

# EC study to review the appropriateness of crash pulses used in current EU legislation

Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs

GROW 1.2 Mobility Unit
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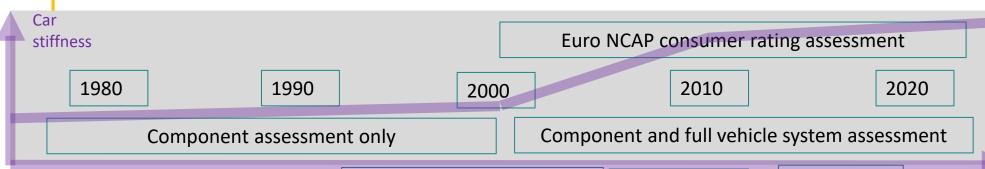
GRSP 10 December 2021

#### Objectives of the research

- Review crash pulses in current legislation and assess their appropriateness
- Identify potential amendments to regulations and assess the potential benefits as well as any (unintended) consequences
- Study carried out by TRL (2021 Edwards et al)
  - https://data.europa.eu/doi/10.2873/58935



## Background – evolution of regulations



Late 70s / early 80s: R11 (door latches):

30-36g for > 30ms

R14 (anchorages):

No crash pulse option

R44 (CRS): corridor max 20-28g,

duration 100-120ms

80s / early 90s

R16 (seatbelts):

corridor max 26-32g, duration 50-80ms

R17 (seats):

seat inertia strength, >20g for >30ms

R21(Interiors):

No crash pulse requirements

R67(LPG): No crash pulse req

**Circa 2000** 

Intro:

Frontal (R94) and side (R95)

**impact Regulations** 

R110 (CNG): >20g for whole veh

**Updated:** 

R14 (SB anchorages): Added crash pulse option, corr max 26-

32g, duration 60-80ms

R17 (Seats): Added protect luggage displacement, corr max 20-28g, duration 100-120ms

**R21 (Interiors):** Added cp option to define head impact zone, corr max 26-32g, duration 60-80ms

**R67 (LPG):** Added > 20g for whole veh approval

Circa 2007 Intro:

R126(Partitions)

: corr max 20-28g, duration 100-120ms

Circa 2013 Updated:

R100 (REESS)

corrid. max 20-28g, duration 100-120ms **Circa 2015** 

Intro:

R134(Hydroge

n): : corr max20-28g,duration 100-120ms

**Circa 2017** 

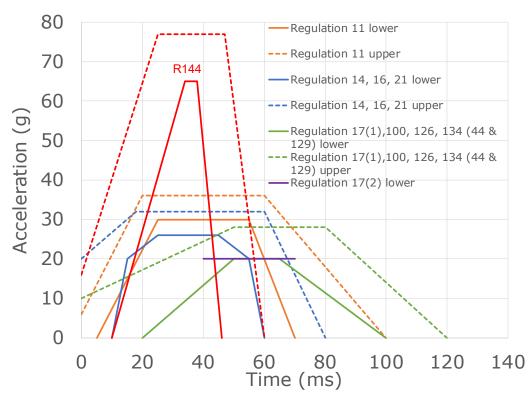
Intro:

R144: corr max 65-77g, duration 38-60ms



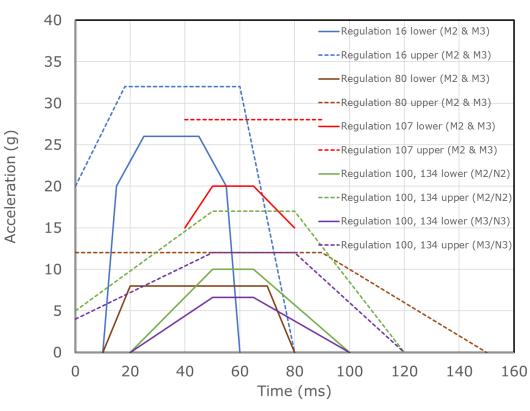
#### Regulatory crash pulses as they exist (frontal)

