

Traffic Accidents caused by Lane Departure in Japan

- **Data of Traffic Accidents
around Japan**

Discussion points in 74th GRRF

- Q1. What is the result of the Impact Assessment of LKAS?
- Q2. Does making a new regulation become restriction to the new technologies?
- Q3. Which is better, amendment of R79 or making a new regulation?
- Q4. Should LKAS become “mandatory” or “if fitted”?
- Q5. What is the schedule? (Is setup of the informal meeting necessary?)

Discussion points in 74th GRRF

Q1. What is the result of the Impact Assessment of LKAS?

- In Japan, concerning commercial vehicles, the number of lane departure accident caused by disturbance of consciousness or drowsy driving which cannot be covered by LDWS was 7608, and also the number of fatal accident was 443 for 10 years from 2001 to 2011.

Discussion points in 74th GRRF

Q1. What is the result of the Impact Assessment of LKAS?

- In Europe, concerning category 1,2,3 vehicles, it is estimated that the number of lane departure accident caused by disturbance of consciousness or drowsy driving was maximum 19313 incidents, and also the number of fatal accident was maximum 1131 for one year in 2006.
- Not all the above accidents can be prevented by LDWS. However it is considered that if the vehicles equipped with LKAS, most of them might be prevented.

The number of Lane Departure Accidents of commercial vehicles (in Japan)

- Lane Departure Accidents on commercial vehicles - (2009 - 2011)
Percentage of Disturbance of Consciousness and Drowsy Driving

	Total number of Lane Departure Accidents (A)	Disturbance of Consciousness (B) (within A)	Drowsy Driving (C) (within A)
Number of Cases	1245	107	118

	(B) / (A)	(C) / (A)
Percentage [%]	8.55	9.55

Estimated number of Lane Departure Accidents of Category 1-3 (in Japan)

The number of the lane departure accidents (the disturbance of consciousness and the drowsy driving situation) is calculated by the percentage of lane departure accidents on commercial vehicles.

- The number of Lane Departure Accidents in case of Disturbance of Consciousness and Drowsy Driving - (2001 - 2011)

Fatalities	Disturbance of Consciousness (X)	Drowsy Driving (Y)	X + Y
Category 1 – 3 (Category M/N)	209	234	443
Number of Accidents	Disturbance of Consciousness (X)	Drowsy Driving (Y)	X + Y
Category 1 – 3 (Category M/N)	3594	4014	7608

Estimated number of Lane Departure Accidents

(in EU)

Transport Research Laboratory



Data from
 STATS19(GB)
 GIDAS(D)
 (provided by TRL)



Study on lane departure warning and lane change assistant systems
 Final report
 by C Vavivakis, T L Smith, M Pitcher and R Smith
 PPR 374
 ENTR/05/17.01 Technical assistance and economic analysis in the field of legislation pertinent to the issue of automotive safety
 PROJECT REPORT

Table 6-1. Target population for LDW.

Equipped vehicle type	Casualty severity	Target population – number of casualties							
		Equipped vehicle		Other vehicle		VRU		Total	
		Min	Max	Min	Max	Min	Max	Min	Max
M1/N1	Fatal	903	5,949	67	612	64	620	1,034	7,181
	Serious	5,773	31,539	1,026	7,530	249	3,197	7,048	42,266
	Slight	21,867	64,838	7,028	19,549	459	1,361	29,354	85,748
M2/M3	Fatal	7	189	0	7	0	5	7	201
	Serious	51	1,045	0	21	0	0	51	1,066
	Slight	338	1,000	27	82	8	23	373	1,105
N2/N3	Fatal	23	111	0	65	0	5	23	181
	Serious	135	615	19	213	3	315	157	1,143
	Slight	404	1,413	184	693	9	42	597	2,148

- The number of Lane Departure Accidents in case of Disturbance of Consciousness and Drowsy Driving based on the impact assessment of LDWS using the ratio of Japanese commercial vehicle accident -

Fatalities	Disturbance of Consciousness (X)		Drowsy Driving (Y)		X + Y	
	Min	Max	Min	Max	Min	Max
Category 1 – 3 (Category M/N)	80	534	89	597	169	1131

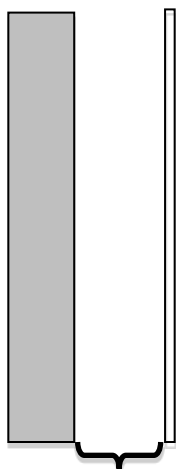
Number of Accidents	Disturbance of Consciousness (X)		Drowsy Driving (Y)		X + Y	
	Min	Max	Min	Max	Min	Max
Category 1 – 3 (Category M/N)	2522	9123	2817	10190	5340	19313

