Minutes of the TED 29 panel meeting held on 16th September 2024 to discuss need for further enhancements in two-wheeler safety provisions

1. Mr. R. S. Mahajan, Panel convener (Dy. Director, ARAI) welcomed all panel members. List of attendees is enclosed as **Annexure-1**. He informed that with reference to discussions in TED 29 meeting held on 4th June 2024 and discussions held in 72nd meeting of AISC held on 7th August 2024, this group needs to work on enhancements in two-wheeler safety (See extracts enclosed as **Annexure-2**). He added that statistics available from various sources like MoRTH and RASSI data shows very high fatalities for two-wheeler users in India. He requested M/s Autoliv to present their study and experimentation inputs / findings, which were presented during last TED 29 sectional committee meeting. SIAM task force assigned by AISC during 72nd meeting for enhancement of two-wheeler safety under Mr. Harjeet Singh from Hero Motors and Mr. Pagare from Bajaj Auto also agreed to provide inputs to TED 29 panel formulated on similar subject.

2. Mr. Sivakumar Sudhachandran, Autoliv briefed panel on their inputs for enhancing two-wheeler safety enclosed as **Annexure-3** of this minute of meeting. He shared their observations on accident data available from CDAS as well as RASSI database. He further added that through their studies, they have identified 250 crash scenarios and most common injuries involve Head, Thorax and Lower leg injuries. Remedies are also linked with modifications needed for Rider related provisions in terms of protective gloves, jackets, etc.

3. Mr. Vishal Rawal, ARAI highlighted that apart from passive safety remedies, active safety provisions which would help to reduce the probability of two-wheeler accidents also needs improvements e.g. control of max. speed of vehicle since on road two wheelers are allowed to ply with maximum speed of 50 km/h, introduction of self-balancing features e.g. gyroscope, usage of twinned wheel provision. He referred discussions in 72nd meeting of AISC held on 7th August 2024 regarding side airbag provisions which would help in improvement of two-wheeler safety. He further briefed about forthcoming discussions under GRSG about lowering of ground clearance requirement below lowest level of side under-run protection from 500 mm to 400 mm based on studies conducted by Japanese experts in lowering possibility of motor-cycle under-run. He further added that many of our standards derive reference from EU Regulations 44/2014 and 168/2013.

4. Mr. B. S. Yamgar, ARAI highlighted that helmet QCO is issued to comply with IS 4151, we may involve helmet manufacturers in the panel. He was requested to share helmet manufacturers' contact details to AISC Secretariat for future communications. He further highlighted that already available references
   in terms of ISO standards and identified load cases may be explored as an immediate step.

5. Mr. Santosh Chopade, ARAI presented on agenda items as circulated vide meeting notice, members noted the same (see **Annexure-2**). He further informed that ISO 13232: 2012 also needs to be reviewed to understand its applicability for Indian accident scenarios.

6. Mr. Manel suggested to refer two-wheeler report based on 921 accident cases available with MAIDS: Motorcycle Accidents In Depth Study. ARAI agreed to study the report for preparing inputs to be presented in the next panel meeting. He further added that even after covering

provisions under EU Regulations by formulating standards, accidents are not reduced and detailed study is required on missing aspects beyond EU Regulation provisions.

7. Mr. R. S. Mahajan sought ideas from all panel members for understanding different accident scenarios and remedies thereof. Panel members also deliberated on various views put forth during discussions. Discussions and decision in the panel meeting are specified below:

