UTAC

ADVANCING MOBILITY SINCE 1924

EqOP – TF rear impact

09/2025

Summary on Rear impact assessment

- Proposal adopted during last GRSP meeting: https://unece.org/sites/default/files/2024-12/GRSP-76-47-Rev.1e.pdf
  - ”The proposal aims to improve the whiplash behavior of occupants of smaller stature and, in particular, of female drivers.” Maximum gap for head restraint placed in it´s lowest position.(5.6.8)
  - Important first step

Remaining Items:

- Headrest adjustment:
  - If headrest is adjustable, the most unfavourable position, means generally highest in the regulations (§ 6.4.1 and 6.8.1.1.3)
  - Incorrect adjustment is observed in the field and can cause higher risks [1] → Is there a problem with current requirements?
  - Lower headrest and performance criteria in rear row; Higher risk observed in the field [2]
- Seatback and dynamic performance:
  - Risk for females is still higher than for males and whiplash still occurs freqeuntly [3]
  - The whole seat back determines performance, which is currently not considered in the static test [4]
  - According to technical services, dynamic test alternative is very rarely / not used
  - Regulations do currently not require robust design protecting different sizes [5]

- Do current regulations hinder the development of a comfortable headrest adjustment into the safest position?
- How can we assess the dynamic performance of a seat for different statures to avoid optimization for the specific test conditions in a narrow way that is detrimental to the protection of a diverse population?

Chapline, J. F., Ferguson, S. A., Lillis, R. P., Lund, A. K., & Williams, A. F. (2000). Neck pain and head restraint position relative to the driver's head in rear-end collisions. *Accident Analysis & Prevention*, *32*(2), 287–297. https://doi.org/10.1016/S0001-4575(99)00126-8
Krafft, M., Kullgren, A., Lie, A., & Tingvall, C. (2003). The risk of whiplash injury in the rear seat compared to the front seat in rear impacts. *Traffic Injury Prevention*, *4*(2), 136–140. https://doi.org/10.1080/15389580309862
https://wiki.unece.org/display/trans/EqOP+1st+workshop, EqOP-Workshop-01-05e - Field data analyses Folksam EqOP sep 2023.pdf, EqOP-Workshop-01-04e - Rear impact research and program updates.pdf
EqOP-Workshop-01-07e - Designing for Equity_230905_LJakobsson.pdf
EqOP-Workshop-01-09e - Svensson Carlsson Kullgren 2022-03-31.pdf

GRSP 77th session – EqOP presentation

Suggested Next steps

Real-world-benefit will be re-analysed in each step

- Continue working on proof of concept for virtual crash testing in frontal sled condition where more variations of seat positions and anthropometries are enabled and robustness of restraint systems is assessed:
  - Check injury risk for different body shapes representing females and males in frontal crashes (sled condition)
  - Discuss to additionally evaluate lower speeds / additional body regions
  - Define thresholds considering aging population
  - Useful short-term side products: specification of more detailed validation and definitions of diverse body shapes which can help to review geometric requirements.
- Discussion and workshop on equity issues in frontal impact and causes to define next steps
- Discuss how and if enhancement of lower extremity and brain injury assessment in UN R94 and R137 makes sense
- Discuss reasons for incorrect adjustment of head restraints – is regulation (e.g. backset) hindering more ergonomic designs?
- Discussion about increasing the use and current limitations of the dynamic alternative in R17 / GTR7
  - BioRID – Change test procedure? Reproducibility?

When talking about “increasing the use of the dynamic test alternative”, what is the goal here ?

to keep only dynamic testing
or
to request static testing alternative and dynamic alternative

R17 S10

Two alternatives in regulation R17 (since S10)

Static testing alternative :

- Frontal energy dissipation
- Displacement (102 mm)
- Head restraint and its anchorage strength (890 N)
- Height retention

+ backset (just for M1 front outboard seat)

Dynamic testing alternative :

Biorid test

Have there been any studies comparing the same seat model in alternative 1 and alternative 2?

Is the dynamic alternative a better solution than the static alternative ?

R17 S10

Two alternatives in regulation R17 (since S10)

Static testing alternative :

- Frontal energy dissipation
- Displacement (102 mm)
- Head restraint and its anchorage strength (890 N)
- Height retention

+ backset (just for M1 front outboard seat)

→ Enable to check mechanical resistance
→ Measurement of effort
→ Less expensive

Dynamic testing alternative :
Biorid test

→ Evaluate biomechanical criteria
→ More suitable solution for dynamic head restraint systems
→ Dynamic test more severe

Strength and limit of each solution should be reviewed, based on recent data