



View on Future Challenges of Automotive Safety

Automotive Safety Council, Florida

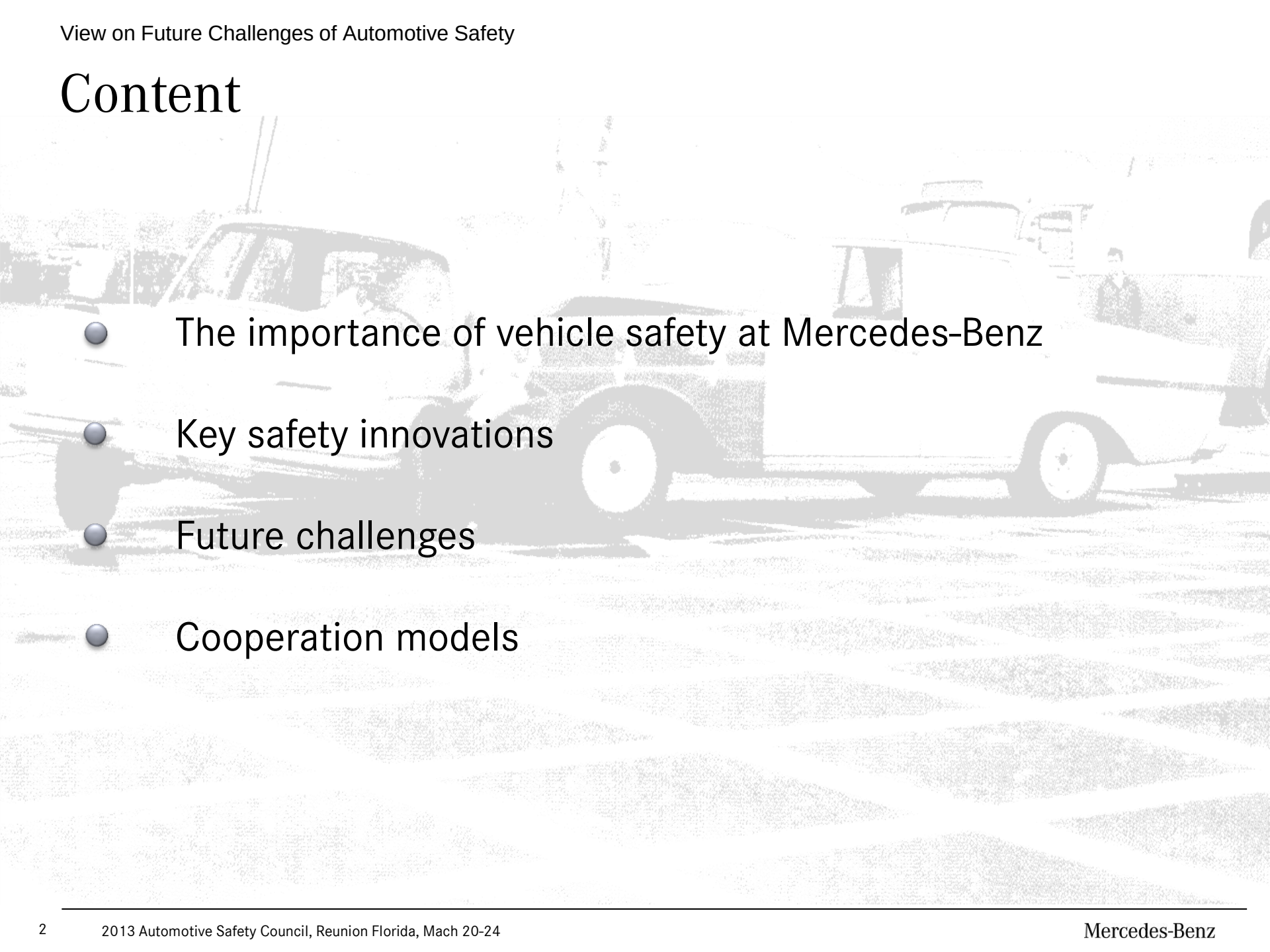
March 20-24, 2013

Prof. Dr. Rodolfo Schöneburg
Director Safety /Durability
Mercedes-Benz Cars
Daimler AG



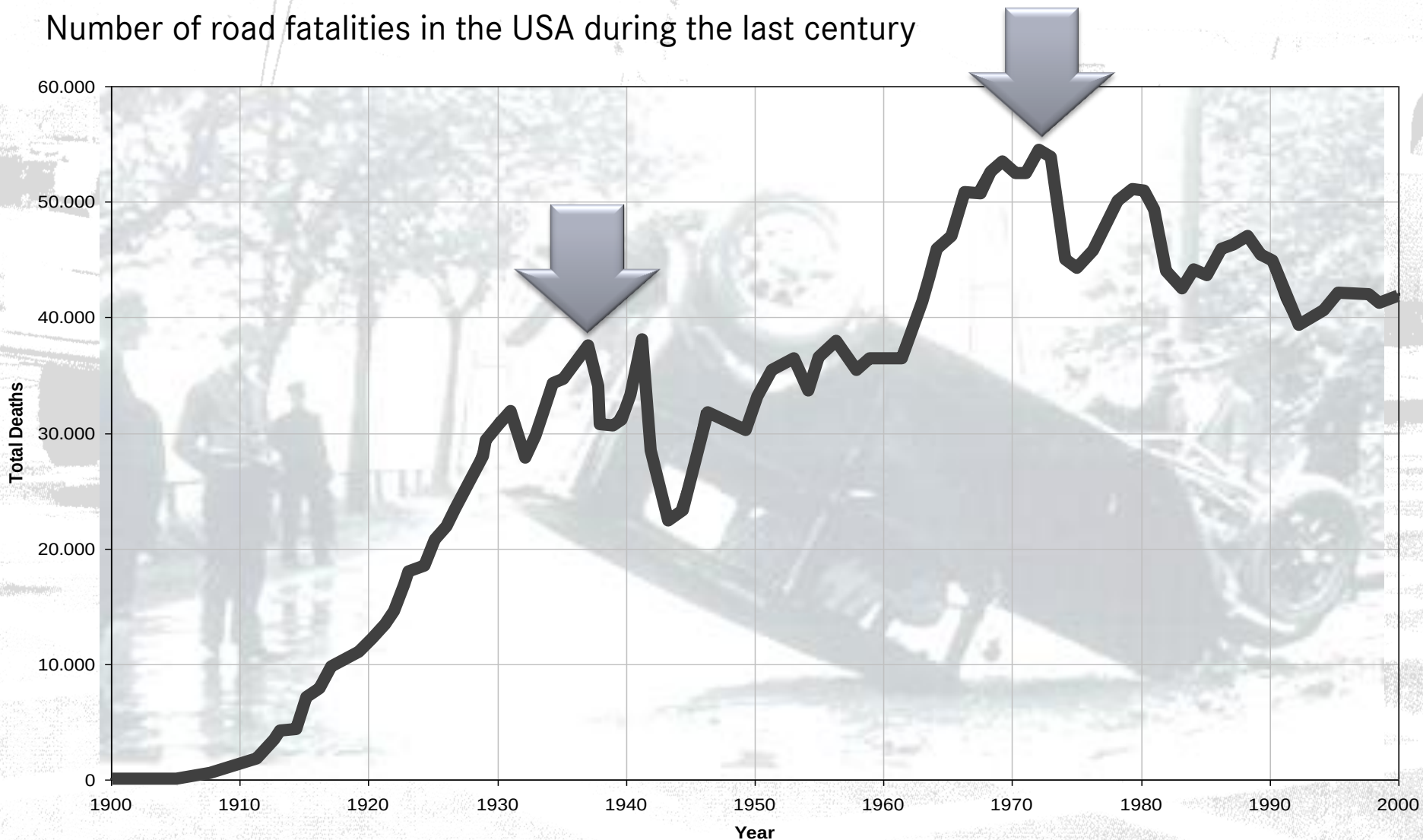
Mercedes-Benz

Content

- 
- The importance of vehicle safety at Mercedes-Benz
 - Key safety innovations
 - Future challenges
 - Cooperation models

Accident Statistics

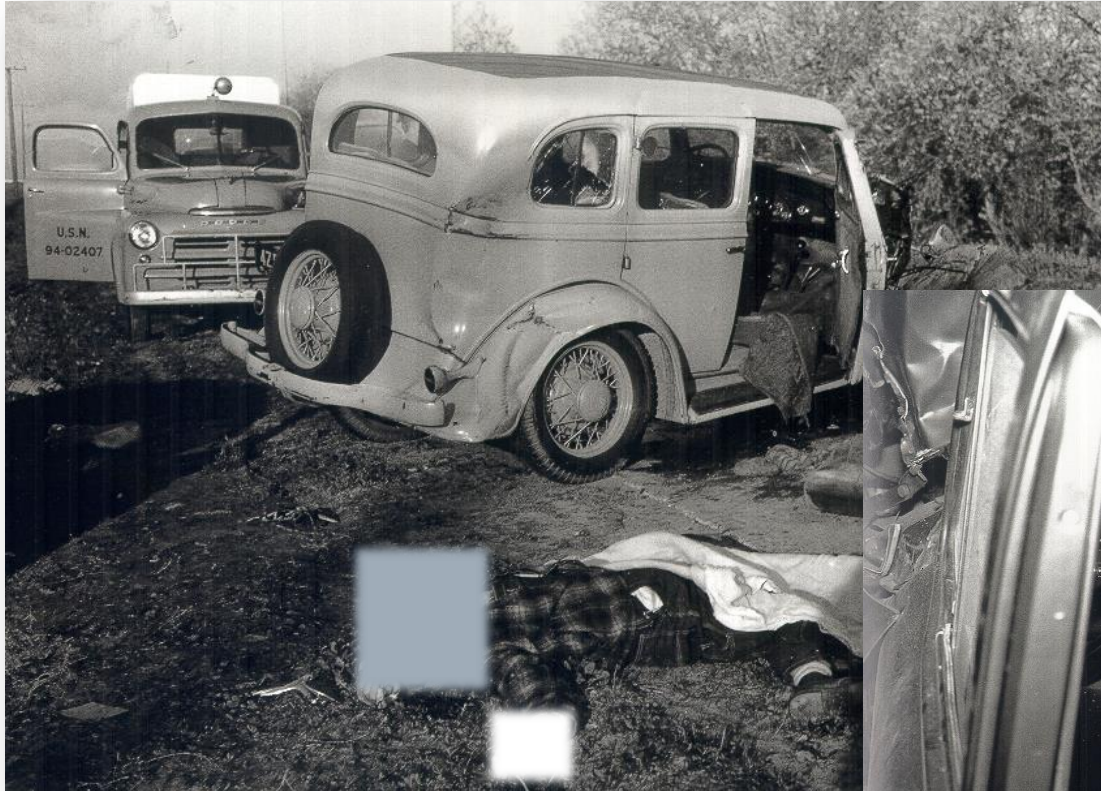
Number of road fatalities in the USA during the last century



