Francois E. Guichard, Engineer, UNECE

Secretary to GRVA, the Working Party on Automated/Autonomous and Connected Vehicles (and also to WP.1/GE.3)

Key active safety regulations UNECE/WP.29/GRVA (to consider when setting minimum requirements for used imports)

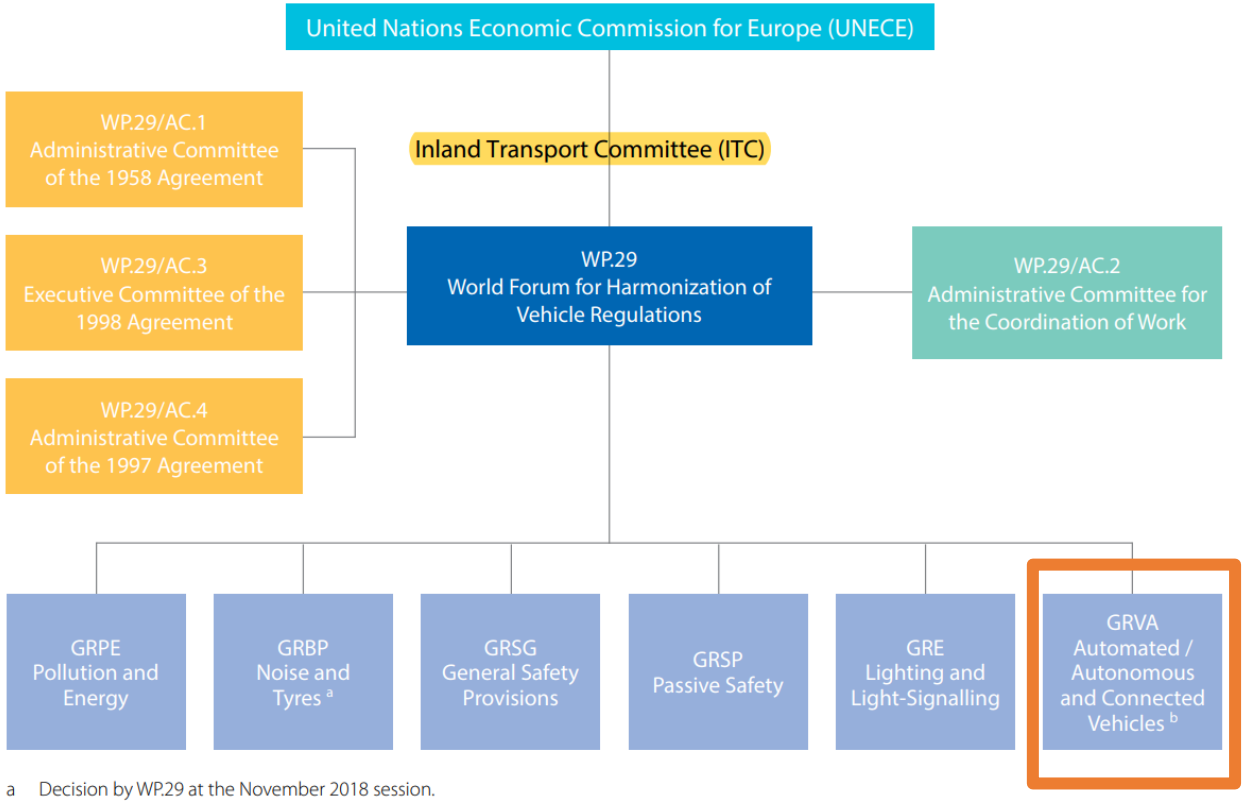
SAFER AND CLEANER
USED VEHICLES

Content

- **Short presentation of UNECE/WP.29/GRVA**
- Vehicle safety – Brief introduction
- Steering
- Braking

SAFER AND CLEANER
USED VEHICLES

WP.29 – World Forum for harmonization of vehicle regulations



a Decision by WP.29 at the November 2018 session.
b Former Working Party on Brakes and Running Gear (see ECE/TRANS/WP.29/1139, paras. 15 and 33).

