



Pedestrian Safety: Deflection of Bonnets in Active Pedestrian Protection Systems

UNECE GRSP Task Force Deployable Bonnet Systems for Pedestrian Safety
1st meeting, Paris, 7 - 8 February 2017

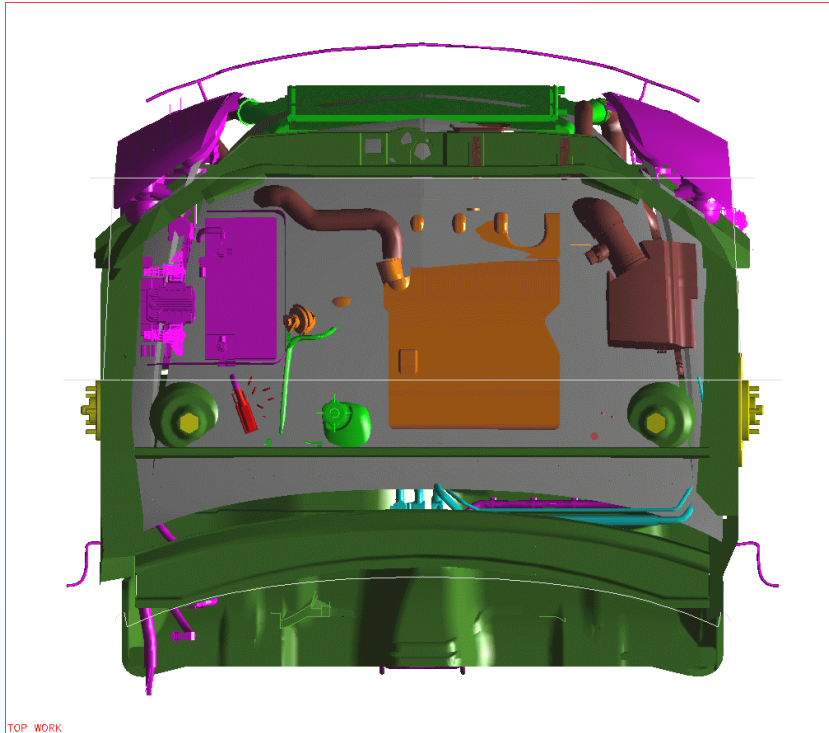
6 February 2017

Issues

- OICA members note that there are some issues with the analyses done by BAST (refer to document “Deflection of Deployable Bonnets in DB Systems”):
 - The whole bonnet deflection is meant to assess the comparison of reaction forces of the supports of passive and active bonnets and their structures themselves - it was never meant to be an assessment of a potential impact situation
 - Not all under-bonnet parts are rigid and therefore causing injury risks
 - Deflection due to the upper body does not necessarily influence the actual contact of the head with the bonnet
 - The vertical distance between bonnet surface and underlying components is mixed with the distance in impactor flight direction
- In general, defining an under-bonnet clearance is design restrictive
- No requirements on this exist for vehicles with “standard” (non-deployable) bonnets



Bonnet Deflection: Rigid Under-Bonnet Parts



Example:

Engine compartment of a large family car with a passive bonnet, bonnet lowered 80 mm (grey area), showing parts with intrusion:

- Only dark-green parts are structural parts, most parts are rubber, plastics, composite materials etc.
- Many parts nowadays are attached so that they move away (e.g. brake fluid container), are collapsible (e.g. engine cover), etc.