Source: <http://www.nhtsa.dot.gov>

Key Safety Issues

Frequent causes of fatalities in the fifties



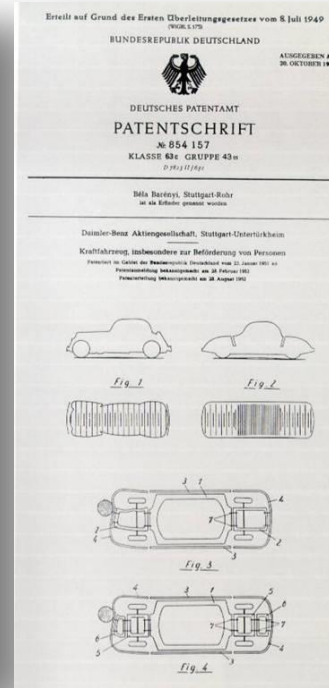
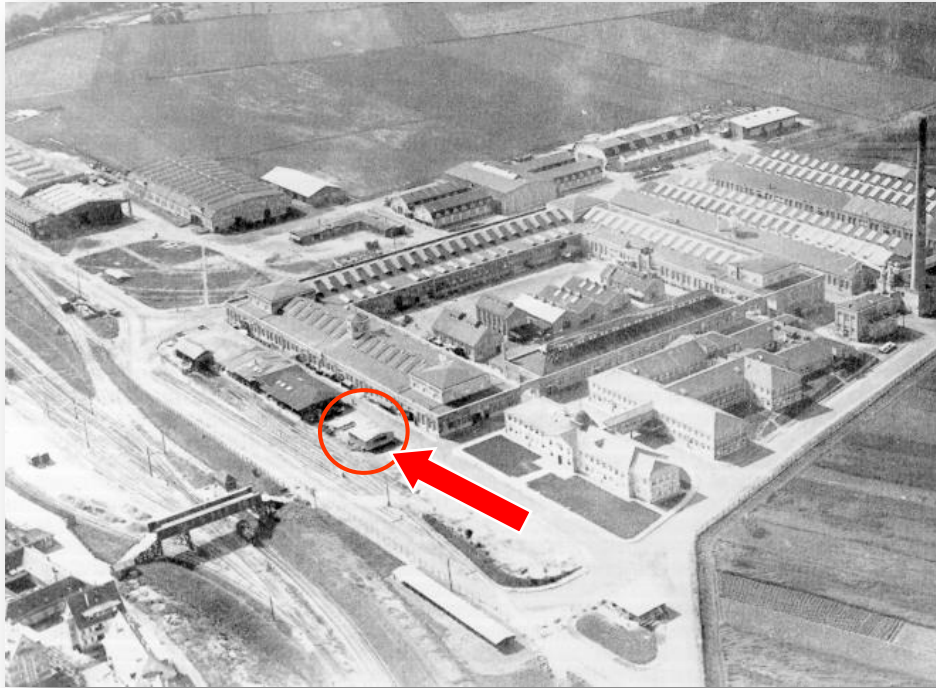
Ejection out of the vehicle



No crumple zone
No restraint system
Lance-shaped steering column
Hard occupant contact zones
Single layer glass

Safety Pioneers at Mercedes-Benz

The beginning of safety research at Mercedes-Benz



1939 Béla Barényi, the inventor of passive safety, was hired by Daimler-Benz.

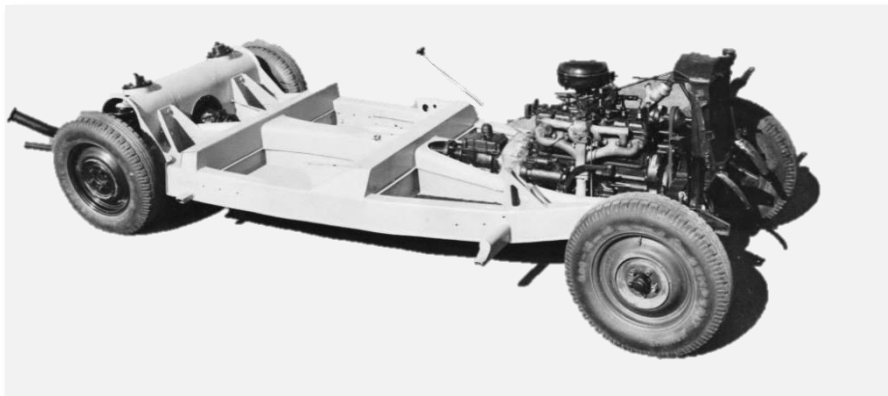
1951 Invention of the crumple zone principle.

Safety Pioneers at Mercedes-Benz

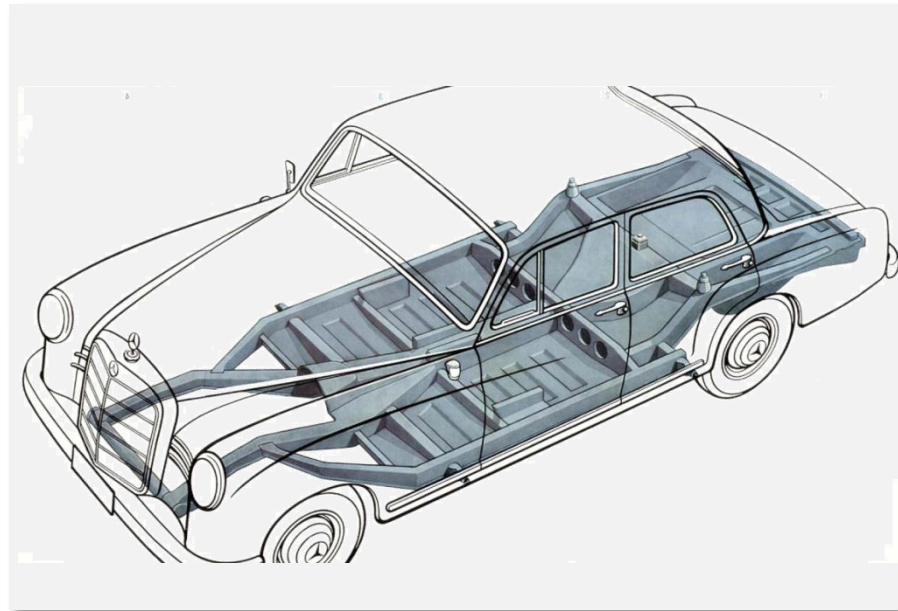
The beginning of safety research at Mercedes-Benz



The strong market presence of Daimler-Benz in the USA led to the development focus “vehicle safety” at a very early stage



Béla-Barényi Study “Safety body”



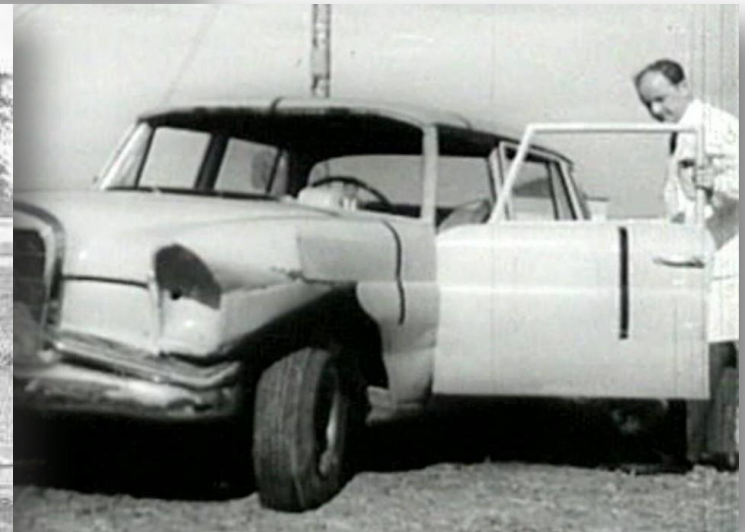
September 1953: W120 “Ponton” self-supporting body with crash-resistant frame/floor unit

Safety Pioneers at Mercedes-Benz

The beginning of safety research at Mercedes-Benz



1959 First crash tests
conducted by
Prof. Dr. Willi Reidelbach
and Prof. Dr. Ernst Fiala



Safety Pioneers at Mercedes-Benz

1959: World premiere of the crumple zone and the soft interior
in the Mercedes-Benz “tail fin” model

August 1959:

First-time implementation into the
W110/111/112 “tail fin” series
production cars started a new era
in vehicle safety



