

## Holistic Approach for Vehicle Safety at Mercedes-Benz

Per Lewerenz, Mercedes Benz AG, RD/KSF, VET 2019



# Agenda

### 1. History of Vehicle Safety

2. The Integral Safety Strategy

## History of Road Accidents



## Safety Aspects of the Benz Patent Motor Car from 1886



# Mercedes-Benz – The Cradle of Vehicle Safety

### More than 75 Years of Experience in Passenger-Car Safety Development





- **1939** The "Father of Passive Safety", Béla Barényi, was employed by Daimler-Benz.
- **1959** Crumple Zone, Rigid Passenger Cell and Interior Paddings were implemented in series production for the first time.

### Mercedes-Benz – The Cradle of Vehicle Safety



## **International Accident Statistics**



### The EU has not yet reached the target value

Worldwide: Increased fatalities in countries with increasing demand for individual mobility

Mercedes-Benz

## SAFE ROADS Global Initiatives to Increase Safety Awareness



## Fatalities from Road Crashes

### 1.250.000 Road Fatalities worldwide<sup>1</sup>



Mercedes-Benz

## Europe 2014 – 25.700 Fatalities on the Road



Source: Spiegel Online, Boeing 747-400, 416 Sitzplätze



# Berliner Erklärung zur Fahrzeugsicherheit

VDI | VDI-FACHGESELLSCHAFTEN | VDI-GESELLSCHAFT FAHRZEUG- UND VERKEHRSTECHNIK | SICHERHEIT, METHODEN UND PROZESSE
BERLINER ERKLÄRUNG ZUR FAHRZEUGSICHERHEIT

### Die Berliner Erklärung zur Fahrzeugsicherheit

#### Handlungsfelder Fahrzeugsicherheit

Die Europäische Verkehrspolitik hat eine Vision: die Vision Zero, einen Straßenverkehr, in dem kein Mensch mehr auf Europas Straßen zu Tode kommt. Auf dem Weg zu diesem Ziel gibt es mehrere Etappenziele: Jeweils von Anfang bis Ende eines Jahrzehnts soll sich in der Europäischen Union die Zahl der Getöteten im Straßenverkehr halbieren.

Dieses Ziel einer Halbierung der Verkehrstotenzahl von 2010 bis 2020 unterstützen auch die Sicherheitsexperten der VDI-Gesellschaft Fahrzeug- und Verkehrstechnik, die sich in der "Berliner Erklärung zur Fahrzeugsicherheit" im Jahr 2011 dazu bekannt haben.

#### Expertenmeeting 2019 am 26.11.2019 in Berlin

Eines der wichtigsten Foren, auf denen sich die Experten der deutschen Industrie und unabhängiger Forschungsinstitute regelmäßig austauschen, ist die zweijährliche VDI-Tagung Fahrzeugsicherheit. Als großer unabhängiger technischwissenschaftlicher Verein bietet der VDI den Experten die Plattform, ihr persönliches Engagement mit der beruflichen Expertise zu verbinden. So entstand die Initiative zur Gründung des VDI-Expertengremiums. Sie alle eint der Wunsch, kooperativ und über die Grenzen ihres jeweiligen Fachgebiets hinaus an einer Senkung der Verkehrsopferzahlen mitzuwirken. Unterstützen auch Sie mit Ihrer Expertise das VDI-Expertengremium der "Berliner Erklärung zur Fahrzeugsicherheit" und helfen Sie mit, interdisziplinär das Ziel der Vision Zero zu erreichen.

