

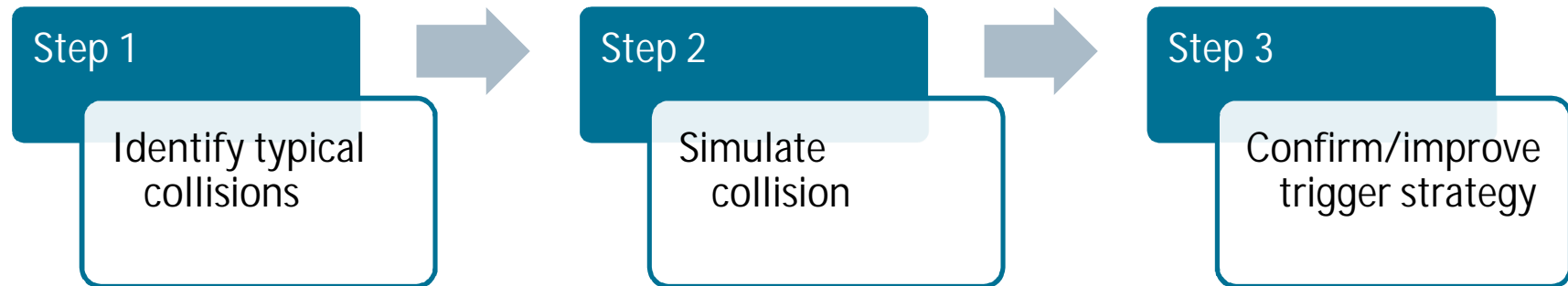


Federal Ministry
for Digital
and Transport

Stimulus: EDR HDV Approach

2024-10-22

EDR HDV three step approach for typeapproval



Step 1: Identify typical collisions

- Identify 'typical collisions' related to the vehicle for approval using accident statistics related to the region of homologation
- Process of identifying 'typical collisions' is up to the manufacturer, but should be supported by a Technical Service
- Set of [three?] typical collisions relevant to the delta-v trigger threshold