Mercedes-Benz Safety Innovations



Angewendet 1909



Angewendet 1909



Angewendet 1910



Angewendet 1925



Angewendet 1921

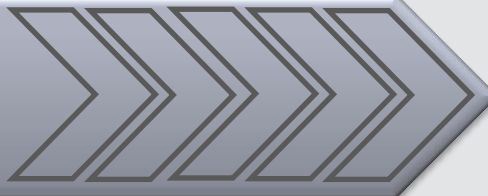
- 1959 Crumple Zone
- 1978 ABS
- 1980 Airbag, Belt Tensioner
- 1989 Automatic Rollover Bar
- 1995 ESP®, Sidebag
- 1996 Brake Assist
- 1997 Sandwich Concept
- 1998 Windowbag, Adaptive Front Airbag
- 2002 PRE-SAFE®
- 2003 Active Light Function
- 2005 Adaptive Brake Lights, Brake Assist PLUS, NECK-PRO Head Restraint
- 2006 PRE-SAFE® Brake, Intelligent Light System
- 2007 Blind Spot Assist
- 2008 Reversible Active Bonnet
- 2009 Attention Assist, Self-Adaptive Belt Force Limiter
- 2013 PRE-SAFE® Impulse, Beltbag, Aktive Buckle Lifter

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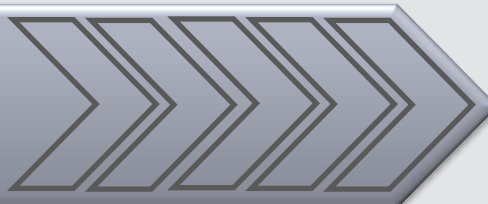
Key Vehicle Safety Technologies

**Crumple Zone,
Stiff Passenger Cell,
Soft Interior**



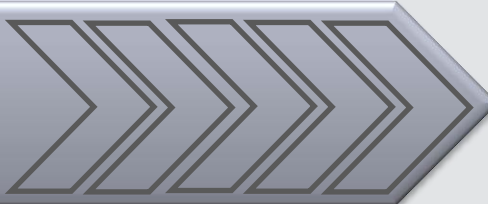
Mercedes-Benz

Seatbelt

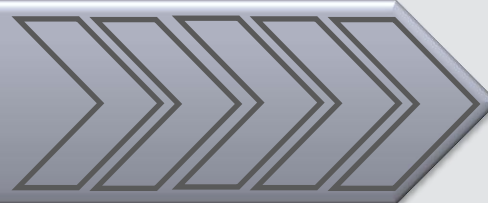


VOLVO

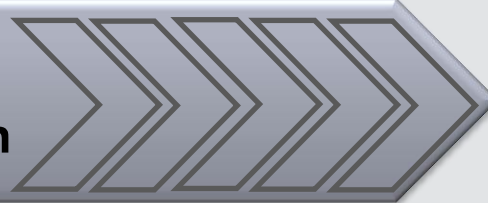
Airbag



**ABS/ ESP® - first Driver
Assistance Systems**



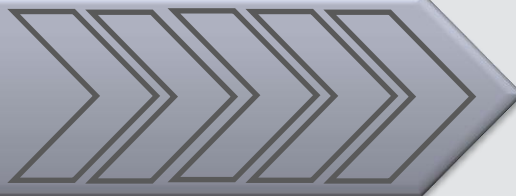
**PRE-SAFE®
Integral Safety Approach**



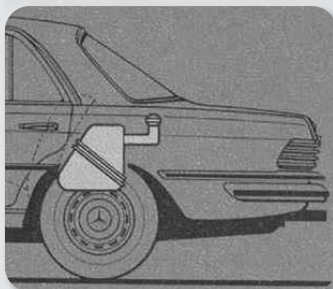
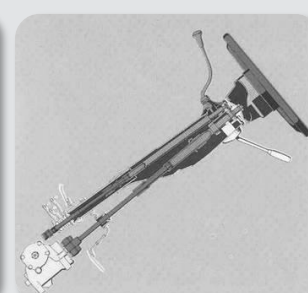
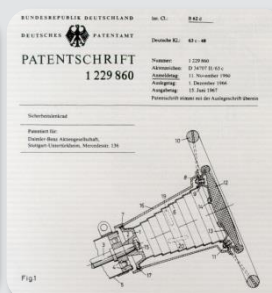
Mercedes-Benz

Key Vehicle Safety Technologies

Crumple Zone,
Stiff Passenger Cell,
Soft Interior



Béla Barényi invented the
crumple zone principle in 1951

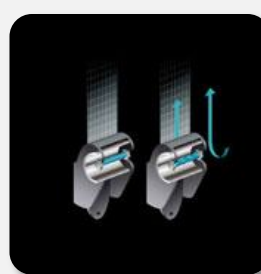
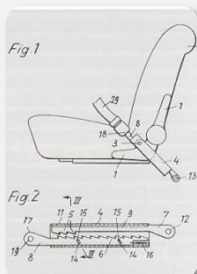
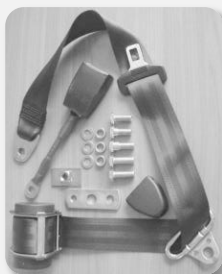


Key Vehicle Safety Technologies

Three-point Safety Belt



Niels Bohlin invented the automatic three-point safety belt in 1959



Key Vehicle Safety Technologies

Airbag Development



Mercedes-Benz first to introduce driver airbag in 1980

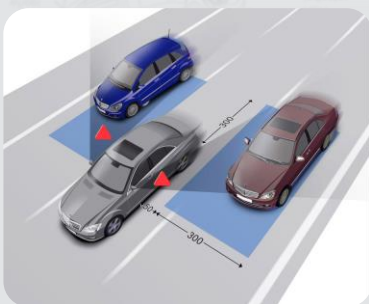
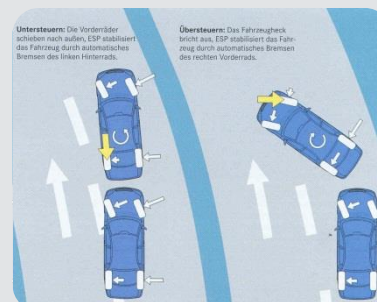
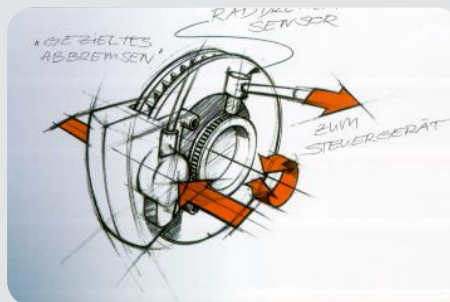
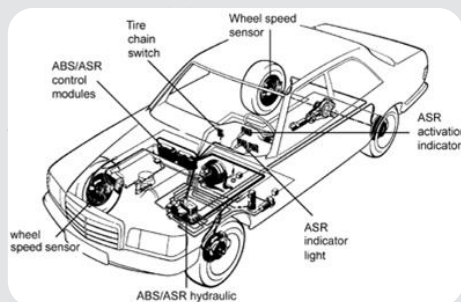


Key Vehicle Safety Technologies

Driver Assistance Systems ABS/ ESP®

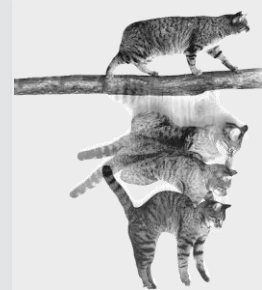
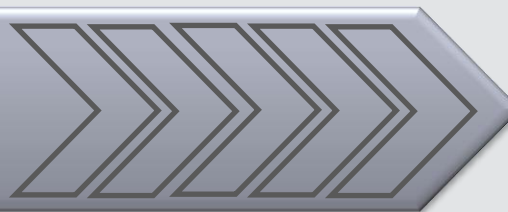


Mercedes-Benz and Bosch implemented ABS into the S-Class in 1978.

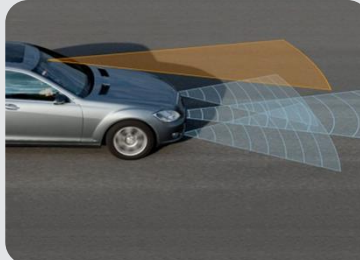
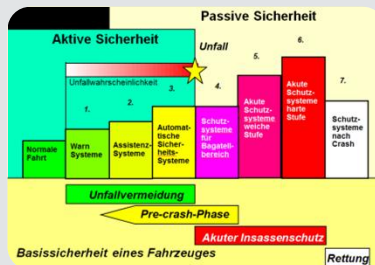