Panel member	Inputs from members
Mr. Ashish Kumar, ICAT	To identify present technology which can be linked for accident reduction. Human behavior, road infrastructure and available technology such as E-call to considered.
Mr. Arpan Shukla, Honda	Literature available needs to be studied
Mr. Sarang Deshpande, Hella	ISO 26262 may be reviewed to understand and the probable provisions for enhancement in two-wheeler safety. He agreed to provide inputs related to ISO 26262 in the next panel meeting.
Mr. Harjeet Singh, Hero Motors	i) Accident data available from RASSI data base may be further studied ii) We may also engage with JP Research Laboratory Root causes of all PTW accident need to be studied in detail He agreed to provide inputs in the next panel meeting based on SIAM group discussions as indicated during 72nd meeting of AISC.
Mr. Anandkumar, TVS	Highlighted the need for detailed study of Road safety data. He also expressed the need for educating two-wheeler users about road safety and also involve multi-faced team.
Mr. Mohit Kansal, Yamaha	He highlighted that compared to four-wheeler stability of two-wheeler is less. Hence Engineering efforts need to be taken towards the same
Mr. Sanchit Khare, Mr. Subrat Das and Deshpande Sarang, OLA	Agreed to support for analysis of report. Also, Active safety and software solutions was suggested. Airbags and software solutions may be deliberated in next panel meeting
Mr. Sanjay Tank, ACMA	He informed that from ACMA, Hella and Minda have shown willingness to support panel activities. Further he added two-wheeler being comparatively unstable and open vehicles, immediate solution or remedies would be challenging and in-depth India Specific study will require. He added that European conditions in terms of two-wheeler population, road conditions and rider behavior are different.

8. After deliberation it was decided to prepare small task force groups on following aspects for further enhancement of safety, which would examine minute details linked with the aspects and will give inputs to this panel:
    - ✓ Active safety: e.g. Speed, self-balancing feature, twinned wheel provision linkage, etc.
    - ✓ Passive safety: identification of important accident scenarios and remedies thereof
    - ✓ Road infrastructure: Suggestions to MORTH for precautionary measures
    - ✓ Enforcement: proposals for improving driving discipline and linked provisions
    - ✓ Accident data: Re-evaluation of RASSI and MORTH accident data to find out root cause

