

**Overview of India's concerns
Presentation to
GTR - BR members
for the 6/MCGTR/Informal meeting**

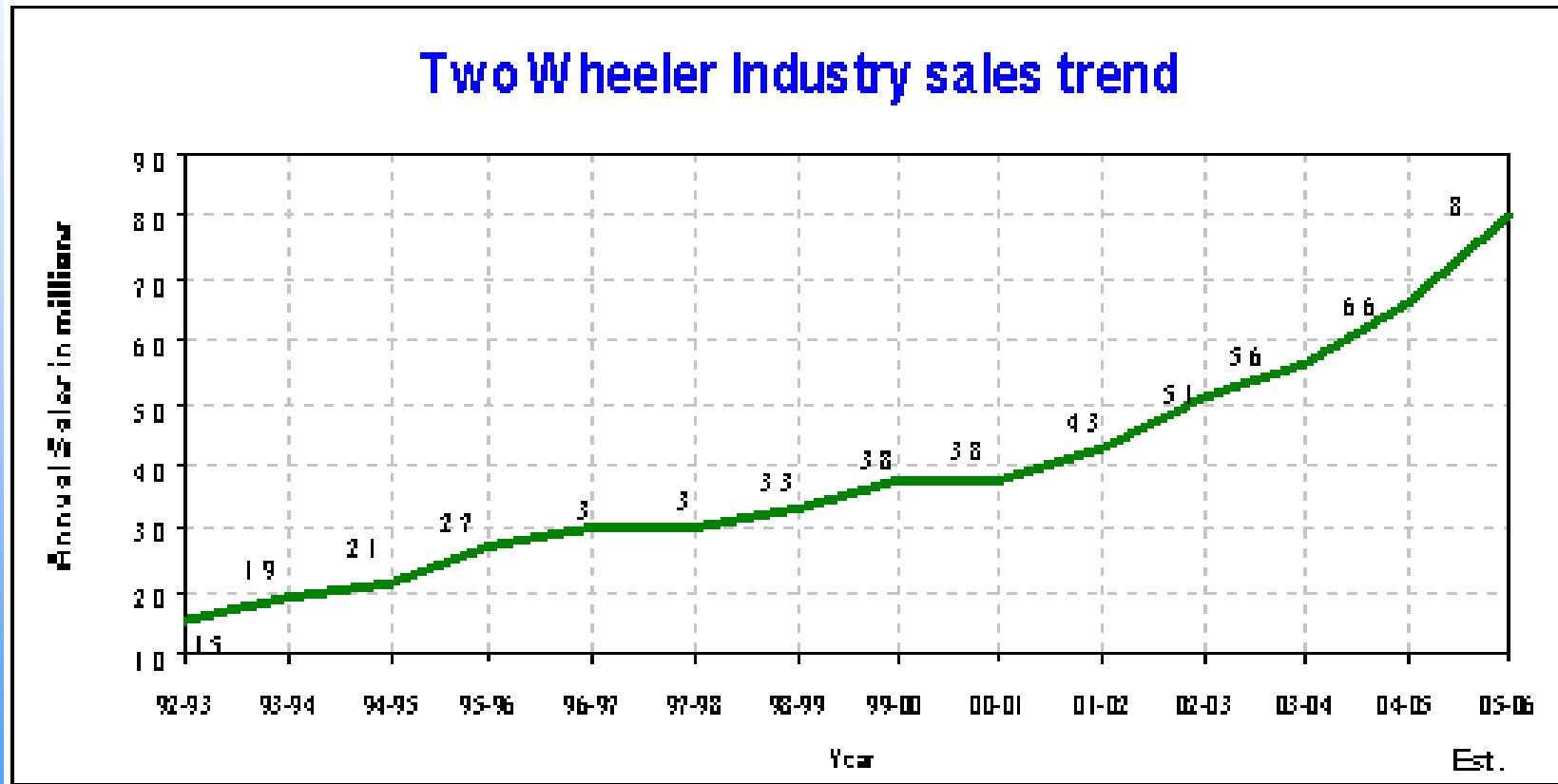
**6th - 7th June 2006
NHTSA Office, Washington DC**

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(V. M. Manel & R. Venkatesan
Regret absence)**