Key Vehicle Safety Technologies

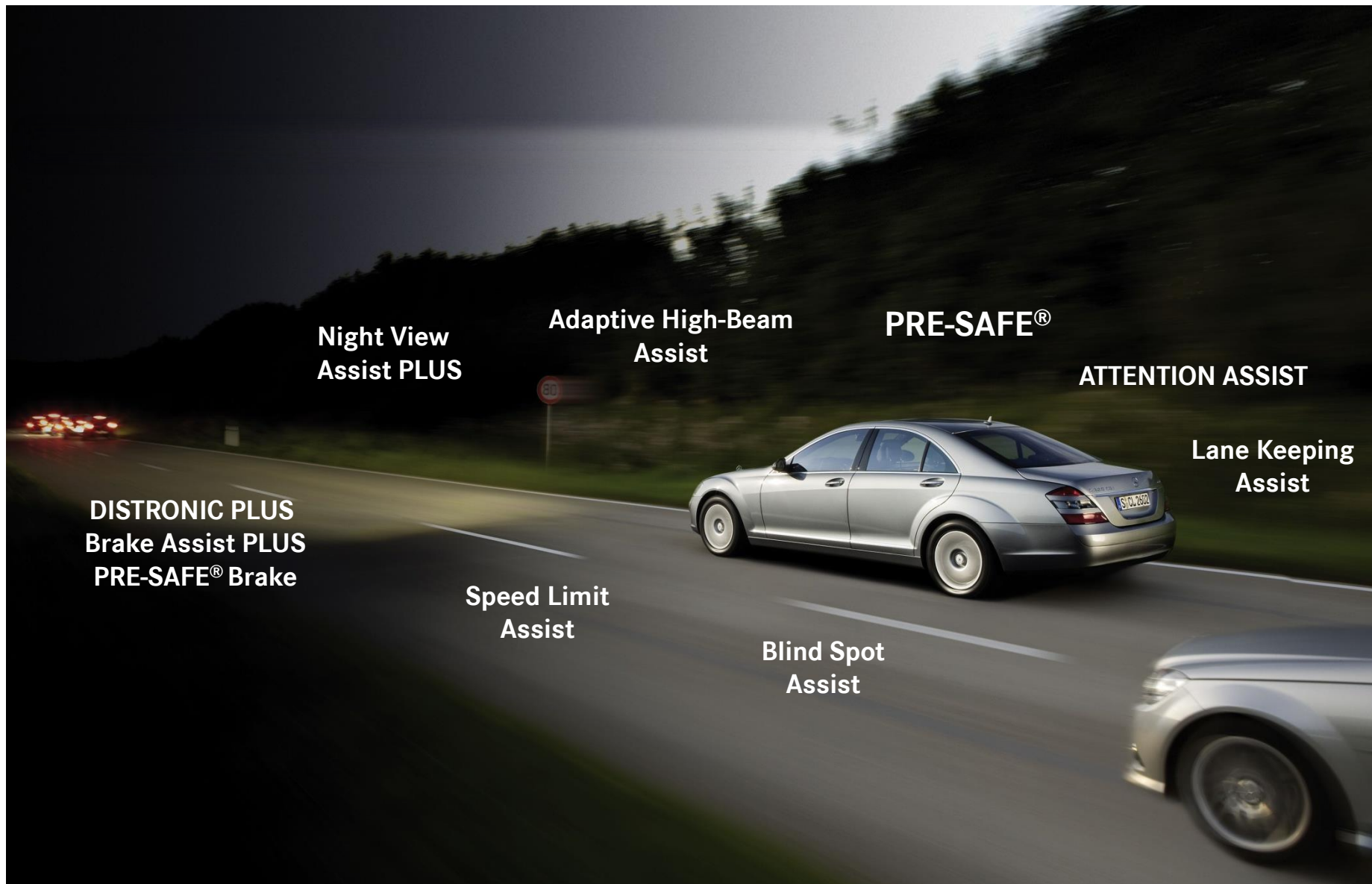
Integral Safety PRE-SAFE®



Mercedes-Benz communicated the Integral Safety Approach in 1999 and added reflexes to the vehicles with PRE-SAFE® in 2002.

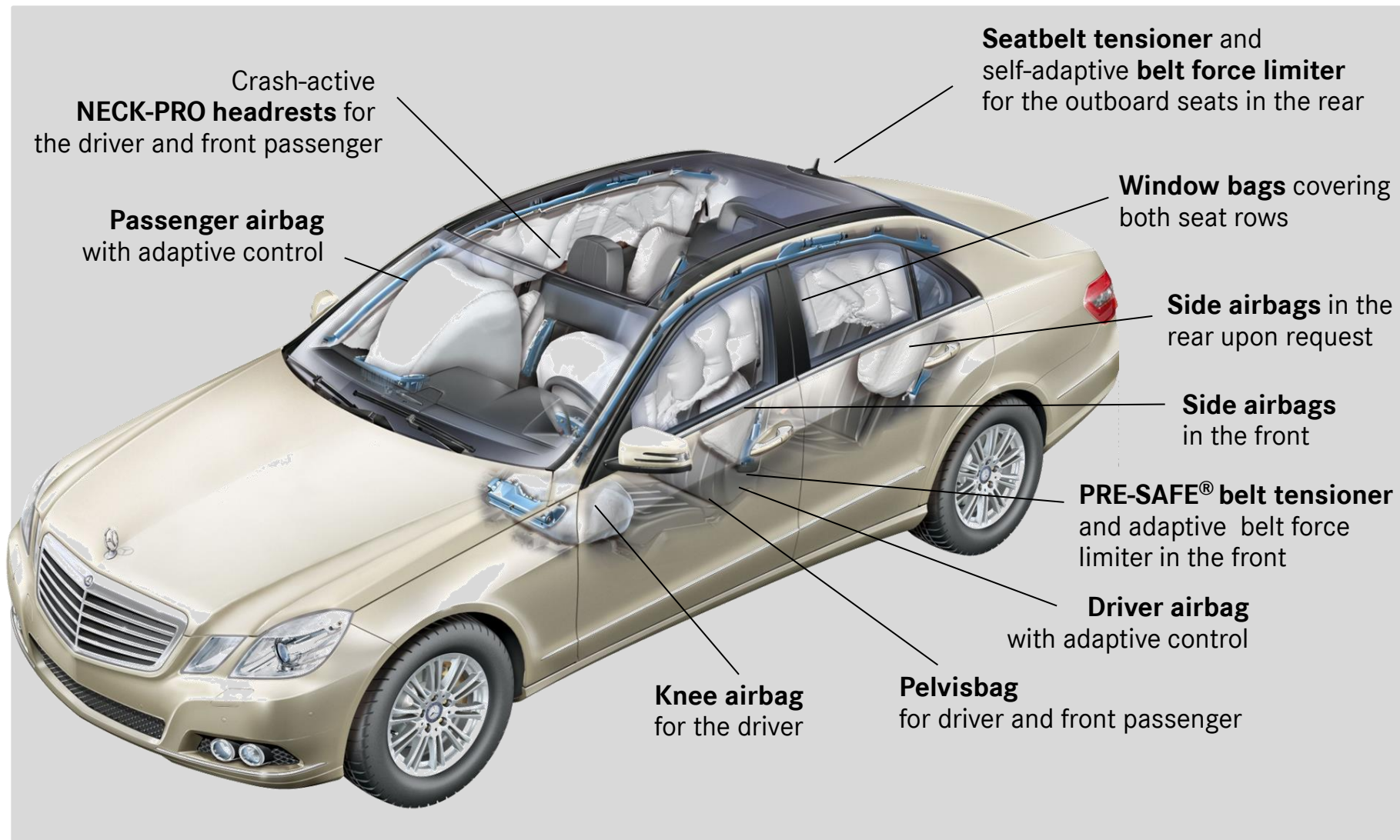


Preventing Accidents with Driver Assistance Systems



Leading-edge Restraint Systems

Leading-edge restraint systems for occupant safety



Mercedes-Benz Integral Safety Strategy



Safe driving:

Avoiding hazards,
timely warning
and assisting



Dangerous situations:

Preventive action with
PRE-SAFE®



During an accident:

Appropriate protection



After an accident:

Avoid worsening and
enable rapid assistance

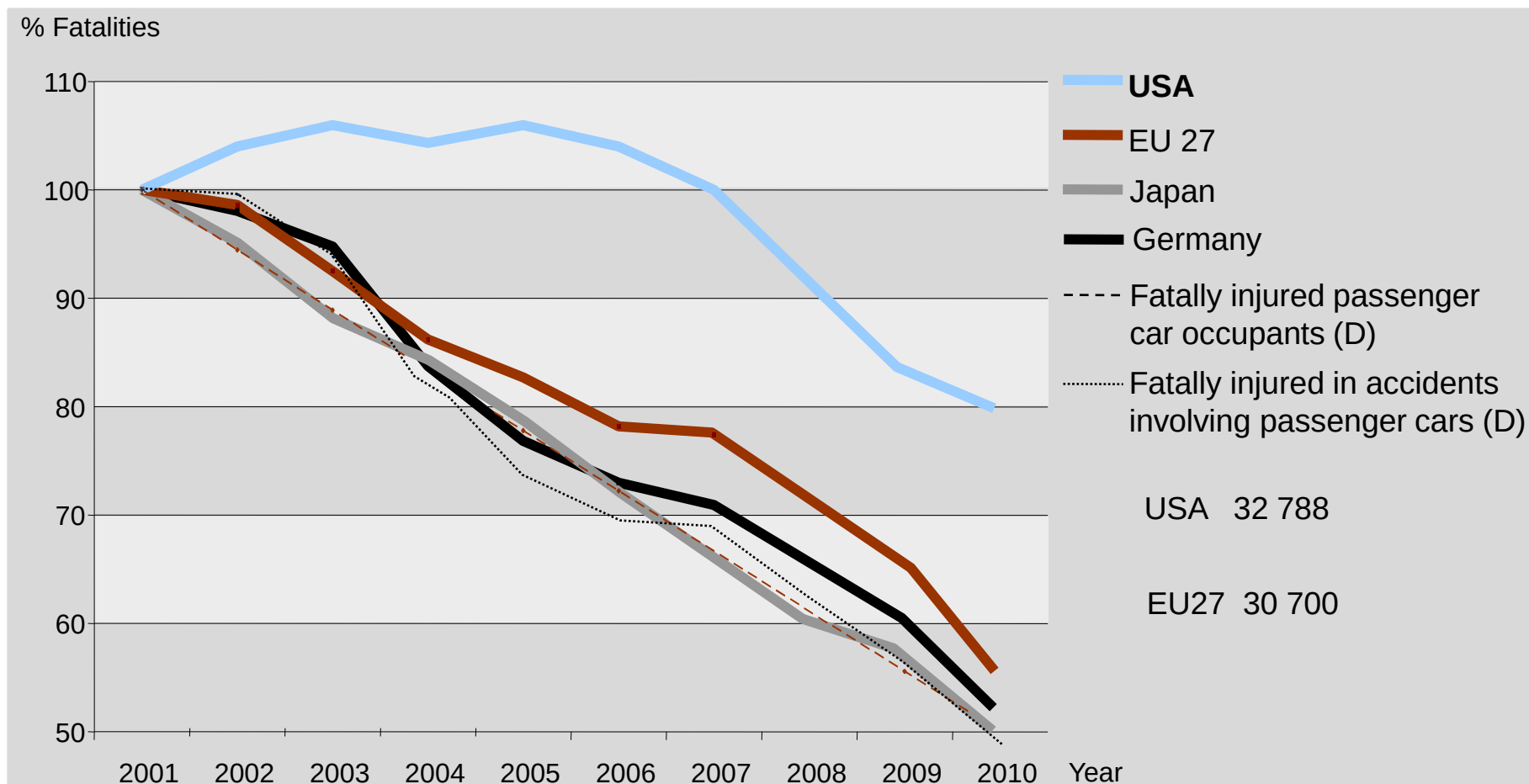
Active Safety

Passive Safety

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- Cooperation models

Statistics on Road Fatalities Today

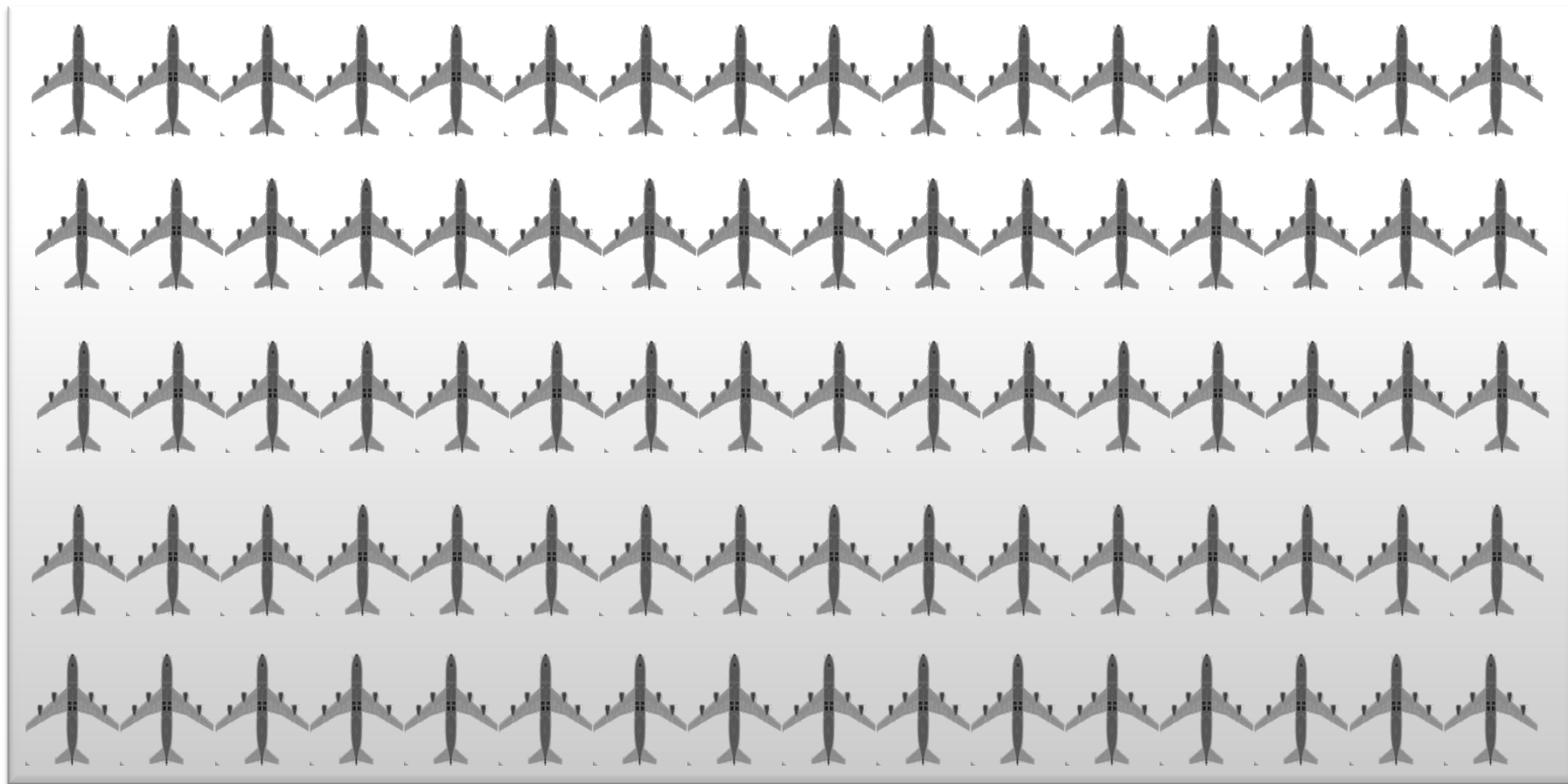


Source: Care Database; EU-27, 2010: Forecast 15.5.11; US Department of Transportation, Press release, March 2011 (Year 2010: Early Estimation)

Success in the U.S., Europe, Japan and Germany

Road Fatalities in the U.S.

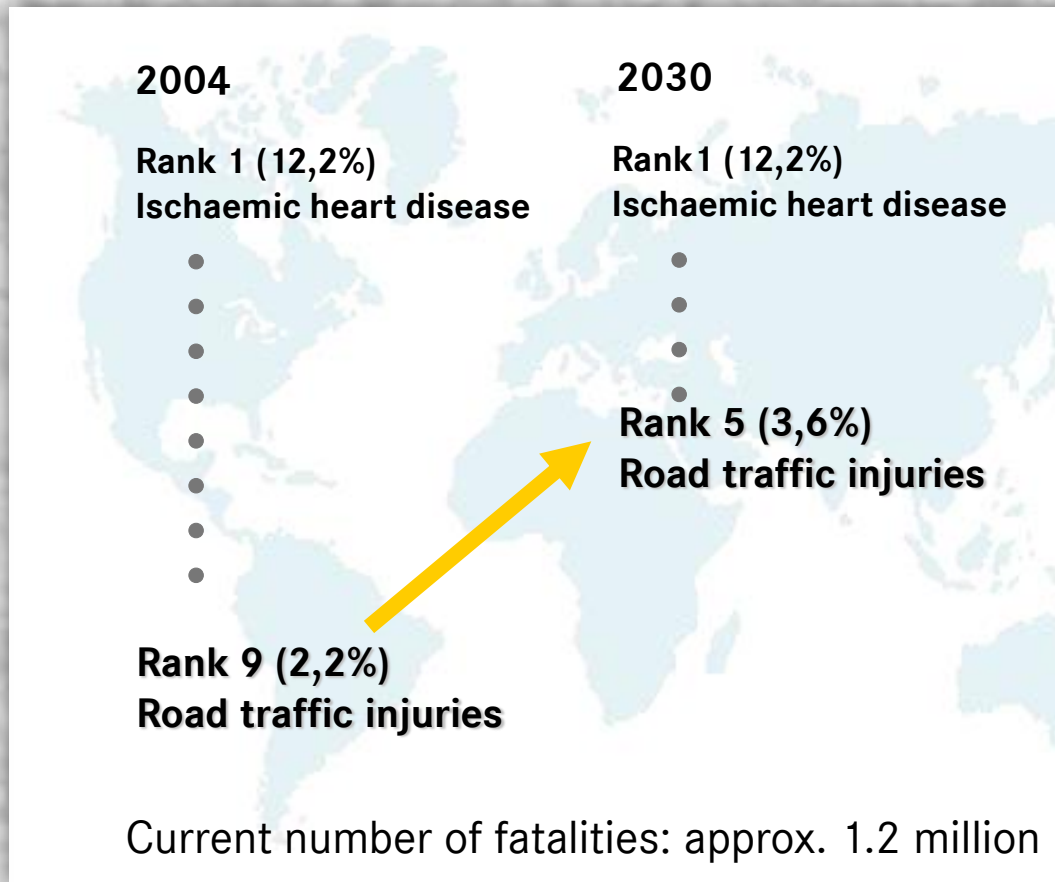
33.000 road fatalities in the U.S.



Would you ever board an aircraft again, if 80 jumbo jets crashed
in the U.S. every year?