9. It was decided to conduct next meeting after two months i.e. 3rd week of November.

10. The meeting ended with the vote of thanks to the Chair and all the members.

Mr. R. S. Mahajan
Deputy Director- ARAI
TED 29 Chairman & Panel Convenor

Annexure - 1

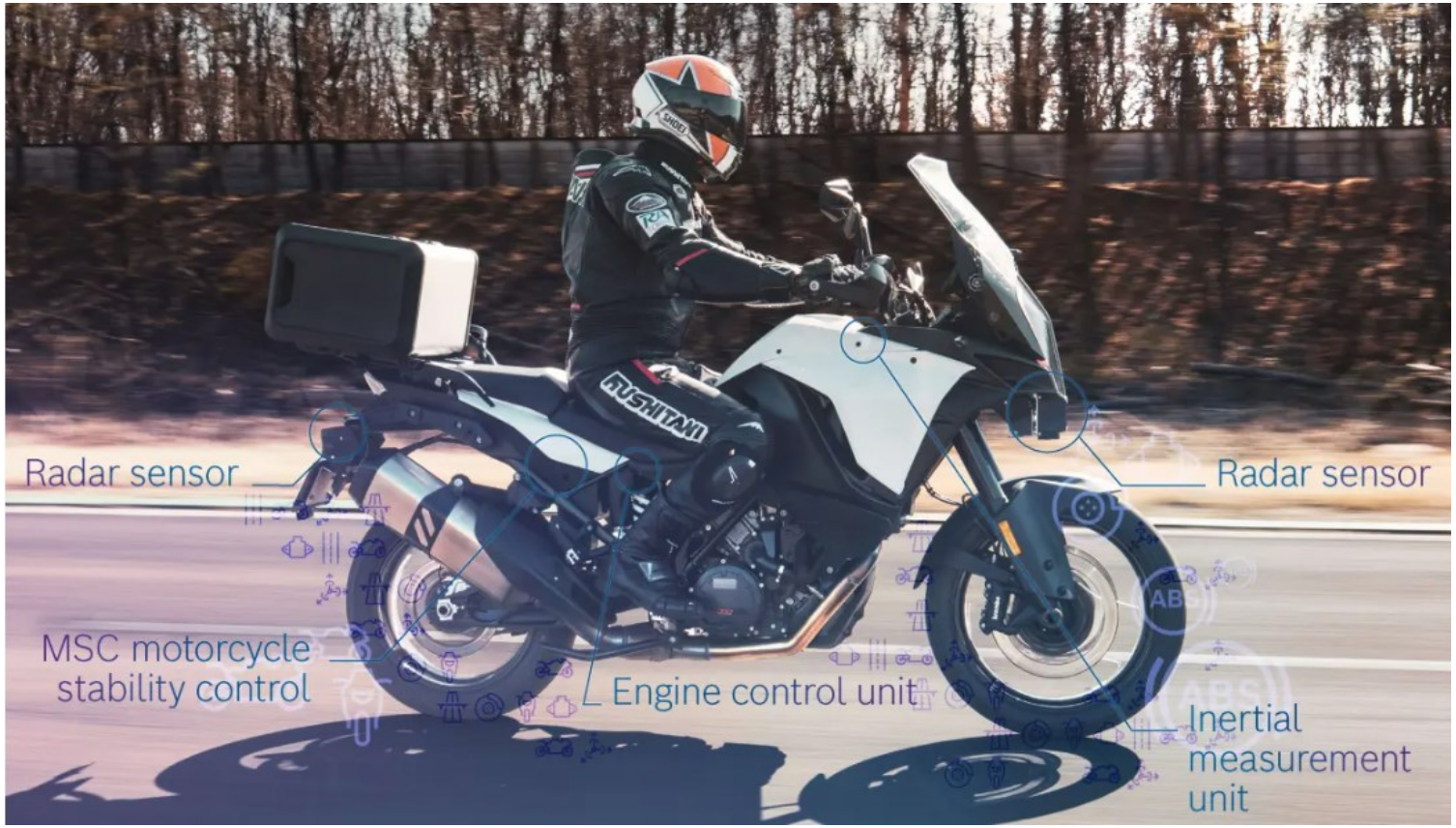
List of attendees as received from Microsoft Teams for TED 29 panel meeting held in hybrid mode on held on 16th September 2024 at ARAI

Name	Designation	Organization
Mr. Rahul Mahajan	Deputy Director (Convener)	ARAI
Mr. B. S. Yamgar	General Manager	ARAI
Mr. S. E. Chopade	General Manager	ARAI
Mr. Nachiket A. Kulkarni	Dy. General Manager	ARAI
Mr. Sachin R. Nigade	Manager	ARAI
Mr. Vishal P. Rawal	Dy. Manager	ARAI
Mr. Sitikantha Padhy	Manager	ICAT
Mr. Ashish Kumar	Manager	ICAT
Mr. V. M. Manel	Advisor	SIAM (Ather Energy Pvt. Ltd.)
Mr. Eshan Gupta	Program Manager	SIAM (Hero Moto Corp. Ltd.)
Mr. Piyush Chowdhry	Asst. General Manager	SIAM (Hero Moto. Corp. Ltd.)
Mr. Harjeet Singh	Executive Advisor (Tech)	SIAM (Hero Moto. Corp. Ltd.)
Mr. Arpan Shukla	Manager - Regulation	SIAM (Honda Motorcycle & Scooter India Pvt. Ltd.)
Mr. Vipin Sharma	Chief Manager	SIAM (Honda Motorcycle & Scooter India Pvt. Ltd.)
Ms. Sonia Nain	Manager Corporate Affaire	SIAM (Honda Motorcycle & Scooter India Pvt. Ltd.)
Mr. Mohit Kansal	Dy. General Manager (Regulations)	SIAM (India Yamaha Motors)
Mr. Venu Suresh C	Team Manager	SIAM (Royal Enfield Ltd.)
Mr. M. S. Anandkumar	Sr. General Manager (R&D)	SIAM (TVS Motor Company Ltd.)
Mr. S. Gururajan	Asst. General Manager	SIAM (TVS Motor Company Ltd.)
Mr. Navneet Kaushik	Deputy Manager	SIAM (Yamaha Motor Research & Development India Pvt. Ltd.)
Mr. Sanchit Khare	Manager	Ola Electric
Mr. Subrat Dash	-	Ola Electric

