



# MAINFORUM™ 2025

Mexico's Automotive  
Innovation Network

**Current and next challenges for  
active and passive safety**

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Applus IDIADA



- 1.- INTRODUCTION
  - 2.- EVOLUTION OF PASSIVE SAFETY
  - 3.- CONTRIBUTION OF NCAP
  - 4.- EVOLUTION OF ACTIVE SAFETY
  - 5.- PROTECTION LEVELS
  - 6.- CONCLUSIONS
-

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**6.- CONCLUSIONS**

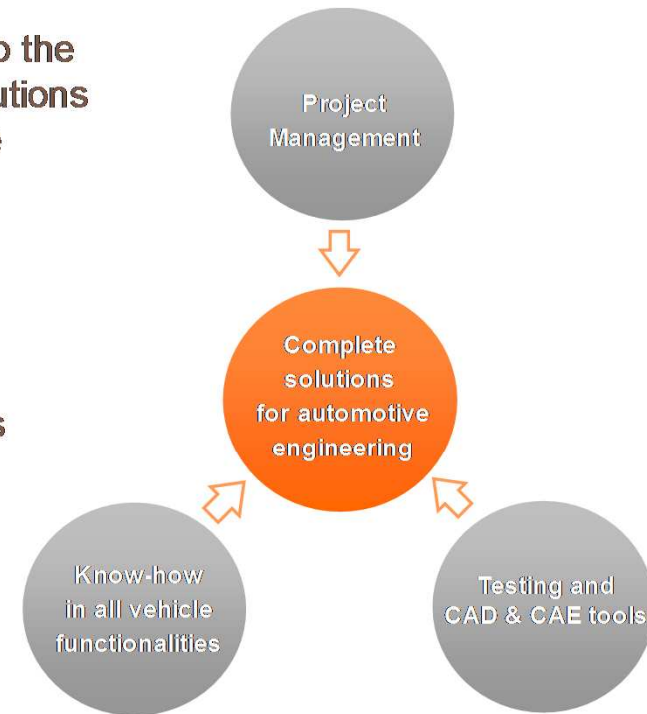
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# Who we are and what we do

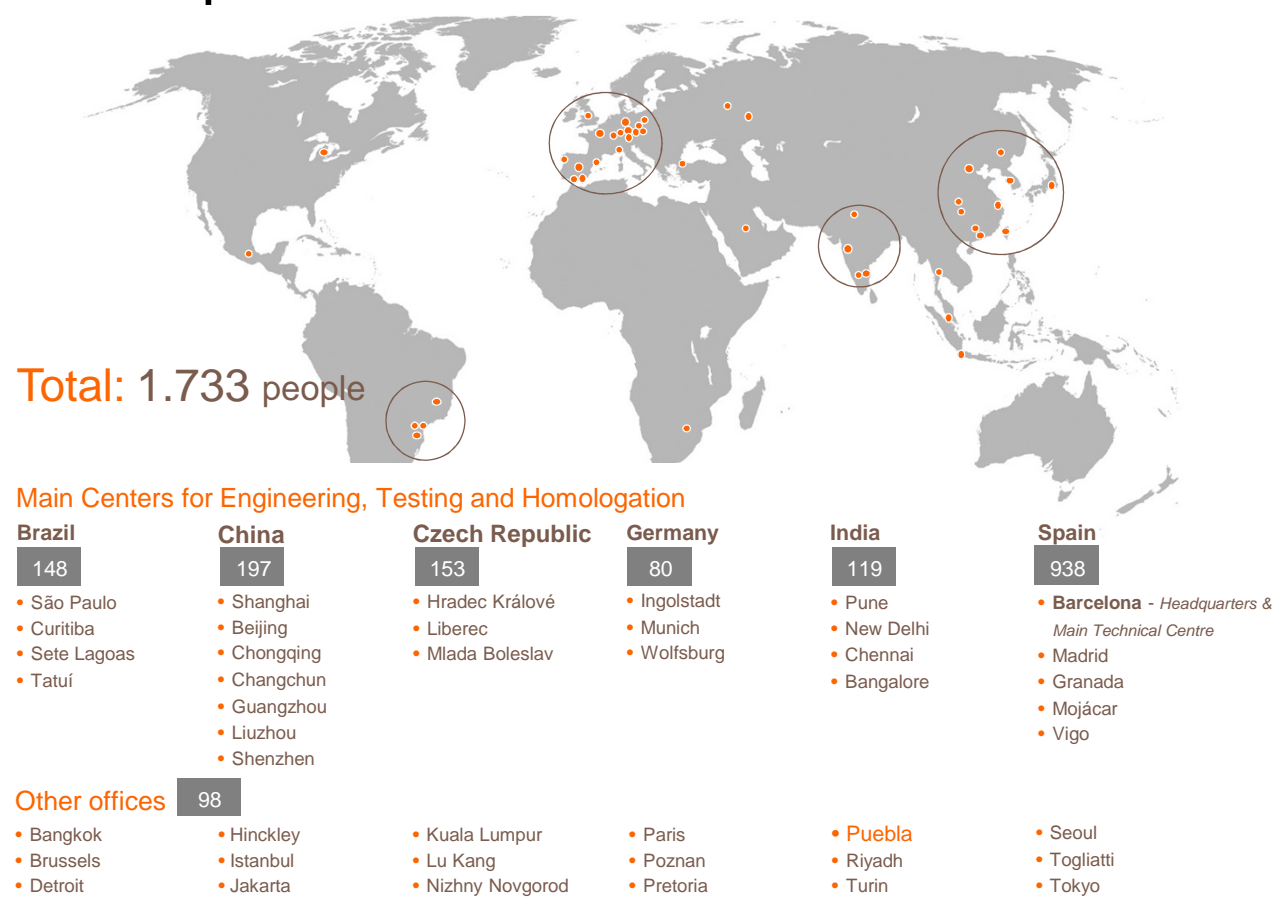
**Applus IDIADA** is an engineering partner to the automotive industry providing complete solutions for product development projects worldwide

## Our assets:

- ⊕ Team of more than 1.700 professionals
- ⊕ First class state-of-the-art testing facilities
- ⊕ International presence in 23 countries
- ⊕ Innovation in new services and technologies



# International presence



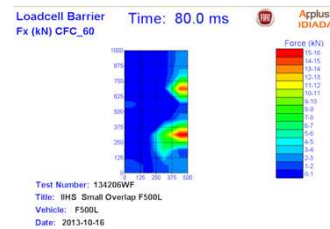
# Advanced development tools

## Small overlap IIHS

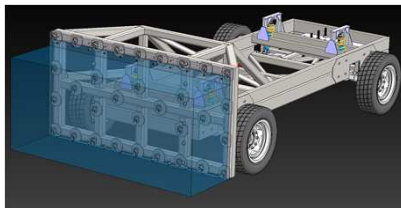


### Small overlap 25% 64 kph barrier & LCW

- 32 load-cell array (8 x 4)
- Tri-axial load cells
- Developed own analysis software tool