The main Forum
6 subsidiary groups
1 executive committee
3 administrative committee
(3 Treaty bodies)

Many informal working groups (+40)

3 multilateral Agreements:
- 1958 Agreement
- 1997 Agreement
- 1998 Agreement

~165 UN Regulations
~22 UN GTRs
~4 UN Rules
~5 Resolutions

WP.29/GRVA stakeholders

The UN Member States (Contracting Parties)

Manufacturers:

OICA

Suppliers:

CLEPA
European Association of Automotive Suppliers

MEMA

JAPIA
一般社団法人 日本自動車部品工業会
Japan Auto Parts Industries Association

Motorists:

FIA

Consumer's representatives:

CONSUMERS INTERNATIONAL

Standard Developing Organizations:

IEC ISO ITU SAE INTERNATIONAL

Observers & others:

...

Road and Public Transport Federations:

UITP IRU

Some numbers about GRVA

# participants:	120-220 per session (Global network of ~4000 WP.29 experts) (50-100 experts per informal meeting)
# meetings:	Several meetings per week
# groups:	Around 15 Working Groups (formal, informal and subgroups)

Content

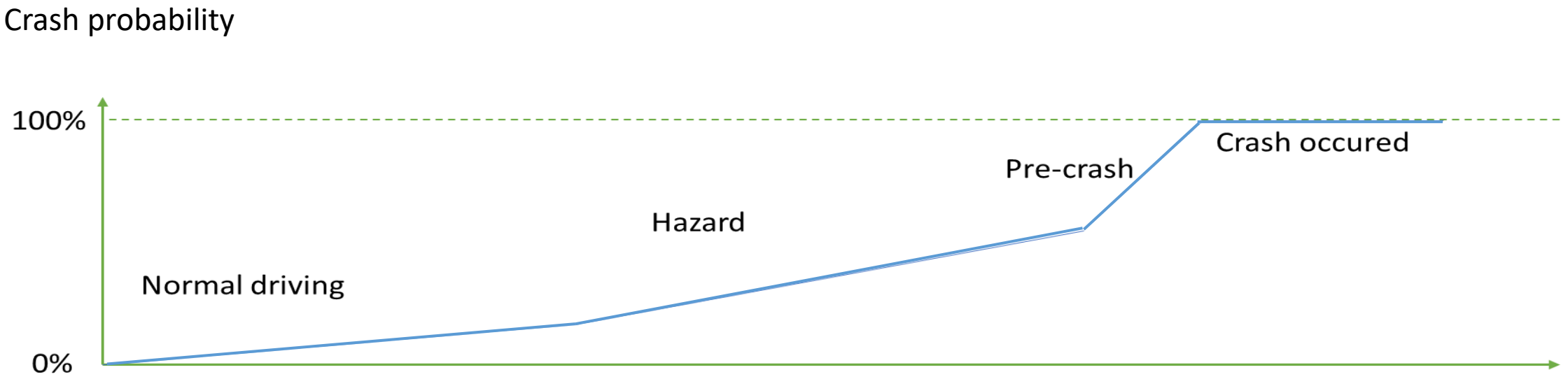
- Short presentation of UNECE / WP.29 / GRVA
- **Vehicle safety – Brief introduction**
- Steering
- Braking

