

Informal document **GRB-59-09**  
(59<sup>th</sup> GRB, 28-30 January 2014,  
agenda item 3 (b))

# Japan proposal for Flat Front Light N1 Vehicle



Flat Front Light N1 Vehicle: GVM  $\leq$  2.5 ton  
PMR (power to mass ratio) of GVM  $\leq$  35kW/t  
Engine capacity  $\leq$  660cc  
d value  $<$  1,100mm

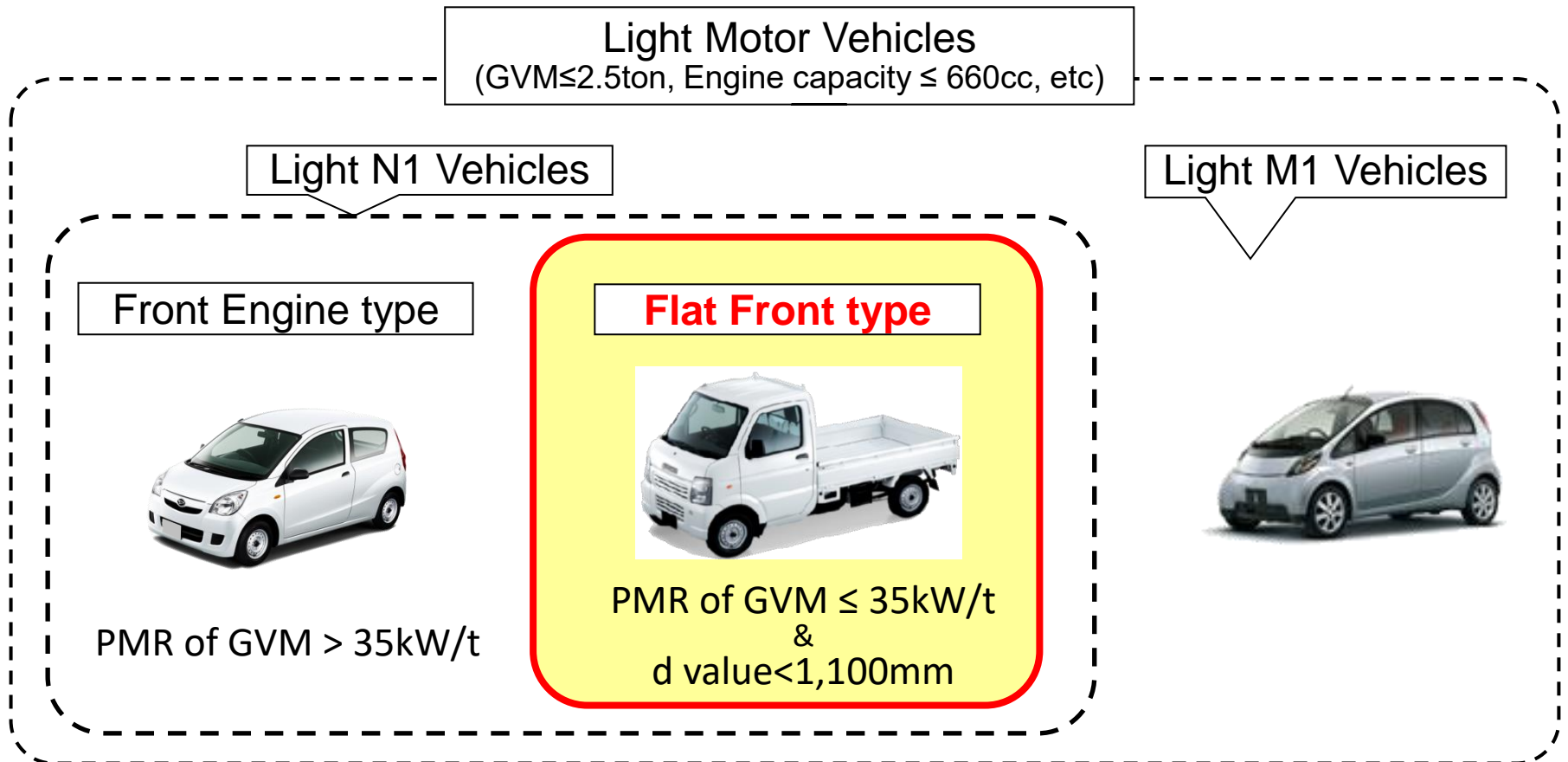
59<sup>th</sup> GRB  
(28-30 January 2014)  
JASIC

*Japan's proposal is  
already included into  
the informal document  
"GRB-59-04"  
submitted by the GRB  
Expert Group on R51.*

# FOR BASIC UNDERSTANDINGS

“Light Motor Vehicle” consists of “Light N1 Vehicle” and “Light M1 Vehicle”.  
“Light N1 Vehicle” consists of “**Flat Front type**” and “Front Engine type”.

This proposal from Japan is only for “**Flat Front type**” of Light N1 Vehicle.



# FOR BASIC UNDERSTANDINGS (additional)

6.2.2.1

Veh.Cat	Vehicles used for the carriage of goods	Phase1	Phase2	Phase3*/
M1	PMR ≤ 120kW/t	72	70	68
	...	...	...	...
...	...	...	...	...
Veh.Cat	Vehicles used for the carriage of goods	Phase1	Phase2	Phase3*/
N1	GVW ≤ 2.5t	72	71	69
	GVW > 2.5t	74	73	71
...	...	...	...	...

**Light Motor Vehicles**  
(GVM ≤ 2.5ton, Engine capacity ≤ 660cc, etc)



Light M1 Vehicles

Light N1 Vehicles



Front Engine type  
(=PMR of GVM > 35kW/t)

**Flat Front type**  
(=PMR of GVM ≤ 35kW/t & d value < 1100mm)

Japan's proposal is already included into the informal document "GRB-59-04" submitted by the GRB Expert Group on R51.

**Japan's proposal**

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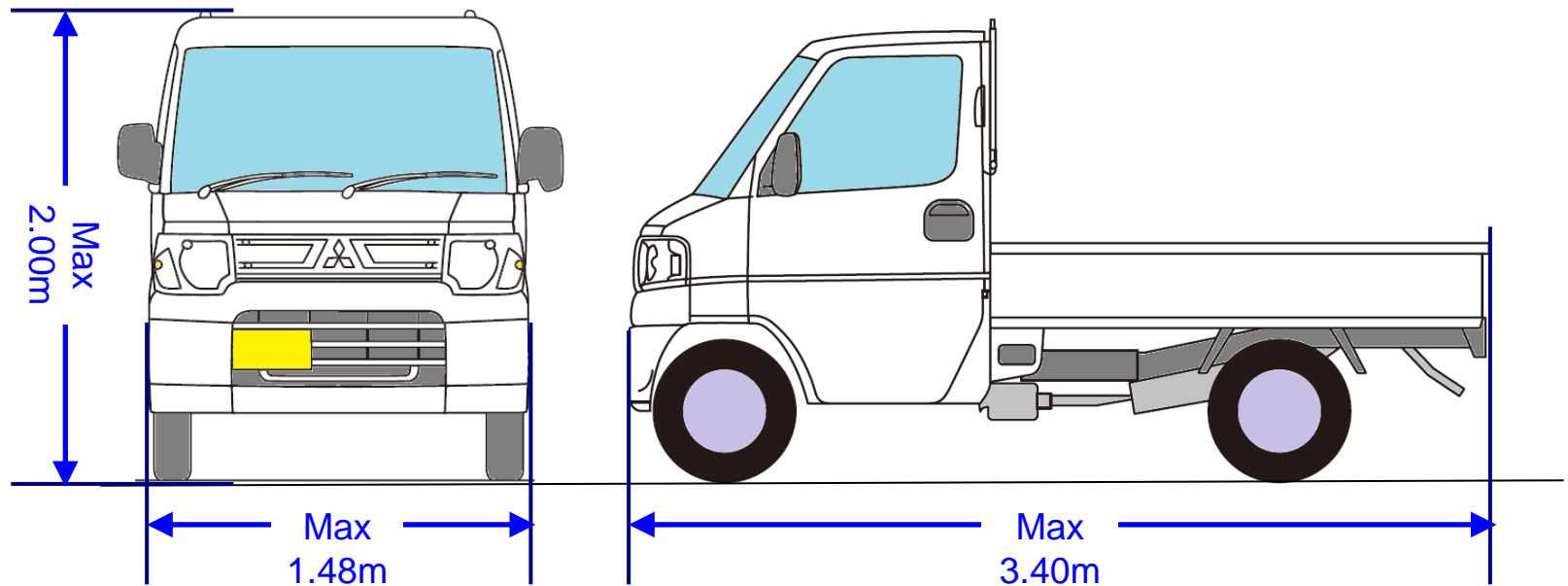
# 1. Japanese Regulations for Light N1 Vehicles