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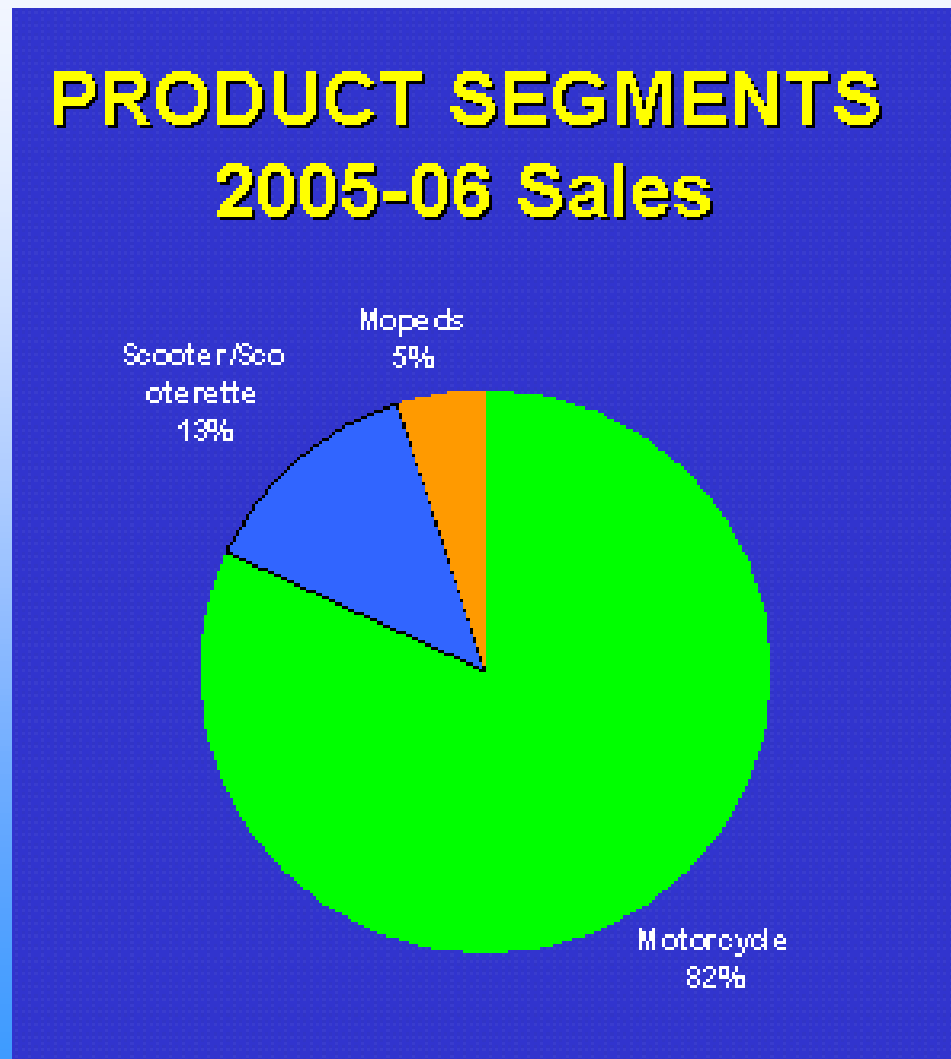
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1. Indian Motorcycle industry



Financial Year

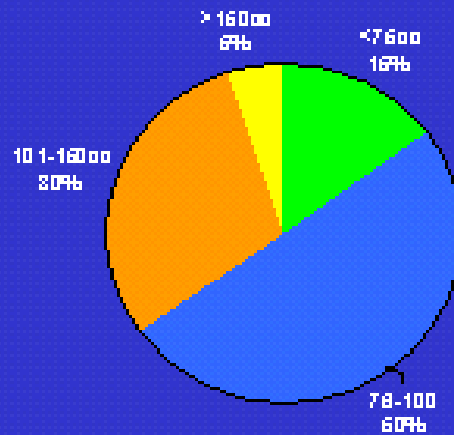
1. Indian Motorcycle industry



1. Indian Motorcycle industry

Estimated Composition of Fleet in India

India

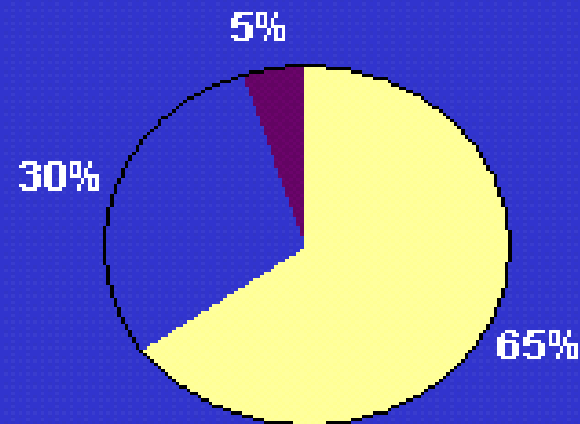


India-Present Market Composition 05-06



1. Indian Motorcycle Industry

Indian-2W Usage Pattern



Max Speeds:

Urban/ Country – 50 kmph

Highway – 70 kmph

Legal Speeds:

Urban – 50 kmph

Note : Indian two wheelers designed and tuned for high fuel economy Average acceleration and low max speeds

2. Indian Motorcycle Industry and Operating Characteristics

- 2nd largest in the world
- 90% are less than 125 cc.
- Maximum operating speed range from 50-70 km/h.
- Designed to be Fuel efficient and Low emission compliant.
- Smaller in size, have shorter wheel base @ 1300 mm, and higher Centre of Gravity, when laden.
- Designed for slow speed maneuverability.
- Used for commuting from residence to place of work.
- Common means of transport in rural, town and cities and not intended for expressways.
- Two wheeler market in India is highly price sensitive.
- In the existing scenario, Indian vehicles are meeting the current ECE requirements and no adverse safety problems have been reported.