Vehicle safety

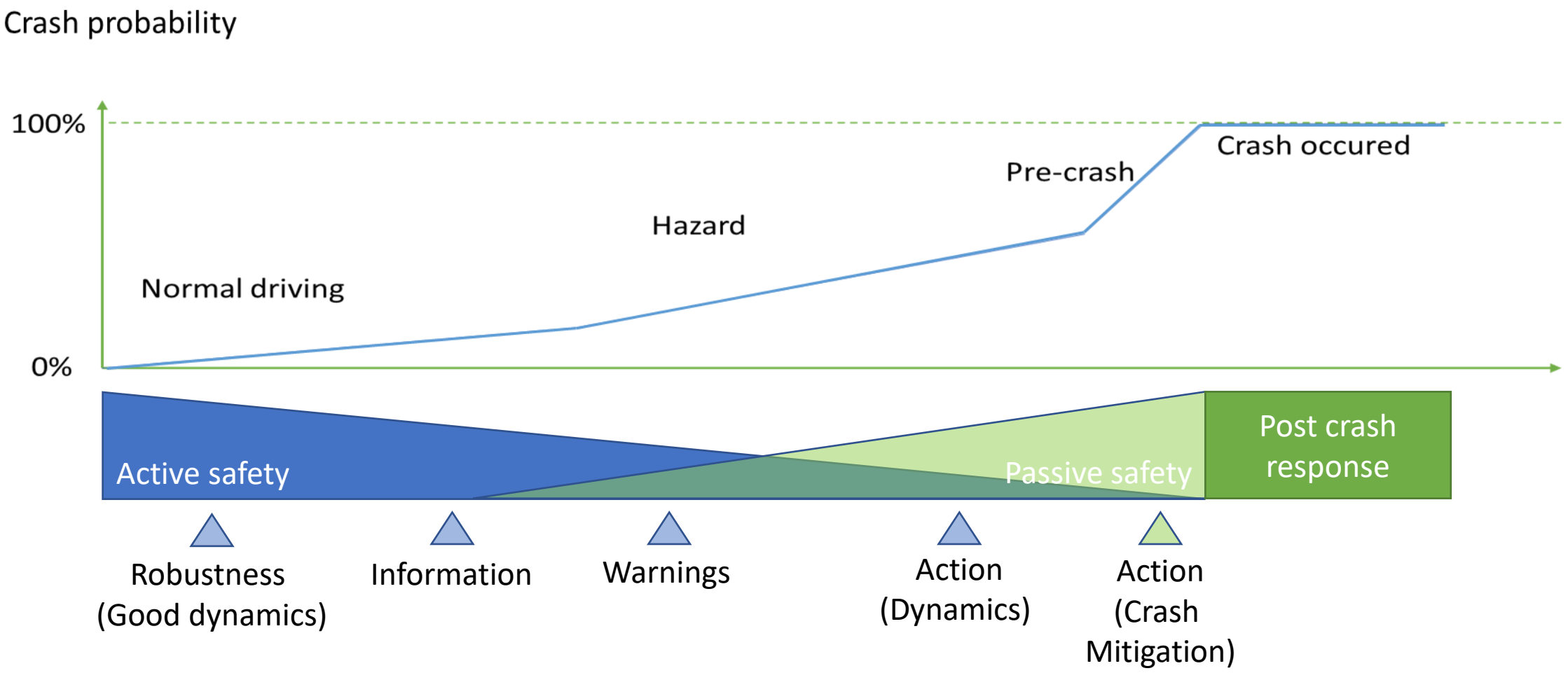
- Why?
  - Economic and transport needs
  - Road safety figures: 1.3 Mio death per year
  - SDG 3.6: halve number of fatalities until 2030

- Vehicle safety levers
  - Vehicle design / performance (checked via certification - 1958/1998 Agreements)
  - Maintenance (checked via PTI - 1997 Agreement)

