Transmitted by the Expert from OICA	Informal document No. **WLTP-01-03** (GRPE Informal Group WLTP, First Meeting 4 June 2008.)

STATUS OF THE WORK OF THE MOTOR INDUSTRY WITH RESPECT TO A GLOBAL TECHNICAL REGULATION ON WORLDWIDE HARMONIZED LIGHT-DUTY TEST PROCEDURES (WLTP)

A. Objective of the document

In previous discussions around the subject of WLTP, and specifically in Informal Document GRPE-55-12, OICA has clearly declared its support for the worldwide harmonisation of the emissions regulation of light duty vehicles. In order to ensure the smooth running of future discussions of WLTP and to secure successful development of a harmonised regulation, OICA proposes the early agreement of a common terminology and a clear statement of the existing diversity of worldwide emissions regulation.

The following papers describe the work performed to date within OICA and are proposed to form a prerequisite basis for future discussions which will be added to and developed throughout the WLTP project.

Comments and contributions from stakeholders and other interested parties to the accurate completion of these documents are requested.

B. OICA Papers

- The aspects of light duty vehicle emission testing (section C of this paper)
- Two separate informal documents addressing definitions:
    i. Definitions of Vehicle Categories
    ii. General Technical Definitions

C. The aspects of light duty vehicle emission testing

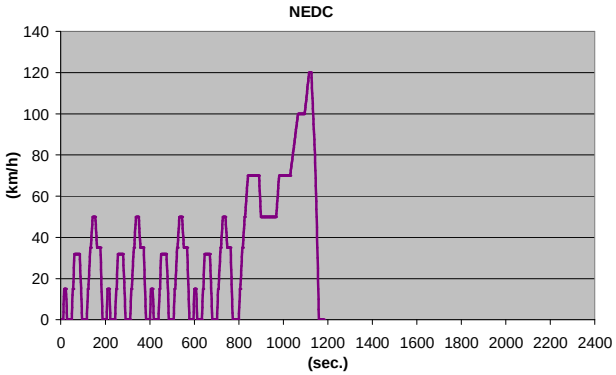
Scope

In order to describe the scope of this document, without overly restricting it and thereby missing important issues, listed below are the aspects of emissions testing that are deliberately excluded from this paper as they will be handled separately:
Vehicle categories, technical definitions (including treatment of defeat devices), measurement equipment, reference fuels, diesel smoke test, OBD, durability.

Some of these subjects are excluded because specialist groups will be expected to address the issues due to their complexity, others are excluded as they are seen to be aspects of the approval procedure rather than technical requirements and such procedures are not covered by global technical regulations.

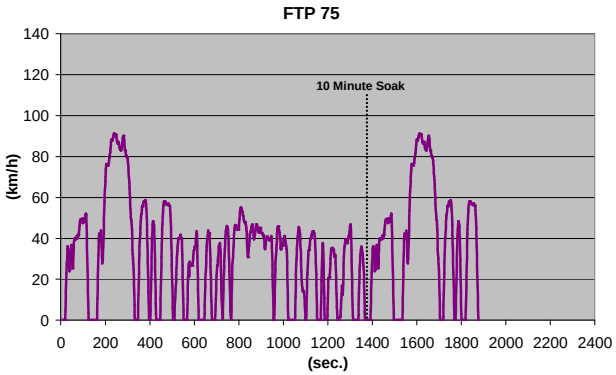
Drive Cycles

EU / ECE / China / Australia etc.

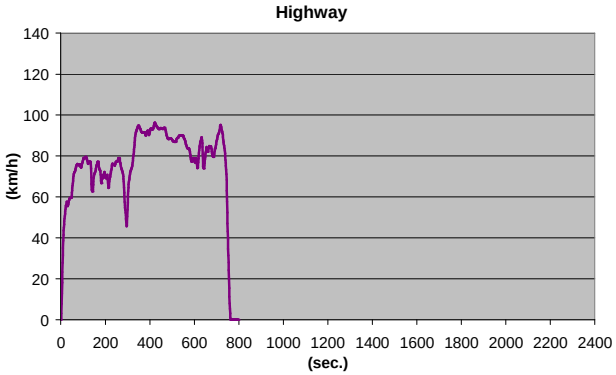


Time	1180 s
Distance	11007 m
Max. Speed	120 km/h
Ave. Speed	33.6 km/h
Soak	N/A
Gear shift (man)	Fixed speeds

USA "Standard Cycles"