3. India's views on GTR Brakes

- **India has been giving feedback on the GTR at appropriate times.**
- **India thanks the IWG for accepting many of our comments earlier.**
- **Difficulties on Clause 4.4.3 as applicable to low speed motorcycles which India has been consistently highlighted through correspondence.**

4. Preliminary Brake test results collected on Indian Motorcycles as per GTR Clause 4.4.3 – Dry Stop Test

Model	V max (km/h)	Test Speed (km/h)	Stopping Distance Requirement, m	Stopping Distance (m) Corrected
A	127	100	60	50.06
				49.19
				53.46
B	90	81	39.36	35.92
				38.35
				35.76
C	80	72	28.51	28.37
				27.93
D	100	90	48.6	45.53
				42.89
E	104	93.6	52.6	53.1
				52.9
				52.2
				53.2
F	100	90	48.6	53.2
				52.6
				52.3
G	80	72	28.5	34.8
				35.3
				35.9
				34.7
H	68	61.2	20.5	25.7
				22.9
				24.6
				27.8
I	90	81	39.36	38.9
				36.6
J	85	76.5	32.18	36.3
				37.19
				37.44
K	125	100	60	67.87
				68.41
				63.64

It can be seen from the above data that the compliance for motorcycles with test speed < 80.5 is very low

5. India's concerns on Clause 4.4.3

- **Stopping distance requirements are more stringent for the lower speed vehicles which are primarily used for commutation.**
- **Stopping distance requirements for high speed vehicles are relatively less stringent.**
- **GTR applies the same yardstick of vehicle performance for small and large vehicle.**
- **Requirements for smaller vehicles need to be addressed in that perspective.**

6. Proposal from India

- India had earlier proposed that

$S \leq 0.1V + 0.0067 V^2$ for vehicle with $V_{\max} \leq 125$ km/h and

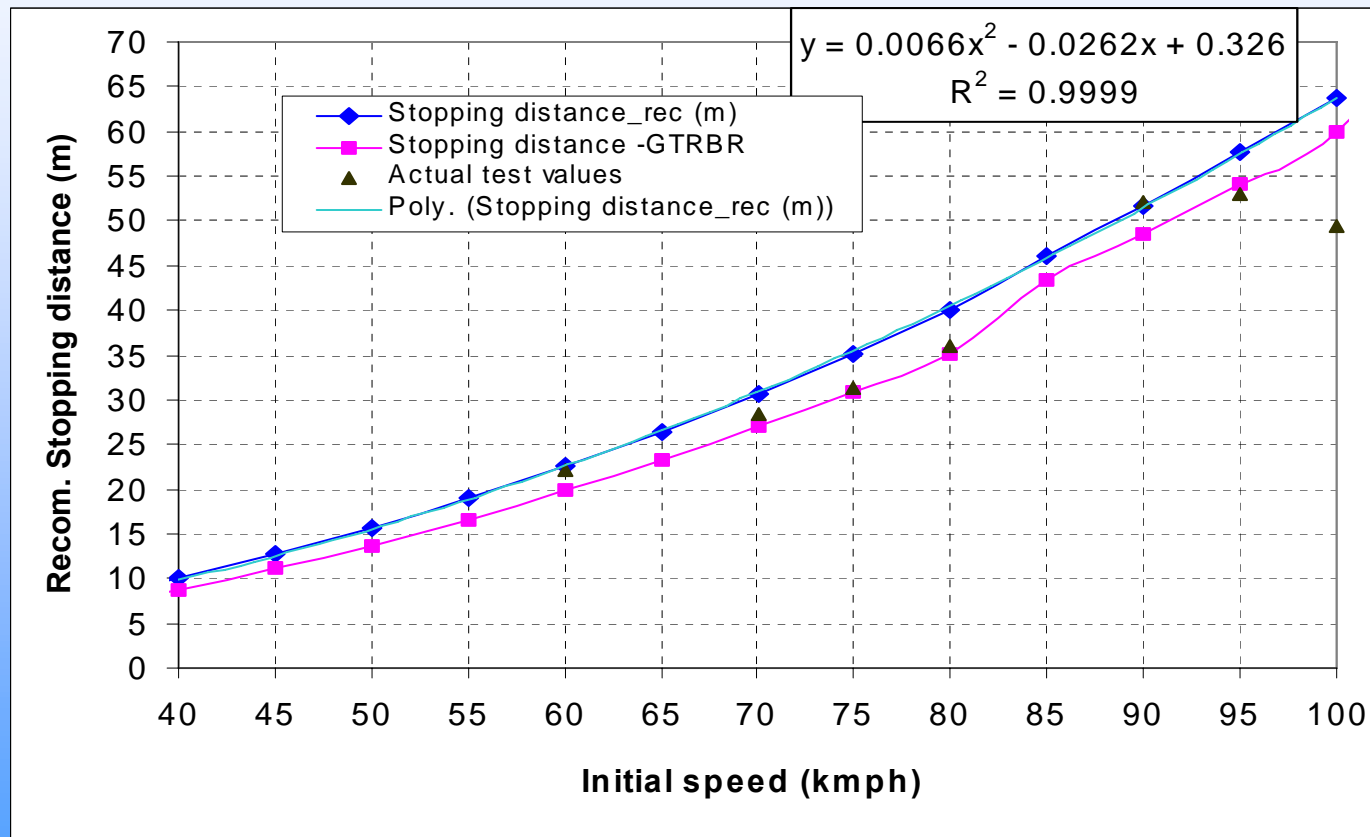
$S \leq 0.0060 V^2$ for vehicle with $V_{\max} > 125$ km/h.