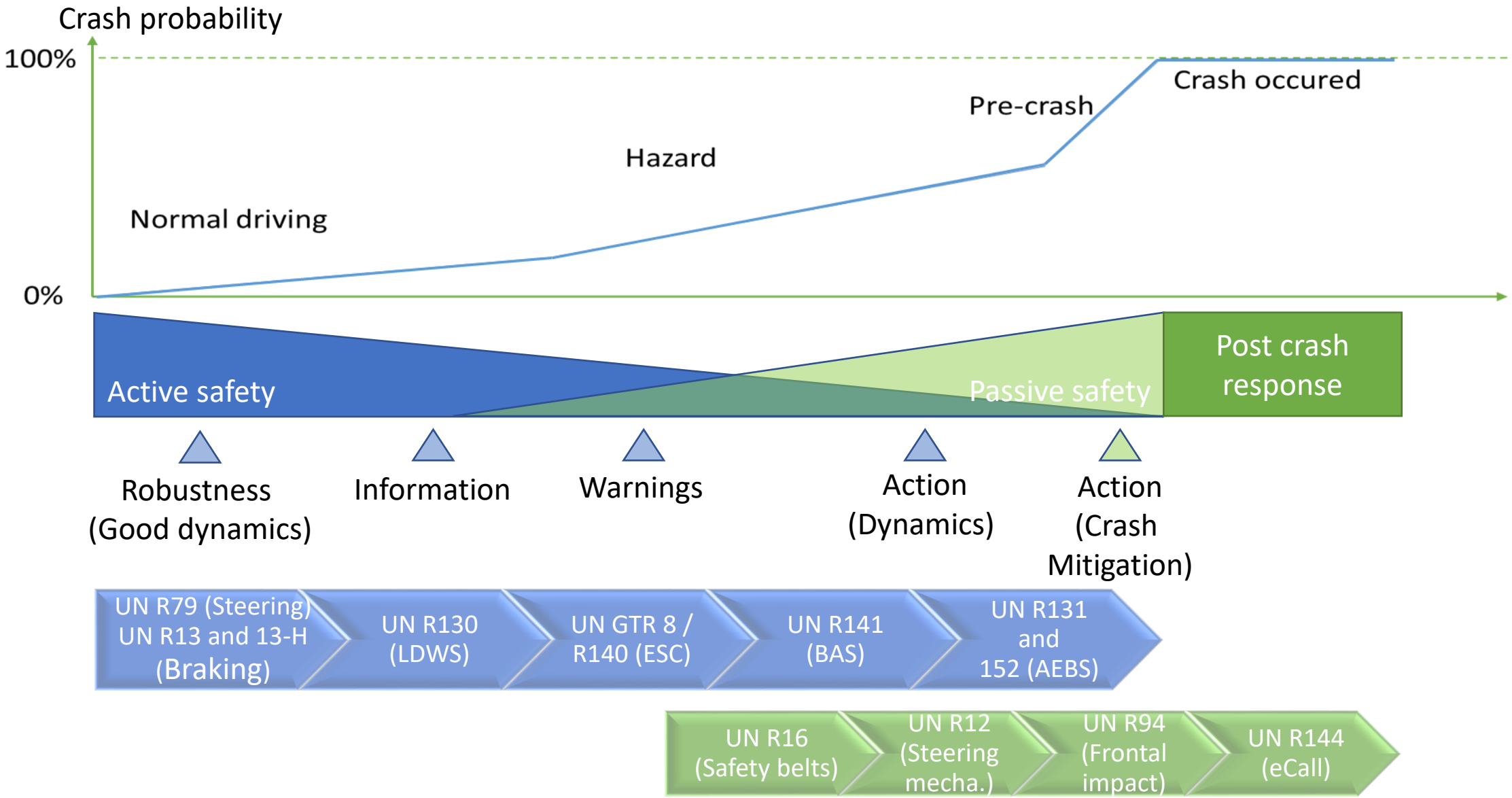
Vehicle safety – tools and regulatory actions



Vehicle safety – tools and regulatory actions



Vehicle safety – tools and regulatory actions



Content

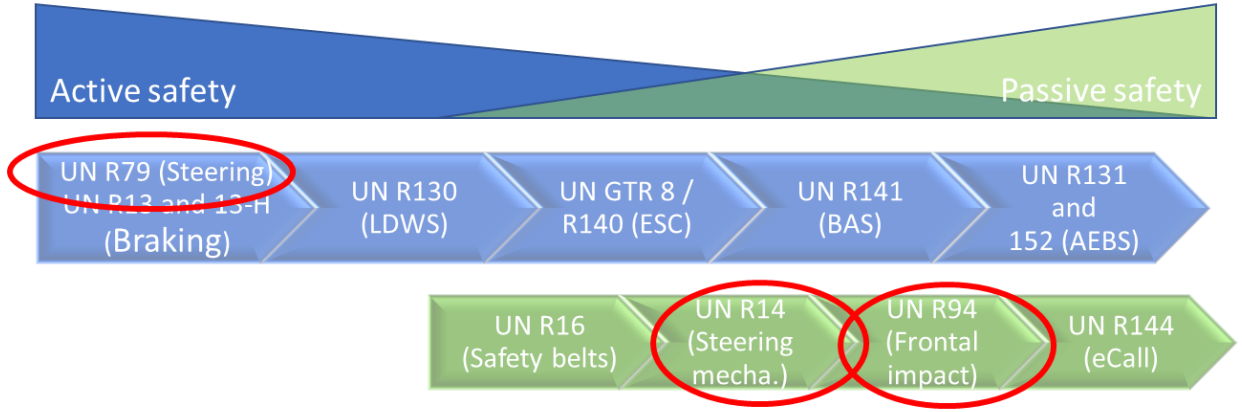
- Short presentation of UNECE/WP.29/GRVA
- Vehicle safety – Brief introduction
- **Steering**
- Braking

SAFER AND CLEANER
USED VEHICLES

Key technical prescription regarding steering

- UN Regulation No. 79 (Steering equipment) covers:
  - Many different types of steering systems
    - Mechanical steering, power steering, auxiliary steering equipment, steer-by-wire, electronic systems influencing the steering (e.g. Corrective SF, ACSF)
  - The following vehicle categories: M1/N1/M2/N2/M3/N3/O
- Basic requirements for the steering equipment itself:
  - The steering must be amply designed to be regarded as non liable to failure
  - Any non mechanical failure must be indicated to the driver via a warning
  - It shall be possible to travel along a straight section of road (also in case of failure)
    - without unusual steering correction by the driver and
    - without unusual vibration in the steering system
  - The vehicle shall have the tendency to self-center
  - The regulation defines steering control effort limit values and testing procedures (without / with failures)
- The Regulation also includes prescriptions for Advanced Driver Assistance Steering Systems (incl. CSF, ESF, ACSF etc.)