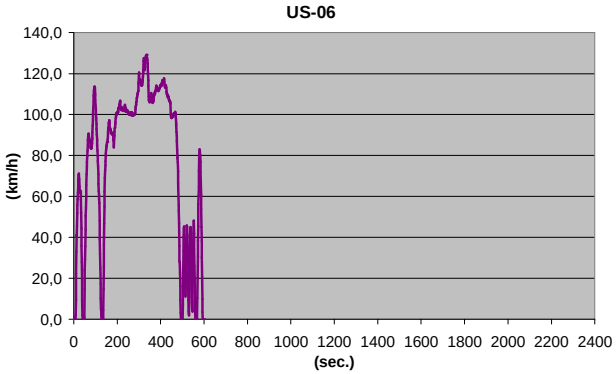


Time (excl. soak)	1877 s
Distance	17860 m
Max. Speed	91.2 km/h
Ave. Speed	34.2 km/h
Soak	600 s
Gear shift (man)	Specific (with evidence)

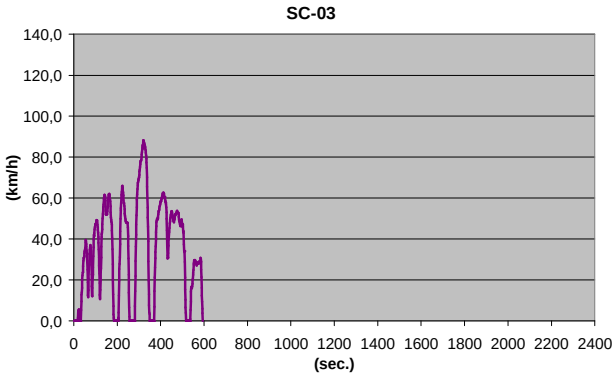


Time	765 s
Distance	16500 m
Max. Speed	96.4 km/h
Ave. Speed	77.4 km/h
Soak	N/A
Gear shift (man)	Specific (with evidence)

USA "Off Cycle"

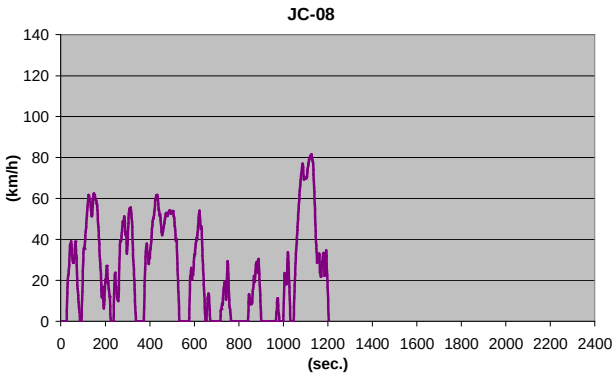


Time (excl. soak)	600 s
Distance	12870 m
Max. Speed	129 km/h
Ave. Speed	77.2 km/h
Soak	N/A
Gear shift (man)	Specific (with evidence)



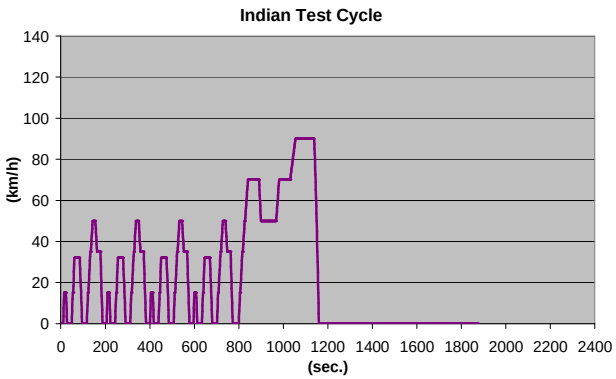
Time (excl. soak)	594 s
Distance	5760 m
Max. Speed	88 km/h
Ave. Speed	34.9 km/h
Soak	N/A
Gear shift (man)	Specific (with evidence)

Japan



Time (excl. soak)	1204 s
Distance	8172 m
Max. Speed	81.6 km/h
Ave. Speed	24.4 km/h
Soak	Repeated as hot test
Gear shift (man)	Fixed speeds

India



Time (excl. soak)	1180 s
Distance	m
Max. Speed	90 km/h
Ave. Speed	km/h
Soak	N/A
Gear shift (man)	Fixed speeds

Inertia Classes

	USA	EU	Japan	
			old	new
Minimum	1000 lbs	455 kg (1000 lbs)	500 kg	455 kg
initial steps	125 lbs (to 4000 lbs)	55/60 kg (125 lbs) (to 800 kg)	125 kg (to 1000 kg)	55/60 kg (to 800 kg)
middle steps	250 lbs (to 5500 lbs)	110/120 kg (250 lbs) (> 800 kg)	250 kg (to 3000 kg)	110/120 kg (to 2270kg)
final steps	500 lbs (> 5500 lbs)			230/250 kg (to 3000 kg)
Maximum	7500 lbs	2270 kg (5000 lbs)	no max. (step by 500kg, >3000kg)	

A further slight offset of the inertia classes is evident due to the positioning of a vehicle within the inertia classes being based on its “reference weight” which is differently defined in each region:

	“Empty & dry vehicle”	Fluids	Fuel	Tools	Spare wheel	Optional equipments	Occupants & test equipment
EU	✓	✓	min. 90 %	✓	✓	×	100 kg
Japan	✓	✓	✓	×	×	Full	110 kg
USA	✓	✓	✓	✓	✓	over 33%	300 lbs (136 kg)

Additionally to the above items, the rules for consideration of accessories or optional fitments according to their (anticipated) take up rates vary between the regions.