- Subsequent to the data collected, India puts forward an alternate proposal, arrived after considering various factors of total braking coefficient etc.

$S \leq 0.0066 V^2 - 0.0262 V + 0.326$

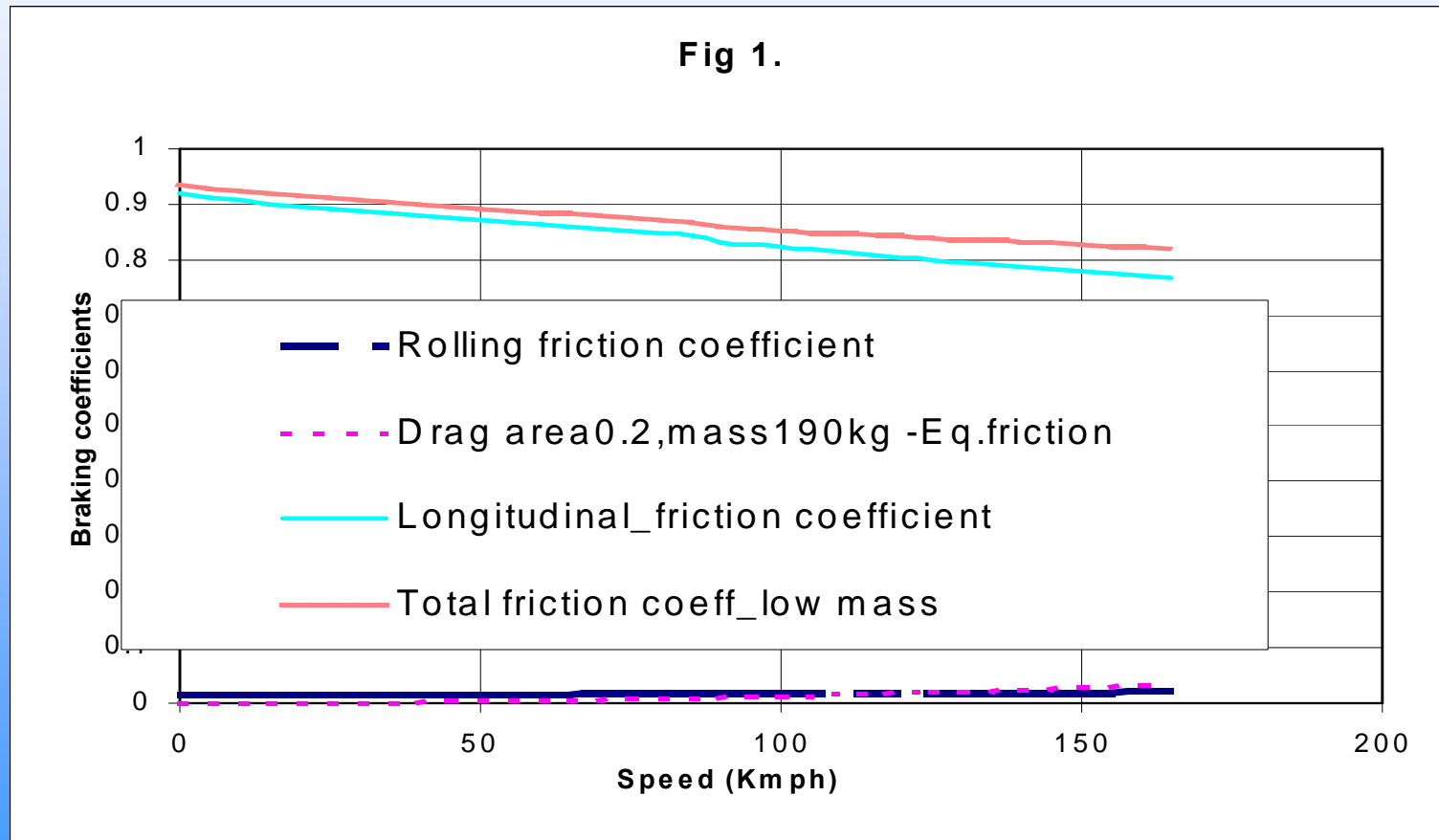
- The stopping distance requirement as per the above formula is stringent than ECE by about 29% @ 60 km/h.
- As per the above formula, the deviation from GTR is about 12% for speeds between 40 km/h to 80.5 km/h and 6% for speeds above 80.5 km/h.