Frontal: M1 & N1



Note: Regulations 67 & 110 pulse magnitude > 20g

Frontal: M2/N2 & M3/N3

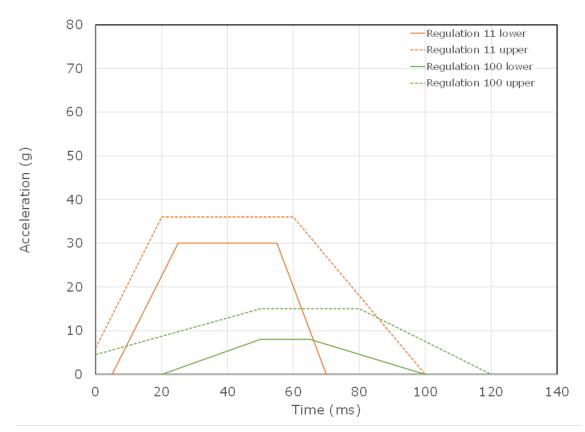


Note: Regulations 67 & 110 pulse magnitude: M2/N2 > 10g; M3/N3 > 6.6g



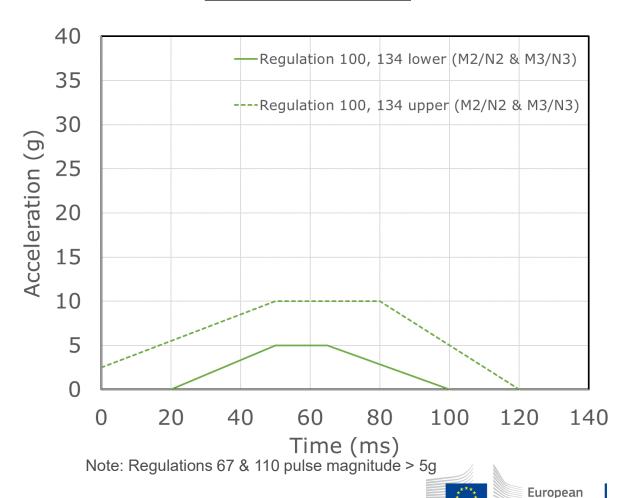
## Regulatory crash pulses as they exist (side)

Side: M1 & N1



Note: Regulations 67 & 110 pulse magnitude > 8g

Side: M2/N2 & M3/N3

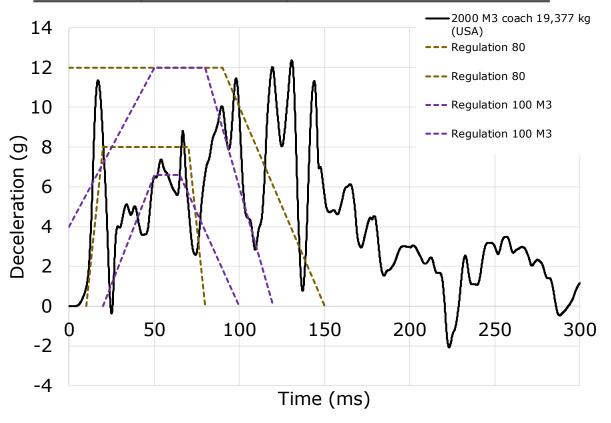


Commission

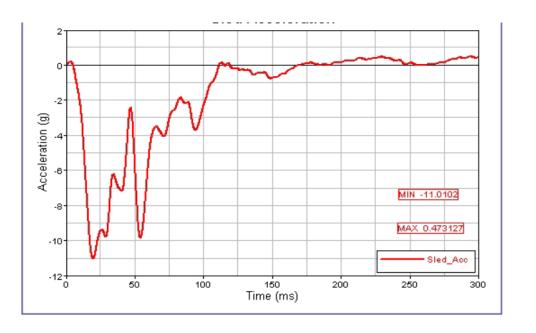
### Comparison M3 frontal impact (example 1)

Limited data shows R100 and R80 corridors reasonably representative in terms of pulse magnitude but duration is much shorter than rigid barrier test