Light N1 Vehicle is defined as follows.

## (1) Exterior dimensions

Length  $\leq 3.40\text{m}$ , Width  $\leq 1.48\text{m}$ , Height  $\leq 2.00\text{m}$

【Enforcement Regulations for Road Vehicles Act】  
Article 2 Attached Table 1



# 1. Japanese Regulations for Light N1 Vehicle



## (2) Engine capacity

Engine capacity  $\leq$  660cc

【Enforcement Regulations for Road Vehicles Act】  
Article 2 Attached Table 1

## (3) Maximum loading capacity (payload)

Maximum loading capacity  $\leq$  350kg

【Light Motor Vehicle Inspection Activity Regulations】  
3-3-67

## (4) Maximum seating capacity

Maximum seating capacity  $\leq$  4persons

【Examination Standards for New Type Vehicle】  
Annex 2-26-3

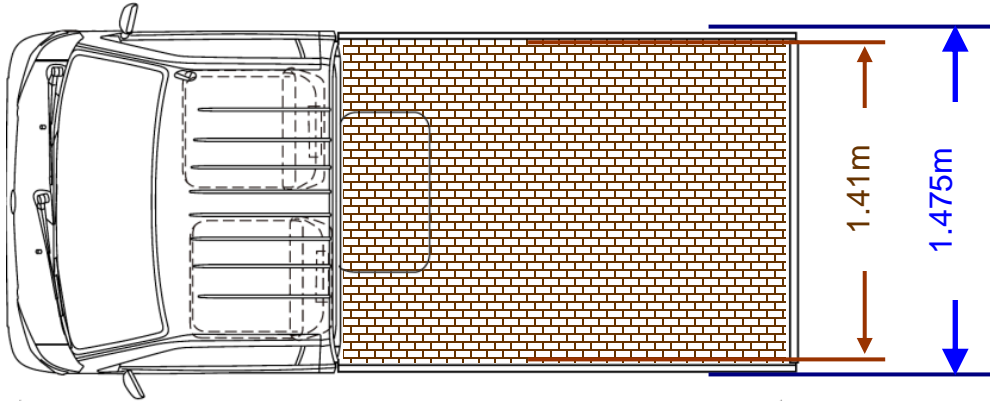
## (5) bed size (loading space)

bed size  $\geq$  0.6m<sup>2</sup>

【Classification of Use of Motor Vehicles, etc.】  
4-1-3

## 2. Bed size (loading space)

Japanese regulation requires that bed size of Light N1 Vehicles is 0.6m<sup>2</sup> or more. There is no regulations stipulating the maximum bed size, while in practice it is as close as possible to the exterior dimensions of the vehicle.

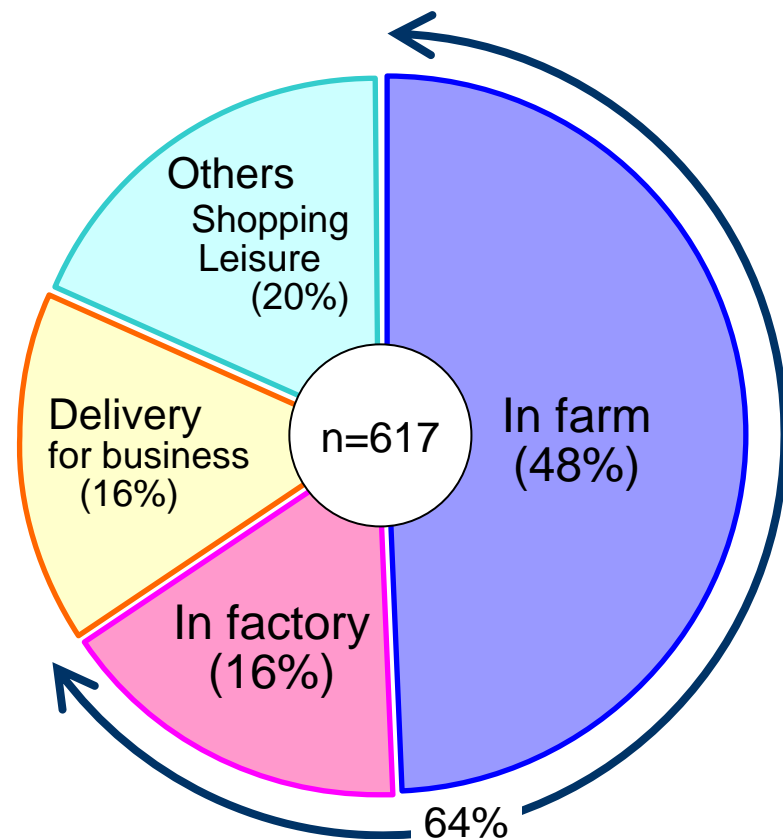


Bed size example of Flat Front Light N1 vehi  
L1920mm x W1410mm ; 2.7m<sup>2</sup>



### 3. Usage of the Flat Front Light N1 Vehicles

48% of Flat Front Light N1 Vehicles are used in agricultural area only.  
64% of Flat Front Light N1 Vehicles are driven near such area (farm or factory), far from urban area.



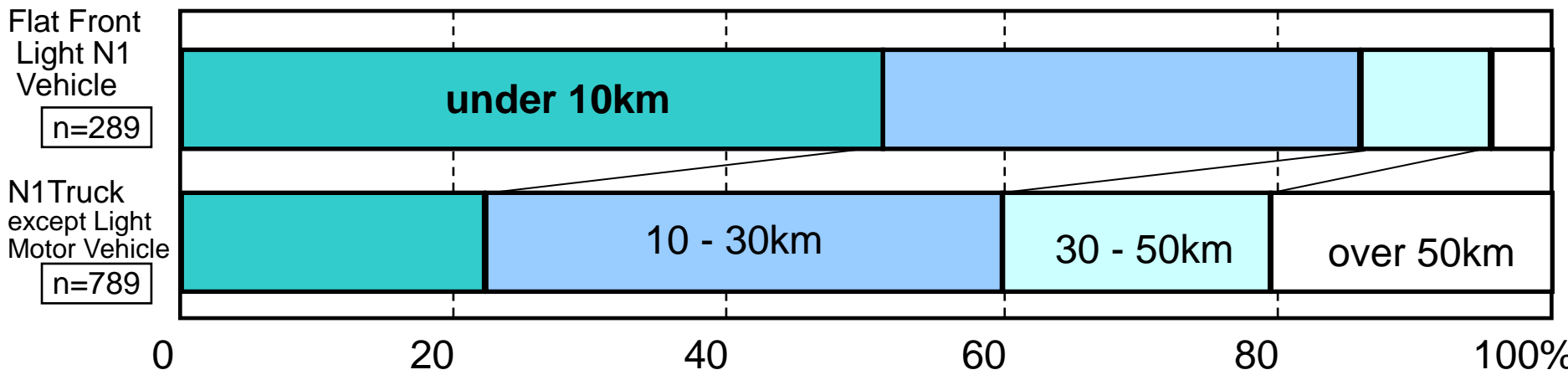
Driven near farm and factory area, far from urban area