6. Proposal from India



7. Technical reasons for supporting India's proposal

1. Drop in total braking coefficient



Source: 1) Motorcycle dynamics- Vittore Cassalor, 2) Publication by K E Holmes & R D Stone 3) Engineering Behind Vehicle design: California State University

7. Technical reasons for supporting India's proposal

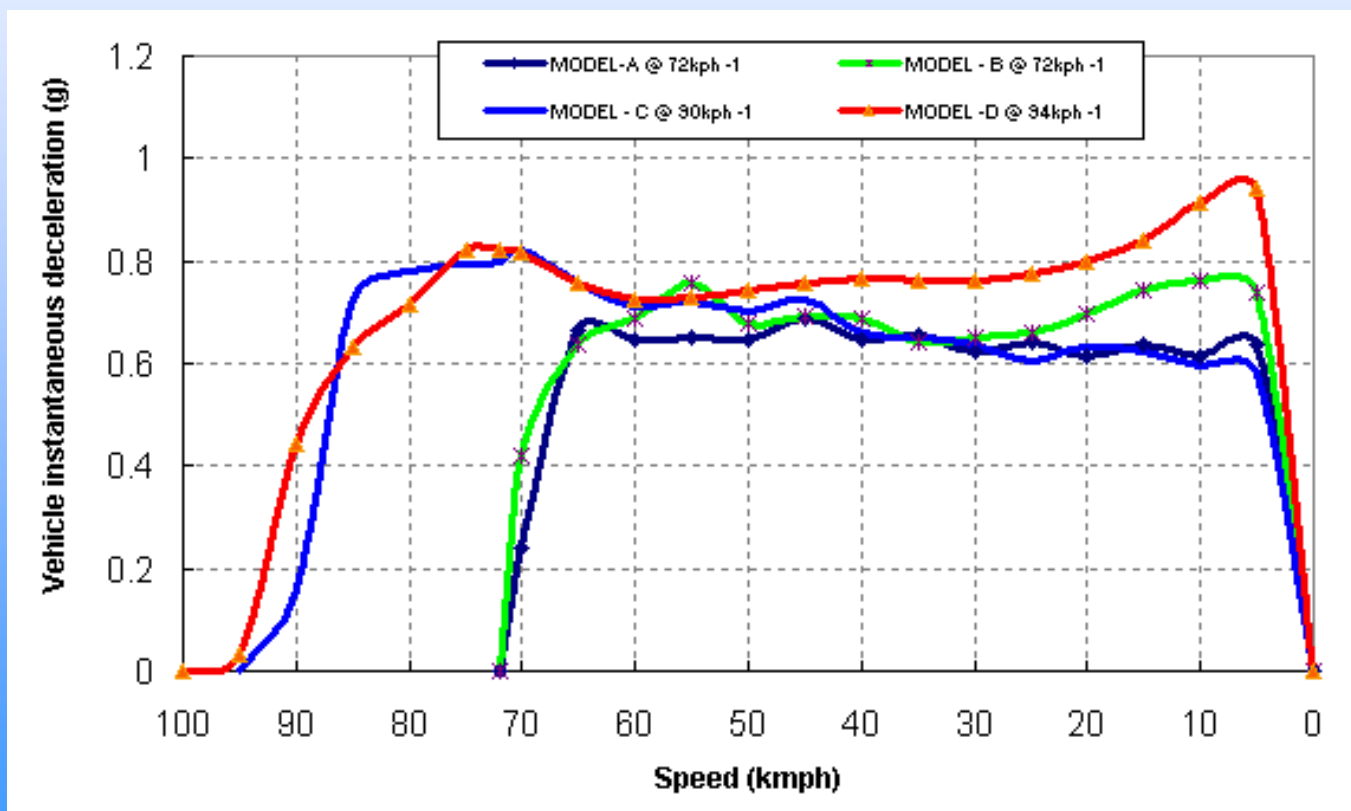
1. Drop in total braking coefficient

Based on the published data

- Drop in sliding friction is @ 14% from 40 km/h to 160 km/h.
- The overall drop considering the effect of rolling and aerodynamic coefficient is only 9%.