#### US coach (circa MY 2000) Frontal FWRB at 50 km/h



#### Simulation US city bus vs MPV both at 50 km/h

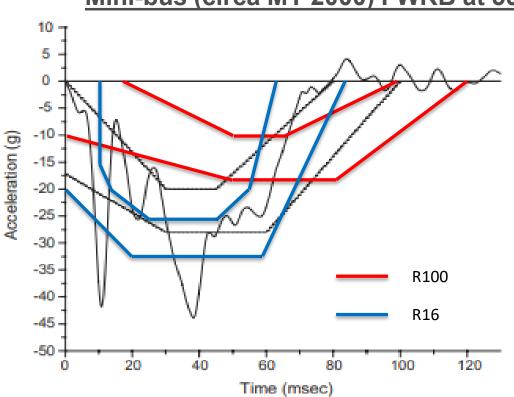




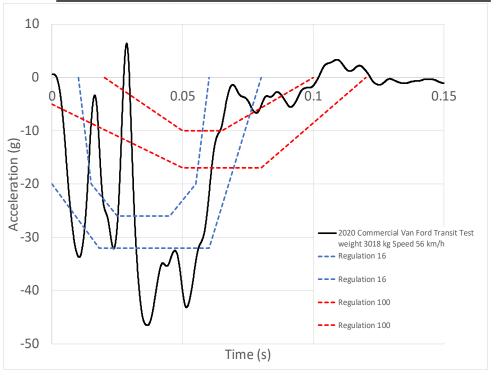
## Comparison M2 frontal impact (example 2)

Limited data shows R100 corridor not representative of current M2 buses (large van types) and that R16 corridor fits better

#### Mini-bus (circa MY 2000) FWRB at 50 km/h



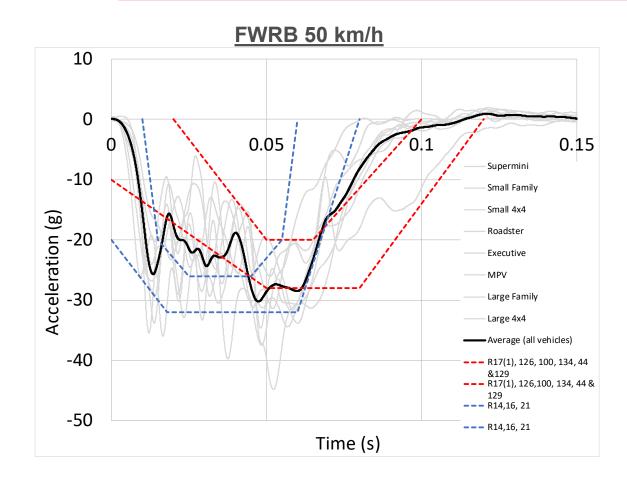
#### Mini-bus (MY 2020) FWRB at 56 km/h

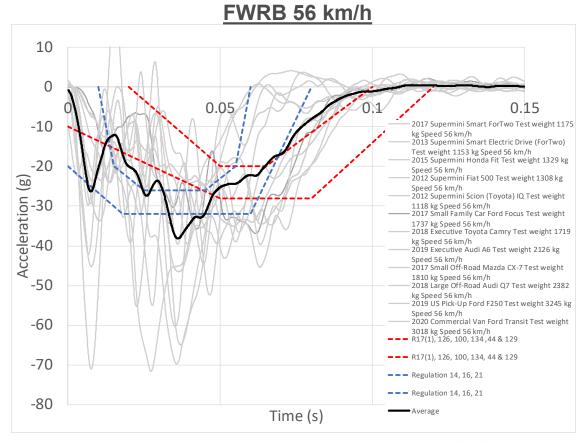




## Comparison M1/N1 frontal impact (example 3)

Shows R129 corridor not representative of current vehicles – average is higher and individual peaks significantly higher; focus on 50 km/h data because equivalent to R137







#### Conclusions

- Refer to Table 18 of the study (pages 139 to 147) with the summary of potential updates by regulation
  - https://data.europa.eu/doi/10.2873/58935
- Downstream alignment necessary in some cases, for example
  - If R129 pulse is increased, the R145 ISOFIX pull force is no longer representative as it is expected to then exceed 8 kN
  - The R80 equivalency between dynamic and static tests need to be reviewed as forces should also become higher
- Limited real-world issues found in literature and accident data
- Lack of concrete cost-effectiveness data (at this stage)



#### Discussion in GRSP

- Consideration by delegates and Contacting Parties if any action based on this research needs to be prioritized
  - The European Commission has an obligation to evaluate vehicle safety by July 2027 (Article 14 of General Safety Regulation (EU) 2019/2144) and will take this research into account at that time
- Recommendations from GRSP to GRSG
  - Notably for UN Regulation No 67 (LPG) and 110 (CNG) as covered by this research, to ensure consistency with UN Regulation No 134 / GTR No 13 (hydrogen safety)



## Thank you

Images:

**European Commission and TRL** 

#### For further information:

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