Default running resistance “table”

Proposal from the Netherlands

WLTP-DTP
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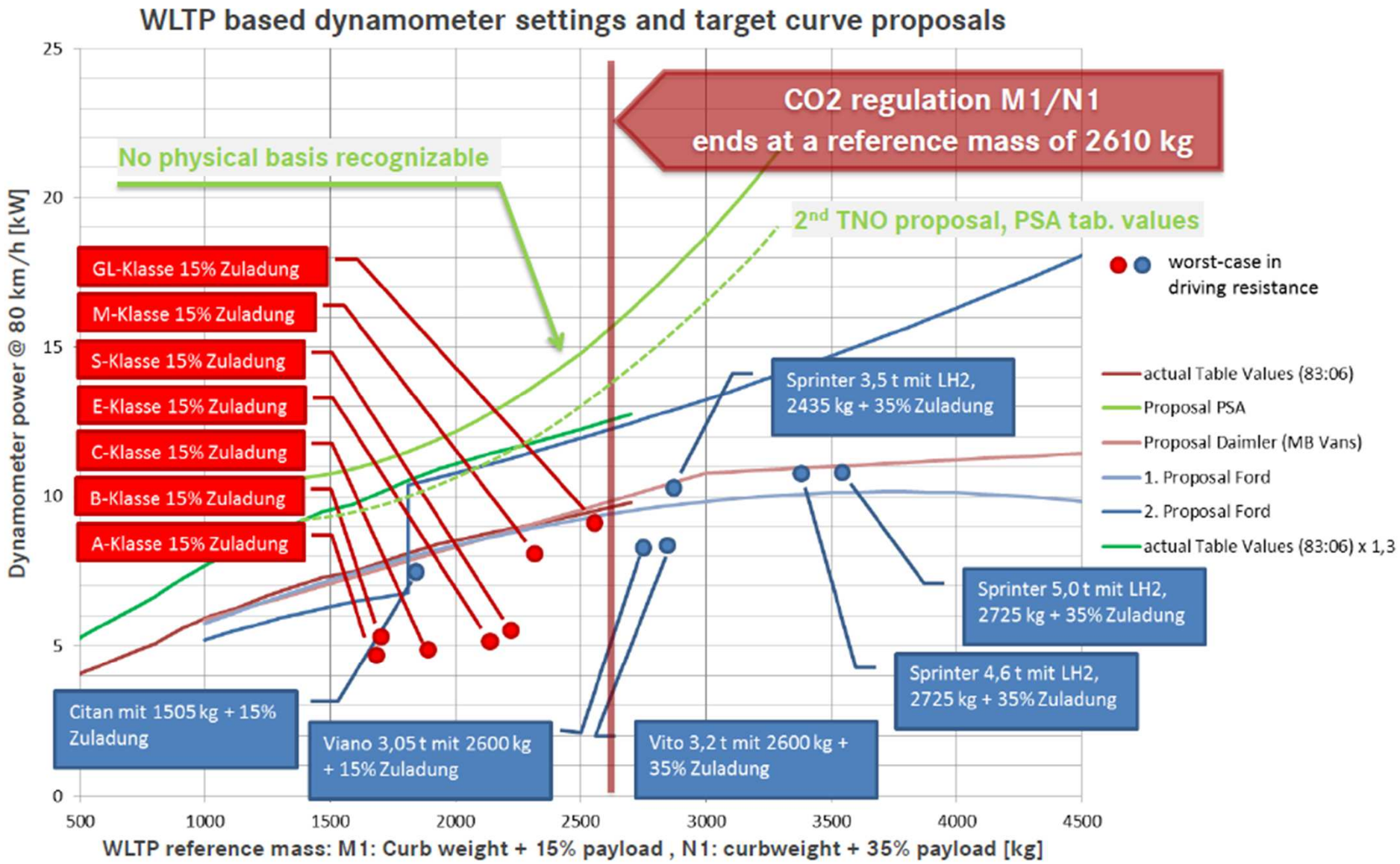
Discussion of different default value proposals



Default values for running resistances

- Road Load or Chassis dynamometer setting?

  preferably road load

- Should table values be representative for all types of vehicles?

  preferably no separate tables for passenger cars and vans

Proposal:

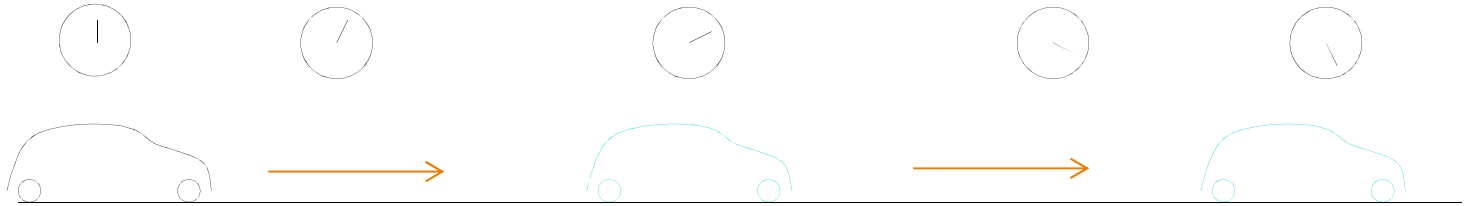
Simple physical model to calculate running resistance values incorporating vehicle weight, width and height

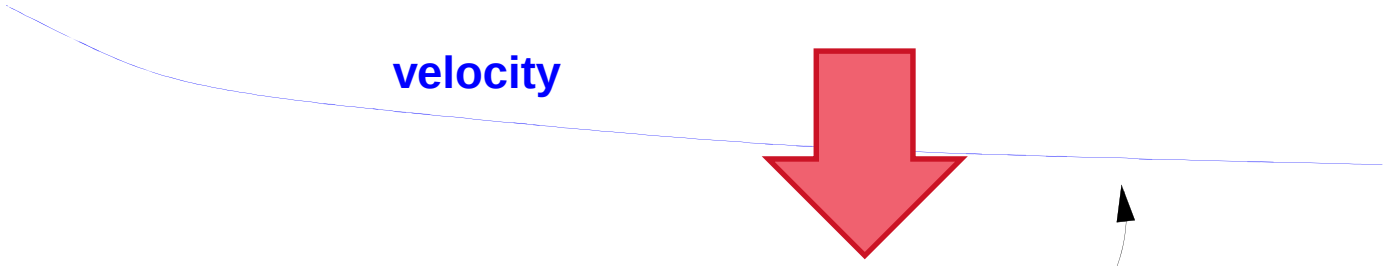
parameters derived from type approval certification data

Repeat coast down on the chassis dynamometer

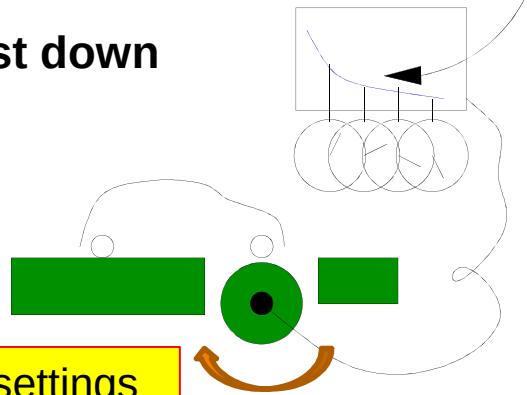
(no reference to dynamometer settings)

On-road coast down





Chassis-dynamometer coast down



matching

current table values are chassis dynamometer settings

Default values for running resistances

- **road-load values**, not chassis dynamometer settings (!):
  - repeat coast down on chassis dynamometer to ensure correct settings of the chassis dynamometer

- physical-model based values:
  - parameter values (**a, b**) fit of data from **certification tests**
  - **Functional form**:
    - F0 = **a** * *weight*
    - F1 = 0
    - F2 = **0.00002 * a** * *weight* + **b** * *width* * *height*