## Small overlap NHTSA



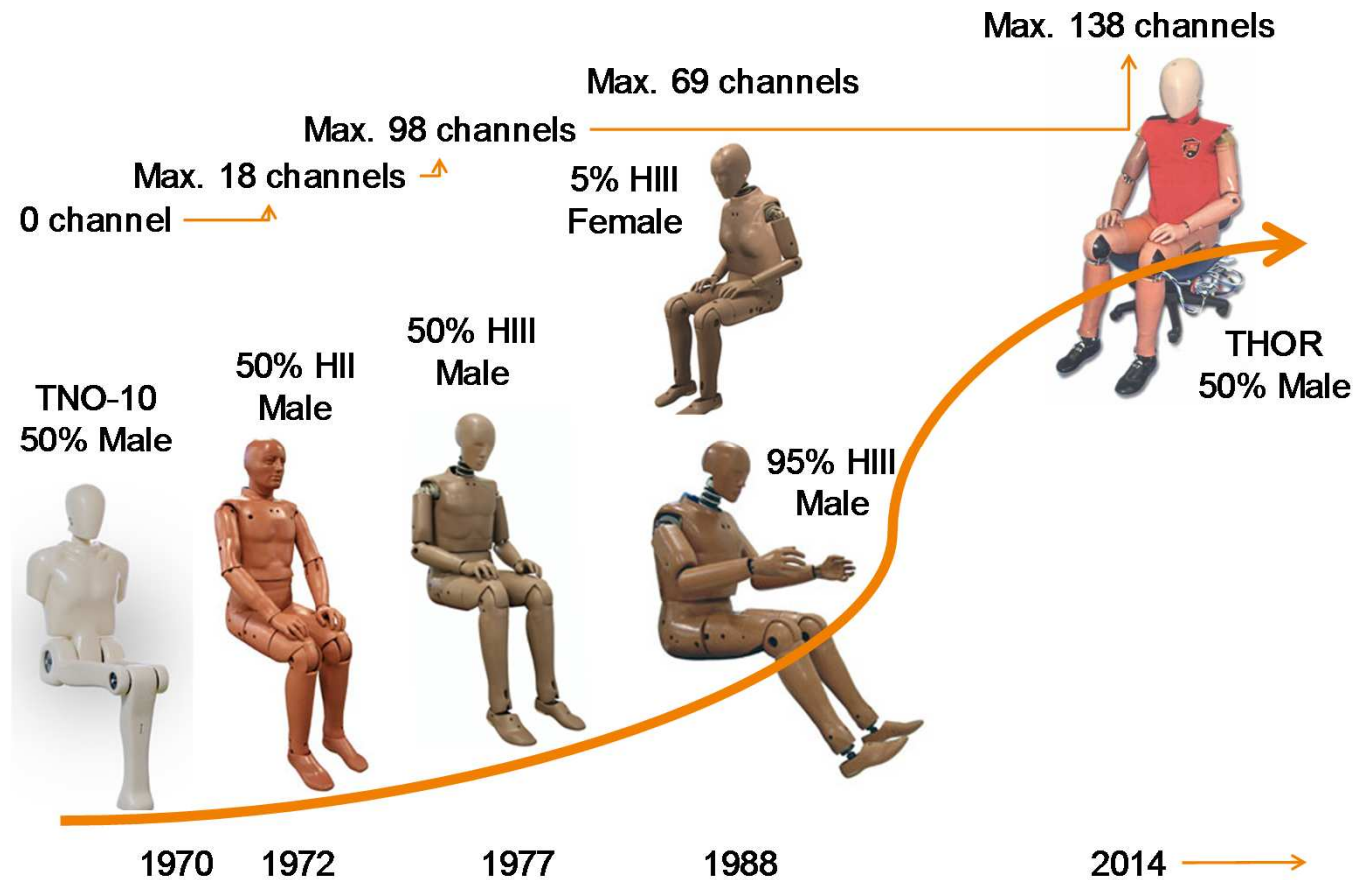
### RMDB

- 18 uniaxial load cells
  - Rated force: 400 kN
  - Weight 70 g
- Development on own analysis software tool



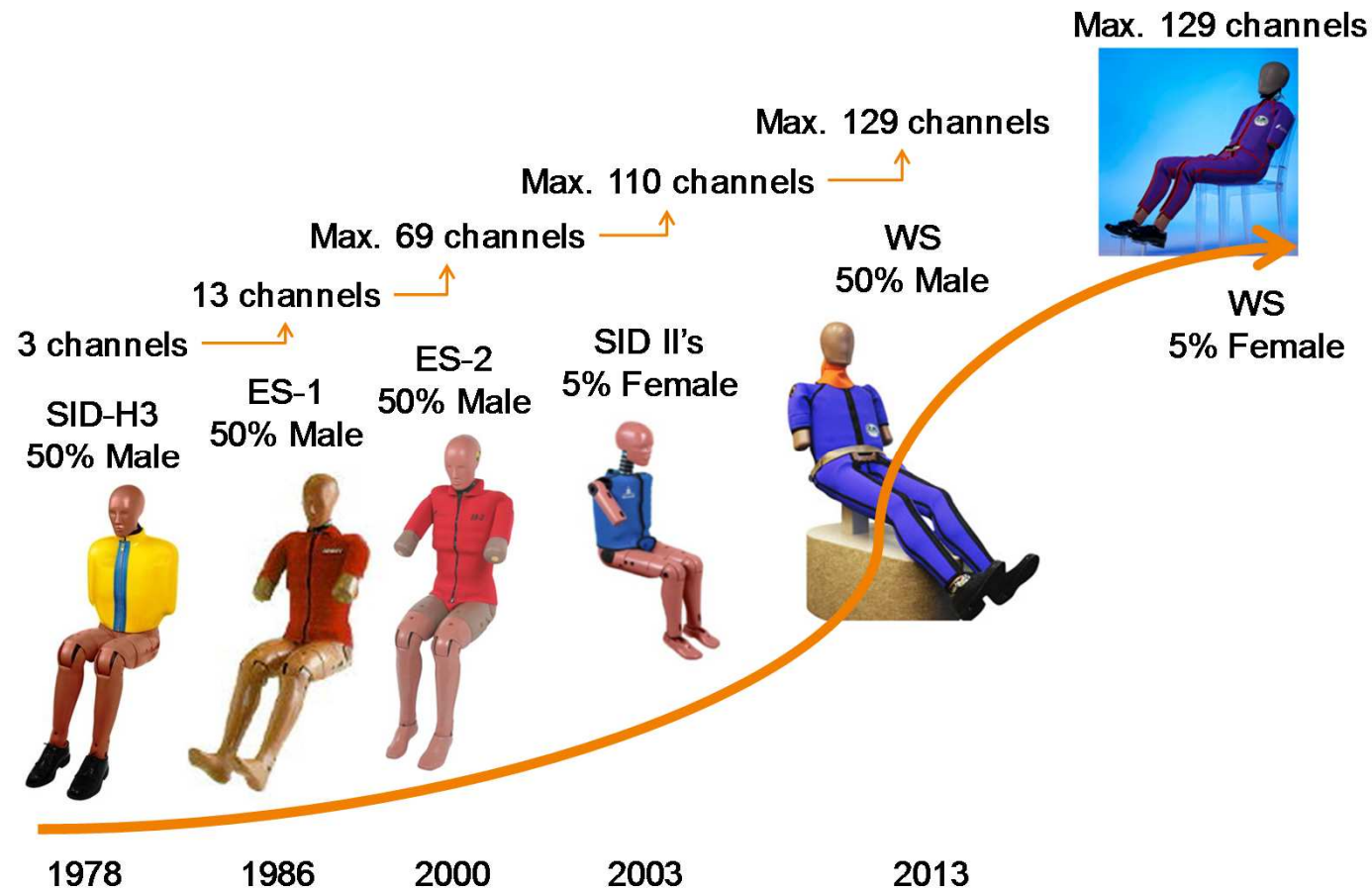
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# Front crash test dummies

