and content (June 2018)

≈ 33.500 completely documented & reconstructed accidents

> 60.000 vehicles

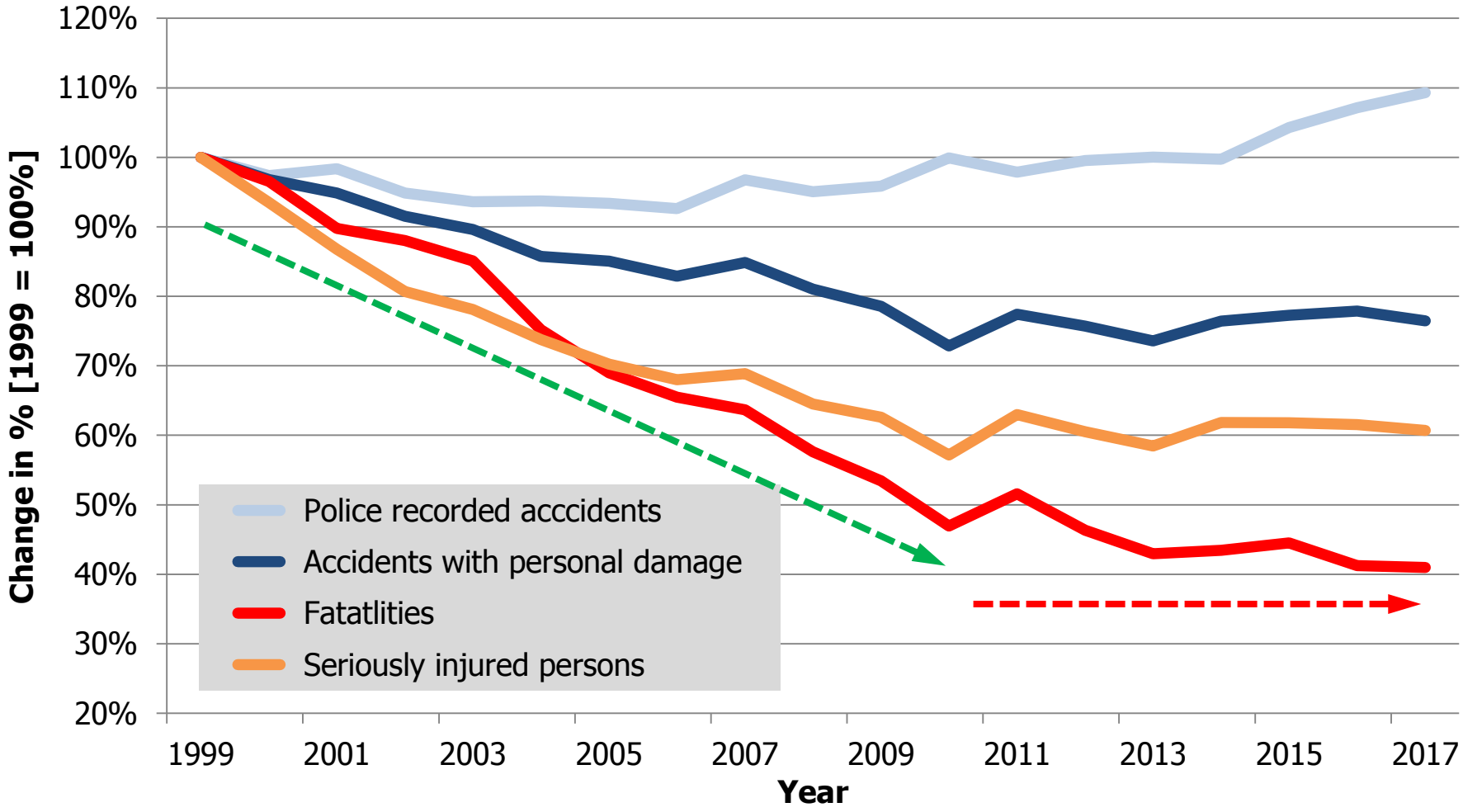
> 83.000 persons

> 44.000 injured persons

≈ 38.000 passenger cars	**≈ 52.000 vehicle-vehicle collisions**	**≈ 57.000 car occupants**	**≈ 120.000 single injuries**
≈ 4.000 trucks	**≈ 16.000 vehicle-object collisions**	≈ 5.000 truck/ bus occupants	≈ 32.000 slightly injured persons
≈ 1.300 busses & trams	≈ 135.000 recon-struction events	≈ 4.500 pedestrians	≈ 11.000 seriously injured persons
≈ 16.000 two-wheelers		≈ 16.500 cyclists	≈ 800 fatally injured persons