Road Fatalities Worldwide

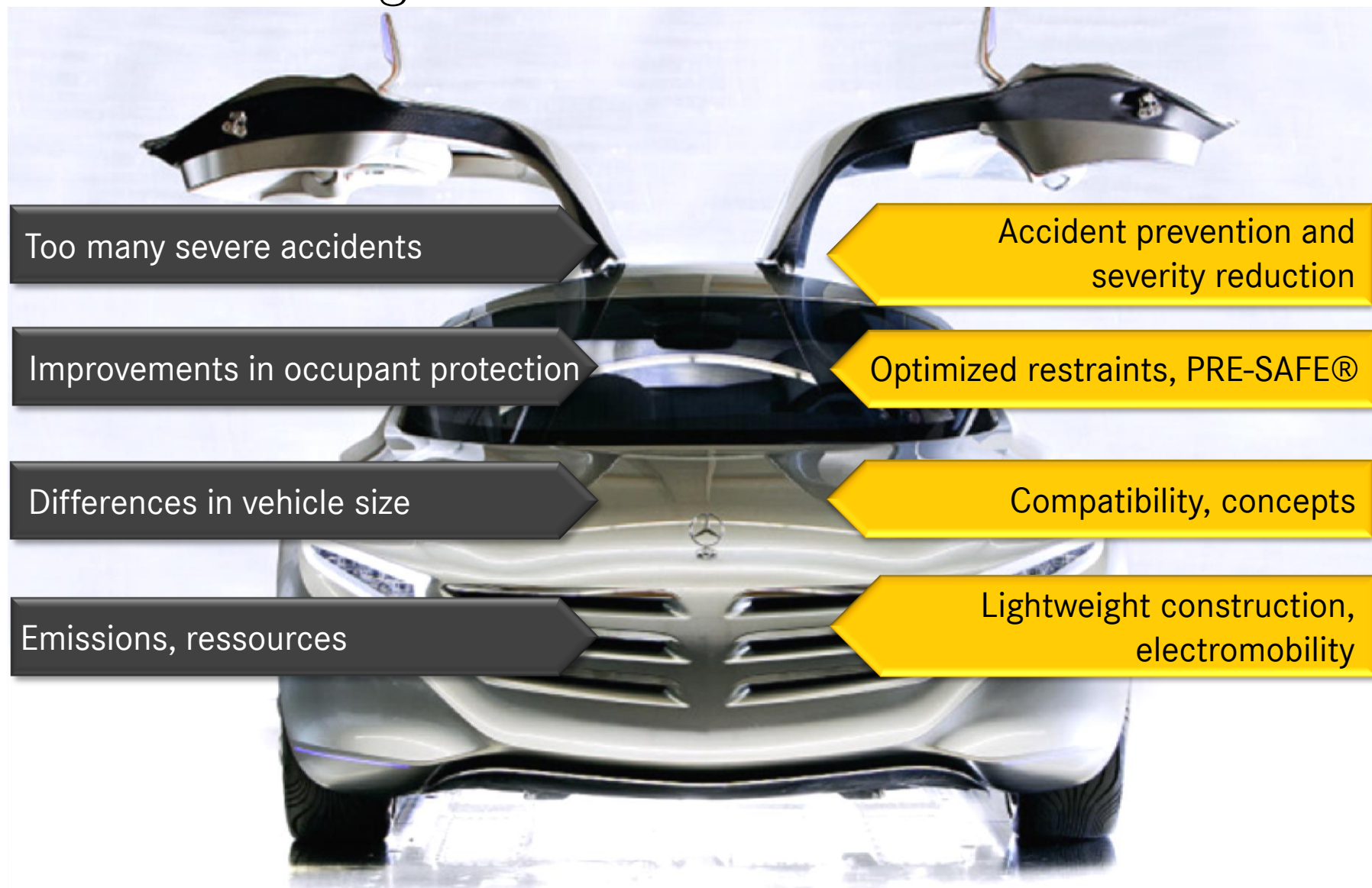
Worldwide leading fatality causes



Accidents will occur – also in the future



Future Challenges

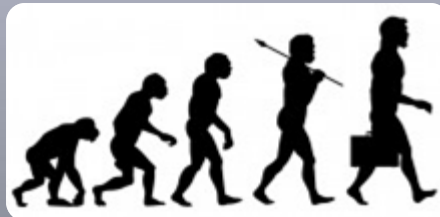


Future Challenges



Mercedes-Benz
SAFETY

Evolutionary innovations



Continuous
development

Revolutionary innovations



Completely new and
innovative approaches

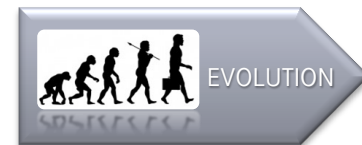
Future Challenges



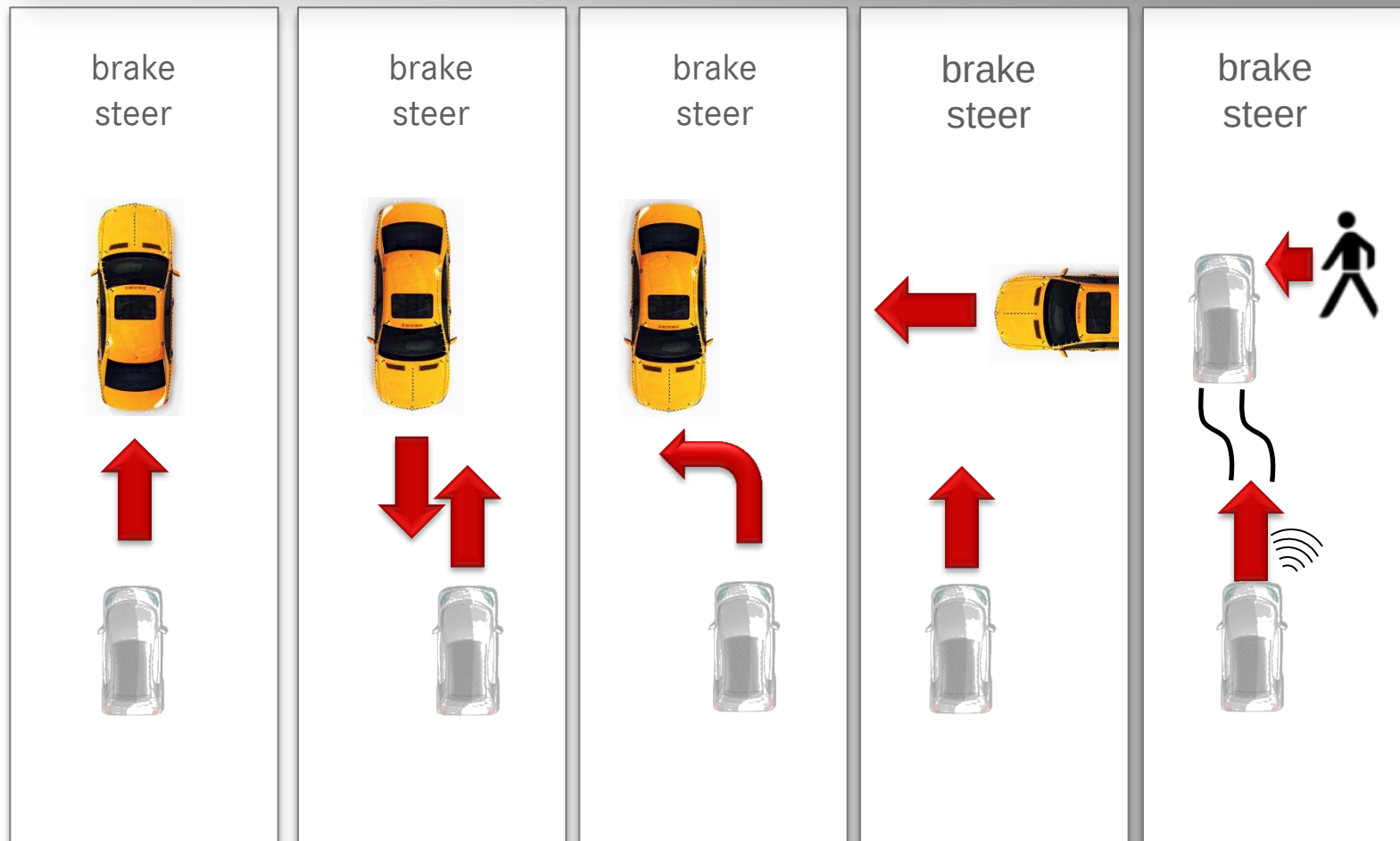
Too many severe accidents

Accident prevention and
severity reduction

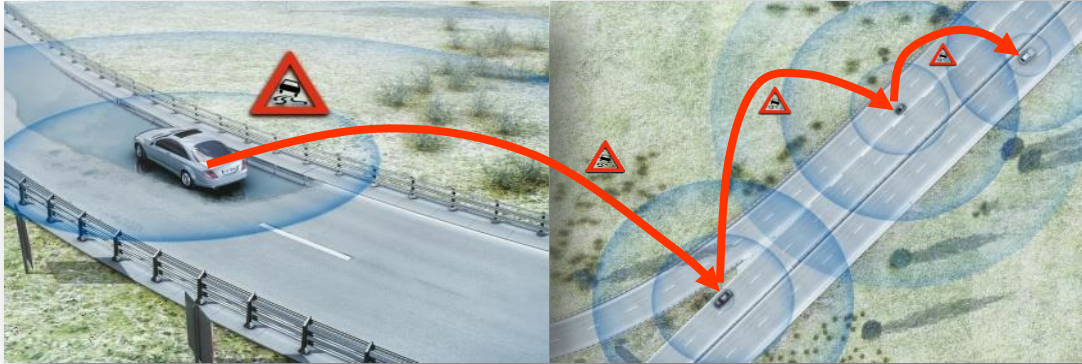
Accident Prevention and Severity Reduction



Autonomously Engaging Systems



Accident Prevention and Severity Reduction



feel



see



communicate



- Vehicles form „ad hoc“ networks to exchange information when located in the range of another vehicle.