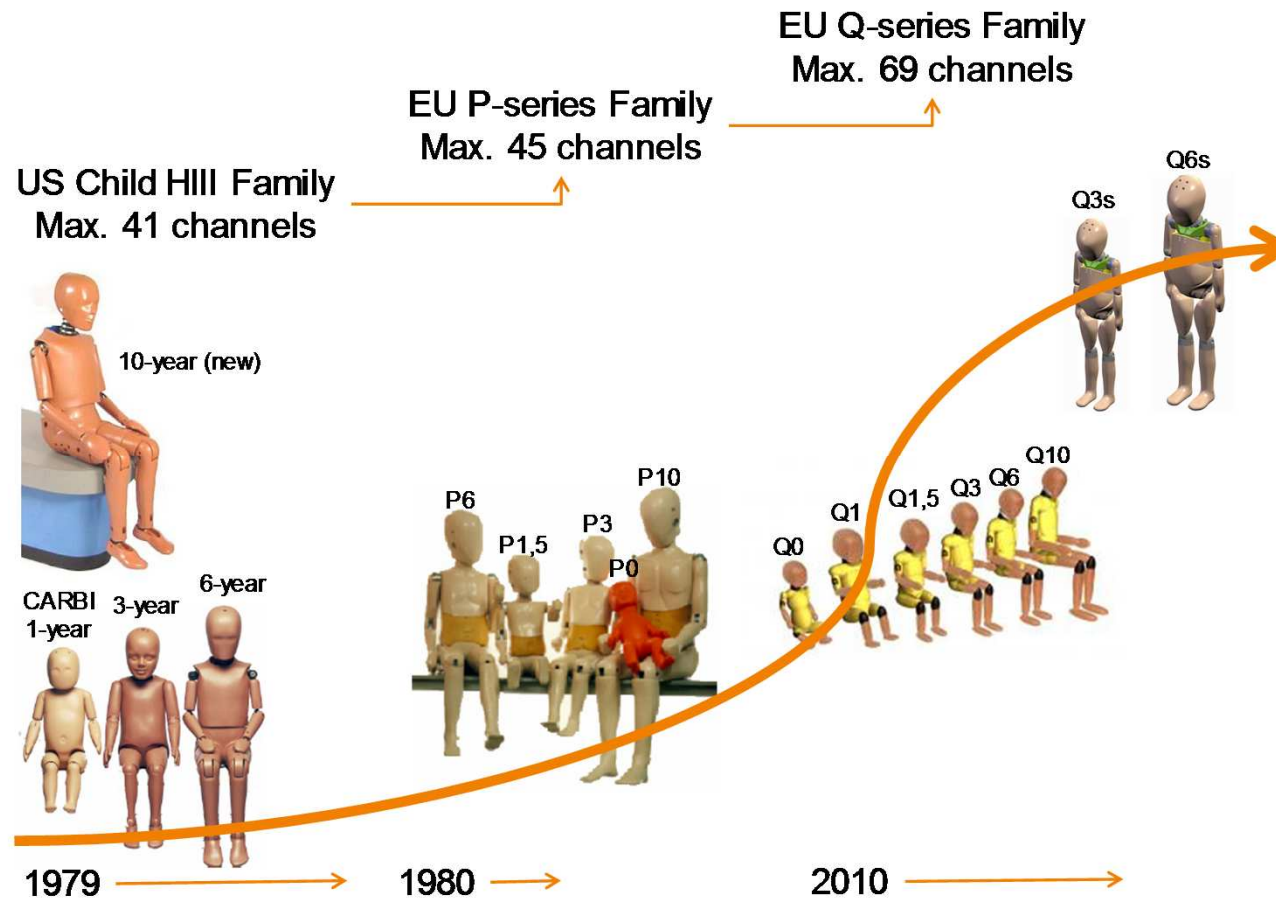




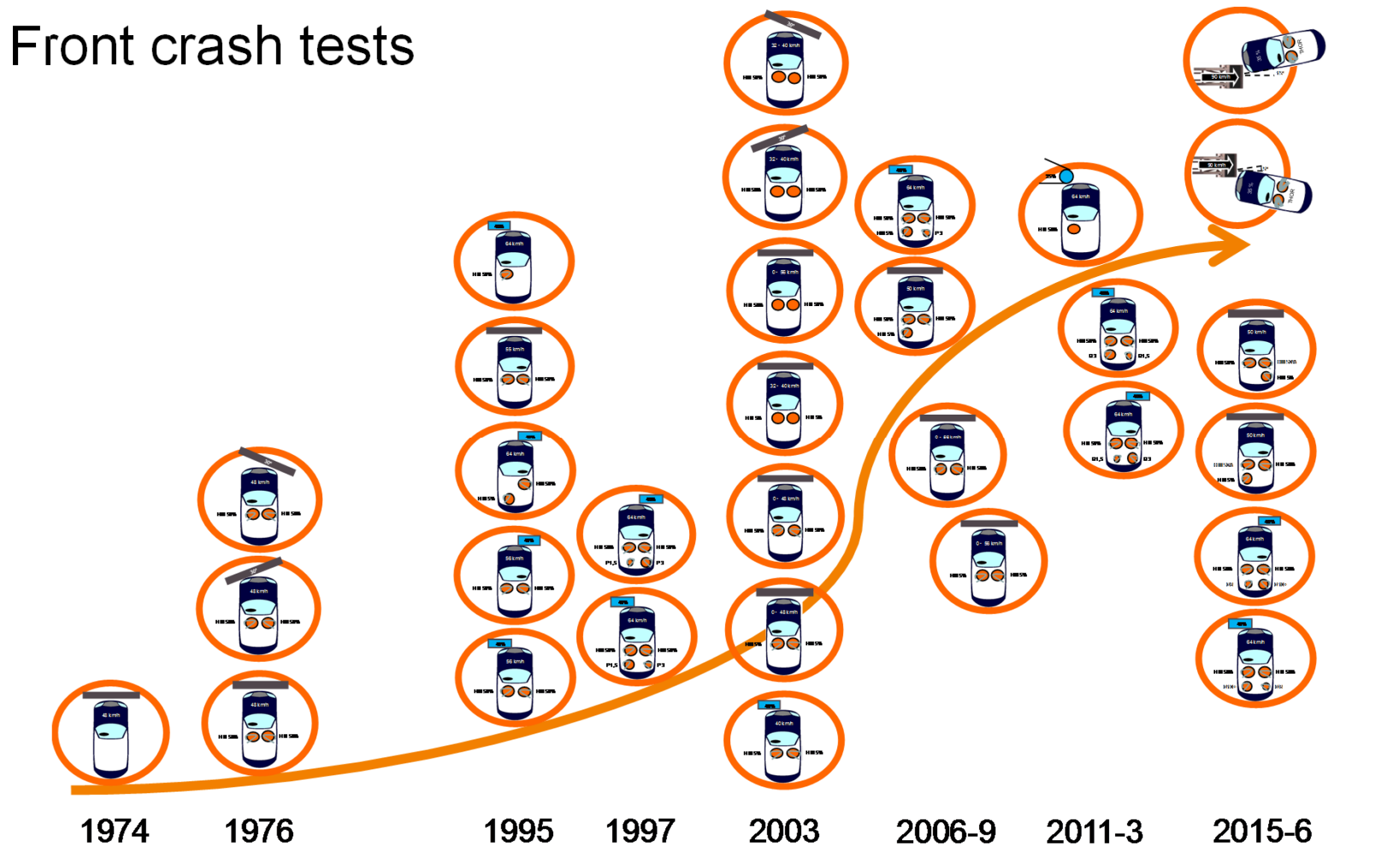
# Side crash test dummies



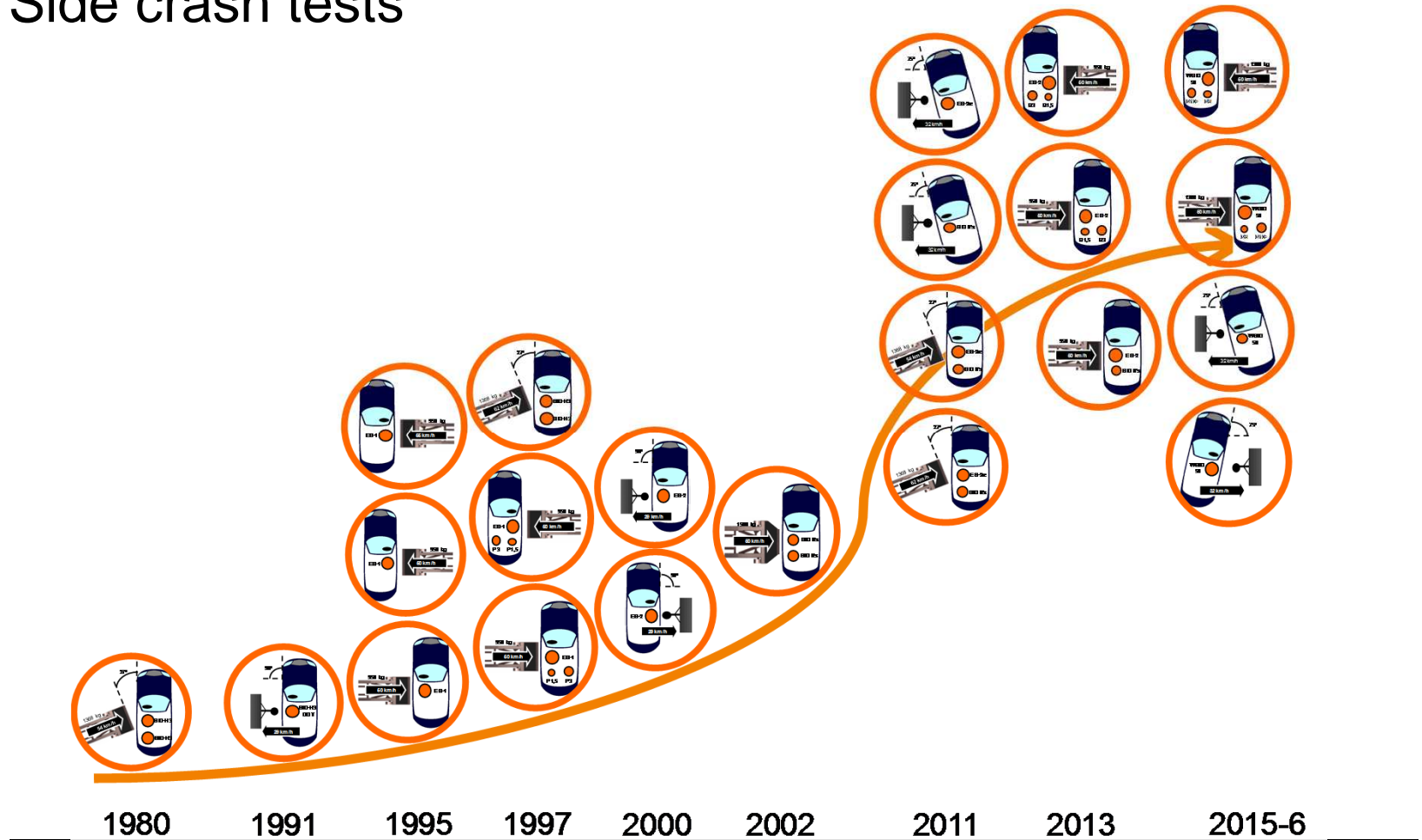
# Child crash test dummies



# Front crash tests

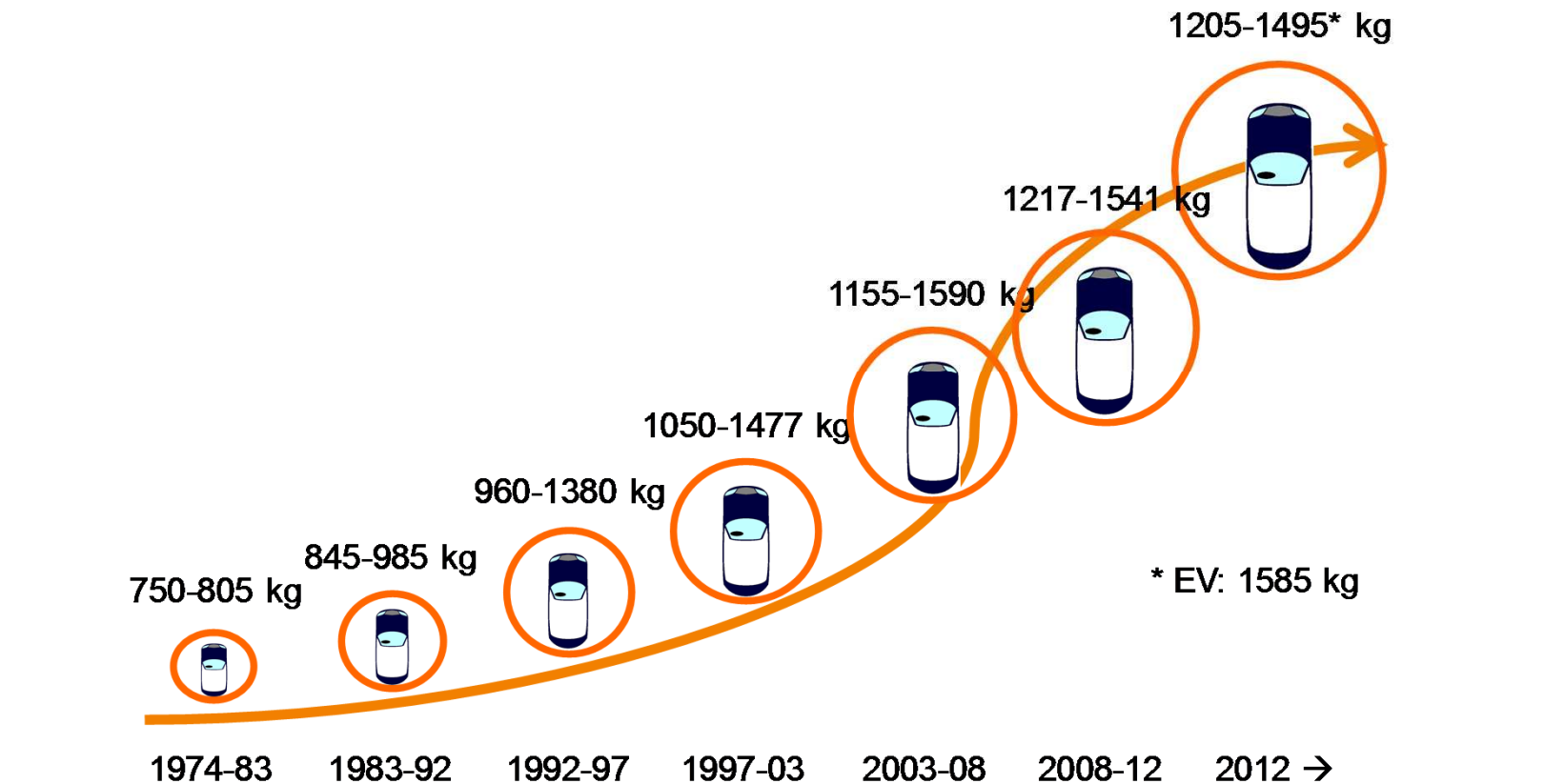


# Side crash tests

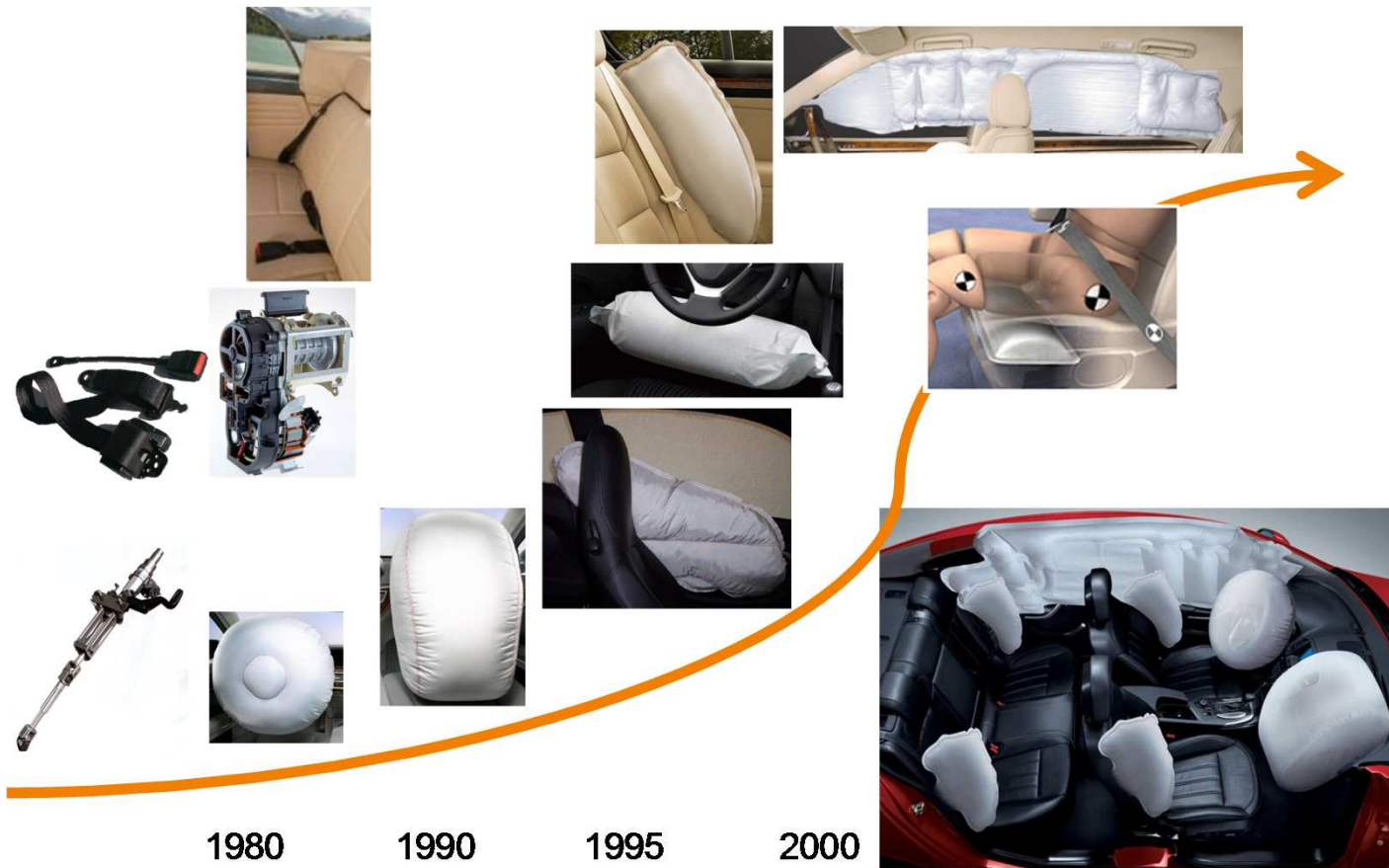


# Weight increase

- ⊕ Vehicle weight increase is not only based on passive safety requirements

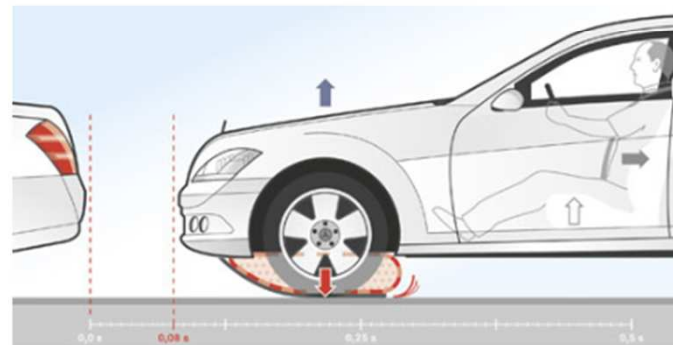