### 3. Usage of the Flat Front Light N1 Vehicles

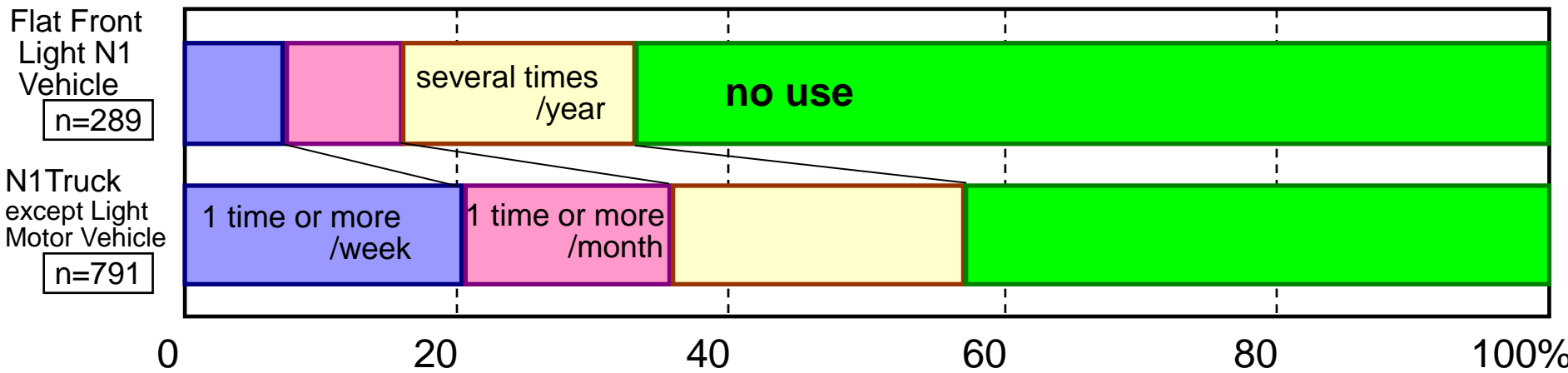
#### ◆ The mileage in one run

Most users of Flat Front Light N1 Vehicles use the vehicle within their neighborhood only, not for long-distance travel.



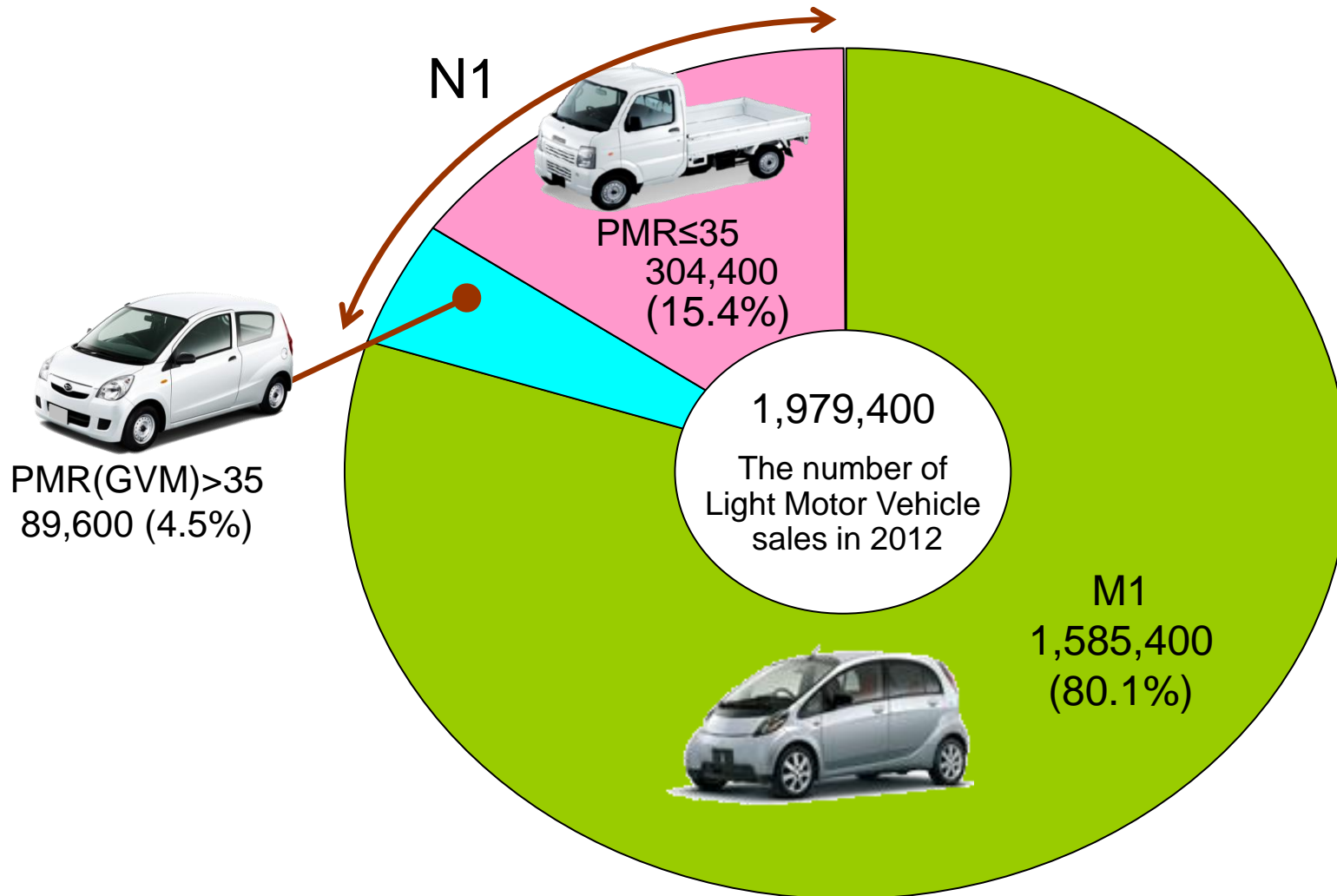
#### ◆ Counts of usage on highway

Most users of Flat Front Light N1 Vehicles do not use the vehicle on highway, because it is hardly possible to run at about 100km/h.