Estimation of Effectiveness of LDWS on the Japanese highway

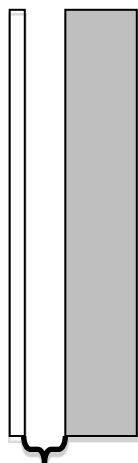
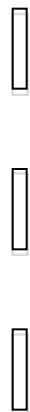
- **This estimation investigates the relationship between the effectiveness of LDWS and the road dimension in the Japanese highway**

Estimation of Effectiveness of LDWS on the Japanese highway

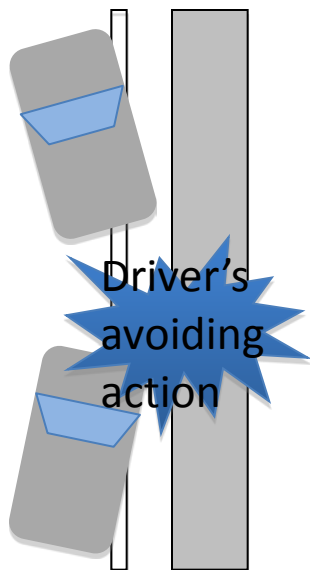
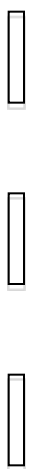
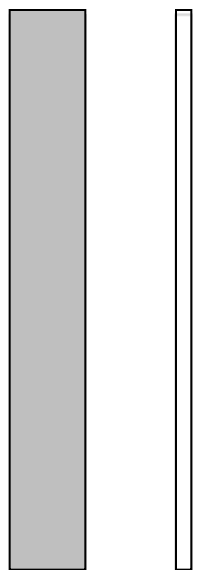
Dimension of Highway in Japan



A(Left side)



B(Right side)

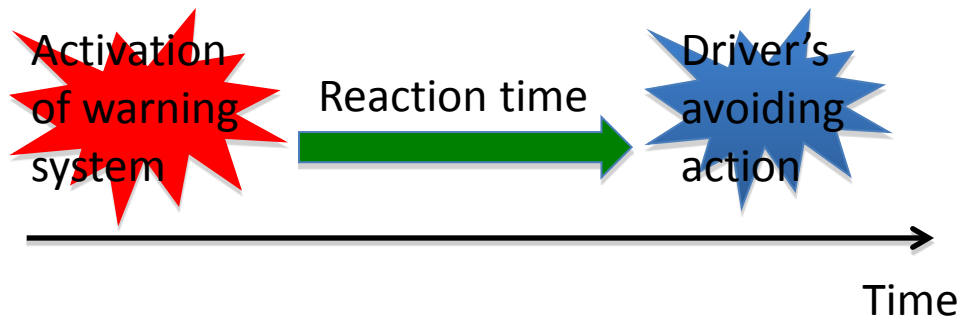


Road dimension on the outside of the lane (Regulation of highway road dimension in Japan)

A (Left side)	B (Right side)
2.5m	1.25m
1.75m	0.75m
1.25m	0.5m
1.0m	

Estimation calculates the timing of the driver's avoiding action.

- When the driver can control the steering after the warning system activation -



Estimation of Effectiveness of LDWS on the Japanese highway

Requirements of LDWS

6.5.2. The LDWS shall provide the lane departure warning indication mentioned in paragraph 5.4.1. at the latest when the outside of the tyre of the vehicle's front wheel closest to the lane markings crosses a line **0.3 m** beyond the outside edge of the visible lane marking to which the vehicle is being drifted.

LDWS shall activate the warning system until the departing of 0.3m from the outside of the lane.

Rate of departure of LDWS

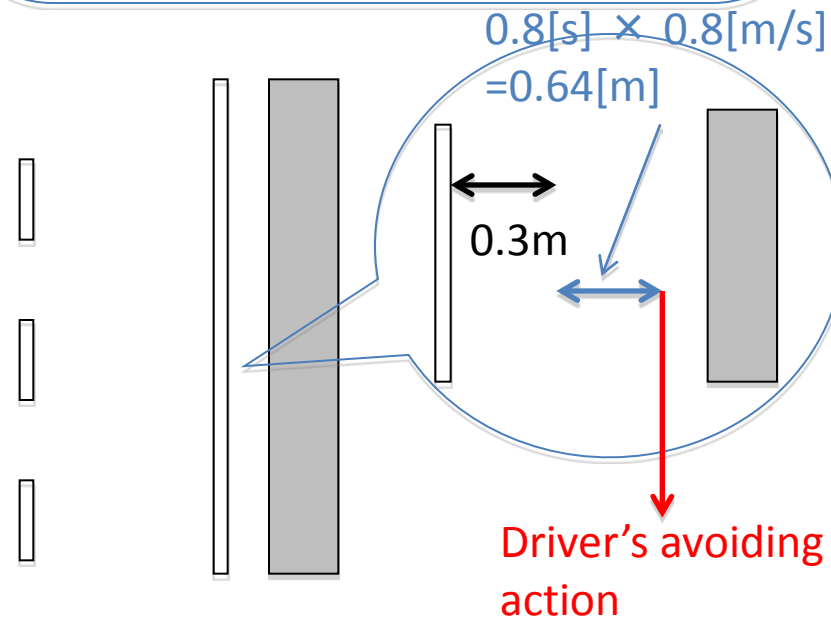
6.5.1. Maintaining the prescribed speed, gently drift the vehicle, either to the left or the right, at a rate of departure of between 0.1 and **0.8 m/s** so that the vehicle crosses the lane marking. Repeat the test at a different rate of departure within the range 0.1 and 0.8 m/s.