# Passive safety components





## New passive safety components



2010

2015

2020

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# What is Euro NCAP

- NCAP stands for **New Car Assessment Programme**,
- Its mission is to provide consumers a **realistic** and **independent** assessment of the **safety performance** of vehicles **recently launched** in the markets

## Regulation

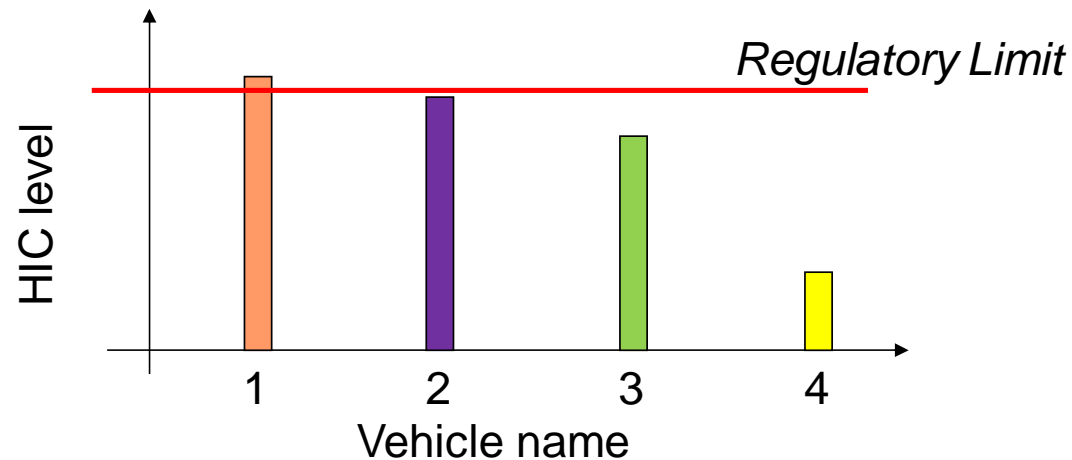
= mandatory requirement  
= **minimum** safety level  
for **all** the vehicles on  
the road

## NCAP

= consumer information  
= ranking  
= not all the models and  
versions sold in the  
market are assessed

# Why NCAP is different from regulation?

Example: HIC value (injury criteria for head)



If there is only Regulation and no NCAP

Only Vehicle 1 would be forbidden on the roads because HIC exceeds the regulatory limit

Consumers can't know that vehicle 4 is far much better than vehicle 3 and 2.

