

Combined approach for vehicle test weight, stepless inertia and vehicle selection

Revised proposal by

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18 January 2012

DTP meeting Geneva

WLTP objective: representative fuel consumption / CO₂ value

This requires:

- A representative vehicle in a representative test
- Representative test mass definition and vehicle selection

Conditions:

- Applicable and verifiable at type approval
- Limited test burden
- Level playing field and sound against wrong incentives
- Similar approach for all vehicle models, categories and types

Vehicle test mass definition

Problem:

How to define representative vehicle test mass?

Approach:

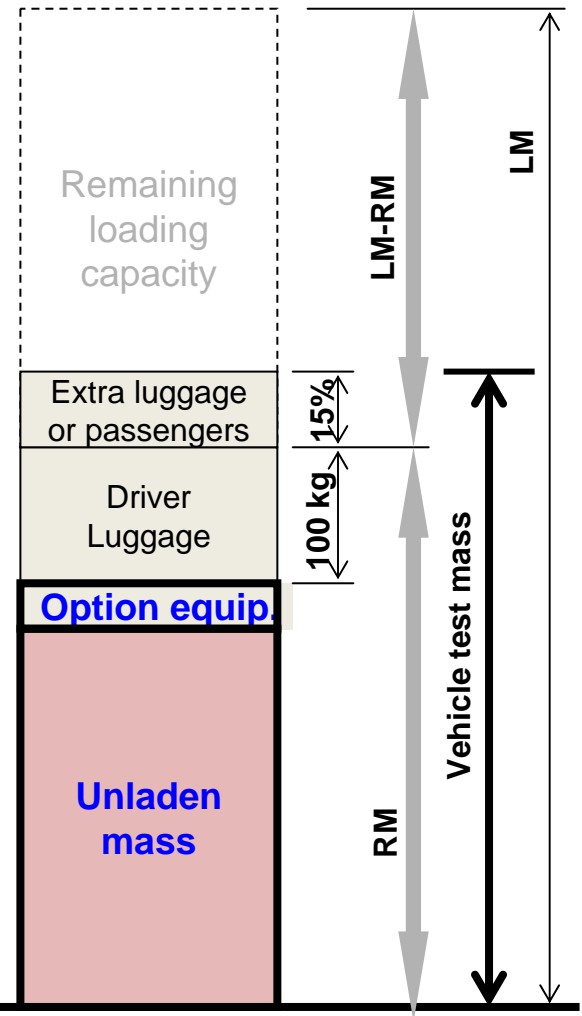
- Take the unladen mass of the vehicle
- Add representative mass for vehicle options
- Identify constant and variable mass contributions
- Relate variable mass contribution to the remaining load capacity of the vehicle.

Vehicle test mass definition

- Constant mass contribution: 100 kg
- Variable mass contribution: 15% of (LM – RM)

Vehicle test mass is the unladen vehicle mass (UM) plus mass of vehicle options (OM) + 100 kg + 15% of remaining difference with LM

$$\text{Test mass} = \text{UM} + \text{OM}_{\text{REP}} + 100 + 0.15 (\text{LM} - \text{RM})$$