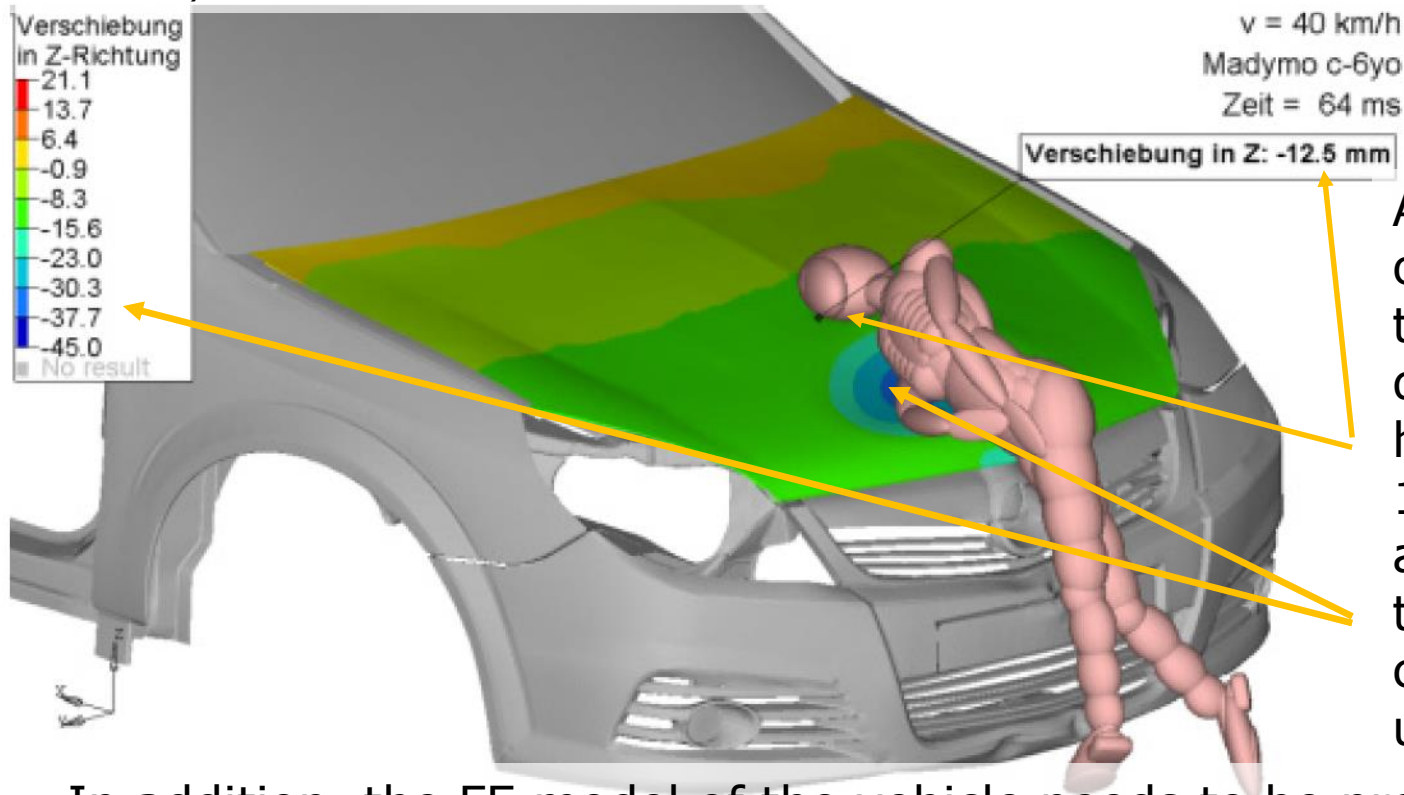
Reference:
Kinsky, 8 – 9 Sept. 2005,
TÜV Rheinland Conference Pedestrian Protection



Bonnet Deflection: Body vs. Head

Reference:

Nuss/Eckstein/Berger (Aachen University): Active Systems of Passive Vehicle Safety (in German), Report F90, Nov. 2013, available at <http://bast.opus.hbz-nrw.de/benutzung> (06.02.2017)



Acc. to the original study, the max. bonnet deflection in the head area is 12.5 mm (or about 1/3rd of the deflection caused by the upper body)

- In addition, the FE model of the vehicle needs to be proven for correlation to the real vehicle
- MADYMO shoulder characteristics tend to be too stiff and therefore shoulder intrusion shown may be too high



Bonnet Deflection: Body vs. Head

- In the tests of BAST (and as required by Euro NCAP) the engine compartment package was not present
 - The missing package, however, does not represent surface intrusions comparable to a potential impact situation where the shoulder may be decelerated by under-bonnet components
 - Consequently, the intrusion in the area of the head impact also does not represent potential impact situation
 - In the study summary, the head was positioned to the shoulder location
- ⇒ **A requirement of 80 mm vertical clearance will lead to an over-engineering of the bonnet and will lead to stiffer overall bonnets – with possible disadvantages for VRUs!**
- ⇒ **Criteria should be performance based and not design restrictive!**



Thank you!

For detailed questions please refer to the authors,
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