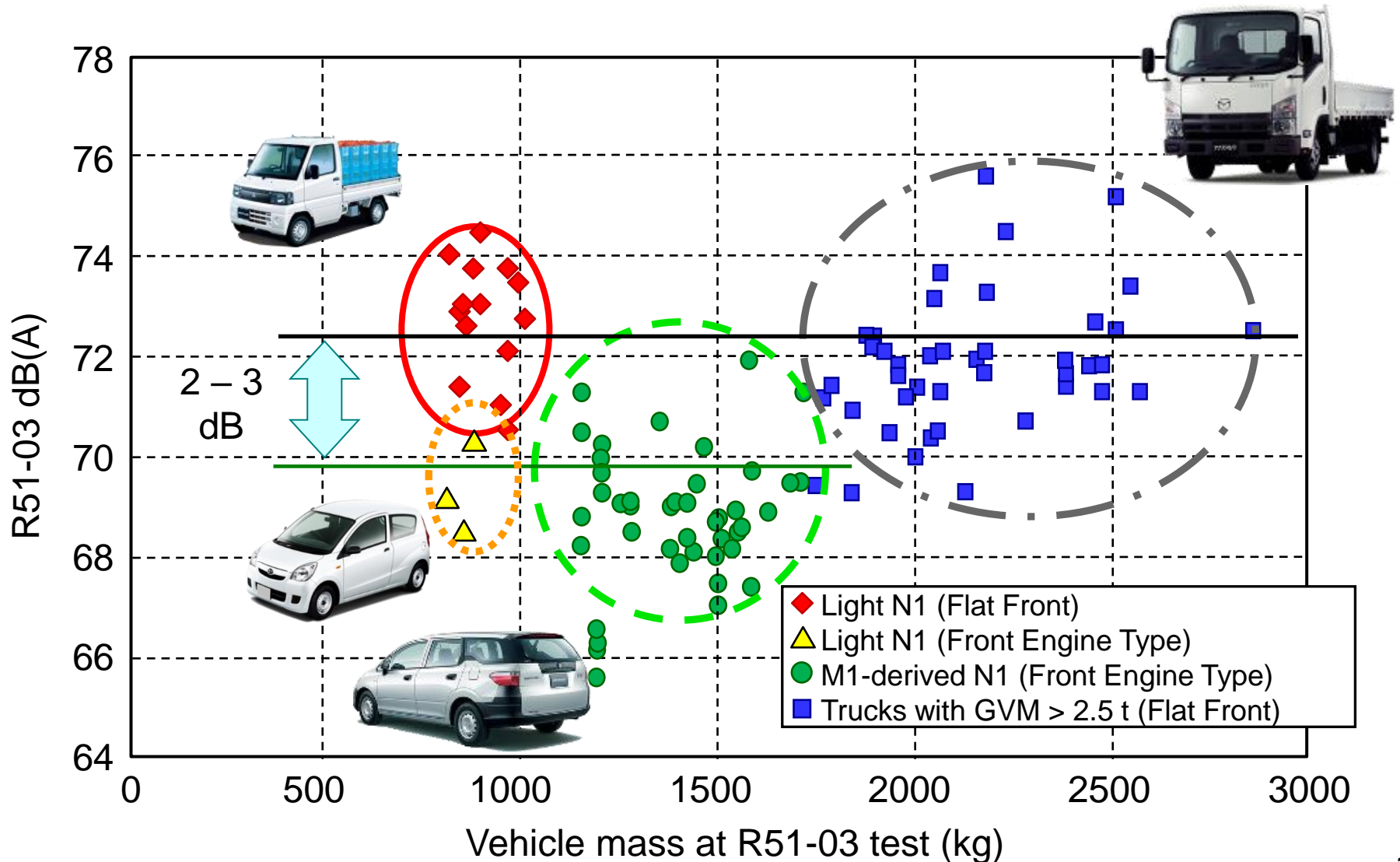
## 4. Sales of Light N1 Vehicles in Japan

The number of sales of Flat Front Light N1 Vehicles is only about 15% of the total sales of Light Motor Vehicles.



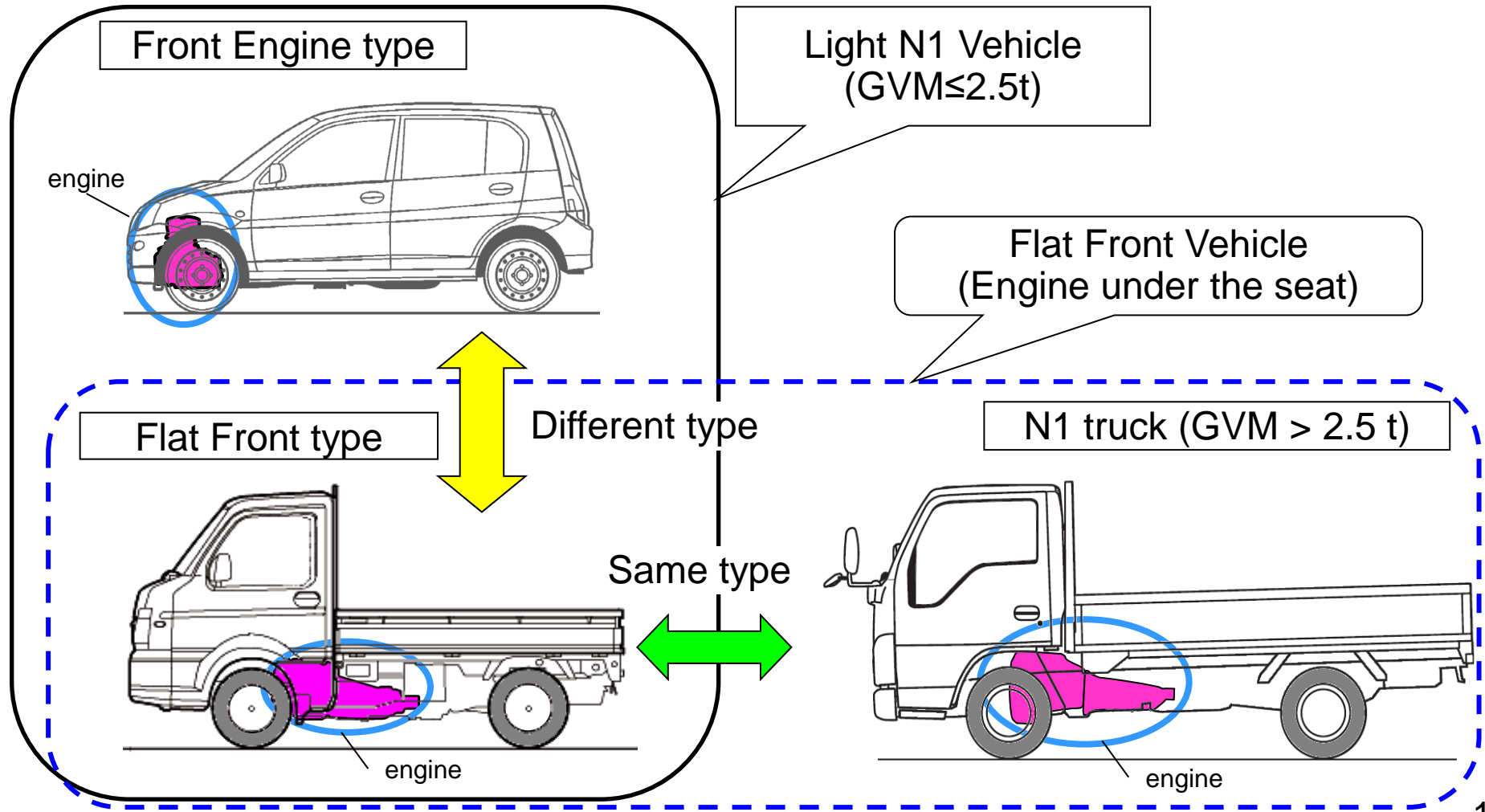
## 5. Noise Levels of Flat Front Light N1 Vehicles in the New Test (R51-03)

The noise levels of Flat Front Light N1 Vehicles are higher than those of Front Engine Type by about 2 – 3 dB and are almost the same as trucks with GVM > 2.5 t.



