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Working Party on Brakes and Running Gear (GRRF)
(Fifty-fifth session, 3-6 February 2004,
agenda item 4.)

PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 111
(Handling and stability of vehicles)

Transmitted by the expert from the Russian Federation

Note: The text reproduced below was prepared by the expert from the Russian Federation to update his proposal concerning tilt angle for the tilt-test, following the recommendation of GRRF at its fifty-fourth session (TRANS/WP.29/GRRF/54, para. 22).

Note: This document is distributed to the Experts on Brakes and Running Gear only.

Insert new paragraphs 2.7. and 2.7.1., to read:

"2.7. "Rollover threshold" means the instant when all the wheels of one side of a vehicle have lost contact with the supporting surface (tilt table platform).

2.7.1. The inclination angle of the tilt table surface is represented by the symbol " β ".

Paragraph 5.3.1.1., amend to read:

"a tilt table angle of $\beta_c = 23^\circ$ has been reached "

Annex 1,

Item 3.2., amend to read:

"3.2. tank; make, model, effective volume:"

Item 6.2., amend to read:

"6.2. mass of vehicle in running order: "

Insert a new item 8.1., to read:

"8.1. Centre of gravity height of the vehicle in running order: "

Insert a new item 11.5., to read:

"11.5. Electronic Stability Programme (ESP) engaged: yes/not/not applicable 2/"

Annex 3,

Paragraph 5., subparagraph b), amend to read:

"b) **the related method for calculation of the new minimal tilt table angle for the lighter test load is given in the paragraph 7.2."**

Insert a new subparagraph c), to read:

"c) **if in case of filling a tank by water, the total vehicle mass and/or axle/bogie load is less than maximum authorized mass of a vehicle, then the total mass of a test vehicle shall be increased by ballasting until it reaches the maximum authorized mass. The ballast shall be attached to the sprung part of a test vehicle in such a way, so the centre of mass of the ballast is coincided with the centre of volume of a tank."**

Paragraph 7., amend to read:

"7 TEST PROCEDURE

7.1. This procedure consists

..... of stick-slip and hysteresis."

Insert a new paragraph 7.2., to read:

"7.2. If, during testing of a vehicle, which tank in case of full load (with respect to its mass) is not filled completely (with respect to its volume), the tilt table inclination angle β is less than value of β_c ~~or/and roll angle ϕ when $\beta = \beta_c$ is more than value of ϕ_e~~ , the test shall be repeated with the fully filled (with respect to its volume) tank. 1/

The values of the recorded at the test tilt table inclination angle β_w ~~and roll angle ϕ_w (when $\beta_p = \beta_c$)~~ shall be corrected by using the following formulae:

$$\tan \beta_p = \tan \beta_w \cdot \frac{A_T \cdot H_w}{A_w \cdot H_g} + \frac{T_T}{2 H_g} \left(1 - \frac{A_T}{A_w} \right)$$

The value of β_p shall be higher **than or equal**, ~~and the value of ϕ_w shall be lower than~~ the corresponding critical values β_c ($\beta_p \geq \beta_c$ ~~$\phi_p \leq \phi_e$~~). ~~[Note by the secretariat: The text and the formulas are contradictory]~~

In the formulas:

A_T = vehicle mass in case of loading by normal fluid;

A_w = vehicle mass in case of loading by water.

$$A_w = A_T + V_l \cdot (\rho_w - \rho_T)$$

H_g, H_w = height of the vehicle centre of gravity in case of loading by normal fluid and water, respectively;

$$H_w = H_g - V_l \cdot (\rho_w - \rho_T) / C_{ST}$$

T_T = theoretical wheel track at the vehicle cross section at the centre-of-gravity point;

V_t = effective tank volume;

$$C_{ST} = \frac{A_g}{H_g - H_l}$$

C_{ST} = vertical stiffness of suspension at the centre of gravity point;

A_g = mass of payload;

ρ_T = density of normal fluid;

ρ_W = density of water;

H_l = height of the centre of gravity of the vehicle in running order.

1/ If a vehicle manufacturer disagrees with the full loading of a tank by water, and the fluid designated for carriage is unsafe, the test can be repeated with a tank filled with the fluid designated for carriage at the facilities of a vehicle manufacturer, who shall provide necessary safety measures."

Annex 4,

Paragraph 7.2., amend to read:

"7.2. In case of semi-trailers separated from tractors, kingpin effects are calculated by using the following formula:

Kingpin trace width:

$$T_K = \frac{\sum_{i=1}^n T_i}{n}$$

The kingpin roll stiffness, which is the roll stiffness of the tractor at the longitudinal position of the fifth wheel/kingpin, will be calculated by using a reference load dependent roll stiffness factor of 4 [kN-m/rad]: $C_{DRESK} = A_K \cdot 4$ "