Step 1: Identify typical collisions

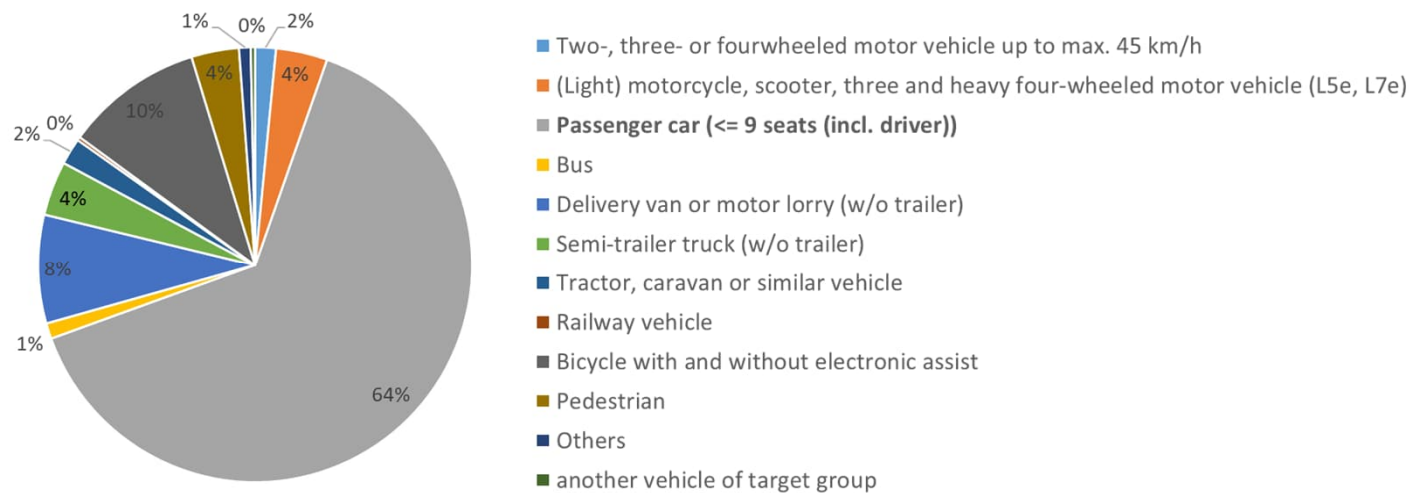
Example with German Data – Filter Data

Filter Criteria for data from 2019 to 2022

- Accidents with personal injury (~severe accidents irrespective of the amount of material damage)
- Crashes of buses and goods road transport vehicles registered in Germany with permissible gross vehicle weight of 8-12 tonnes (here: “target group”)
 - Includes buses and coaches with more than 9 seats including driver's seat, coaches, buses and school buses
 - Includes trucks with a tanker bed without a trailer, trucks with a gross weight over 3.5 tonnes with and without a trailer, tractor units, other tractors (including with tankers) and trucks with special bodies

Step 1: Identify typical collisions

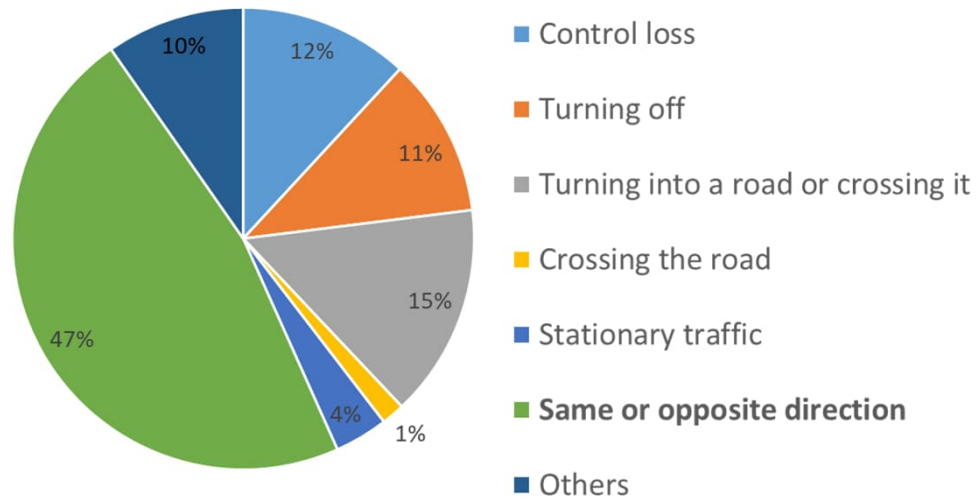
Example with German Data – Results (1)



Typically, the other party is a passenger car

Step 1: Identify typical collisions

Example with German Data Results (2)



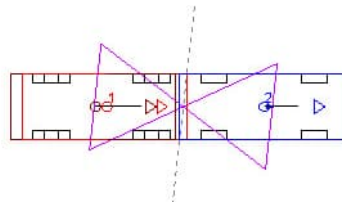
Typically, both parties move in opposite or same direction

Step 2: Simulate collisions

- Simulate typical collisions using widely available crash reconstruction software (e.g., PC Crash or Virtual Crash)
- No Finite Element simulations or real crash tests required (but could also be presented!)
- Vehicle in crash reconstruction software should be modified as possible to represent vehicle up for approval

Step 2: Simulate collisions

Example cases



Here 4 cases are simulated:

1. Ego vehicle and impacted vehicle are the same, original mass 2,1 t
2. Ego with 8 t
3. Ego with 10 t
4. Ego with 12 t

Other collision variables held constant, for example impact speed of 30 km/h

Step 2: Simulate collisions

Example results

Case 1: Ego 2,1 t

Stoß-Einlauf-Impuls	
Fahrzeug:	1 Mercedes-Å 2 Mercedes-Å
Einlauf:	
Geschw. [km/h]:	29 0
Richtg. [°]:	0.00 0.00
Omega [rad/s]:	0.00 0.00
φ Stoßpunkt [°]:	-180 0
Auslauf:	
Geschw. [km/h]:	13.10 15.95
Richtg. [°]:	0.00 0.00
Delta-v [km/h]:	15.95 15.95
Omega [rad/s]:	0.00 -0.00
Def[cm]:	11 11
Def. Energie [kJ]:	17.0 17.0
EES [km/h]	14.43 14.43
delta v: 4 [km/h] (Ist: 2.90)	
k: 0.1 Reibung: 0.6	
Koordinaten [m]:	
Stoßpunkt	
Berührebene	
x: 1.65 phi -96.32	
y: 0 psi	
z: 0.45 0	
Nr.: 1	
Stoß	
Optionen...	
Stoß	
autom. Ber	