# NCAP's overview



# Role of IDIADA in Euro NCAP



⊕ Official Euro NCAP test house for all tests and assessments (around 60



complete vehicle evaluations made since **2002**)



⊕ Member of Euro NCAP WG: Pedestrian, Heavy vehicles, Front Impact, Side Impact, Whiplash, Child, ISA (Intelligent Speed Assistance), ESC, AEBS (Autonomous Emergency Braking Systems)



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# Relevant steps in active safety

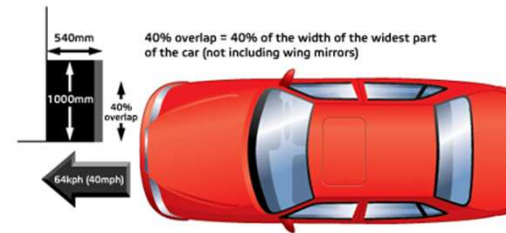


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# Head-on and rear-end collisions (impacting vehicle)

## Cases addressed by frontal crash tests

- Euro NCAP ODB as a reference
- Equivalent to IIHS evaluation



- ⊕ In terms of energy,\*
  - it is equivalent to a head-on collision, both vehicles driving at 50 km/h
- ⊕ In terms of occupant protection, top performing vehicles would provide\*\*
  - <5% injury risk AIS3 in head area
  - <5% injury risk AIS3 and AIS4 in chest area

\* FIMCAR project (EU funding)

\*\* Euro NCAP AOP assessment protocol

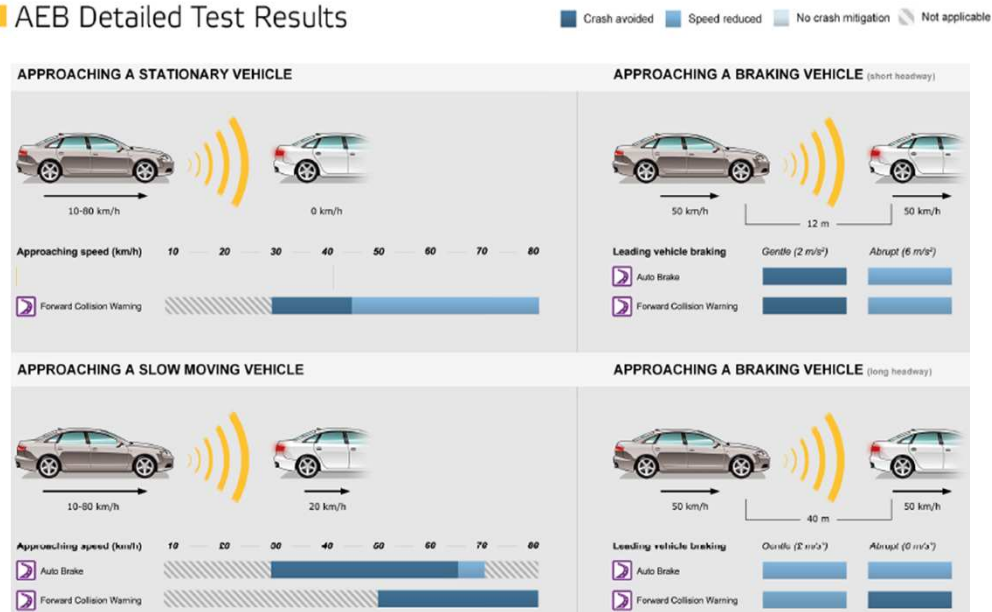


# Head-on and rear-end collisions (impacting vehicle)

## Scenarios addressed by AEB

- Euro NCAP AEB for passenger cars\*

### AEB Detailed Test Results



- ⊕ In terms of energy,\*\*
  - it is equivalent to a head-on collision, both vehicles driving at 25 km/h

**MOVING  
AEB 50 km/h**

**MOVING  
AEB 70 km/h**

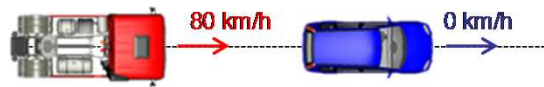
- \* Euro NCAP AEB test results for Volvo V40
- \*\* Perfect restitution of the collision assumed, in order to find equivalents with passive safety tests

# Head-on and rear-end collisions (impacting vehicle)

## Scenarios addressed by AEB

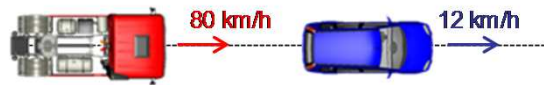
- Requirement for heavy trucks in EU\*

### Stationary test



Warning modes		Speed reduction
$\geq 1.4$ s before braking	$\geq 0.8$ s	$\geq 20$ km/h

### Moving test



Warning modes		Speed reduction
$\geq 1.4$ s before braking	$\geq 0.8$ s	No impact



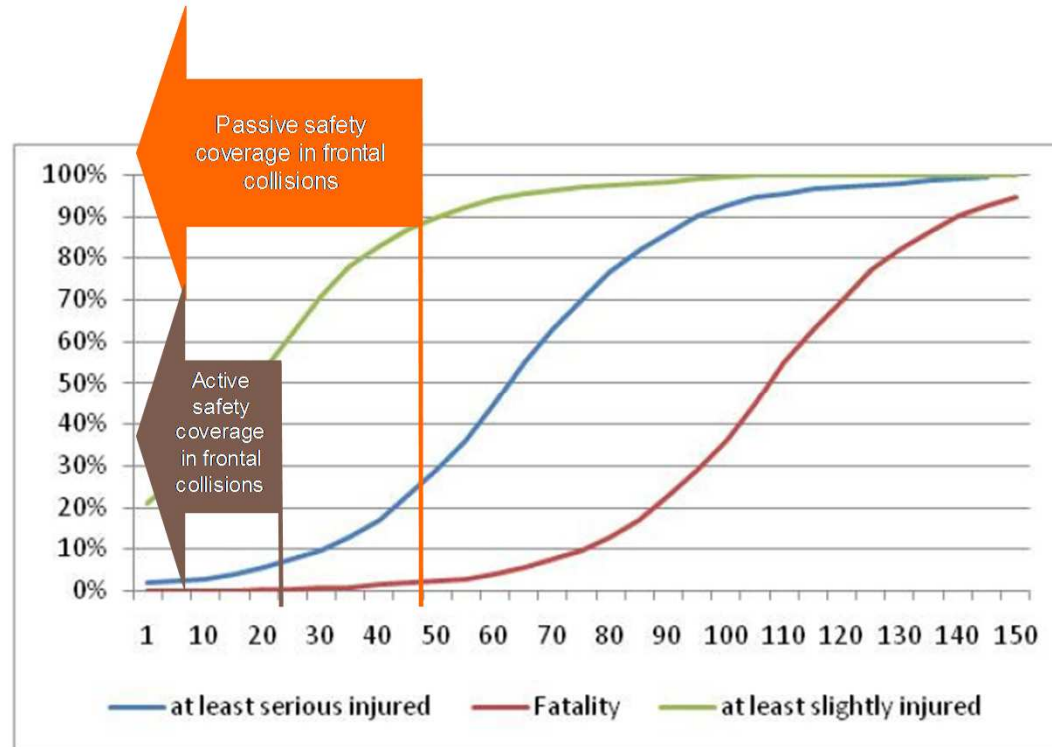
\* UN-ECE Regulation 131 - Advanced Emergency Braking Systems (AEBS)