Determination of Road Load

The differences between the regions in terms of road load determination, whether by Coastdown or torque measurement procedure consist of the speeds at which the vehicle is operated (related to cycle speeds), the weight of the vehicle that is tested (related to definitions and rules for inclusion of optional features), the specification of the vehicle that is tested (related again to rules for inclusion of optional features e.g. tyres, spoilers), the process for translation of the measured data to the dynamometer and the process for repeated usage of the dynamometer settings.

Off Cycle Tests

The issue of off-cycle emissions testing is very complex one as it needs to achieve a balance between preventing what may be termed as cycle beating, and a need to avoid a) a massive increase in certification workload and b) a manufacturer's uncertainty of having to certify the unknown. The subject of off-cycle testing will need to be considered in connection with that of defeat devices, the definitions of which are handled in another paper.

The current test cycles that are utilised for light duty off-cycle checks are tabulated below:

	Low Temperature	High Altitude	High temperature / Air Cond.	High Speed
EU	Type 6, -7℃, Petrol & E85 only, CO & THC			
USA	20℉ (-6.7℃), Petrol only, CO ,NMHC(10MY Phase-in)	over 4000 ft	SC 03, 35℃, CO, NMHC + NOx & PM	Highway NOx
	50℉ (10℃) Petrol only, CO NOx, NMOG & HCHO			US 06, CO, NMHC + NOx & PM

As off-cycle emissions are a matter for all motor vehicles, there are already existing solutions in other fields e.g. heavy duty vehicles, which will need to be discussed during the WLTP project, including for example the concept of "not to Exceed".

The differences between certification procedures and concepts and more importantly the difference between absolute and specific emissions measurements introduce difficulties when making comparisons between concepts.

It will therefore be important during WLTP discussions to remember that the following alternatives need to be assessed:

Tests:

- defined test procedures or
- random "real life" testing.

Assessment criteria:

- Unique pass/fail limits independent of certification limits or

- Pass/fail limits based on certification limits (offset or factor) or
- A statistical or dimensionless pass/fail assessment system

Ambient Conditions

	Temperature	Humidity	Cooling Fan
EU	293 to 303 ℉ (20 to 30 ℃)	Absolute 5,5 g ≤ H ≤ 12,2 g H_2O/kg dry air	- Speed proportional from 10 km/h to at least 50 km/h - Area: at least 0,2 m_2 - Height of the lower edge above ground: approximately 20 cm - Distance from the front of the vehicle: approximately 30 cm As an alternative the blower speed shall be at least 6m/s (21,6 km/h).
Japan	298 ± 5 K (25 ± 5℃)	Relative 30% to 75%.	During the test running, the test vehicle shall be cooled by a cooling fan or the like so that actual running conditions may be simulated. (bonnet closed)
USA (FTP75)	68 to 86 ℉ (20 to 30 ℃)	NA	fixed speed fan (not exceed 5300cfm)

Measured/Regulated Components

		CO	THC	NMHC	NMOG	HCHO	NOx	PM	P#
EU	SI	✓	✓	✓			✓	DI only	EU 6
	CI	✓	THC+NOx				✓	✓	EU 5b
Japan		✓		✓			✓	✓ CI only, SIDI*	
EPA		✓			✓	✓	✓	✓	
CARB		✓			✓	✓	✓	✓	

* only DI with NOx catalyst

Durability

As the differences between durability procedures cause difficulties for manufacturers, a brief textual overview is included below and a comparison table is contained in a separate document. However, there is an argument that durability processes are part of the approval process and should therefore not be included in a GTR.

In Europe the “useful life” of a light duty vehicle is fixed at 5 years or 160,000 km. The alternatives are to perform a demonstration of this, either with a whole vehicle or a bench test, or to utilise assigned deterioration factors (DFs).

The USA have a “full useful life” of 10 years or 120,000 miles (193,000 km) but also apply standards at the “half useful life” of 5 years or 50,000 miles (80,000 km). There is the option to extend the “full useful life” to 15 years or 150,000 miles (240,000 km) and thereby either receive a fleet NOx/NMOG (EPA/CARB) bonus or an exemption from the half life standards. Separate arrangements exist for the durability of evaporative emissions. The alternatives are to perform a demonstration of this, either with a whole vehicle or a bench test (SI only). Usage of assigned deterioration factors is restricted to small volume manufacturers.

In Japan the “useful life” of a light duty vehicle is fixed at 80,000 km. The alternatives are to perform a demonstration of this (recognition of EU/US tests is possible), or to utilise assigned deterioration factors (DFs).

Alternatives for a Durability Test in Europe