## 6. Characteristics of Flat Front Light N1 Vehicles

Flat Front Light N1 vehicles are configured differently from Front Engine type vehicles (so-called M1-derived N1 vehicles) and have the same configuration as N1 vehicles (trucks) with GVM > 2.5 t.

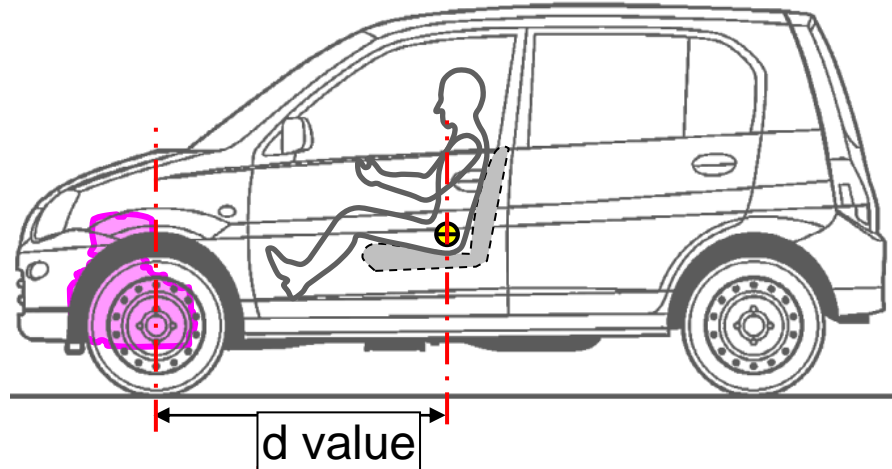


## 6. Characteristics of Flat Front Light N1 Vehicles

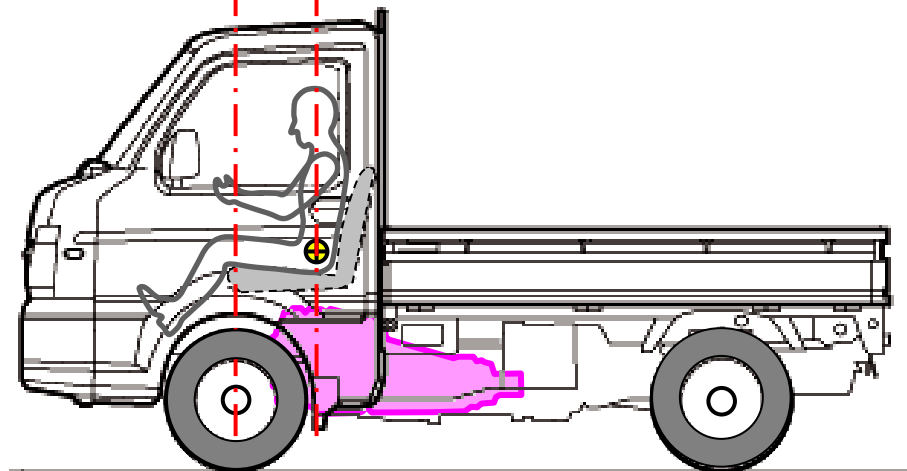
In Flat Front type vehicles, differently from Front Engine type vehicles, the engine and front tyre are located below the occupant to ensure large cargo space. Therefore, d value, which expresses the positional relation between occupant and front tyre can be used to classify these two vehicles.

d value: Horizontal distance between the front axle and the driver's seat R-point

Front Engine type  
(M1-derived N1)



Flat Front type  
(commercial N1)

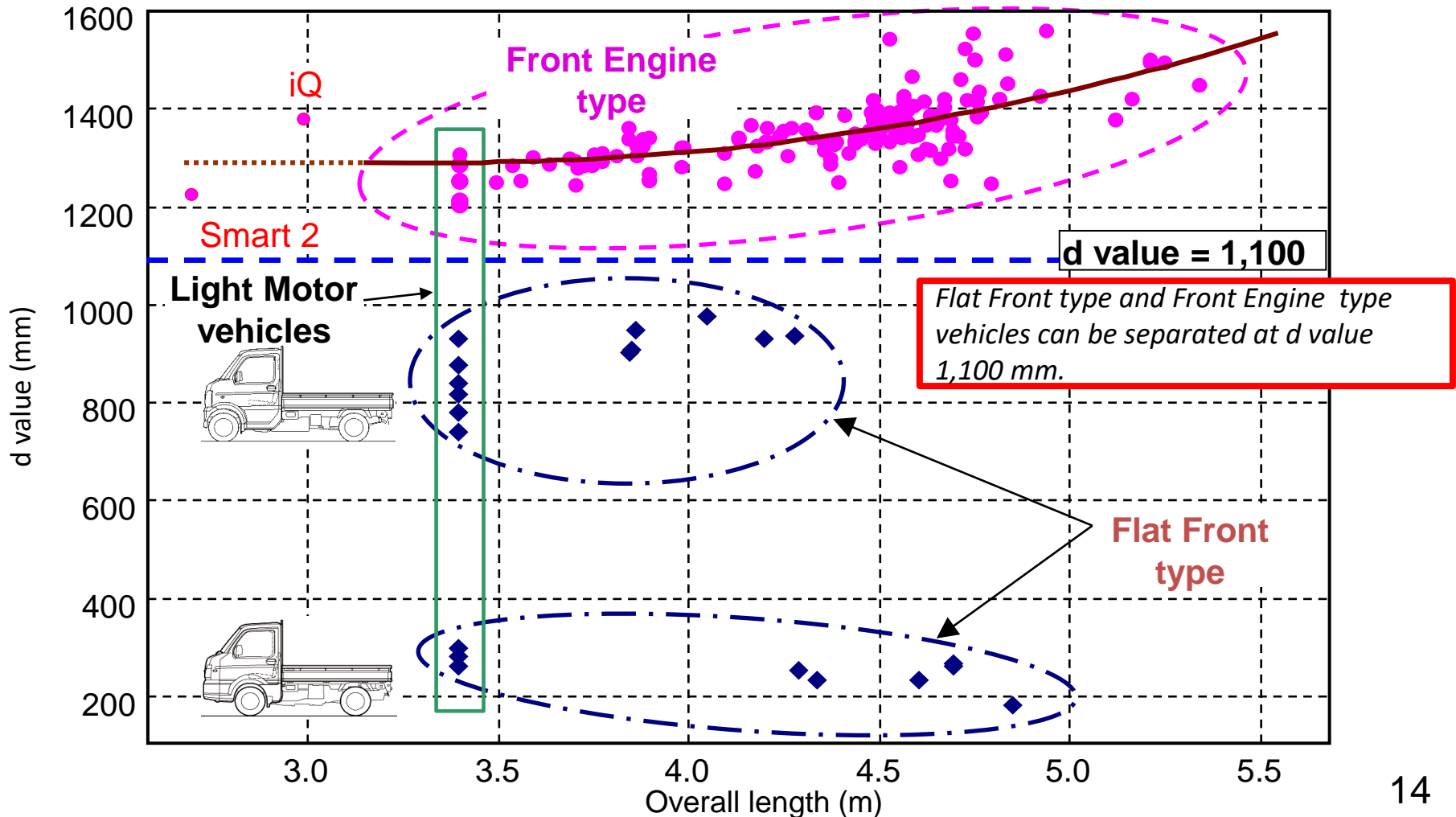


## 6. Characteristics of Flat Front Light N1 Vehicles

### -Comparison of d Values Between Flat Front type and Front Engine type Vehicles-

In Front Engine type vehicles, since it is necessary to install the steering wheel, pedals, etc. between front wheel and driver's seat, their d values need to be at least 1,100 mm even in small vehicles.