Future challenges

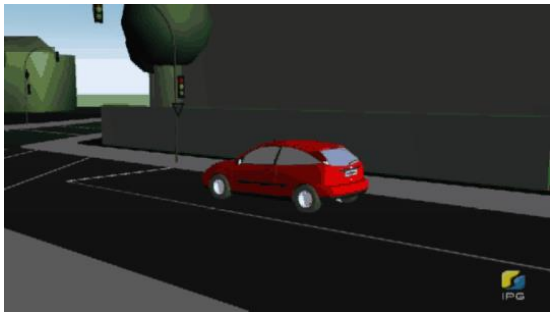
Accidents and casualties in Germany (1999-2017)



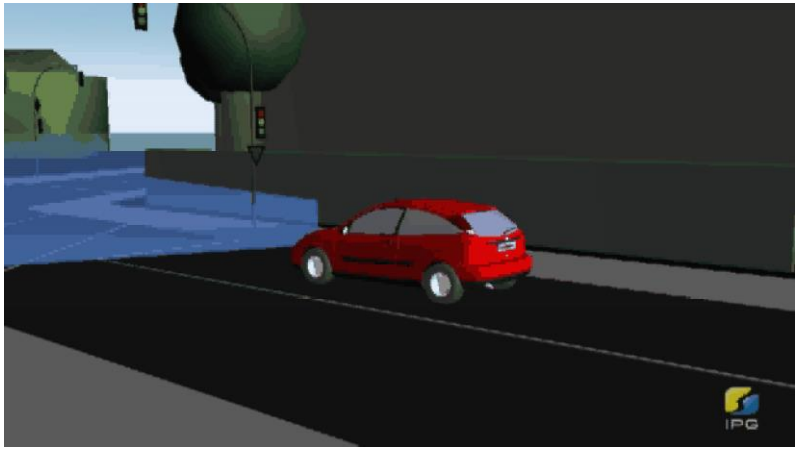
Future challenges in accident research

Which accidents are „easy" to avoid?