Mr. Sanjay Tank	Technical Expert	ACMA
Ms. Rutuja Raverkar	General Manager	ACMA (Uno Minda Ltd.)
Mr. Boobalan Natarajan	Sr. Lead Engineer	Autoliv India Pvt. Ltd.
Mr. Sivakumar Sudhachandran	Asst. General Manager	Autoliv India Pvt. Ltd.
Mr. Kiran Sheelavant	A. V. P	Autoliv India Pvt. Ltd.
Mr. Deshpande Sarang	---	Hella
Mr. Gaikwad Sujeet	---	Hella
Mr. Vikrant Lokhande	Lead Homologation	Ultraviolette
Mr. Naresh Chama	---	Ultraviolette
Mr. Sivaramakrishnan	---	---
Mr. Puttaraja B V	---	---
Mr. Harjeet	---	---

Two Wheeler Safety

ARAI



9/26/2024

Agenda:

1.	Welcome Address by Chairperson
2.	Extract of minutes of the TED 29 & AISC Meetings
3	Presentation from M/s. Autoliv on 2 Wheelers Safety for the members who were not present in the meeting.
4.	Current Indian Regulations for 2 Wheeler Safety
5.	Review of BS ISO 13232:2012
6.	Discussion on new subjects of 2-wheeler safety with following objectives: i) Studying various aspects of 2-wheeler safety, i.e. accident research, Literature survey on global trends towards 2W safety ii) Various crash scenarios for 2W and possible use of various technologies for avoiding/reducing fatalities due to 2W accidents iii) Preparation of recommendatory report as final deliverable
7.	Any other point with permission of panel Chairperson.

Extract of minutes of 16th meeting of TED 29 held on 4th June 2024

11	**Presentation by Shri Boobalan from M/s. Autoliv on 2 Wheelers Safety** The committee appreciated the detailed presentation by M/s. Autoliv on 2 Wheelers Safety and advised M/s. Autoliv to form a panel to word on standardization in field of 2 wheeler safety.

Extract of minutes of the 72nd meeting of AISC held on 7th August 2024

6.3. Enhancing safety of two-wheeler riders by using side airbags:

Secretariat informed that in the last meeting, SIAM was requested to share its view on the proposal for having airbags for two wheelers. Also, CMVR-TSC in its last meeting directed AISC to formulate a working group to deliberate on enhancing active safety aspect of two wheelers. Chairman suggested that a working group may be formulated to discuss and explore the different safety initiatives, including airbags, that can be taken to enhance active safety of two wheelers. He suggested that the expert group may also work on the type of data that needs to be generated by accident research teams so that it can help in decision making. Shri Balraj Bhanot, IRF, recommended that IRF team which had submitted the airbag proposal to MoRTH may be called for discussion by the expert group to understand the proposal in detail. Shri Harjit Singh and Shri Milind Pagre, SIAM, mentioned that the SIAM two-wheeler group will initiate the discussions as suggested. Chairman requested SIAM to share the nominations for the expert working group and the subject may be reviewed in the next meeting of AISC.

Current Indian Regulations for 2 Wheeler (Safety related)

Brake test - IS:14664-2010

Gradeability - AIS-003-1999

Rear view mirror installation - AIS-002

Pillion hand hold -IS:14495-1998

Footrest - AIS-148-2018

Automobiles Lamps – AIS 034

Lighting & light signalling devices - AIS-010 & AIS 012

Safety standards of components – AIS 037

Existing ISO Standard for Rider crash protective devices

Motorcycles - Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles – BS ISO 13232:2012