Did you know? Steering is part of active safety and passive safety



Steering requirements in:

- UN Regulation No. 79 (described before)
- UN Regulations Nos. 12 and 94
  - Steering column displacement limits (crash test)
  - Dynamic steering wheel displacement limits (crash test)
  - Test with limit values on the force applied on a virtual head hitting the steering wheel

➔Regulations and technology go hand in hand to address vehicle safety

Content

- Short presentation of UNECE / WP.29 / GRVA
- Vehicle safety – Brief introduction
- Steering
- **Braking**

SAFER AND CLEANER
USED VEHICLES

Braking requirements for passenger cars and vans

- UN Regulation No. 13-H
  - Service brake tests (loaded/unloaded)
    - Type 0 tests, (1) engine disconnected,
      (2) engine connected
    - Type I tests, (1) hot performance,
      (2) recovery performance
  - Secondary brake tests
    - Type 0 test, engine disconnected
  - Parking brakes
  - ABS
    - Utilization of adhesion test
    - Additional check
  - Requirements and data for PTI

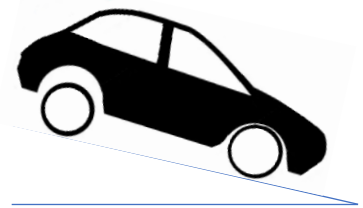
Example: requirements for M1 (stopping distance, deceleration)

100 km/h : 70m 6,43 m/s²

80% Vmax: 187,5 m 5,76 m/s²
(160 km/h max) (for 160 km/h)

75 % of the test type 0 limits
60% of the measured test type 0 value

100 km/h : 168m 2,44 m/s²



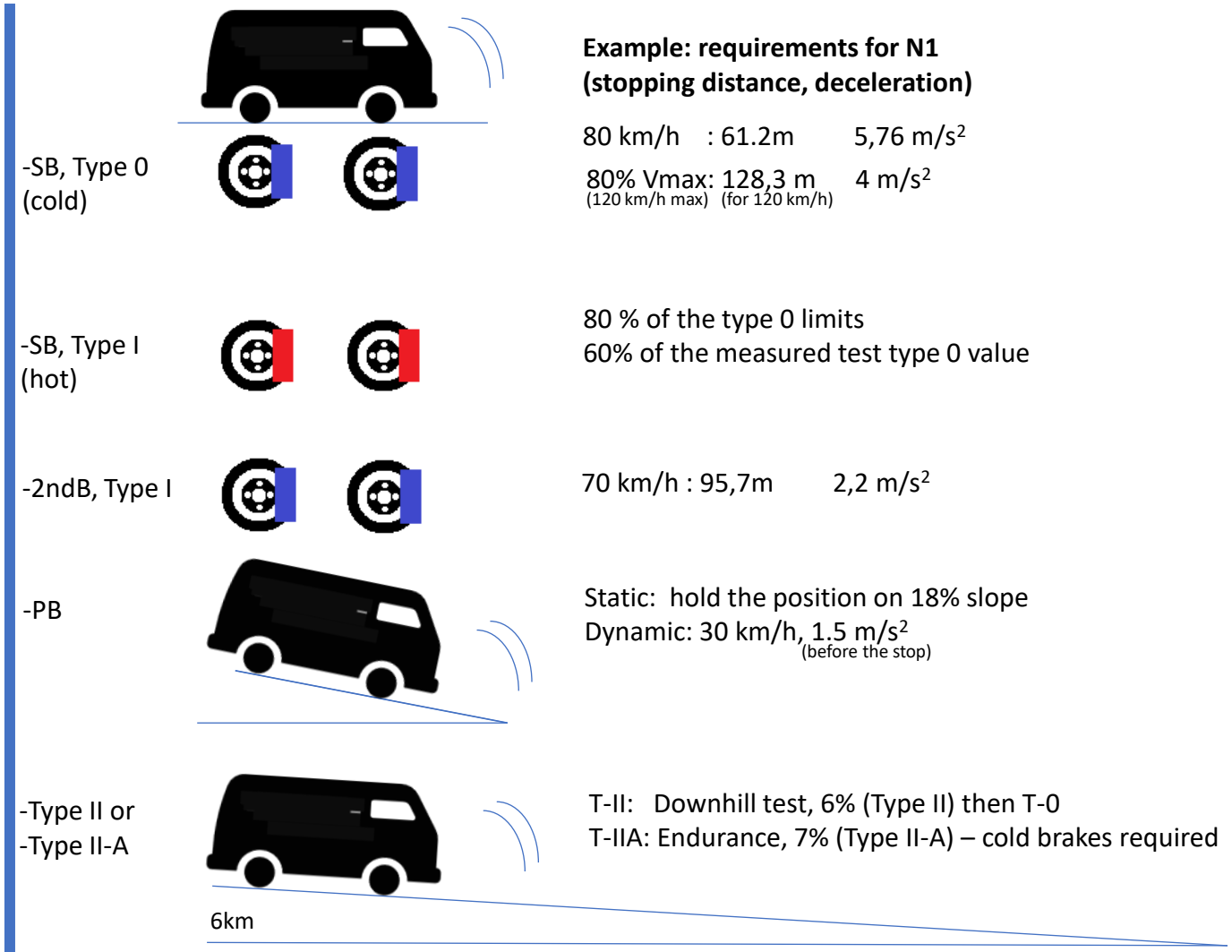
Static: hold the position on 20% slope
Dynamic: 30 km/h, 1.5 m/s²
(before the stop)

