

## AEBS-12 – Industry Input

## **Car to Bicycle – Why Car2Bicycle AEBS is such a challenge**

## Why Car2Bicycle AEBS is a much greater challenge than Car2Car or Car2Pedestrian?

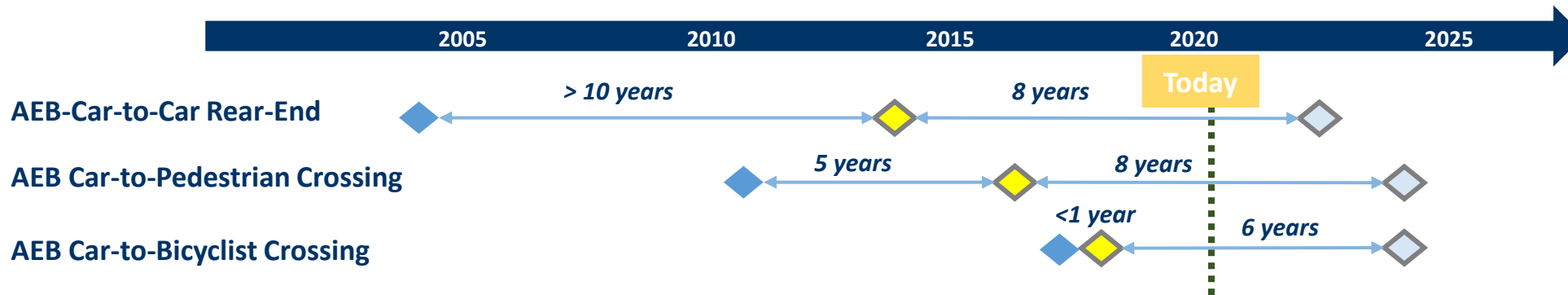
- **At the lower speed limit:** Stable detection of a bicycle is far more difficult than that of a pedestrian.
  - The limiting factor of performance is the field of view of the sensing system.
  - Due to the speed relation, decisions often need to be made while the bicycle is at the edge of the detection area.
  - In order to make a robust decision for intervention, the objects need to be detected and classified consistently over a period of time.
- **At the upper speed limit:** The PONR calculation used in system design is more complex than the basic assumptions used to calculate the maximum speed reduction.
  - Car2Pedestrian = intervention starts, when the pedestrian is only 30cm away from the path of the vehicle.
  - Car2Bicycle = intervention starts, when the bicycle is several meters away.
  - Therefore the risk of false activations is increased.
- **Car2Bicycle AEB is not yet as mature** and well established as vehicle or pedestrian detection (see next slide)
  - EURO NCAP implemented Car2Pedestrian in 2016
  - EURO NCAP implemented Car2Bicycle in 2018

# AEB IWG 12 – Industry Input

## Robustness of Car2Bicycle AEB



Examples: Selected ADAS features – Market Entry vs. 1<sup>st</sup> Euro NCAP requirements vs. Minimal Legal Regulations



◆ Market Entry (in premium segment)

◆ 1<sup>st</sup> Euro NCAP requirements introduced

◆ Type Approval Regulation



## **Car2Bicycle – Influence of the bicycle speed**

#### 5.2.3.4. a) with unobstructed crossing bicycles with a lateral speed component of not more than 15 km/h;

##### ► Problem:

Different bicycle velocities will lead to different avoidance speeds. If we include a table in the regulation it will only apply to one specific bicycle velocity. If a speed range for the bicycle is defined, we either need to include various tables or we need to agree to use the values of the lowest achievable speed reduction for all bicycle speeds.

However, it might not be necessary to define a bicycle speed range since we are bound by this sentence: “It is recognised that the performances required in this table may not be fully achieved in other conditions than those listed above. However the system shall not deactivate or unreasonably switch the control strategy in these other conditions. This shall be demonstrated in accordance with Annex 3 of this Regulation.”

##### ► Proposal:

Change the sentence to

(a) With unobstructed **perpendicularly (90°+/-3°)** crossing bicycles with a speed of 15 **+0/-2** km/h;