Part 1: Definitions, symbols and general considerations

Part 2: Definition of impact conditions in relation to accident data

Part 3: Motorcyclist anthropometric impact dummy

Part 4: Variables to be measured, instrumentation and measurement procedures

Part 5: injury indices and risk/benefit analysis

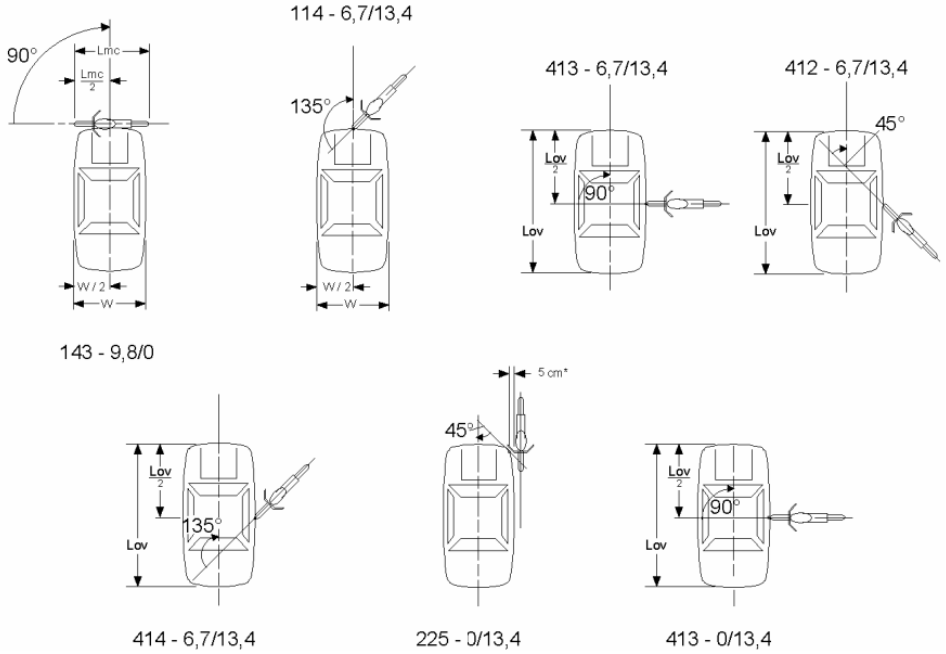
Part 6: Full-scale impact-test procedures

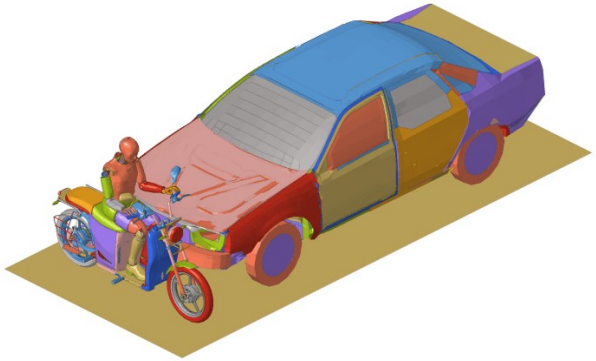
Part 7: Standardized procedures for performing computer simulations of motorcycle impact tests

Part 8: Documentation and reports

BS ISO 13232:2012

Requirements - (as per part-2 Definition of impact conditions in relation to accident data)





Configurations 1

Impact configurations for preliminary assessment

Configuration number	OV contact point code	MC contact point code	Relative heading angle code	OV speed m/s	MC speed m/s
1	1	4	3	9.8	0
2	1	1	4	6.7	13.4
3	4	1	3	6.7	13.4
4	4	1	2	6.7	13.4
5	4	1	4	6.7	13.4
6	2	2	5	0	13.4
7	4	1	3	0	13.4

Key Elements to avoid Road Accidents

Active Safety- Anti-lock braking system(ABS), Autonomous emergency braking (AEB), Electronic Stability control (ESC), Advanced Rider Assistance Systems (ARAS)

Passive Safety- Rider Airbag, Safety gears

Safe road infrastructure design

Road side barriers

Vehicle safety assessment regulations

Advancement in traffic rules

Strict enforcement of rules and regulations

Objective

1. Statistical data available with Industry
2. 2W Accident Research based on RASIC data
3. Literature Survey on global trends towards 2W safety
4. Technology for avoiding/reducing fatalities due to 2W accidents
5. Recommendations to the ministry

Deliverables : Recommendatory report

Thank you !