Accident Prevention and Severity Reduction



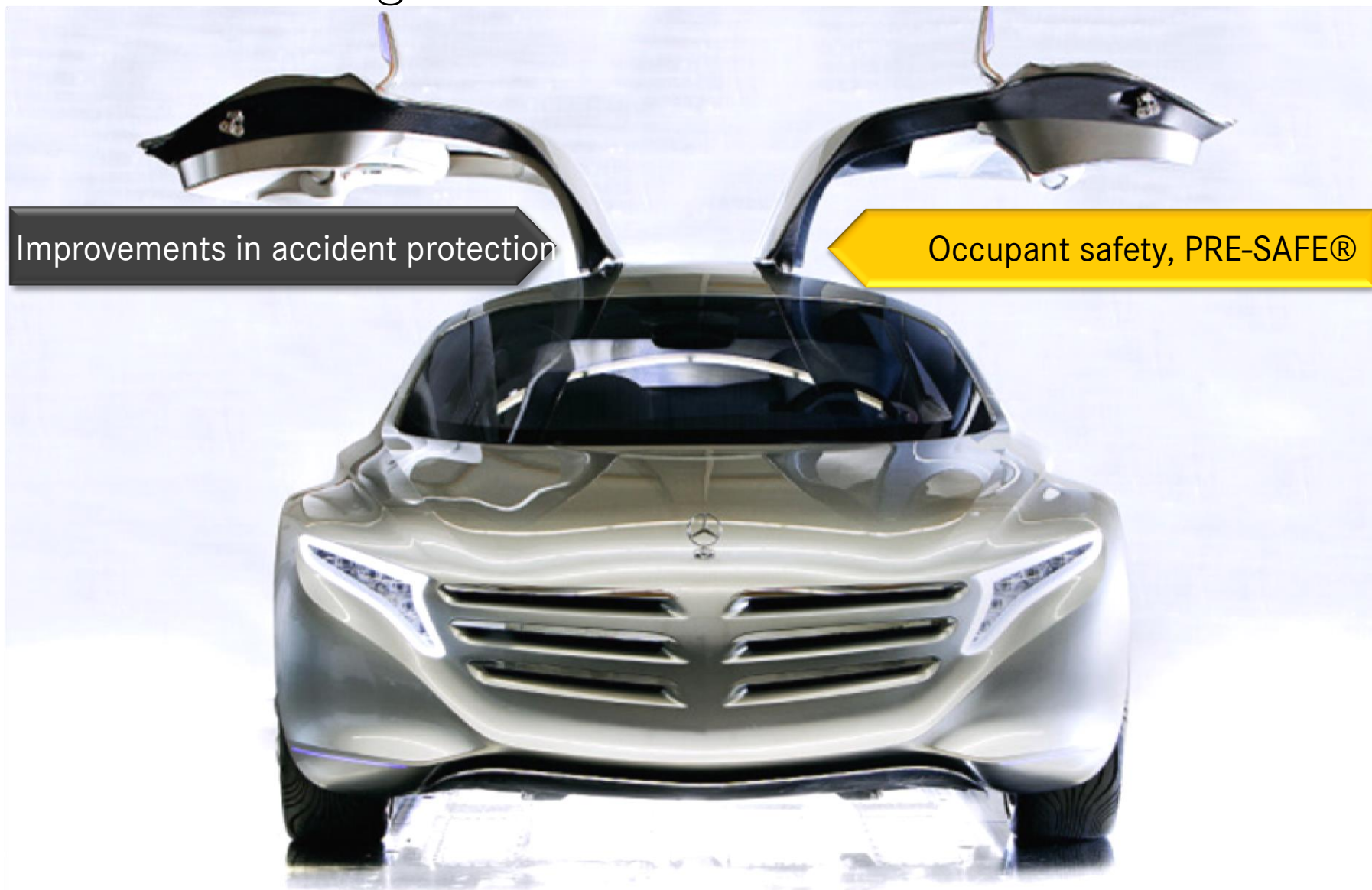
Accident Prevention and Severity Reduction



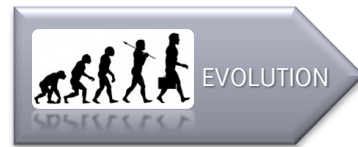
PRE-SAFE® Brake



Future Challenges



Occupant Safety, PRE-SAFE®



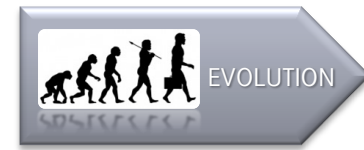
Beltbag: Mercedes-Benz reinvents the safety belt for rear seat passengers



- The **inflatable belt strap** can significantly reduce the risk of injury for the rear passengers.
- Due to the enlarged contact surface it **minimizes the force** applied onto the occupants' thorax.
- It is used the same way as a classical seatbelt and offers **best wearing comfort**.

Occupant Safety, PRE-SAFE®

Aktive buckle lifter



- Enhanced safety:
 - Reduction of belt slack
 - Better belt geometry
 - Post-safe function
- Increased comfort:
 - Simplification of the procedure to fasten the seatbelt
- More PRE-SAFE®:
 - Reversible seat belt tensioning also in the rear

Occupant Safety, PRE-SAFE®

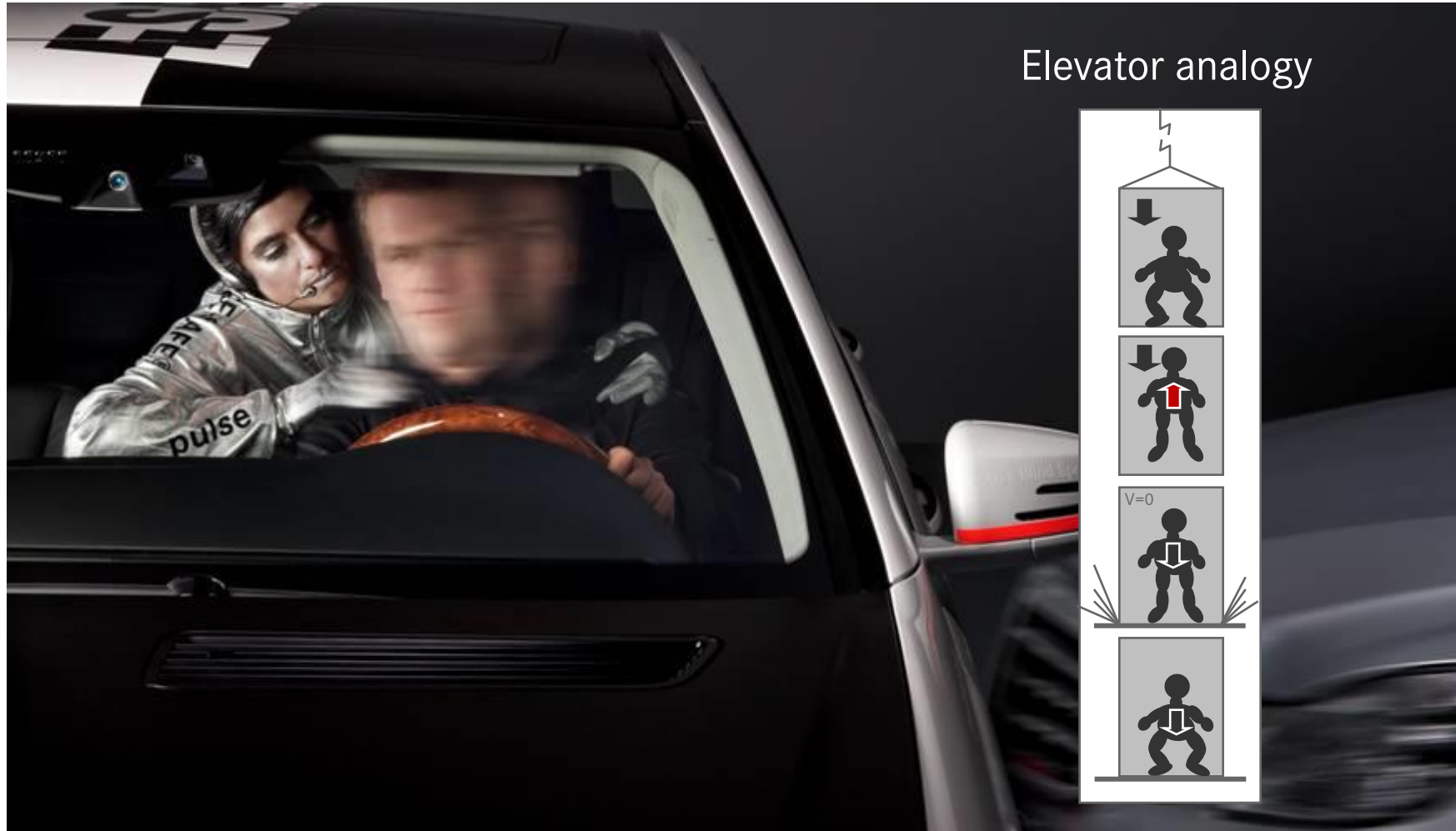
The events of a crash over time



In case of an unavoidable crash, the severity of the accident can be reduced by braking autonomously and also a **pre-impacting safety system** – **PRE-SAFE® Impulse** – can significantly increase occupant protection

Occupant Safety, PRE-SAFE®

PRE-SAFE® Impulse: Functional principle



Occupant Safety, PRE-SAFE®

PRE-SAFE® Impulse: Functional principle



Occupant Safety, PRE-SAFE®

PRE-SAFE® Impulse: Functional principle

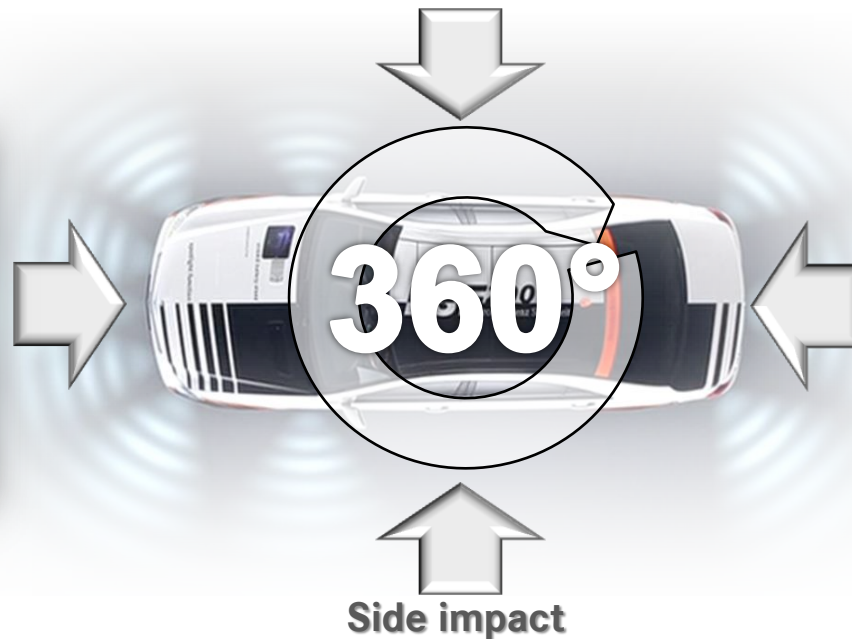
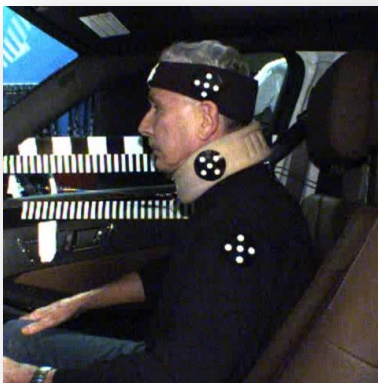