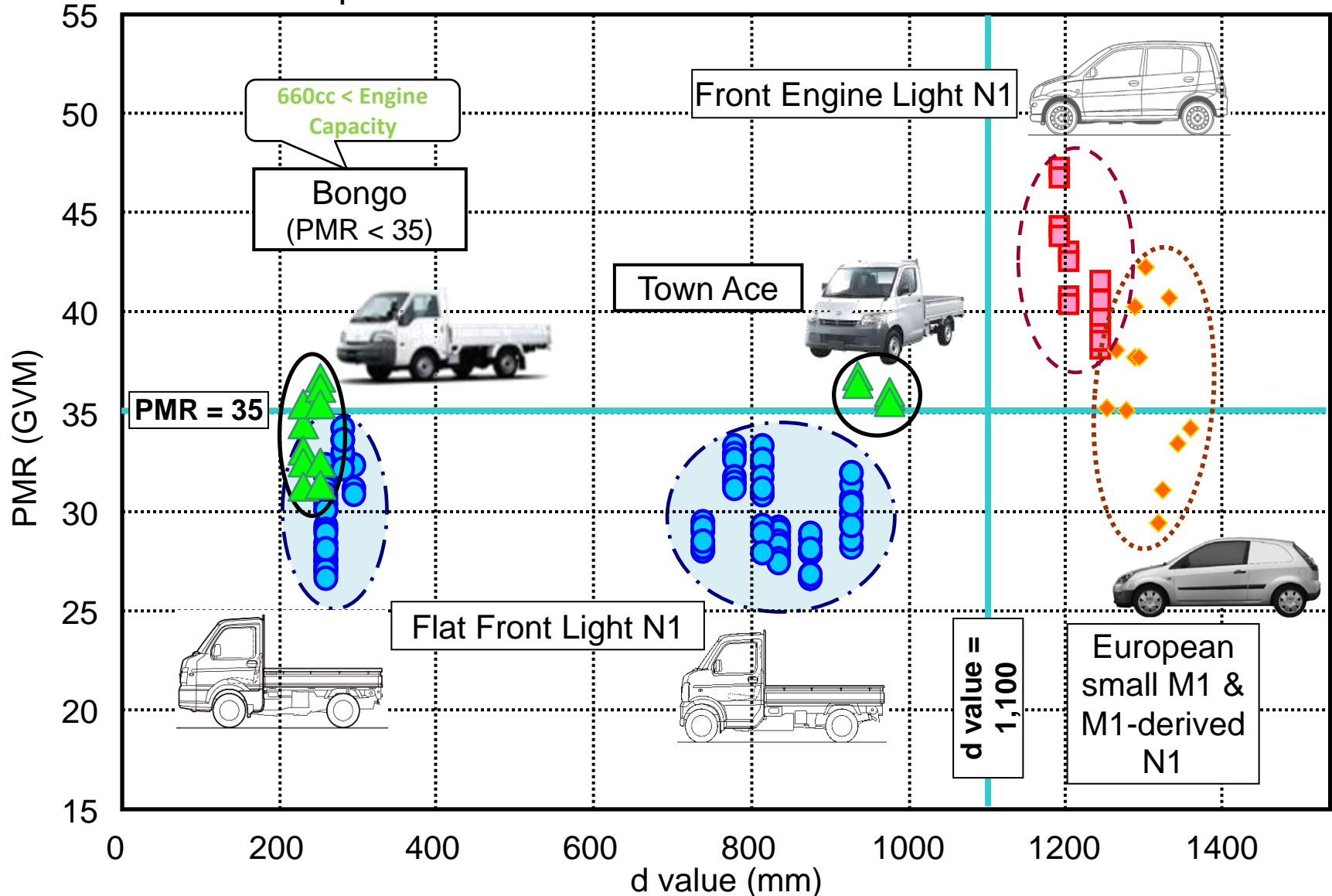
In Flat Front type vehicles, to ensure large cargo space, it is necessary to locate the driver's seat as forward as possible, i.e., above the engine and front wheel. Thus, their d values are no more than 1,100 mm.



## 6. Characteristics of Flat Front Light N1 Vehicles

-Status of Categorization Based on the d Value and PMR (GVM)-

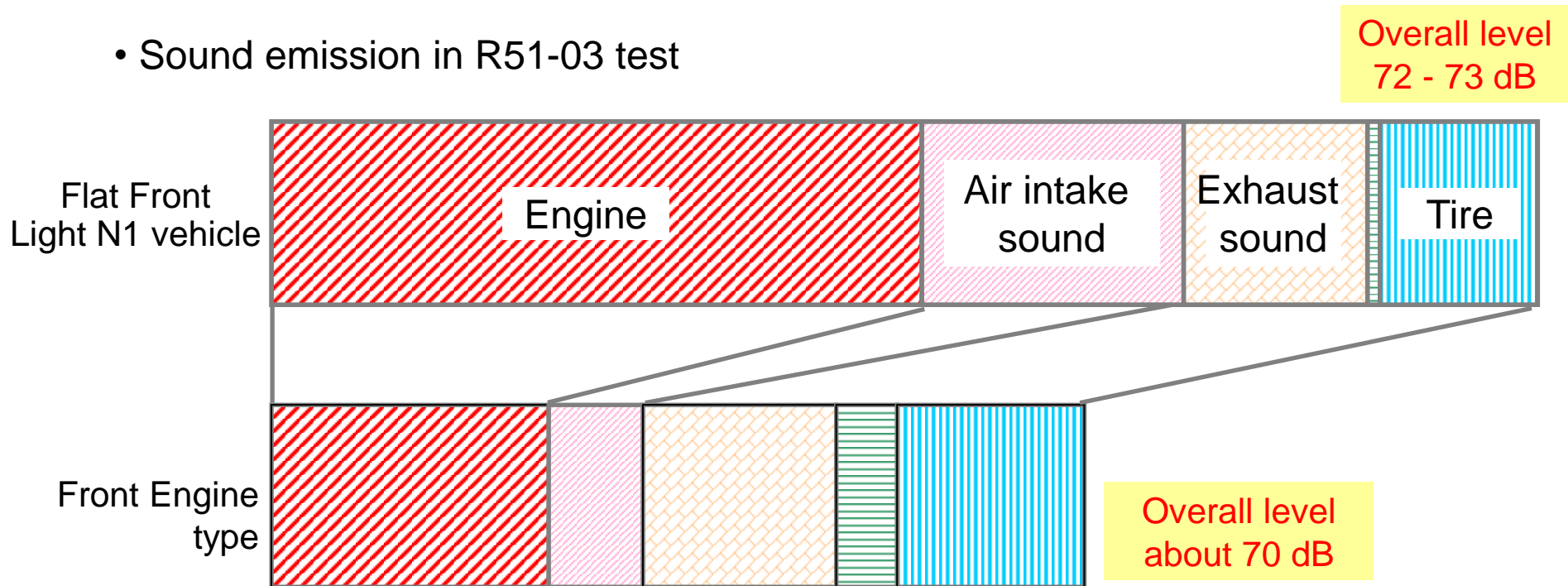
Using the d value  $< 1,100$  mm and PMR (GVM)  $\leq 35$ , most Flat Front light N1 vehicles can be separated from other N1 vehicles.



## 7. Reasons Why the Noise Level of Flat Front Light N1 Vehicles is High

Since engines of Flat Front Light N1 vehicles are exposed, the engine radiated sound and air intake sound are emitted directly outside the vehicle. As a result, the vehicle external noise level and the engine sound contribution of Flat Front Light N1 Vehicles are higher than those of Front Engine type vehicles.