7. Technical reasons for supporting India's proposal

2. Variation in the vehicle deceleration



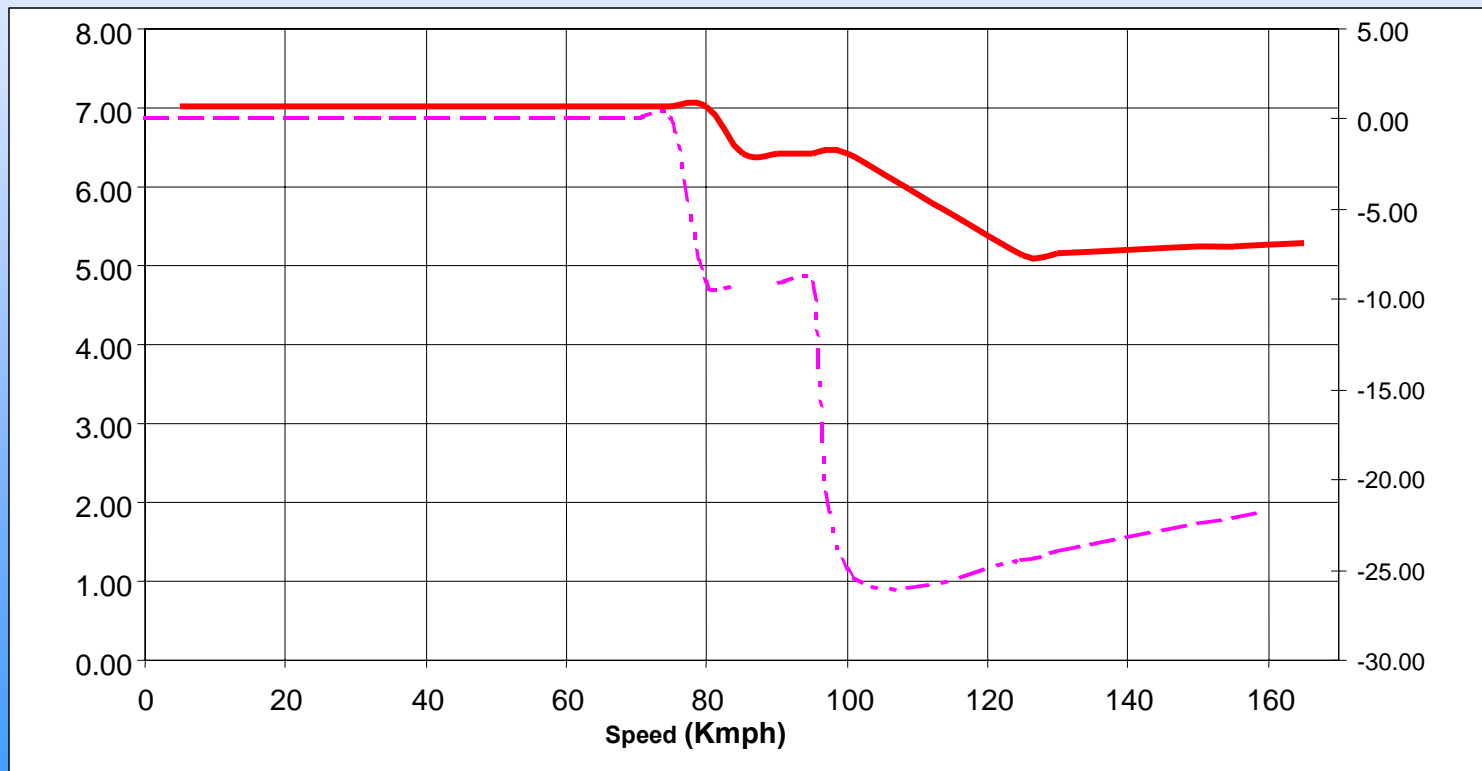
7. Technical reasons for supporting India's proposal (contd..)