Occupant Safety, PRE-SAFE®

PRE-SAFE® Impulse: Areas of application



Frontal impact



Rear impact

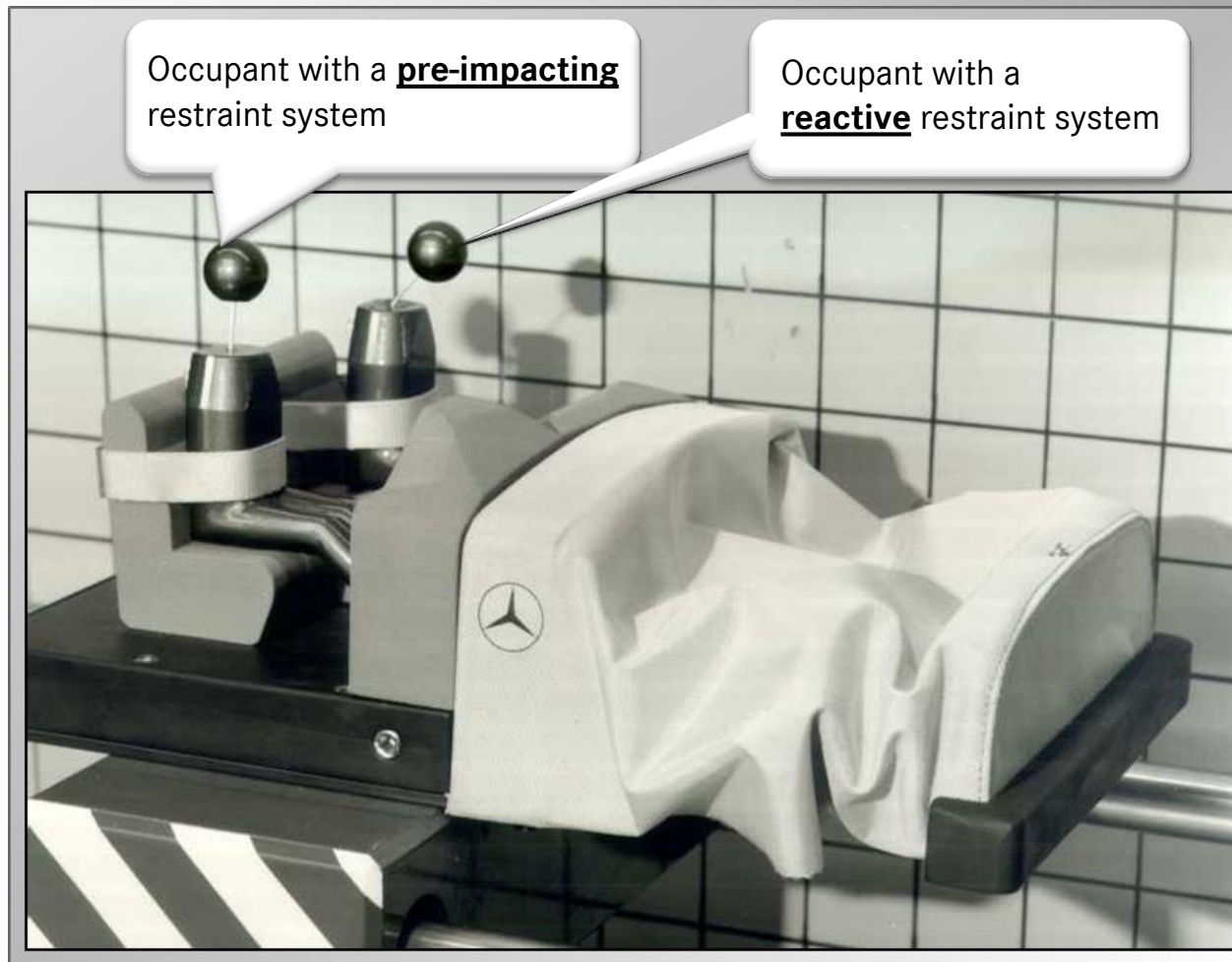


Side impact



Occupant Safety, PRE-SAFE®

PRE-SAFE® Impulse: Experiment



Occupant Safety, PRE-SAFE®



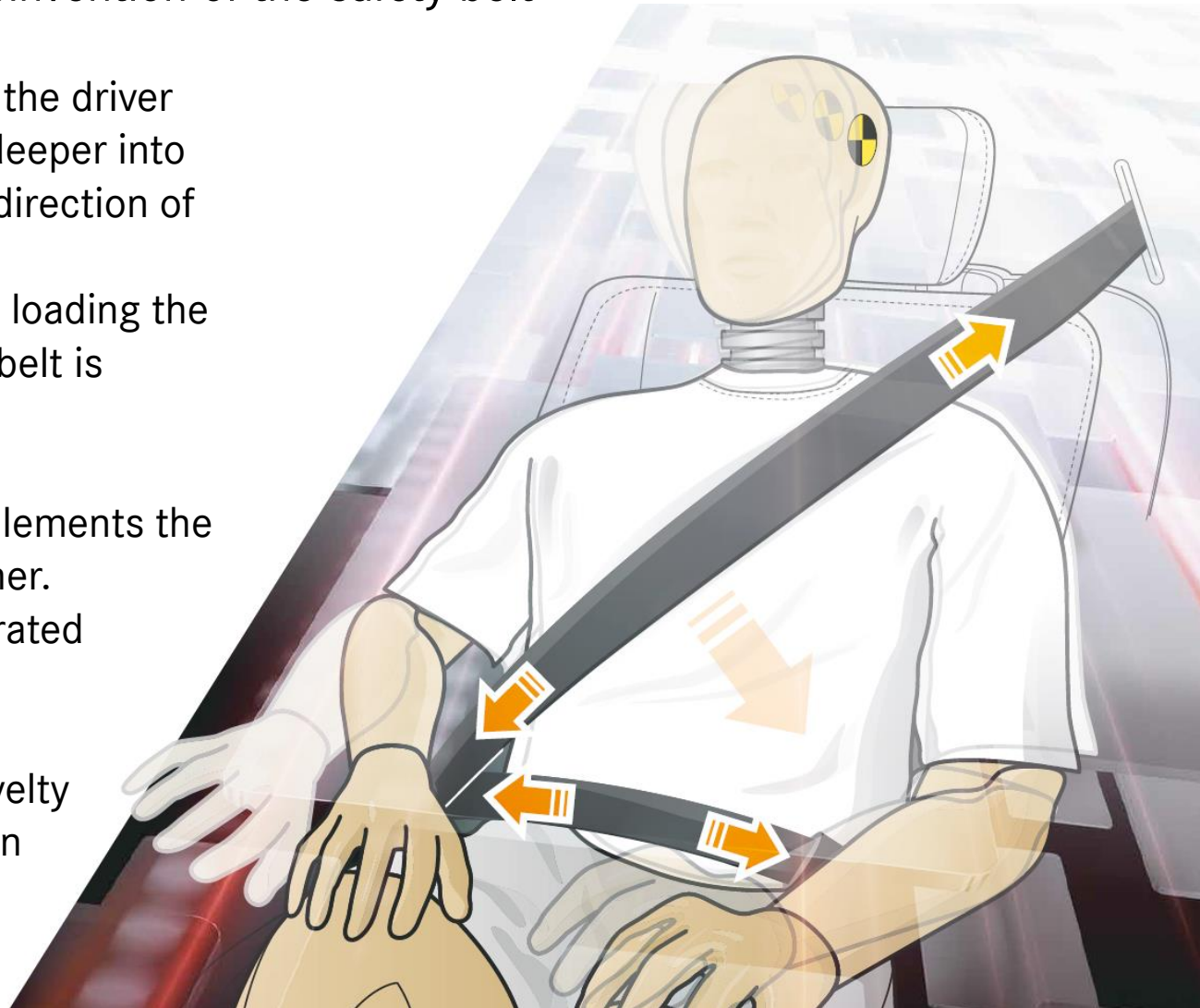
PRE-SAFE® Impulse: Reinvention of the safety belt

PRE-SAFE® Impulse pulls the driver and the front passenger deeper into the seat (in the opposite direction of the impact).

At the time of the highest loading the retracted part of the seatbelt is released.

PRE-SAFE® Impulse supplements the pyrotechnical reel tensioner. All components are integrated into the seat structure.

The system is a world novelty which will be introduced in the new Mercedes-Benz S-Class for the first time.



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- Future challenges
- **Cooperation models**

Mercedes-Benz Safety Innovations



Argemont 1909



Argemont 1923



Argemont 1916



Argemont 1925



Argemont 1921

Bosch
Petri/ TAKATA
TRW
Autoliv

■ **1978 ABS**

■ **1980 Airbag**

■ **2002 PRE-SAFE®**

■ **2013 Beltbag**

Cooperation Models

Regular meetings and networking with system developers, suppliers, authorities and universities

Regular meetings
with system developers and suppliers at Mercedes-Benz



Presentation of project status

Research and strategy meetings
when visiting suppliers and authorities



Alignment of the strategy, determination of the strategic direction

Innovation workshops
with system developers and students



Diplom theses and research assignments for innovation ideas

Cooperation Models

Developing new technologies with system developers and suppliers

Example: Mercedes-Benz ESF2009



Cooperation Models



View on Future Challenges of Automotive Safety



Mercedes-Benz