- Sound emission in R51-03 test



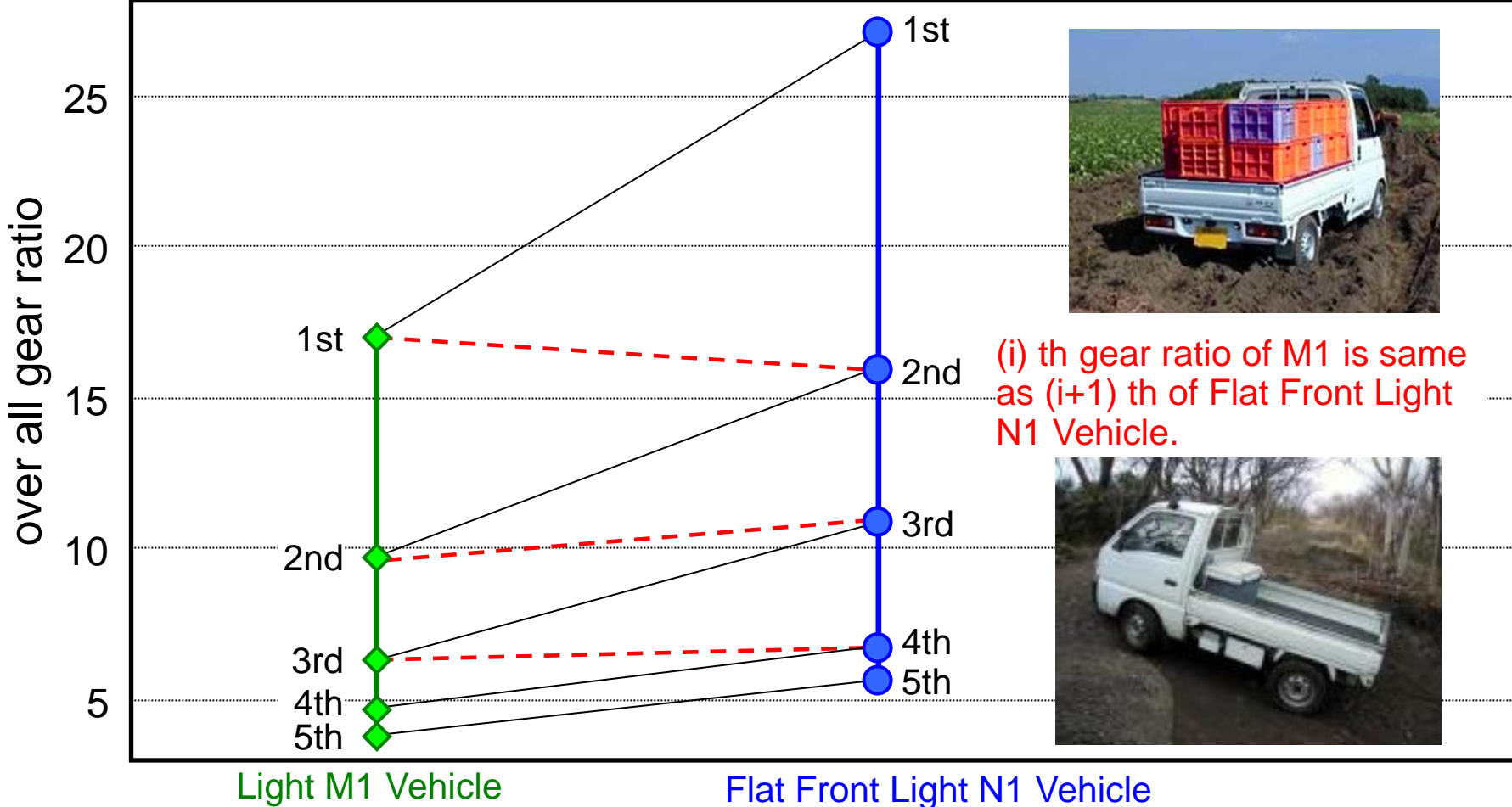
Contribution of each sound source of the vehicle external noise in average vehicles (amount of energy)



# 7. Reasons Why the Noise Level of Flat Front Light N1 Vehicles is High

Flat Front Light N1 Vehicle is required driving force at low speed, considering the usage environments such as load capacity (high load), high gradient, muddy ground, etc.


These situations demand higher gear ratio than M1 vehicle, as a result, Flat Front Light N1 Vehicles run with extra high engine speed making louder engine noise.



Gear ratio comparison in 5-speed transmission cars(Light M1 vs. Flat Front Light N1)

## 8. Data of Flat Front Light N1 Vehicle

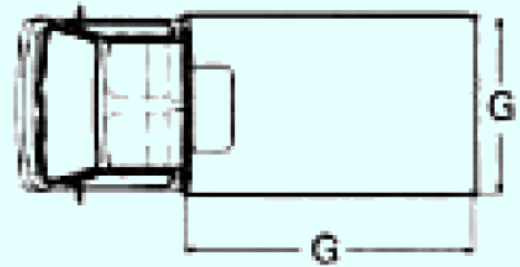
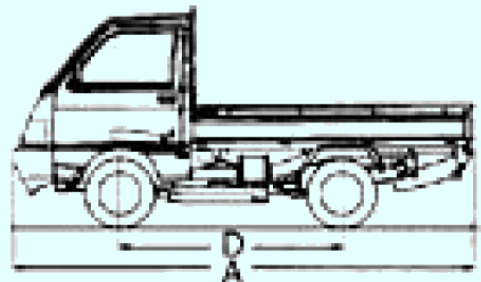
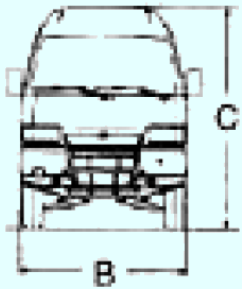
Flat Front Light N1 Vehicle does not meet the preference of European market, given that the vehicle's performance such as **payload**, **maximum speed**, etc, are limited.

Items		Regulation for Light Motor Vehicle	Flat Front Light N1 Vehicle 	Piaggio Porter*	
				PI engine	CI engine
Vehicle length	mm	≤ 3400	3395	3390	3390
Vehicle width	mm	≤ 1480	1475	1395	1395
Vehicle height	mm	≤ 2000	1735 - 1905	1730	1730
Bed size	m <sup>2</sup>	≥ 0.6	2.53 - 2.7	2.5	2.5
Bed size length	mm		1700 - 1940	1760	1760
Bed size width	mm		1240 - 1415	1270	1270
Bed size height	mm		235 - 1235	?	?
Wheel base	mm		1900 - 2450	1810	1810
Axle track	mm		1290 - 1310	1210	1210
Number of seats	-	≤ 4	2 - 4	2	2
<b>Payload</b>	<b>kg</b>	<b>≤ 350</b>	<b>350</b>	<b>550 - 700</b>	<b>550 - 700</b>
GVM	kg		1140 - 1510	1500	1500
Engine capacity	cc	≤ 660	656 - 658	1300	1200
Max power	kw		33 - 37	52	47
Max torque	Nm		59 - 63	105	140
<b>Max speed</b>	<b>Km/h</b>		<b>104 - 107</b>	<b>130</b>	<b>130</b>
Number of sales	'2012		304,400	4,400	
Price	€		4,300 -	10,800 -	

\* Piaggio Porter does not meet the Light Motor Vehicle regulation in Japan.

# 9. Example of the vehicle similar to Flat Front Light N1 Vehicle sold in Europe

Piaggio Porter



Länge A (in mm)	3390
Breite B (in mm)	1395
Höhe C (in mm)	1730
Radstand D (in mm)	1810
Ladevolumen (in mm)	-
Höhe des Laderaumes über dem Boden F (in mm)	715

From internet homepage

# 10. The situation of conformity to the UN/EU Regulations of Flat Front N1 Vehicle

Flat Front Light N1 Vehicle can not be sold in Europe since it is not adaptable to many regulations.