# Agenda

1. History of Vehicle Safety

2. The Integral Safety Strategy

## Vehicle Safety as a Core Value of Mercedes-Benz



## Real Life Safety – Never Stop Improving



## The Integral Safety Strategy of Mercedes-Benz

### **Integral Safety Approach**



Phase 1: Safe driving



Phase 2: In critical driving situations



Phase 3: During a crash



Phase 4: After a crash

**Active Safety** 

**Passive Safety** 

## The Driving Assistance Package Plus in the new GLE

### Car-to-X Communication

#### ATTENTION ASSIST

S=V 1674

#### Active Lane Keeping Assist

### **Active Steering Assist**

- Active Lane Change Assist
- ▲ Active Emergency Stop Assist
- with emergency corridor function

### **Active Brake Assist**

standard with pedestrian/bicyclist detection in Driving Assistance Package with: cross-traffic function

- congestion emergency braking function
- turning maneuver function

#### **PRE-SAFE<sup>®</sup> PLUS**

### PRE-SAFE<sup>®</sup> Sound

Active Parking Assist PARKTRONIC Trailer Maneuvering Assist

### Active Blind Spot Assist

with vehicle exit warning function

### **Evasive Steering Assist**

### **Active Distance Assist DISTRONIC**

- with route based speed adjustment
- with end of a traffic jam function
- Active Speed Limit Assist
- Active Stop-and-Go Assist

#### Mercedes-Benz

### MULTIBEAM LED

- Adaptive Highbeam Assist Plus
- ULTRA RANGE Highbeam

#### PRE-SAFE<sup>®</sup> Impulse Side

NEW

## PRE-SAFE®Preventive Care

### Preparing the Vehicle and the Occupant for a Possible Crash



# PRE-SAFE<sup>®</sup> Impulse Side Components

The first pyrotechnical restraint system that uses radar only for the deployment decision





PRE-SAFE Impulse Side coldgas inflator



PRE-SAFE Impulse Side sensor

## PRE-SAFE<sup>®</sup> Sound



## PRE-SAFE<sup>®</sup> Sound



1 Eardrum	3 Stapedes
2 Inner ear	4 Stapedius muscle

#### Preventive pre-conditioning of the occupants

- Idea: reduce the effects of noise stress caused by collisions
- Function: If the car detects certain critical situations, the sound system emits a short pink noise signal

### Reflex mechanism

- Pink noise pattern is able to make the stapedius muscle contract
- Protective effect: reduced noise effect on the inner ear

## The Integral Safety Strategy of Mercedes-Benz

### **Integral Safety Approach**



Phase 1: Safe driving



Phase 2: In critical driving situations



Phase 3: During a crash



Phase 4: After a crash

**Active Safety** 

**Passive Safety** 

## Restraint Systems (Example: S-Class)

Kneebag

for the driver

Driver fro

Windowbags Curtain-airbags for front and rear seats

Front passenger airbag with active vent PRE-SAFE<sup>®</sup> rear seatbelt buckles for outer rear-seat passengers Pyrotechnical belt pretensioner and self-adaptive belt force limiter at the outside seats in the rear compartment

> **Beltbag -** inflatable seatbelts for outer rear-seat passengers

Sidebags for front and rear

Seat cushion airbag (executive reclining seat)

**PRE-SAFE® belt tensioner** and adaptive **belt force limiter** for driver and front passenger

**PRE-SAFE** <sup>®</sup> **Impulse** pretensioner and load limiter for driver and front passenger Highly sophisticated restraint systems

Advanced restraint systems in combination with an intelligent body design are the key for efficient occupant protection.

# The Key Principles of Passive Safety

- 1) Dissipate energy during a crash
- 2) Maintain a stable passenger compartment
- 3) Provide proper restraint of the occupant



blue: aluminium parts

## The Integral Safety Strategy of Mercedes-Benz

### **Integral Safety Approach**



Phase 1: Safe driving



Phase 2: In critical driving situations



Phase 3: During a crash



Phase 4: After a crash

**Active Safety** 

**Passive Safety** 

# After a Crash – depending on the severity of the crash



- Activate for instance: hazard warning lights, interior lights, door position lights
- Automatic Collision Notification (Emergency Call)
- Lower front windows to ventilate the interior
- Warn other vehicles by car-to-car communication
- Automatic engine off switch



# Rescue Assist App

(C) Mercedes-Benz





 $\wedge \wedge$ 



1 Linkslenker 2 Rechtslenker

3 AMG (Linkslenker/Rechtslenker)











## Thank you for your attention!