**Car to Bicycle – Justification for a two step approach  
or generally increased lower avoidance speed**

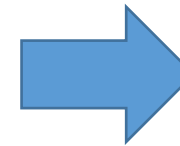
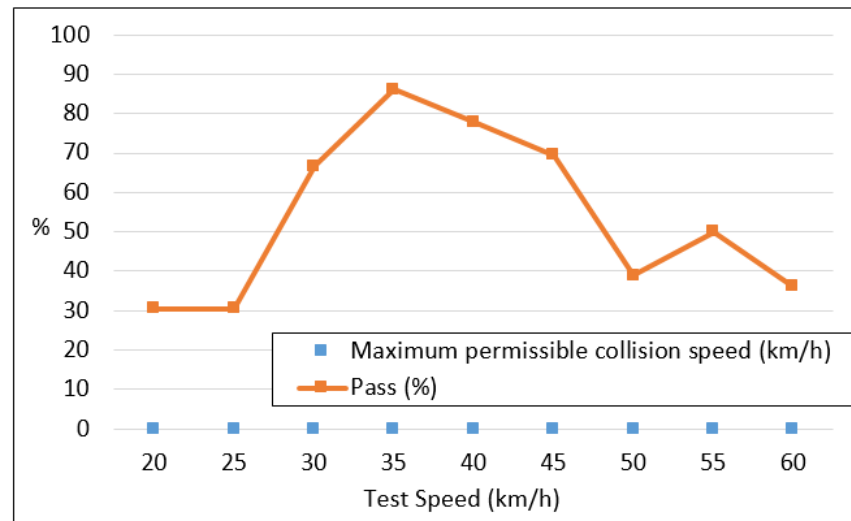
# AEB IWG 12 – Industry Input

Two step approach

Collision avoidance in the speed range of 20-60km/h does not reflect the performance of today's AEB systems.

## EURO NCAP Test results (according to AEBS-10-04))

Number of vehicles	Pass at 20 km/h	Pass at 42 km/h	Pass at 60 km/h	Pass at all test speeds	Fail at all test speeds
36	31 %	69 – 78 %	36 %	6 %	8 %



## Impact speed acc. to Industry proposal

### Maximum Impact Speed (km/h) for $M_1^*$ (Step 1)

Subject vehicle speed (km/h)	Maximum mass	Mass in running order
35	0	0
40	10	10
45	25	25
50	30	30
55	35	35
60	40	40

### Maximum Impact Speed (km/h) for $M_1^*$ (Step 2)

Subject vehicle speed (km/h)	Maximum mass	Mass in running order
25	0	0
30	0	0
35	0	0
38	0	0
40	10	10
45	25	25
50	30	30
55	35	35
60	40	40



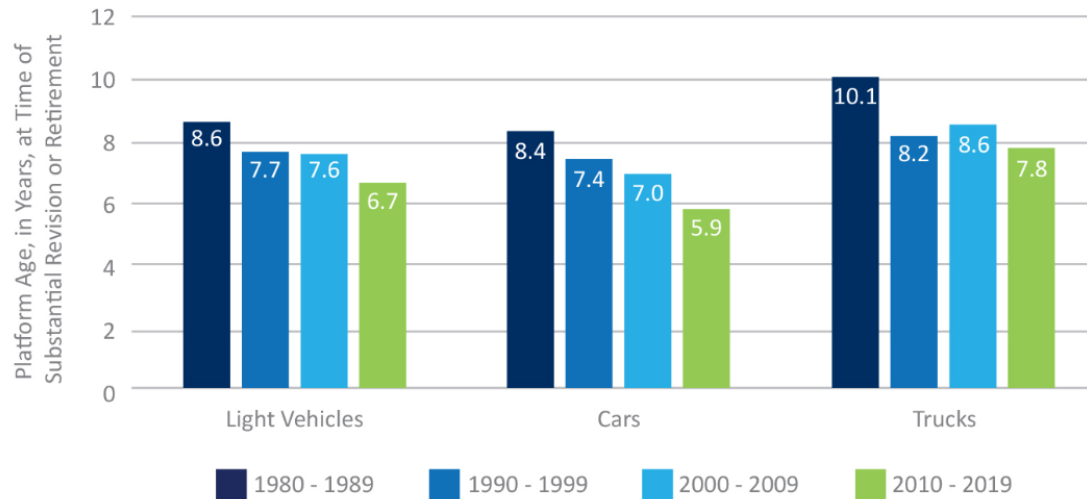
# AEB IWG 12 – Industry Input

Justification for increasing the lower avoidance velocity



## Automotive Product Development Cycles.

Chart 1: Average Platform Longevity by Decade of Introduction and Vehicle Type



Vehicle model	Production Period
RR Ghost	2010-20??
RR Phantom VII	2003-2017
Bentley Mulsanne	2009-2020
VW T5/6	2003-20??
Renault Twingo 1	1993-2006
Fiat Panda 1	1980-2003
Fiat Cinquecento (500)	2007-2020