Regulation	Conformity	Reasons
Emission levels R15	No	The maximum speed of the test procedure is 120 km/h. But, Flat Front Light N1 Vehicle cannot trace this speed. So, running with wide open throttle is required.
Air-conditioning system EEC2006/40/EC	No	New air-conditioning system is necessary.

## Future Regulation

Pole side impact performance	No	<p>The informal document was submitted in the last GRSP (2013.12). The document will be discussed in next GRSP (2014.5). The requirements are as follows.</p> <p>[13X]00series test vehicle speed is below;            32 +/- 1km/h (vehicle width &gt;1500mm)            26 -0/+6 km/h (vehicle width ≤1500mm)</p> <p>[13X]01series test vehicle speed is 32 +/- 1km/h            In case that 01series becomes mandatory, Light N1 Vehicle cannot comply with 01 series due to narrow space between frame and seats.</p>
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The following countermeasures are necessary, if Flat Front Light N1 Vehicle shall comply with European requirements.

- Install drastically changed cooling system etc. for running at higher maximum speed.
- Develop a completely new air conditioner system.
- No countermeasures to comply pole side impact regulation with 01 series due to narrow space between frame and seats.

## 11. Maximum speed of Flat Front Light N1 Vehicles

Flat Front Light N1 Vehicles have very high gear ratio aiming at usage in farm area. As a result, the maximum speed of the vehicle is about 105km/h. The lower maximum speed makes great influence to the exhaust emission test result and utility on highway.

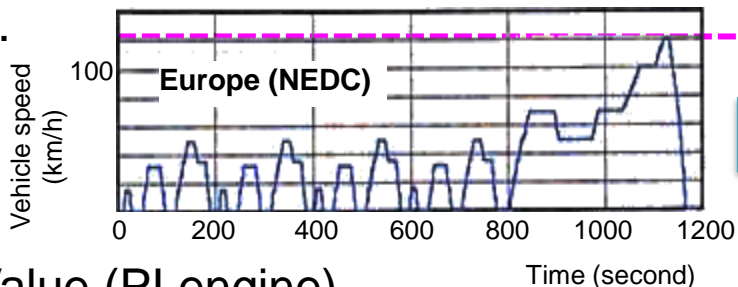
Maximum speed calculated with "S" rpm and over all gear ratio

"S" : Rated rotational engine speed at maximum power

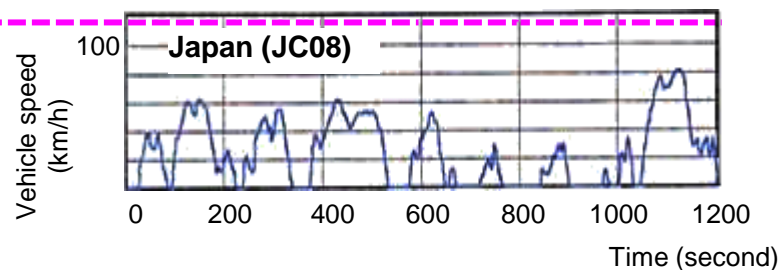
Names of Flat Front Light N1 Vehicles	Engine power "S" rpm	Over all gear ratio	Diameter of tire (mm)	Maximum speed (km/h)
SUZUKI CARRY	37kw/5700rpm	5.625 (5th:1.000, final:5.625)	550mm (145R12)	<b>105</b>
DAIHATSU HI-JET	37kW/5700rpm	5.586 (5th:0.838, final:6.666)	550mm (145R12)	<b>106</b>
HONDA ACTY	33kW/5500rpm	5.364 (5th:0.861, final:6.230)	550mm (145R12)	<b>104</b>
MITSUBISHI MINICAB	35kW/6000rpm	5.842 (5th:0.852, final:6.857)	550mm (145R12)	<b>107</b>

## 12. Exhaust emission of Light N1 Vehicles (compared with EURO5)

Light N1 Vehicle is adjusted to emission regulations for four-wheel vehicles in Japan, however, it is very difficult to conform Light N1 Vehicles to EURO5 (exhaust emission), because Light N1 Vehicles cannot run at 120km/h. Therefore wide open throttle which causes severe condition in the exhaust emission test is required during running the test cycle.



120km/h



### Limit Value (PI engine)

mode test						
	(g/km)	CO	THC	NMHC	NOx	PM
EURO5b (NEDC)	N1 ≤ 1305kg	1.000	0.100	0.068	0.060	0.0045
	N1 1306 - 1760kg	1.810	0.130	0.090	0.075	0.0045
Japan (JC08)		4.02	-	0.05	0.05	0.005

Idling test		
	CO(%)	HC (ppm)
EURO5	0.3	—
Japan	2.0	500

Note: Since the test mode is not the same, a simple comparison is not possible.

### Range of measured values of Flat Front Light N1 Vehicle

mode test						
	(g/km)	CO	THC	NMHC	NOx	PM
Flat Front Light N1 Vehicle (JC08)		1.05 - 1.15	—	0.025 - 0.05	0.025 - 0.05	—

Idling test		
	CO (%)	HC (ppm)
Light N1 Vehicle	0.2 - 0.3	200 - 300

## 13. The past sales of Light Motor Vehicle in Europe

Light Motor Vehicle is **not sold** and the type approval has **not been granted** in Europe so far, because of utility, sales-ability, etc.

The vehicle with maximum speed of about 105km/h does not fit to Europe traffic flow, so **Light N1 Vehicle will not be sold in Europe.**

## 14. The case of sales to Europe by using the chassis of Japanese Light Motor Vehicle in the past

It was necessary to improve the vehicle performance in order to sell in Europe, so engine capacity was modified from 660cc to 1000cc.

Daihatsu Cuore 989cc M1  
(Name at Japan : Mira)  
Sales year: 2007 - 2012  
End of sales



Suzuki Super Carry 970cc N1  
Sales year: 1986 - 1993  
End of sales



# Summary

With regard to the sub-category and limit values for Flat Front Light N1 vehicles, we propose the following:

6.2.2.1	...	...	...	...	...
	Veh.Cat	Vehicles used for the carriage of goods	Phase1	Phase2	Phase3*/
	N1	GVW≤2.5t	72	71	69
		GVW>2.5t	74	73	71
	...	...	...	...	...

6.2.2.2.6 For vehicle types of category N1 having a maximum technically permissible laden mass of less than or equal to 2.5 tons, a PMR of GVW of less than or equal to 35 kW/t and a horizontal distance “d” between the front axle and the driver’s seat R-point of less than 1100 mm, the limits of the vehicle types of category N1 having a maximum technically permissible laden mass above 2.5 tons apply.

(excerpt from GRB-58-17-Rev.1)



*Japan’s proposal is already included into the informal document “GRB-59-04” submitted by the GRB Expert Group on R51.*

6.2.2.1	(same as the above)
6.2.2.1.5	For vehicle types of category N1 having a maximum technically permissible laden mass of less than or equal to 2.5 tons, <b><u>the engine capacity not exceeding 660 cc and the power-to-mass ratio (PMR) calculated by using the maximum technically permissible laden mass not exceeding 35kW/t and a horizontal distance “d” between the front axle and the driver's seat R point of less than 1100 mm</u></b> , the limits of the vehicle types of category N1 having a maximum technically permissible laden mass above 2.5 tons apply

(excerpt from GRB-59-04 )

**END**