- Mandatory in new certified vehicles as from 01/11/2013

- All vehicles 01/11/2015

# Head-on and rear-end collisions (impacting vehicle)

Injuries addressed\*



\* ASSESS project (EU funding, based on HANNAWALD 2008)

# Rear-end collisions (impacted vehicle)

## Scenarios addressed by passive safety in Whiplash prevention

- Euro NCAP AEB for passenger cars\*



### ⊕ Performance criteria\*\*

- “As the injury mechanism is not well enough understood, the assessment is based on 7 seat performance criteria which are not fully confirmed by biomechanical research”

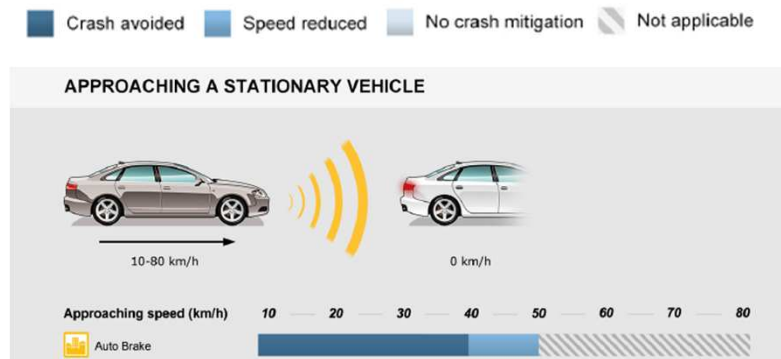
- Euro NCAP Whiplash test and assessment protocol

\*\* The Euro NCAP whiplash test, van Ratingen et Altri,, ESV 2009

# Rear-end collisions (impacted vehicle)

## Scenarios addressed by AEB – Whiplash prevention

- Euro NCAP for passenger cars\*
- Equivalent to new IIHS protocol for AEB



- ⊕ In terms of occupant protection, top performing vehicles:
  - should avoid all impacts up to 50 km/h against stationary vehicles

\* Euro NCAP AEB test results for Volvo V40

\*\* Video from VW Up!

# Vulnerable road users

## Cases addressed by pedestrian protection tests

- Euro NCAP PP protocols as a reference

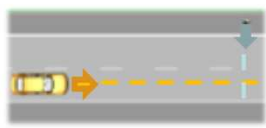
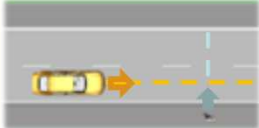
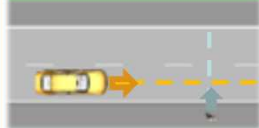
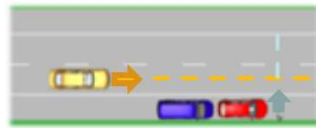


- ⊕ In terms of occupant protection, top performing vehicles would provide\*
  - <5% injury risk AIS3 in head area
  - <20% risk of femur/pelvis fracture
- ⊕ Unfortunately, reaching these levels is very constrained from a design point of view

# Vulnerable road users

## Scenarios addressed by AEB VRU

- Draft Euro NCAP AEB VRU protocols as a reference

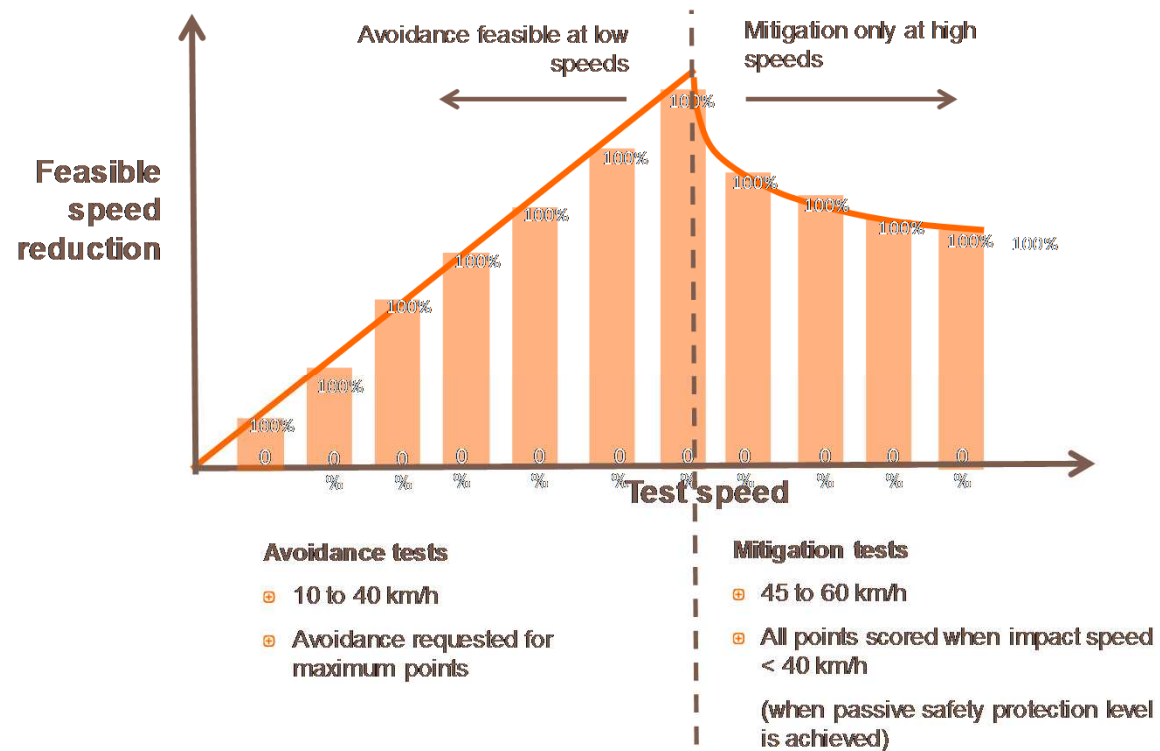
				
Scenario name	Running adult crosses from far-side	Walking adult crosses from near-side 25%	Walking adult crosses from near-side 75%	Walking child crosses from near-side behind obstruction
Pedestrian velocity	8 kph	5 kph	5 kph	5 kph
Vehicle velocity	10-60 kph	10-60 kph	10-60 kph	10-60 kph
Obstruction	no	no	No	yes
Impact position	50 % (center)	25% (near-side)	75% (off-side)	50 % (center)



