# Proposal for target performance of Car to Bicycle scenario

11th meeting of the Informal Working Group on AEBS for light vehicles
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JAPAN AUTOMOBILE STANDARDS INTERNATIONALIZATION CENTER

# Background of Japan proposal

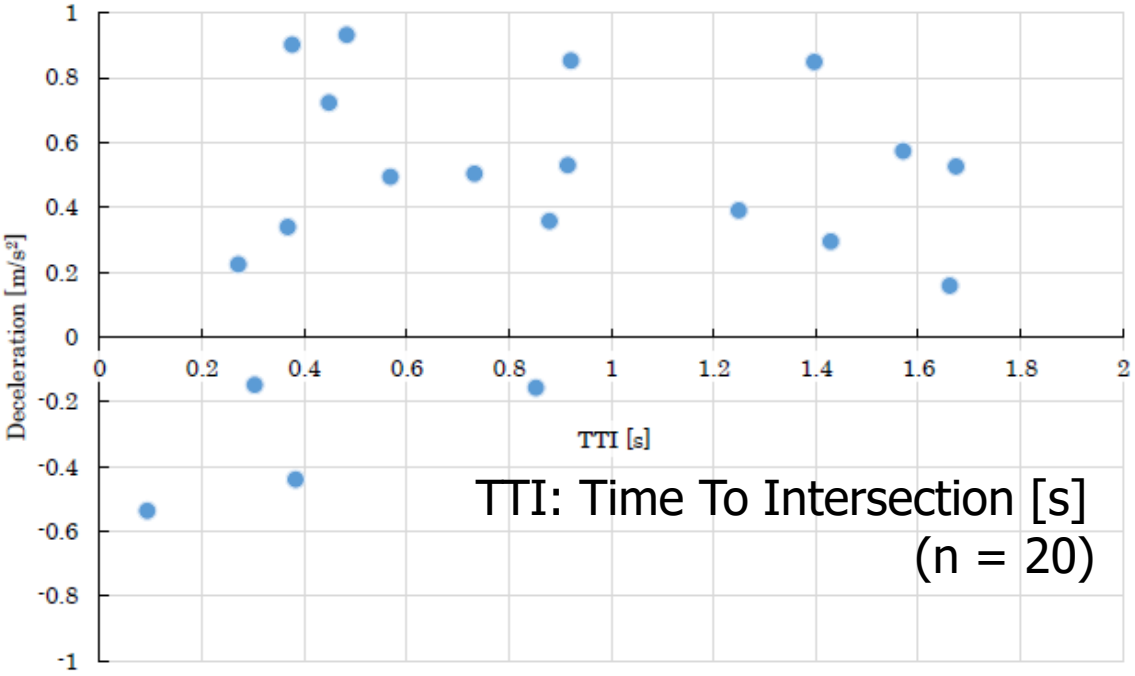
- The situation that a bicycle doesn't take avoidance action be able to consider as a typical case of accident

- The AEBS performance requirement that takes into account the deceleration of bicycle impose braking performance of the bicycle indirectly.

⇒C2B requirements should start at the same value as the C2P requirements on 01 series.

# Behavior of cyclist - Data of observation in an intersection -

These data was measured by observing the intersection with a video camera.




TTI: Time To Intersection [s]
(n = 20)

This data shows the deceleration when the bicycle and the vehicle approach.

Bicycle was not completely stopped before an intersection.

The behavior of cyclist in the intersection (n = 256)

| | Stop | Stop pedaling | Continue pedaling |
|---|---|---|---|
| Female | 3 % | 76 % | 21 % |
| Male | 1 % | 75 % | 24 % |

# Way of thinking

Apply the pedestrian scenario approach which is the same crossing scenario . This doesn't depend on the deceleration of the bicycle.