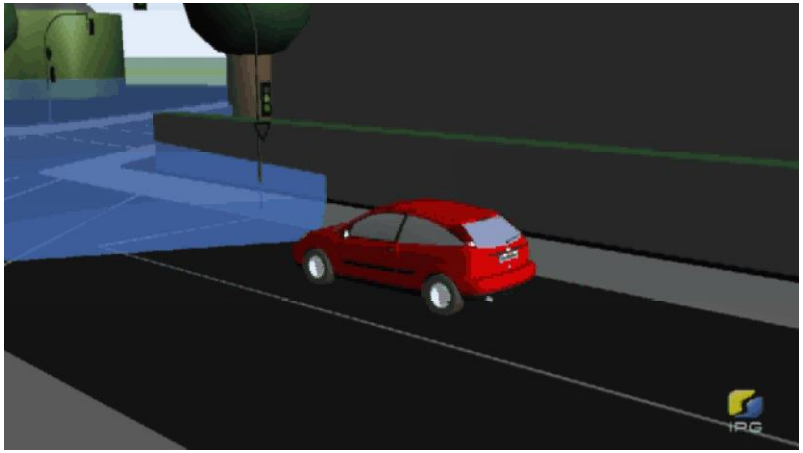
Original case



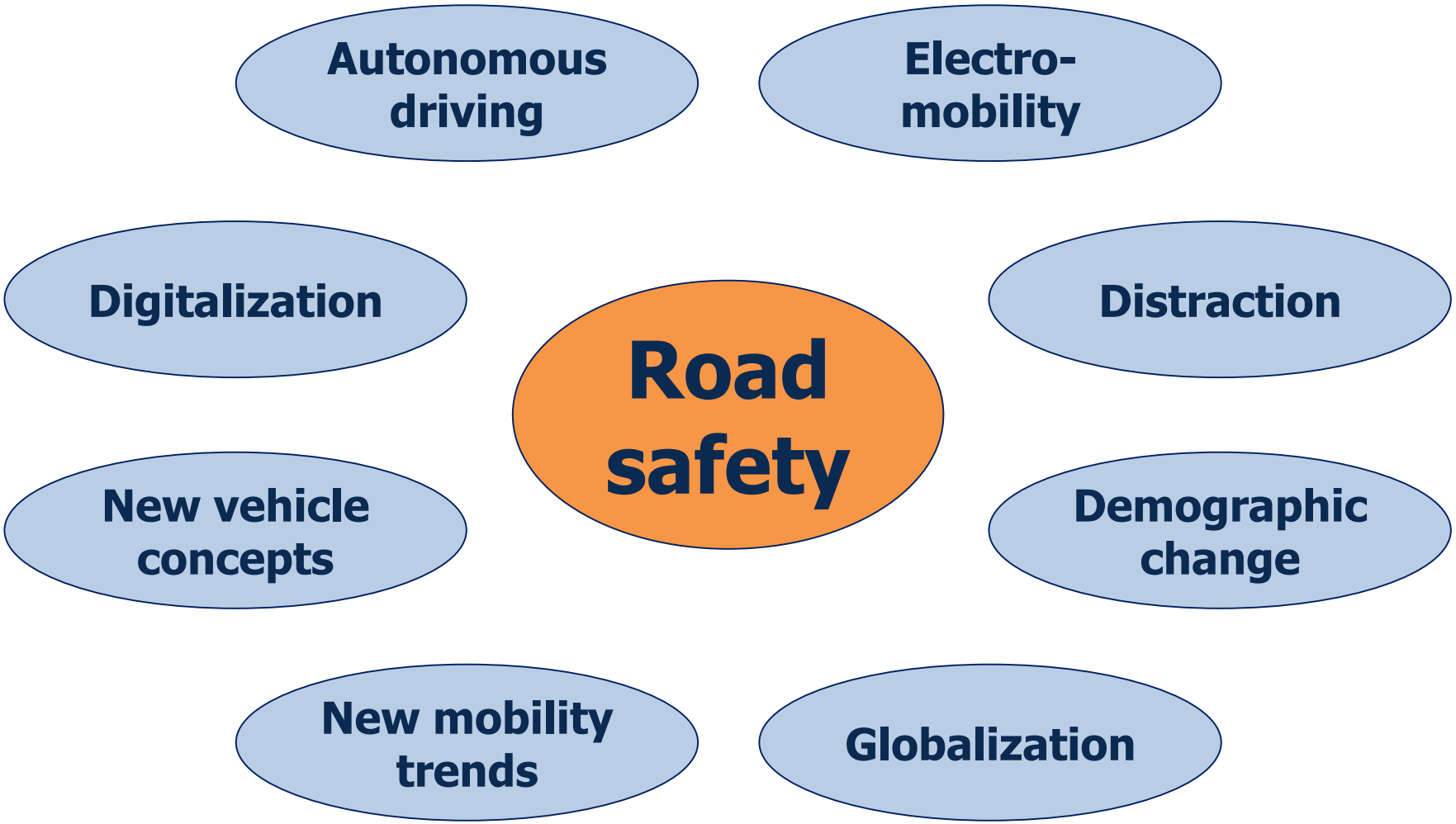
Future system A



Future system B



New challenges and aspects



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In-depth data: **Essential** for stakeholders in the field of **traffic safety**!

It enables …

… **OEMs** and **suppliers** to invent, develop, evaluate, and observe (active and passive) safety systems and autonomous driving functions.

… **Lawmakers** to create (effective) laws on the basis of real-world data.

… the **Police / Authorities** to do targeted prevention / enforcement.

… **Doctors** to understand biomechanics and enhance rescue medicine.

… **Infrastructure planners** to reveal deficits in the infrastructure.

… **Research institutes** to do scientific work in the field of traffic safety.

… **Road safety councils** to start qualified prevention campaigns.

To reduce time and costs, and to speed up the development of safe roads and vehicles, **pre-competitive research is essential.**

Summary

The GIDAS project:

… is running successfully since more than 19 years.

… bases on a cooperation between automobile industry and authorities.

… served as role model for accident investigation projects worldwide.

… has become one of the most important in-depth accident databases worldwide.

As long as road traffic accidents occur, **in-depth investigation** will play a **crucial role** to understand **how** accidents happen, **why** people are injured/killed and **which measures** should be taken to avoid accidents and injuries.

THANK YOU FOR YOUR ATTENTION

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