dv = 15,95 km/h

Case 2: Ego 8 t

Stoß-Einlauf-Impuls	
Fahrzeug:	1 Mercedes-Å 2 Mercedes-Å
Einlauf:	
Geschw. [km/h]:	29 0
Richtg. [°]:	0.00 0.00
Omega [rad/s]:	0.00 0.00
φ Stoßpunkt [°]:	180 0
Auslauf:	
Geschw. [km/h]:	22.39 25.24
Richtg. [°]:	0.00 0.00
Delta-v [km/h]:	6.66 25.24
Omega [rad/s]:	-0.00 0.00
Def[cm]:	11 11
Def. Energie [kJ]:	26.8 26.8
EES [km/h]	9.33 18.16
delta v: 4 [km/h] (Ist: 2.90)	
k: 0.1 Reibung: 0.6	
Koordinaten [m]:	
Stoßpunkt	
Berührebene	
x: 1.65 phi -96.32	
y: 0 psi	
z: 0.45 0	
Nr.: 1	
Stoß	
Optionen...	
Stoß	
autom. Ber	

dv = 6,66 km/h

Case 3: Ego 10 t

Stoß-Einlauf-Impuls	
Fahrzeug:	1 Mercedes-Å 2 Mercedes-Å
Einlauf:	
Geschw. [km/h]:	29 0
Richtg. [°]:	0.00 0.00
Omega [rad/s]:	0.00 0.00
φ Stoßpunkt [°]:	-180 0
Auslauf:	
Geschw. [km/h]:	23.49 26.34
Richtg. [°]:	0.00 0.00
Delta-v [km/h]:	5.56 26.34
Omega [rad/s]:	0.00 -0.00
Def[cm]:	11 11
Def. Energie [kJ]:	28.0 28.0
EES [km/h]	8.52 18.55
delta v: 4 [km/h] (Ist: 2.90)	
k: 0.1 Reibung: 0.6	
Koordinaten [m]:	
Stoßpunkt	
Berührebene	
x: 1.65 phi -96.32	
y: 0 psi	
z: 0.45 0	
Nr.: 1	
Stoß	
Optionen...	
Stoß	
autom. Ber	

dv = 5,56 km/h

Case 4: Ego 12 t

Stoß-Einlauf-Impuls	
Fahrzeug:	1 Mercedes-Å 2 Mercedes-Å
Einlauf:	
Geschw. [km/h]:	29 0
Richtg. [°]:	0.00 0.00
Omega [rad/s]:	0.00 0.00
φ Stoßpunkt [°]:	180 0
Auslauf:	
Geschw. [km/h]:	24.28 27.13
Richtg. [°]:	0.00 0.00
Delta-v [km/h]:	4.77 27.13
Omega [rad/s]:	-0.00 0.00
Def[cm]:	11 11
Def. Energie [kJ]:	28.9 28.9
EES [km/h]	7.89 18.83
delta v: 4 [km/h] (Ist: 2.90)	
k: 0.1 Reibung: 0.6	
Koordinaten [m]:	
Stoßpunkt	
Berührebene	
x: 1.65 phi -96.32	
y: 0 psi	
z: 0.45 0	
Nr.: 1	
Stoß	
Optionen...	
Stoß	
autom. Ber	

dv = 4,77 km/h

EDR HDV three step approach for typeapproval

Step 3: Confirm/improve trigger strategy

- In this case the triggering strategy for the EDR would have to be adjusted if the EDR was set to trigger at 8 km/h
- Other strategy than speed reduction could be used
- Strategy choice and rationale up to the manufacturer, but should be supported by a Technical Service

Thank you for your attention.

Contact details

Federal Ministry for Digital and Transport
RV 3
Robert-Schuman-Platz 1
53175 Bonn

Contact
ref-rv3@bmdv.bund.de
www.bmdv.bund.de