⇒bicycle conditions

- Speed: 15km/h
- Behavior: crossing with constant speed

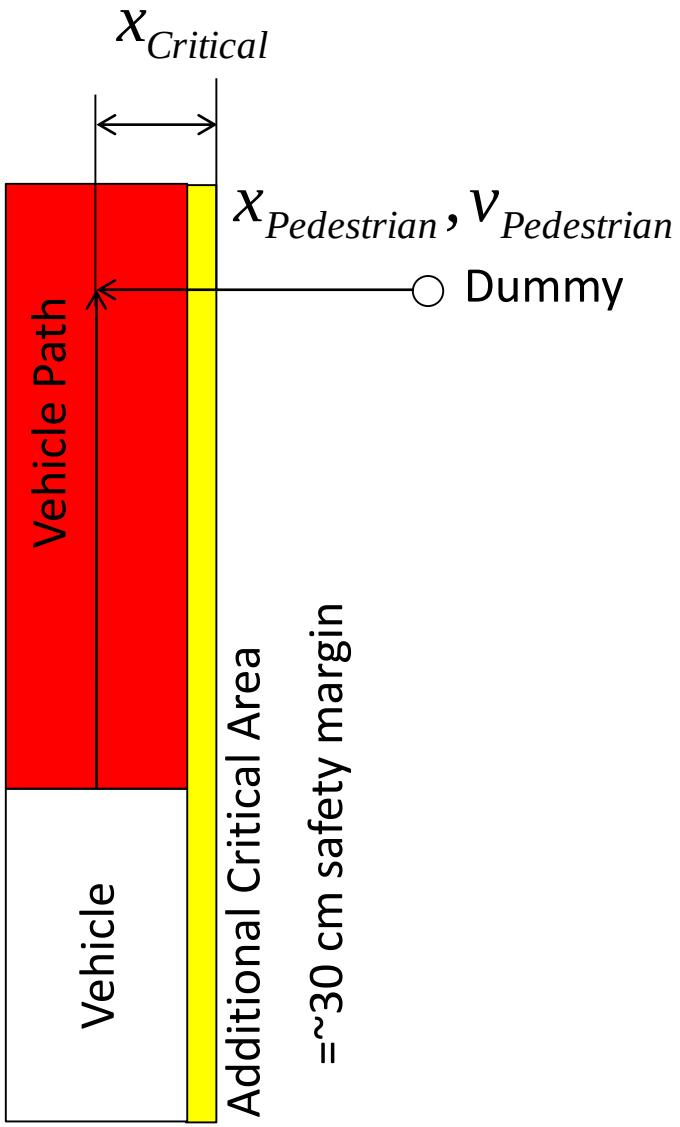



Fig.1 Critical-Area-Approach on pedestrian study

# Approach

The point of difference is to change the definition of the safety margin. The margin of pedestrian is 0.3m. It seems about pedestrian thickness. But length of bicycle is much longer.

⇒It's reasonable to set the margin the bicycle length as 1.9m

And the bicycle speed is faster than pedestrian , the driver should reacts before the bicycle enters the lane edge.

⇒change the critical point from vehicle edge to lane edge. Consider it as 0.75m.
(It is based on 3.5m as the lane width and 2m as the vehicle width）

χcritical= road edge 1.75m＋margin 1.9m=3.65m
Time for VUT = 3.65m/（15km/h/3.6)＝0.876s

**This result show that the performance is almost the same as C2C that TTC is 0.9s.**

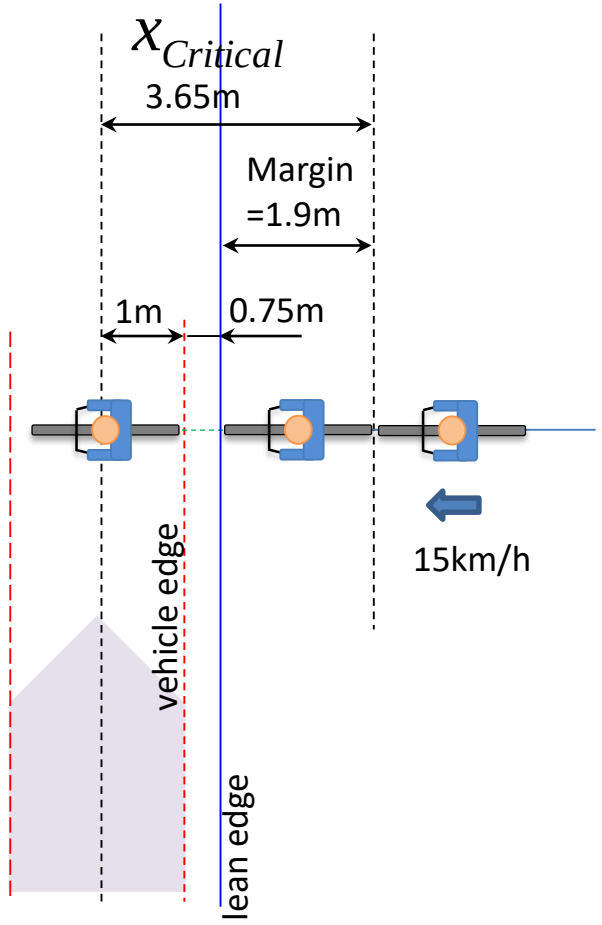



Fig.2 Critical-Area-Approach on bicycle study

# Proposal of Performance

Table. 2　C2B maximum relative impact speed on best activation timing

| C2B (These value is same as C2P on 01 series) | | collision speed (km/h) | | | |
|---|---|---|---|---|---|
| | | M1 | | N1 | |
| | | Maximum mass | Mass in running order | Maximum mass | Mass in running order |
| Activation TTC (s) | | 0.9 | 0. 9 | 0.9 | 0.9 |
| MAX G (m/s$^2$) | | 9 | 9 | 9 | 9 |
| Time to 10m/s2 (s)<br>Jark (m/s$^2$/s) | | 0.66<br>15.15 | 0.6<br>16.67 | 0.73<br>13.69 | 0.6<br>16.67 |
| Full avoidance speed(km/h) | | 40 | 42 | 38 | 42 |
| 相対速度 (km/h) | 20 | 0 | 0 | 0 | 0 |
| | 25 | 0 | 0 | 0 | 0 |
| | 30 | 0 | 0 | 0 | 0 |
| | 35 | 0 | 0 | 0 | 0 |
| | 38 | 0 | 0 | 0 | 0 |
| | 40 | 0 | 0 | 10 | 0 |
| | 42 | 10 | 0 | 15 | 0 |
| | 45 | 15 | 15 | 20 | 15 |
| | 50 | 25 | 25 | 30 | 25 |
| | 55 | 30 | 30 | 35 | 30 |
| | 60 | 35 | 35 | 40 | 35 |

Thank you!