Braking deceleration requirement with a unbraked trailer
Max effort requirements (hand / foot)

Main braking requirements for trucks, buses and trailers

- UN Regulation No. 13 covers:
  - Vans, Trucks, buses, coaches, trailers
  - Air and hydraulic brakes
  - Various technologies (disks, drums, retarder), ABS, Vehicle Stability Control

- UN Regulation No. 13 includes requirements for:
  - Service brakes requirements
  - Secondary brakes
  - Parking brakes
  - Downhill / endurance test
  - ABS
  - Vehicle Stability Function
  - Fade test for laden trailers (Type III)
  - Specific tests for trailers / subsystems
  - Link towing/towed vehicles
  - Compatibility requirements
  - Requirements and data for PTI



Example: requirements for N1 (stopping distance, deceleration)

80 km/h : 61.2m 5,76 m/s²

80% Vmax: 128,3 m (120 km/h max) (for 120 km/h) 4 m/s²

80 % of the type 0 limits
60% of the measured test type 0 value

70 km/h : 95,7m 2,2 m/s²

Static: hold the position on 18% slope
Dynamic: 30 km/h, 1.5 m/s² (before the stop)

T-II: Downhill test, 6% (Type II) then T-0
T-IIA: Endurance, 7% (Type II-A) – cold brakes required

-Braking deceleration requirement with a unbraked trailer
-Max effort requirements (hand / foot)

Braking for powered-two-wheeler (L categories)

- UN GTR No. 3 and UN Regulation No. 78

  Cover:
  - 1. Dry stop - single brake control actuated / CBS
  - 2. Dry stop - all service brake controls actuated
  - 3. High speed
  - 4. Wet brake
  - 5. Heat fade
  - 6. If fitted:
    - 6.1. Parking brake system
    - 6.2. ABS performance and ABS switch off provisions
      - Stops on a high friction surface
      - Stops on a low friction surface
      - Wheel lock checks on high and low friction surfaces.
      - Wheel lock check - high to low friction surface transition.
      - Wheel lock check - low to high friction surface transition.
      - Stops with an ABS electrical failure
    - 6.3. Partial failure, for split service brake systems
    - 6.4. Power-assisted braking system failure

Benefits of ABS for motorcycles:

I was estimated that, in the EU, 5000 fatalities over 10 years could be avoided, thanks to ABS

Performance requirements:

- Decelerations (2.5 – 5.4 m/s^2)
- Braking distances

Electronic Stability Control

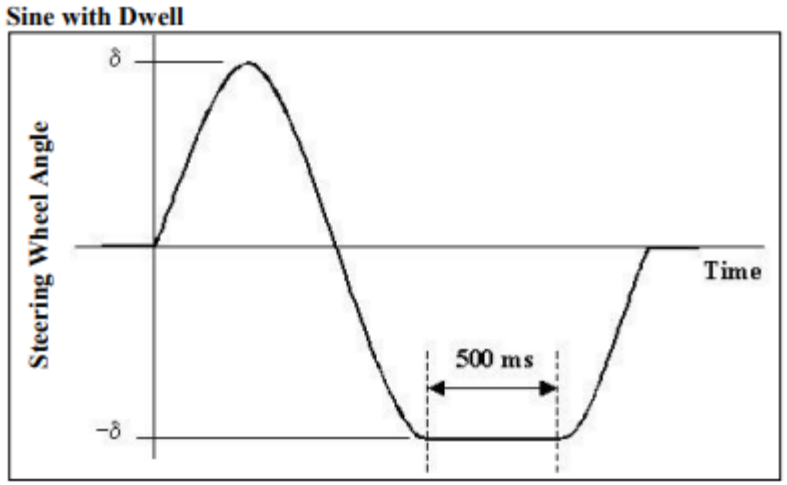
- ESC

  An ESC, if the vehicle starts to skid, corrects the slide by reducing engine torque and braking individual wheels to bring the vehicle back on course, on dry, wet, or slippery roads

- UN GTR No. 8, UN Regulation No. 140 and UN Regulation No. 13
  - Include:
    - Vehicle conditioning and preparation (brakes and tyres)
    - ESC malfunction warning
    - Test procedure “Sine with Dwell”
  - UN Regulation No. 13 includes in addition anti rollover prescriptions

ESC Benefits:

When UN GTR No. 8 was drafted, it was estimated that if all light vehicles on the road in the United States of America were equipped with ECS systems:
- 5 300 to 10 300 lives would be saved and
- 168 000 to 252 000 injuries would be prevented in all types of crashes annually



Advanced Emergency Braking

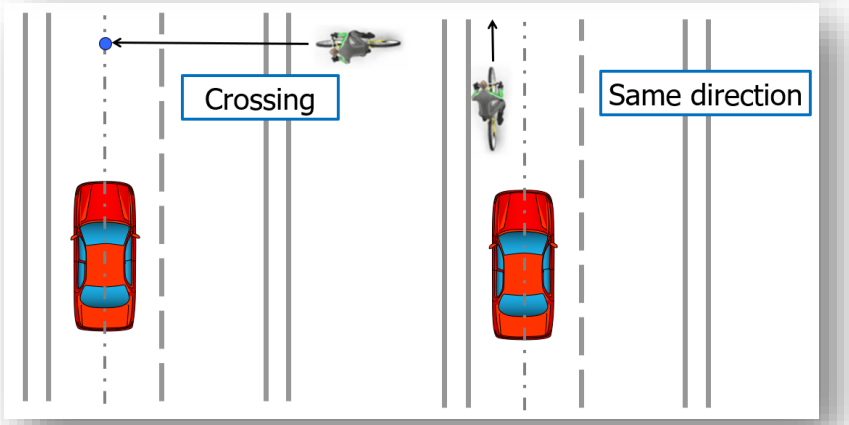
- AEBS – UN Regulation No. 131 (2011)
  - Trucks and coaches are equipped for a decade already
  - This AEBS is meant for motorway conditions
  - Last amendment adopted in June 2022

- AEB for cars and vans – UN Regulation No. 152
  - More recent legislation (2018)
  - Will become mandatory in EU (2022/2026)
  - Also covers urban conditions
    - Car-to-car scenario
    - Car-to-pedestrian scenario
    - Car-to-bicycles scenario

  (soon also for trucks and coaches too – last amend.)

Benefits of the last amendment to UN R131:

In 6 European countries (Austria, France, Germany, Italy, Sweden and the UK), rear-end accidents involving Heavy Duty Vehicles caused the deaths of over 1 000 people between 2016 and 2018 that can be avoided with AEBS complying with the last amendment



Active safety: still relevant?

Automated Driving Systems

Functional requirements

Validation Method

Data storage for AD

Artificial Intelligence

Connected vehicles

Cyber Security and CSMS

Software Updates (incl. OTA) and SUMS

Open: Remote access to in-vehicle data

Active safety

Steering and braking (EVs, HEVs)
Addressing technical progress

Addressing new propulsion systems
e.g. EV trucks

Thank you for your attention

Francois E. Guichard