assuming a 20% increase in rolling resistance at 100 km/h

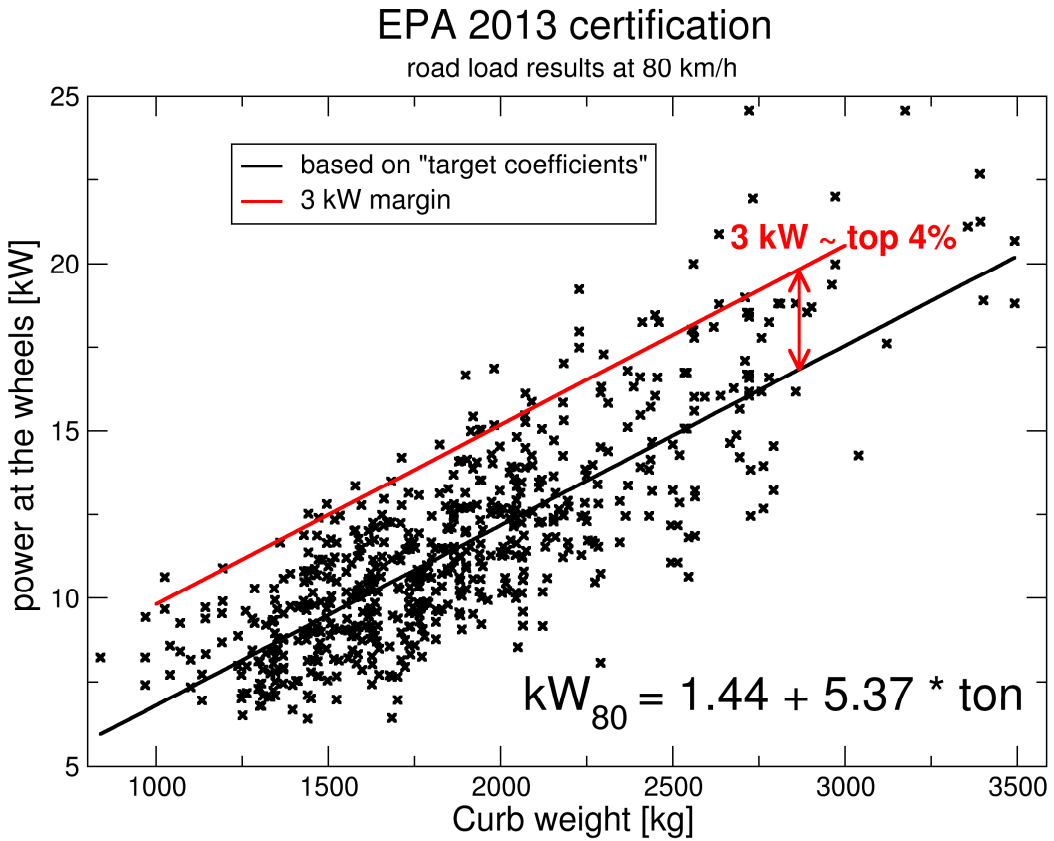
correlated: difficult to determine separately

effective frontal area, based on size data

set $F1_{new} = 0$ by least-squares fit: $F0_{new} = F0_{old} + 3*F1_{old}*V_{max}/16$ and $F2_{new} = F2_{old} + 15*F1_{old}/(16*V_{max})$ with $V_{max} = 100$ km/h

Road-loads from US certification data

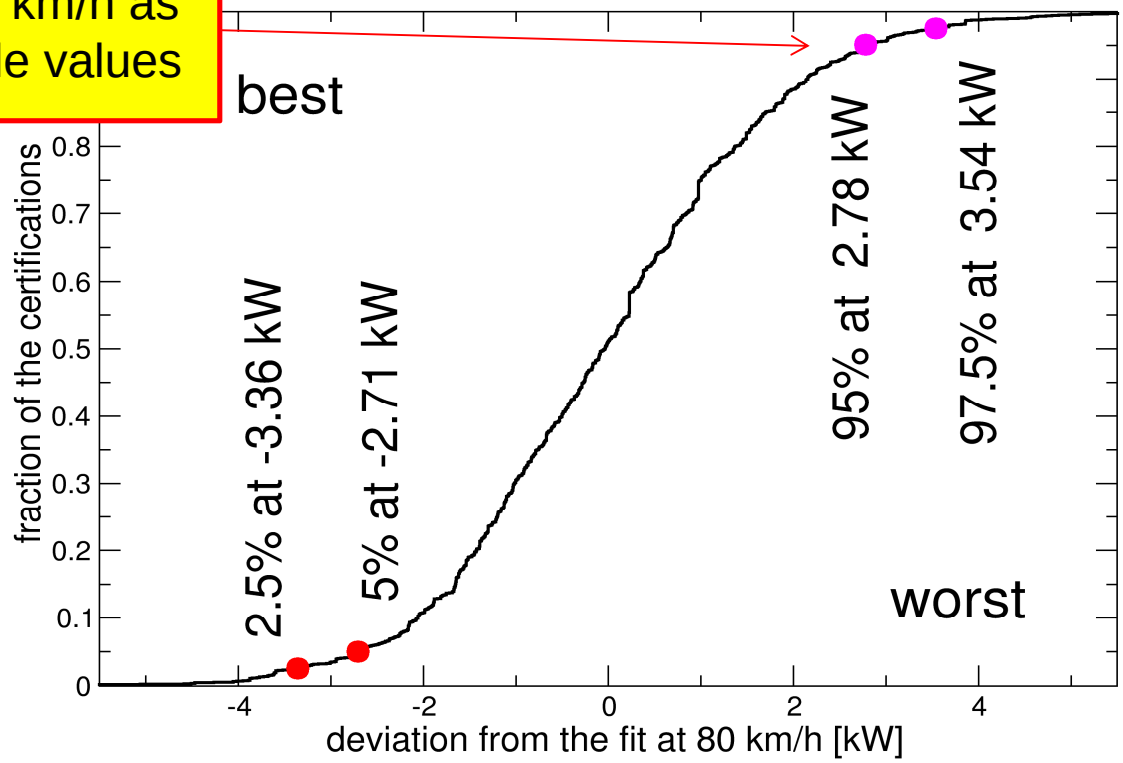
(width and height not available)



