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THE ROLE OF FULL-SCALE FRONTAL IMPACT TEST OF BUSES

(Frontal collision of buses)
Presented by Hungary

Thinking about the possible safety regulations in respect to the frontal collisions of buses a basic question is the possible role of the full-scale front impact tests. (FSFIT) Do we really need these tests in the approval process, is their cost/benefit ratio profitable, advantageous? To answer on these questions it is worthwhile to survey the important safety subjects belonging to the frontal collision of buses:

- Reducing the agressivity of buses, protecting the other road users in frontal collisions of buses. This does not need FSFIT.
- Underrun protection is closely connected to the collisions with cars. It protects the car occupants as well as the main control systems of the bus (steering, braking) and the bus drivers in the low position DC. This also does not need FSFIT.
- The task of the safety bumper system is not well defined yet in the case of buses. It should protect the colliding partners, the underrun or it should have a certain energy absorbing capacity, too? But in any case the safety bumper may be tested separately, this test does not need FSFIT.
- Protection of bus driver, assuring the integrity of the DC, that of the survival space. One of the most important problem which is not regulated yet. It is proved either by FSFIT -s, or by real accidents that the partial impact on the DC is more severe, more dangerous than the full front impact.. The FSFIT may be used for this purpose but there are some other possibilities, too (e.g. pendulum impact test, moving trolley impact test, etc.) which seem to be more effective.
- Protection of the crew having special seats in the front part of the bus. Very similar problem (and possible solution) to the protection of the driver.
- Protection of the passengers may be assured mainly by appropriate seats and using seat belt. ECE Reg.80 gives the requirements and approval tests for seats, this is the only regulation belonging to the problem of frontal collision of buses. For the dynamic impact sled test of the seats a deceleration pulse is defined: from an impact speed of 30-32 km/h the deceleration shall be in the range of a 8-12 g in a time interval of 150 ms. This pulse represents the standard accident (head on impact) for the bus seats. But the question is: what is the real behaviour of the bus structure in the standard accident (e.g. head on impact with a wall, having 30 km/h impact speed) what kind of deceleration pulses are produced by the different bus constructions, bus types? The really good answer on this question may be given by FSFIT, or certain estimations may be done by using other tests and calculations. (Static or dynamic component test, calculation of energy absorption, etc.)

Summarising this study it may be said that the FSFIT for buses:

- is a very informative tool in the development stage of new buses, it can be proposed to the big bus manufacturers to perform this test – as the last test – on the prototypes of new constructions. It could help in the validation of new test methods, structural models and simulation programs.
- seems to be not an appropriate approval test (standard accident) in the international approval process considering the small bus manufacturers and the cost/benefit ratio of this test.
- could be a good reference when specifying the different approval tests for buses in case of frontal collisions.