Maximum rate of departure is 0.8 m/s in test procedure of LDWS

Driver's response time in AEBS

A	Stationary target			Moving target			H	
	Timing of warning modes		Speed reduction (ref. paragraph 6.4.4.)	Timing of warning modes		Speed reduction (ref. paragraph 6.5.3.)		
	At least 1 haptic or acoustic (ref. paragraph 6.4.2.1.)	At least 2 (ref. paragraph 6.4.2.2.)		At least 1 haptic or acoustic (ref. paragraph 6.5.2.1.)	At least 2 (ref. paragraph 6.5.2.2.)			
M ₃ , N ₂ >8t and N ₃	Not later than 1.4 s. before the start of emergency braking phase	Not later than 0.8 s. before the start of emergency braking phase	Not less than 10 km/h	Not later than 1.4 s. before the start of emergency braking phase	Not later than 0.8 s. before the start of emergency braking phase	No impact	32 ± 2 km/h	1

Driver's response time is 0.8[s] for the purpose of collision avoidance.



Estimation of Effectiveness of LDWS on the Japanese highway

This estimation investigates the relationship between the effect of LDWS and the road condition in Japan

Conclusion:

When we take into account of the Japanese highway dimension, in some cases LDWS is not enough to avoid the vehicle hitting the side wall.

A (Left side)		B (Right side)	
Road dimension	Margin	Road dimension	Margin
2.5m	1.56	1.25m	0.31
1.75m	0.81	0.75m	-0.19(Collision)
1.25m	0.31	0.5m	-0.44(Collision)
1.0m	0.06	-	-

Calculating formula:

Margin= (Road dimension – Warning timing[0.3m]) – (Response time[0.8s] × Rate of departure[0.8m/s])

*Minus means that the driver control the steering after the vehicle collide the side wall.

Summary of LKAS Effectiveness Estimation

- In Japan, it is estimated that 44 fatalities can be reduced per one year in addition to the effectiveness of LDWS.
- In EU, by using Japanese accident data of disturbance of consciousness and drowsy driving , it is estimated that maximum 1131 fatalities can be reduced per one year in addition to the effectiveness of LDWS.
- In addition, when we take into account of the Japanese highway dimension, effectiveness of avoiding side wall hitting can be expected in the condition of no disturbance of consciousness and not drowsy driving .

Discussion points in 74th GRRF

Q2. Does making a new regulation become restriction to the new technologies?

- That is making the provisions as the minimum requirement to prevent the drivers confusion and becoming their safety worse because of various kinds of LKAS going on the market.
- That has to be provisions which avoid any inconsistency between current LDWS and LKAS.
- The provisions, which become disturbances for the development of the future LKAS technology, have to be avoided .

Discussion points in 74th GRRF

Q3. Which is better, amendment of R79 or making a new regulation?

- For Japan, we don't stick to establishing a new regulation.

Discussion points in 74th GRRF

Q4. Should LKAS become “mandatory” or “if fitted”?

- Japan does not see any necessity to make the LKAS regulation as mandatory.
- Since the purpose of the LKAS regulation would be to add the provisions as the minimum requirement to prevent the drivers’ confusion and decreasing safety because of various kind of LKAS available the market, “if fitted” is acceptable.

Discussion points in 74th GRRF

Q5. What is the schedule? (Is setup of the informal meeting necessary?)

- At the present, Japan doesn't stick to setting up of the Informal meeting.
- In GRRF, the time is very limited for sufficient discussion.
- We would like to propose the ad-hoc meeting between now and the next February, and based on the result of the ad-hoc meeting, we would like to consider the Informal meeting if necessary.
- We would like to propose to hold the ad-hoc meeting in November 2013 in Paris, Geneva or Sweden.