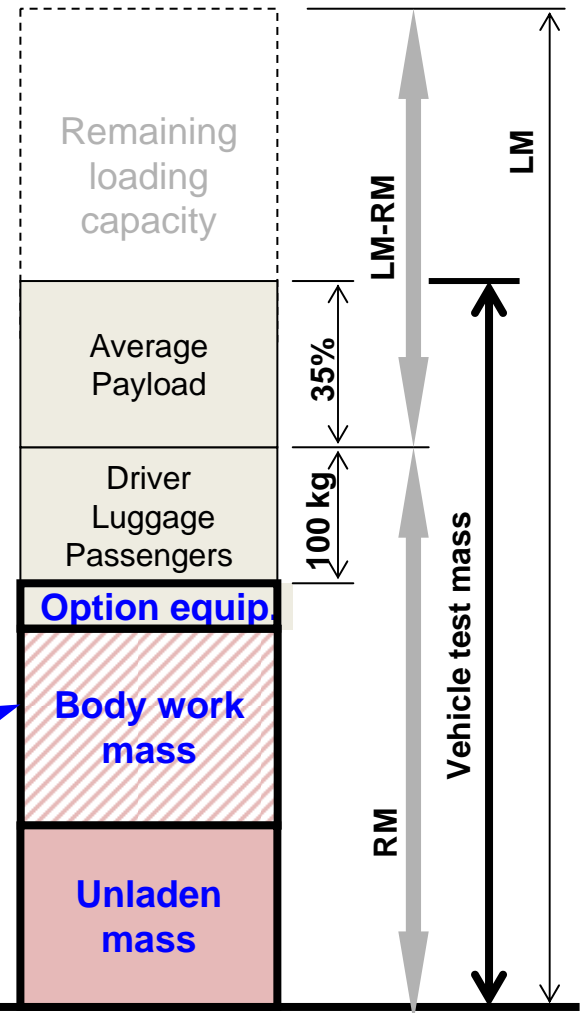
M1 vehicles

Vehicle test mass for N1 vehicles

- Same approach chosen as for M1 vehicles
- Same constant mass of 100 kg
- Variable added mass based on AEA report, results in 35% of (LM – RM)

Vehicle test mass is the unladen vehicle mass (UM) plus mass of vehicle options (OM) + 100 kg + 35% of remaining difference with LM
Test mass = $UM + OM_{REP} + 100 + 0.35 (LM - RM)$

Discussion necessary for multi stage vehicles



N1 vehicles

Representative mass for vehicle options

Problem:

How to define representative mass for vehicle options?

Approach:

- Define best case and worst case test mass (vehicle with no options and vehicle with full options)
- Interpolation based on actual vehicle weight (assuming linear relation between mass and CO₂)

Note:

Emission compliance only demonstrated at worst case vehicle

Representative vehicle selection

Problem:

How to select a representative vehicle for road load determination?

Approach:

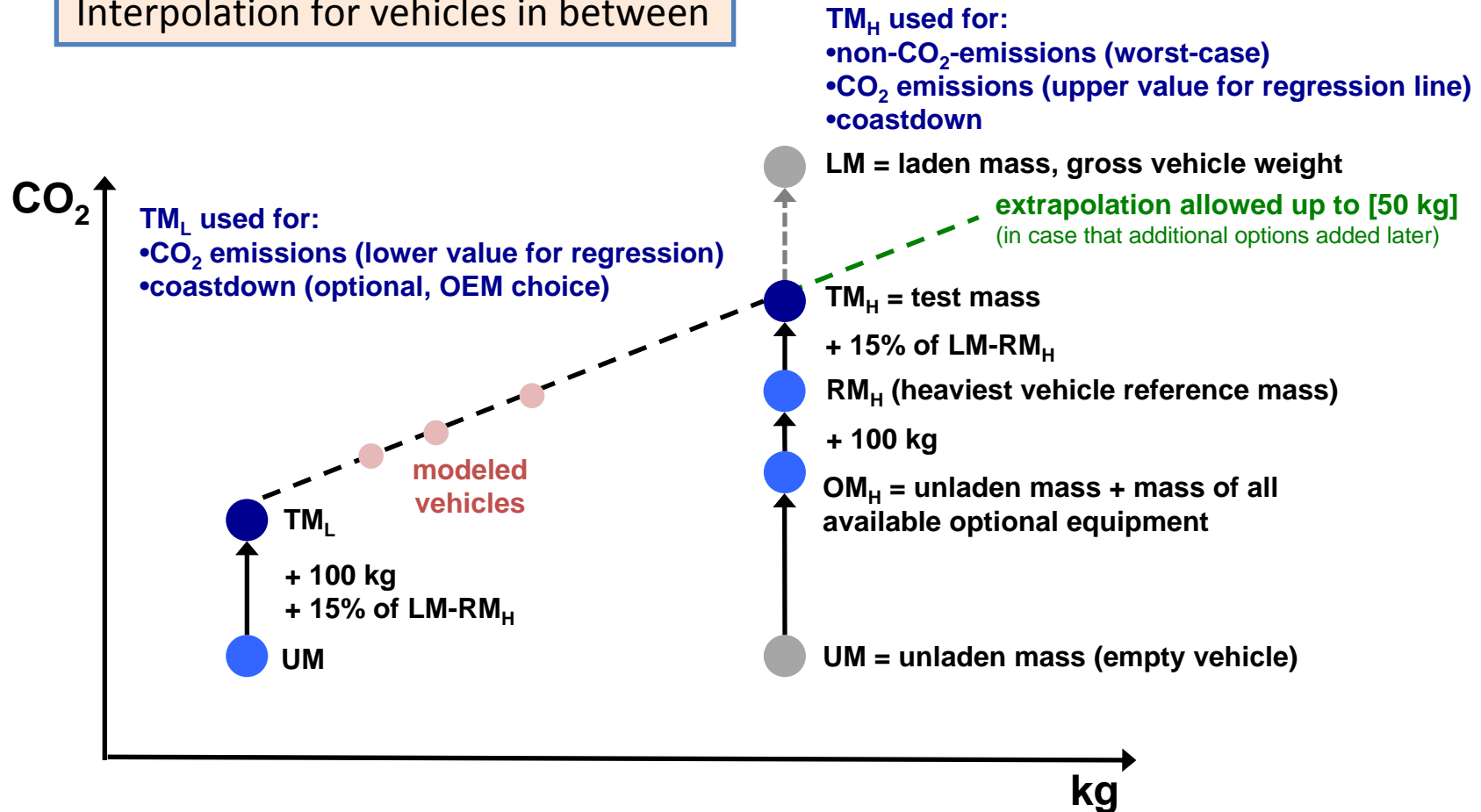
- Road load is dependent of vehicle options
- Determine road load at worst case vehicle, and optionally at best case vehicle (at choice of manufacturer)
- Interpolation based on actual vehicle weight (assuming linear relation between mass and CO₂)

Combined approach

Stepless inertia:

Best and worst case vehicle tested at their defined test masses

Interpolation for vehicles in between



Conclusions

Advantages:

- More representative vehicle test mass (actual mass of optional equipment, actual loading capacity considered)
- Same definition applicable for all vehicle models, types and categories (M1 and N1)
- Test mass also considers vehicle construction features and design
- Improved representativity of road load values
- More accurate and vehicle specific CO₂ values

Disadvantages:

- Administration of masses for individual vehicles needed
- CO₂ performance depends on customer's choice

End of presentation

Defining representative vehicle mass

Total vehicle mass is considered to be composed of:

- Unladen mass
- Optional equipment (factory installed)
- Optional equipment (after sales, owner installed)
- Driver mass
- Passengers mass
- Luggage / Payload

These mass contributions can be:

- Constant (vehicle independant)
- Variable (dependant of vehicle construction and design)

Approach to define representative vehicle mass:

- Estimate each individual contribution (constant and variable)

Defining representative vehicle test mass

| | Constant | Variable (payload dependent) |
|---|-------------|------------------------------|
| Unladen mass | Actual mass | |
| Optional equipment (factory installed) | Actual mass | |
| Owner installed equipment (after sales) | 5 kg | 0 kg |
| Driver | 75 kg | 0 kg |
| Passengers | 0 kg | 0 to 60 kg |
| Luggage / Payload | 20 kg | 0 to 40 kg |
| Total | 100 kg | 0 to 100 kg |

Variable mass translates on average in **15%** of (LM-RM) for M1 vehicles