2. Variation in the vehicle deceleration

- **The instantaneous deceleration values do not remain steady during the entire braking process.**
- **The values drop down to a speed upto 20 km/h and then gradually shoot up.**

7. Technical reasons for supporting India's proposal

3. Change in deceleration requirements between test speeds 40 km/h to 160 km/h



7. Technical reasons for supporting India's proposal

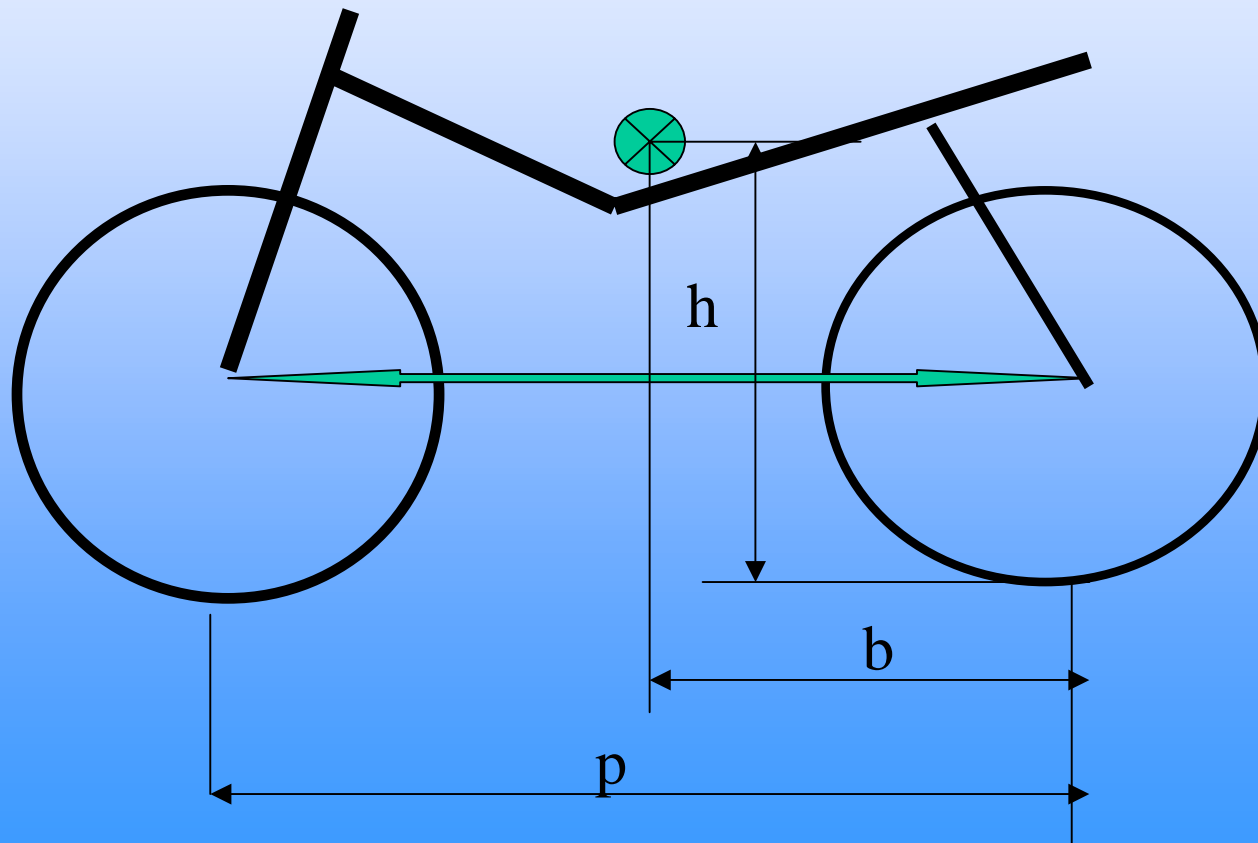
3. Change in deceleration requirements between test speeds 40 km/h to 160 km/h

From this Figure as per GTR requirement

- The average deceleration requirement is 7.01 m/sec^2 up to test speed 80.5 km/h.
- The decrease in the deceleration value is 12% between 80.5 km/h to 100 km/h and about 21% for 100 km/h to 160 km/h when tested as per clause 4.5 of the draft GTR
- The drop in the total braking coefficient is only 9% as shown in the SI no.1.
- Any vehicle falling between 40 km/h to 80.5 km/h has to meet more stringent requirement.