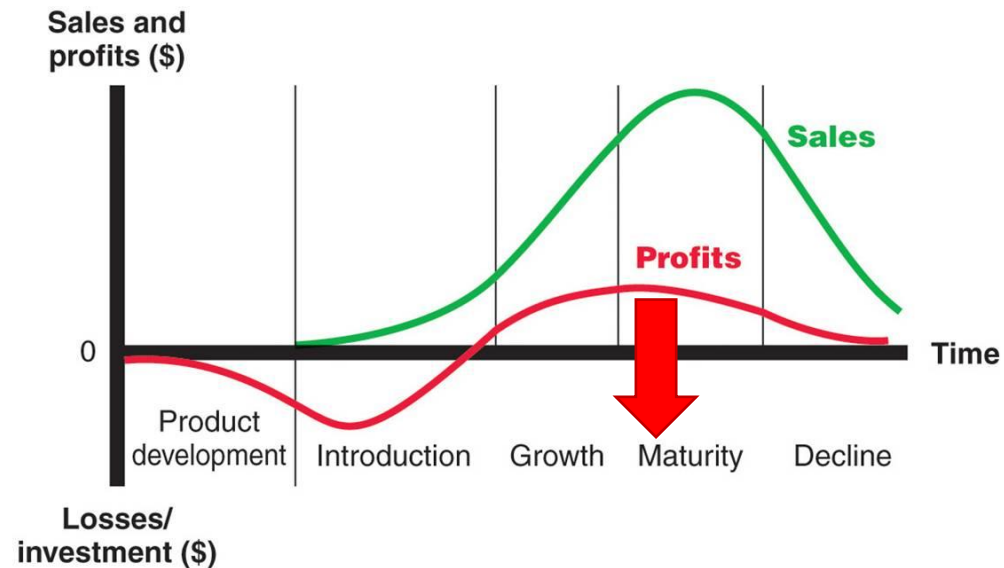
- ▶ If the average platform longevity is assumed to be 6.7 years, additionally a development time of 3-5 years has to be taken into account. Especially for small-scale series the platform longevity can be significantly longer.
- ▶ Even assuming average development and production periods the AT date for C2B in 07/2026 will affect vehicles whose development started around 2015.

# AEB IWG 12 – Industry Input

Justification for increasing the lower avoidance velocity



## Automotive Product Life Cycle.



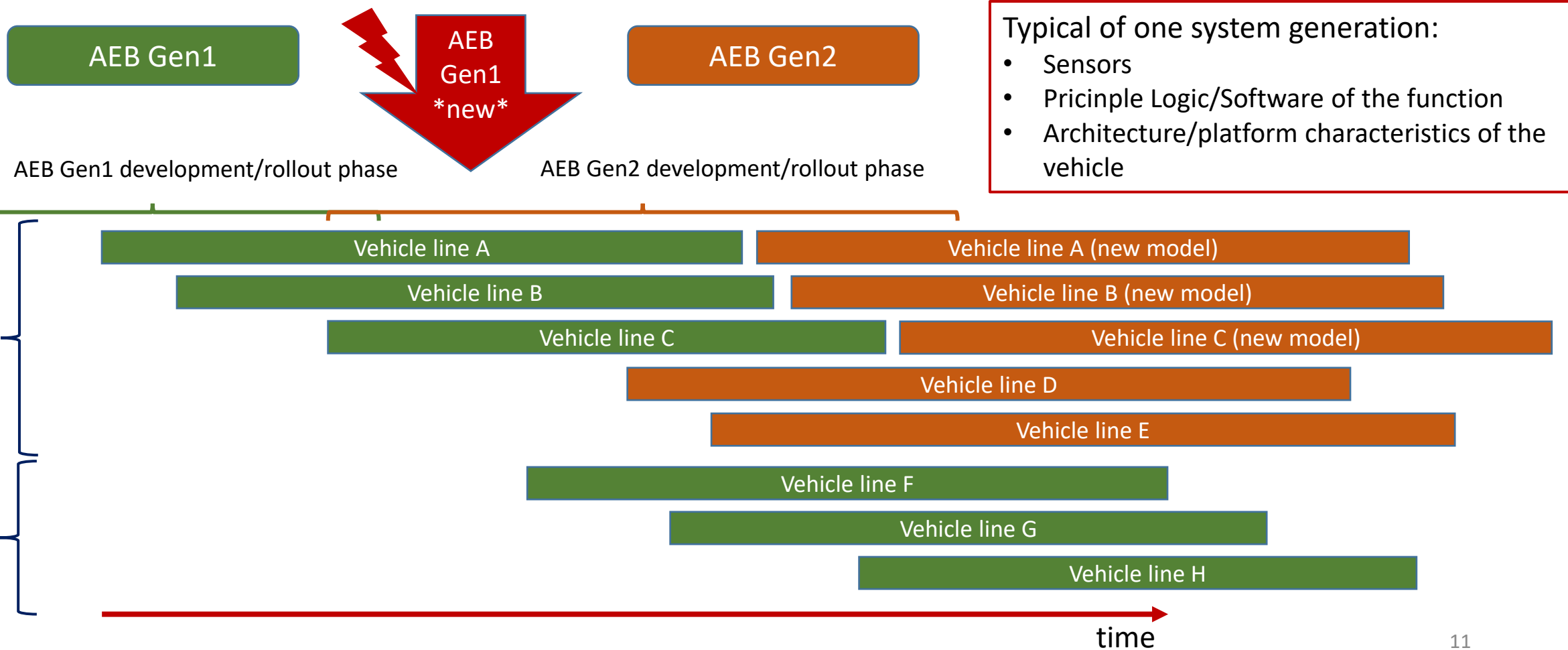
- ▶ Regulation changes in late stages of the product life cycle will necessitate unplanned investments and affect the profitability of the vehicle model.
- ▶ This can force an early end of production.