Example of required margin values from US data

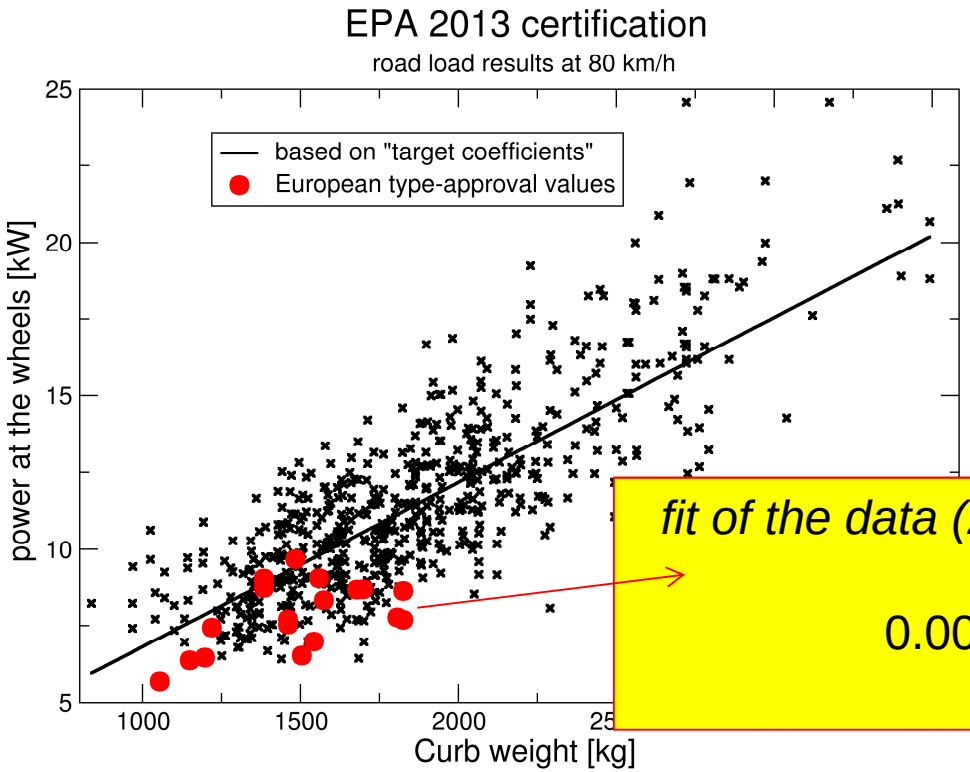
(with table values 2.5 - 3.5 kW apart from the mean)

using **3 kW** at 80 km/h as **margin** in the table values



Using available European type-approval values

basis for the parametric fit of a_{fit}=0.105 and b_{fit}=0.0126



air-drag parameter is 8% lower due to assumed velocity dependence of the rolling resistance

fit of the data (23 vehicles, 6 velocities)

$F[N] = \mathbf{0.105}*weight * + 0.00002 * \mathbf{0.105}*weight*v^2 + \mathbf{0.0126}*width*height*v^2$

Proposal for WLTP road-load "table" values

(target set at 38% above mean)

Use the formulas: *(weight in kg, width and height in m, velocity in km/h)*

Force [N] = 0.145*weight + $2.90*10^{-6}$*weight*v^2 + 0.0174*width*height*v^2

Power [kW] = (v/3600)*Force[N]

	per weight [ton]		per width*height [m2]	
velocity [km/h]	force [N]	power [kW]	force [N]	power [kW]
20	146.2	0.81	7.0	0.04
40	149.6	1.66	27.8	0.31
60	155.4	2.59	62.6	1.04
80	163.6	3.63	111.4	2.47
100	174.0	4.83	174.0	4.83
120	186.8	6.23	250.6	8.35