# Vulnerable road users

## Scenarios addressed by AEB VRU

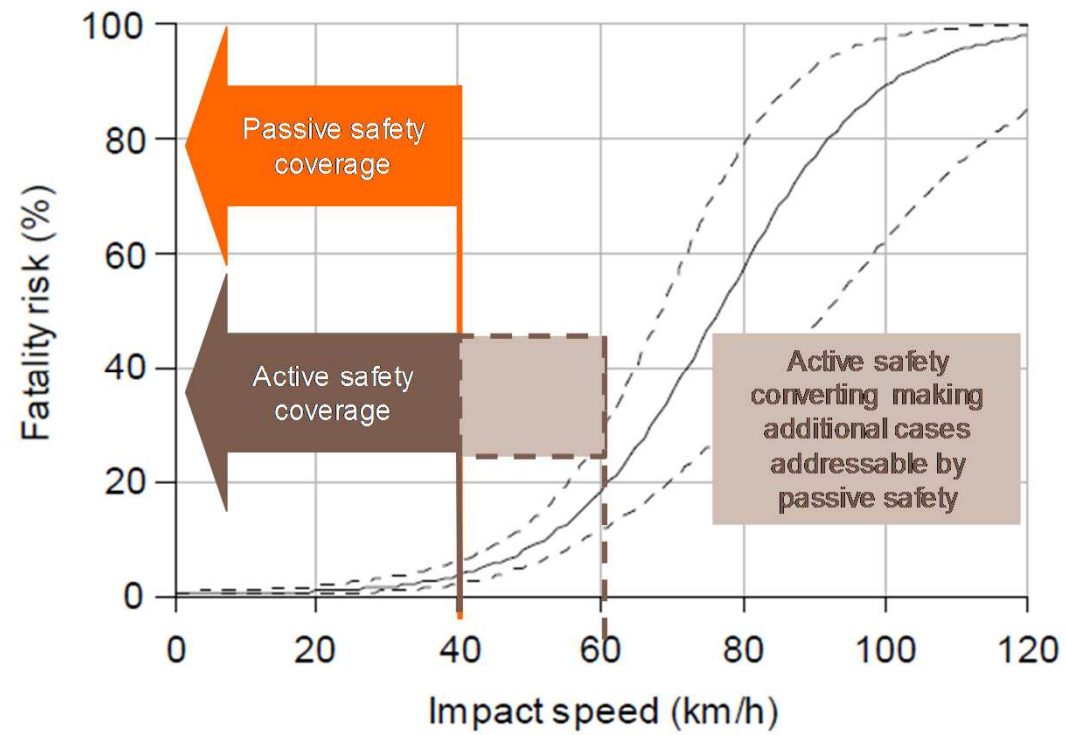
- Draft Euro NCAP AEB VRU protocols as a reference









# Vulnerable road users

Fatalities addressed\*



\* Data from Erik Rosén and Ulrich Sander, 2009

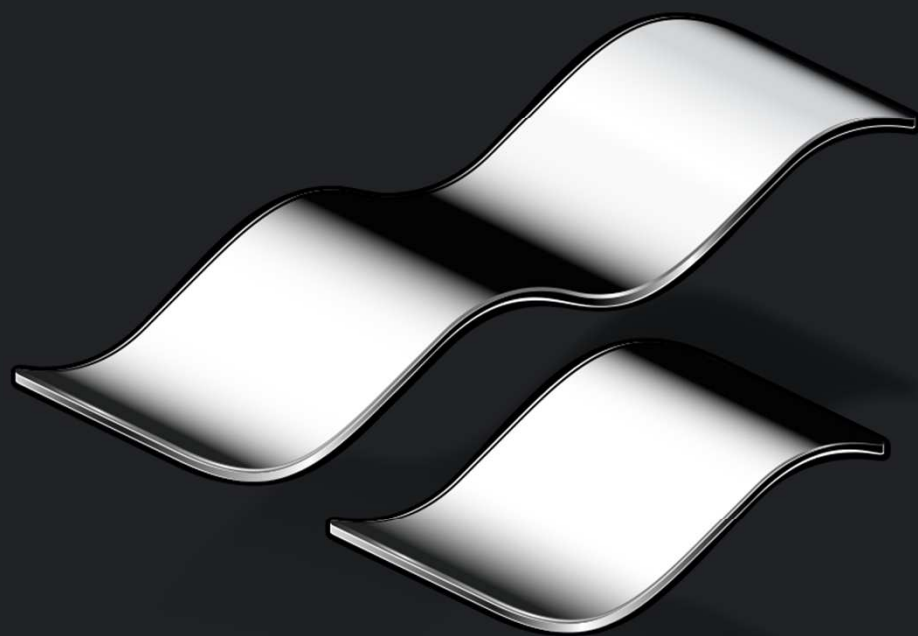
# Summary

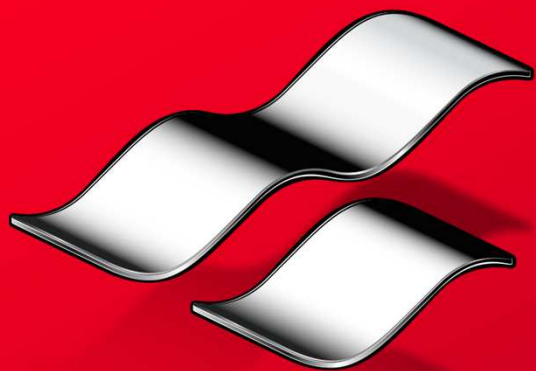
	Passive safety	Active safety
<b>On-coming and rear-end collisions</b>	<ul style="list-style-type: none"> <li>Protection over 50 km/h deltaV impacts</li> <li>Low probabilities of severe injuries</li> </ul> 	<ul style="list-style-type: none"> <li>Avoidance in collisions with up to 50 km/h closing speed</li> <li>Avoidance brings full protection</li> <li>Mitigation needs to rely in passive safety</li> </ul>
<b>Whiplash protection in urban rear-end crashes</b>	<ul style="list-style-type: none"> <li>Biomechanical data still missing</li> </ul>	<ul style="list-style-type: none"> <li>Avoidance at low speeds efficient and feasible</li> </ul> 
<b>Pedestrian protection</b>	<ul style="list-style-type: none"> <li>Complex to protect up to the 40 km/h impact speed range</li> <li>Issues with secondary impact not addressed</li> </ul>	<ul style="list-style-type: none"> <li>Performance still limited to certain scenarios</li> <li>Feasible to avoid up to the 40 km/h impact speed range</li> <li>Beyond this range, needs to rely in passive safety</li> </ul> 
<b>Additional considerations</b>	<ul style="list-style-type: none"> <li>Will always remain</li> </ul> 	<ul style="list-style-type: none"> <li>Very useful when interacting the driver</li> <li>Constrains for automated actions</li> <li>Cannot guarantee 100% operation</li> </ul>

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## Conclusions

- Legal and consumer requirements are becoming more complex and diverse
- Safety developments are mainly being lead by consumer test programmes, both for active and passive safety functionalities
- Brand image is affected by the safety performance
- It is not clear whether the future increase of active safety might help to stable or reduce
  - Test configurations
  - Test number
  - Passive safety components
  - Vehicle weightas different considerations need to be made.





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# MF2025

Automotive Frontiers.