Source: <https://marketing-insider.eu/marketing-explained/part-iii-designing-a-customer-driven-marketing-strategy-and-mix/product-life-cycle-strategies/>

# AEB IWG 12 – Industry Input

Justification for increasing the lower avoidance velocity

Why is it not possible to rework an entire AEB function within the lifecycle of a vehicle?



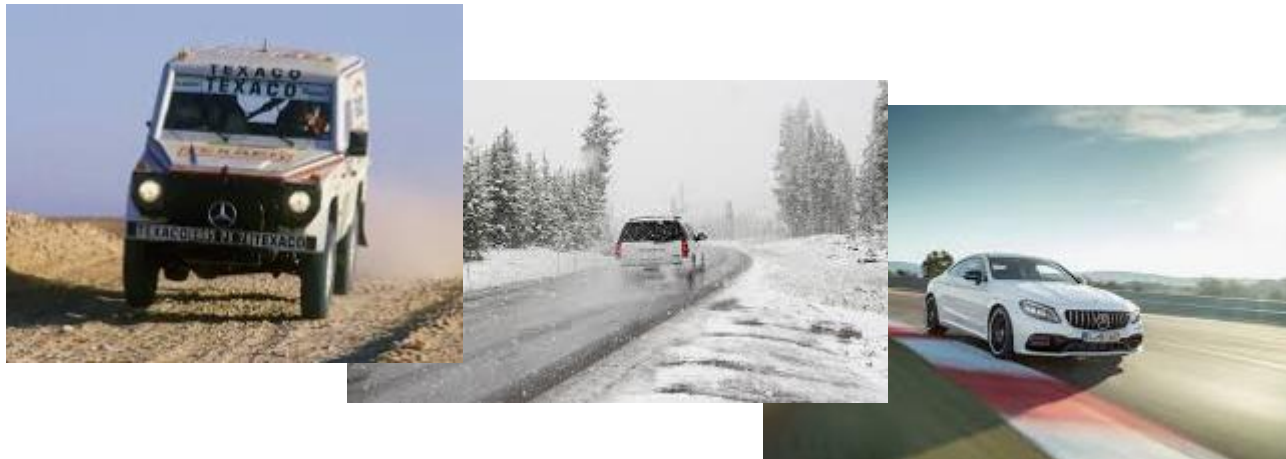


## **Automatic Deactivation of AEBS**

## Seeking Clarification that deactivation of the AEBS as a response to the ESC being unavailable is considered „automatic deactivation“

### What causes this need for clarification?

- In a lot of vehicles ESC cannot be fully deactivated, but only reduced to a very late/reduced intervention, which will likely not lead to a deactivation of the AEBS
- Some special vehicles provide, due to their operating environments, the possibility to fully deactivate the ESC
- Both, the deactivation of ESC as well as the automatic deactivation of the AEBS will be indicated to the driver



### Why is it necessary to provide the possibility to fully deactivate the ESC in these vehicles?

- Under certain circumstances, any ESC intervention, even a reduced one, can be unwanted by the driver.

### Why is it necessary then to deactivate the AEB also?

- Under these circumstances, an AEB intervention could lead to unexpected vehicle behavior



**GSR requirement to “easily suppress audible warnings”**

## AEB IWG 12 – Industry Input

“easily suppress audible warnings”



Is the GSR provision „easily suppress audible warnings“ sufficiently reflected by UN-R152?

GSR has the requirement:

Art. 9 4. (c) it shall be possible to easily suppress audible warnings, but such action shall not at the same time suppress system functions other than audible warnings;

In the Tokyo session IWG AEBS settled for the provision

5.3.1. The AEBS shall provide the means for the driver to interrupt the collision warning and the emergency braking.

**Industry understanding:**

UN-R152 was drafted taking the guidance from the GSR into account. Therefore we understand an approval to UN-R152 sufficient to comply with the general AEB related provisions of the GSR.

➤ Is this understanding correct?