7. Technical reasons for supporting India's proposal

4. Laden CG Height / Wheel base ratio



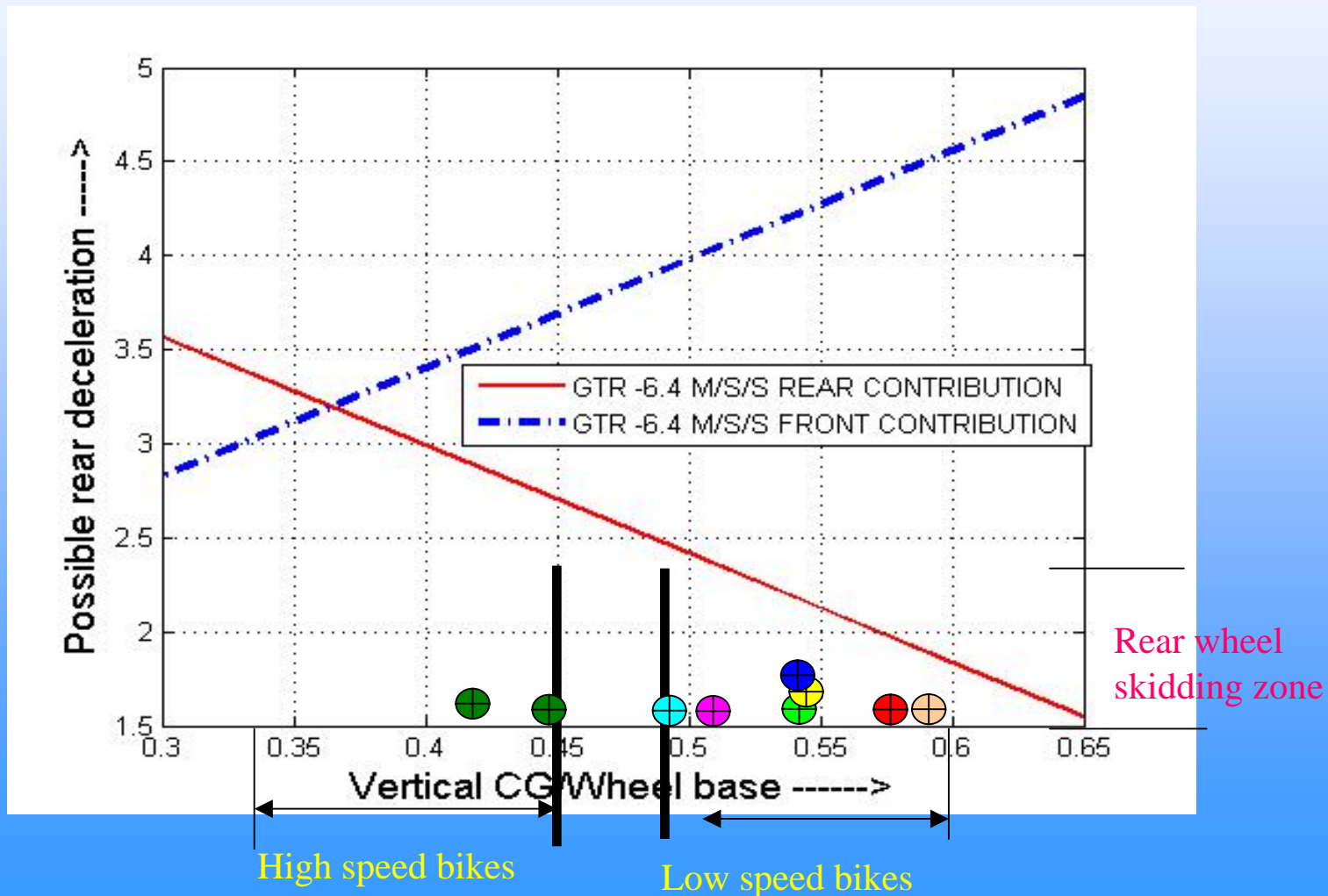
7. Technical reasons for supporting India's proposal

4. Wheel base comparison

#	Wheelbase of typical high end motorcycles	Wheelbase of typical Indian motorcycles
1	1420	1330
2	1415	1235
3	1450	1225
4	1435	1305
5	1392	1260
6	1390	1260
7	1395	1250
8	1380	1230
9	1430	1270
10	1385	1280
11	1410	...
12	1460
13	1445
14	1405

7. Technical reasons for supporting India's proposal

4. Laden CG Height / Wheel base contribution



7. Technical reasons for supporting India's proposal

4. Effect of Vertical CG / Wheel base ratio

- Majority of Indian motorcycles have shorter wheel base due to riding style and for better slow speed maneuverability.
- The ratio of height of CG to wheelbase (h/p) is higher in these motorcycles (0.5 – 0.6) as compared to high end bikes (0.4 – 0.45). This results in larger load transfer on the front brake and rear brake is found to be less effective when tested as per Clause 4.4.3 of the GTR.
- In high end motorcycles with larger wheel base, the load transfer from the rear wheel to the front wheel is comparatively lesser and hence produces better deceleration.

8. Summary

- As per the Technical Rationale and justification for the development of GTR, the representative world wide motorcycle operations need to be considered.
- The same yardstick of vehicle performance for small to large motorcycles should not be applied and needs to be addressed.
- There is a necessity to review the requirements as per the proposal by India.
- India is committed to the process of harmonization for the development of new test standards.
- India would support by putting extra efforts to work further in the direction as decided by Working Group.

Thank you