Powered Two-Wheeler Rider Safety – Autoliv's work

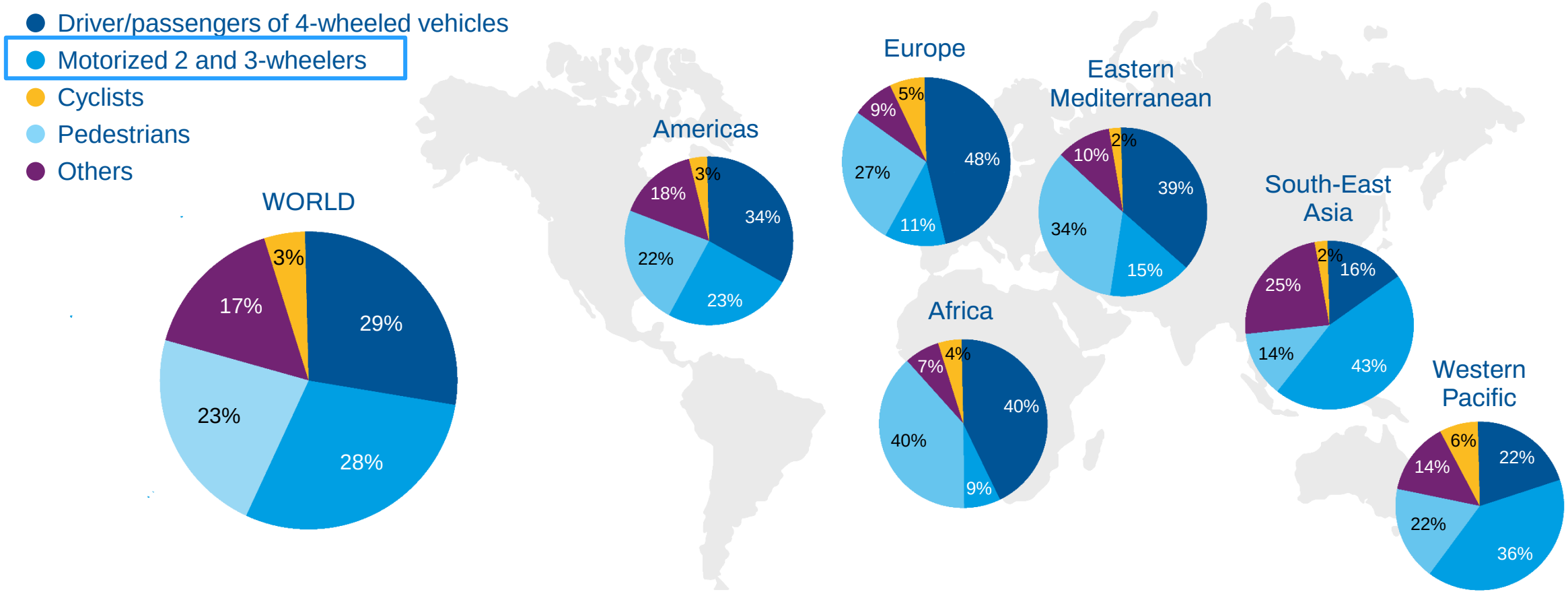
Sivakumar Sudhachandran

Research, Development/Engineering, Autoliv India Pvt Ltd

Powered Two-Wheeler Rider Safety

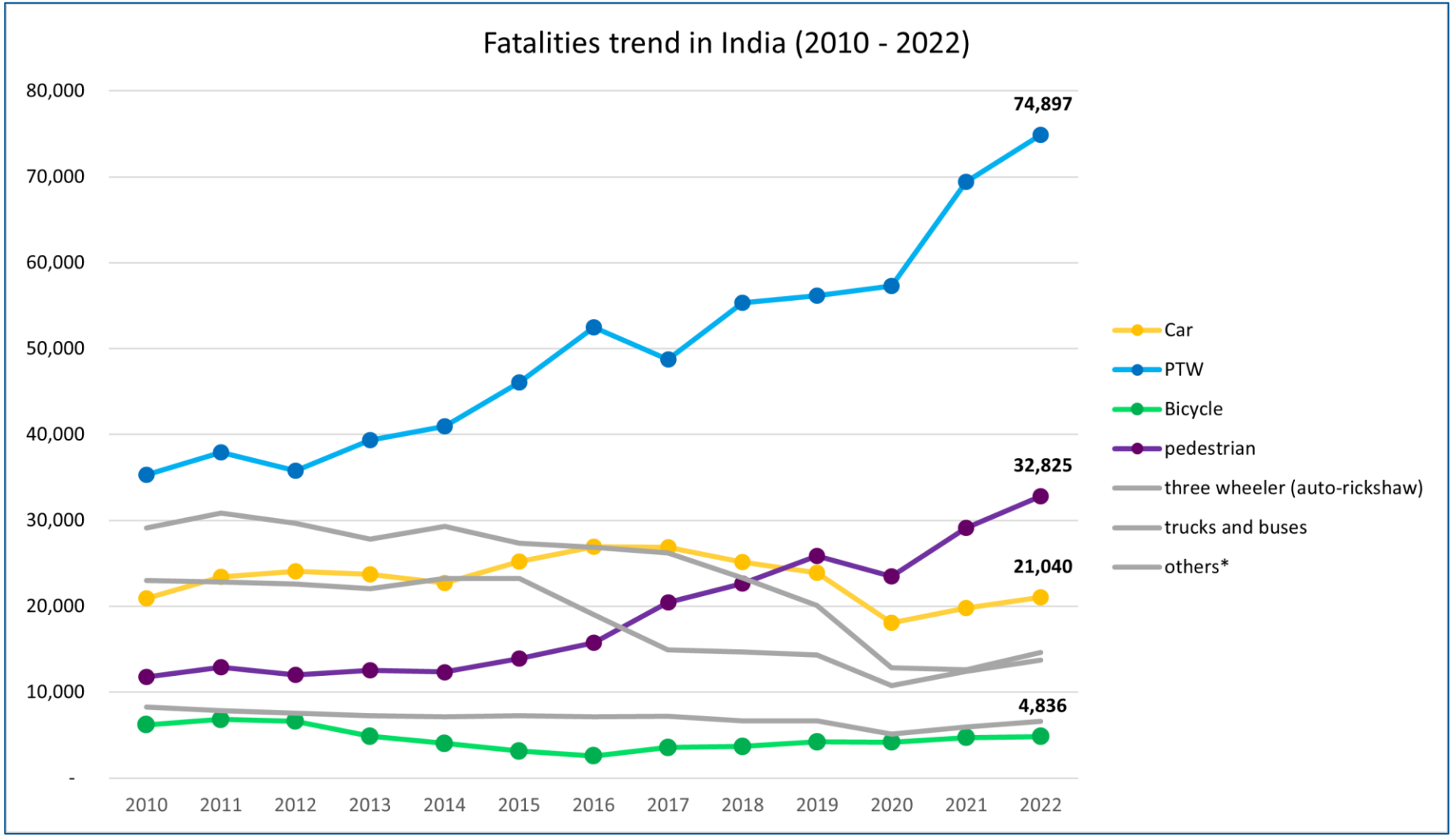
- Global statistics
- Safe System Approach
- Vehicle engineering needs – deep dive of crash protection
  - Autoliv circle of life for safety
  - Research findings – Macro level
  - Deep diving of accident research - GIDAS
  - Tools – CAE / Testing
  - Autoliv's current solutions
- Q & A – Next steps

Vulnerable road users dominate road fatalities



Source: WHO Road Safety report 2018

Indian Scenario

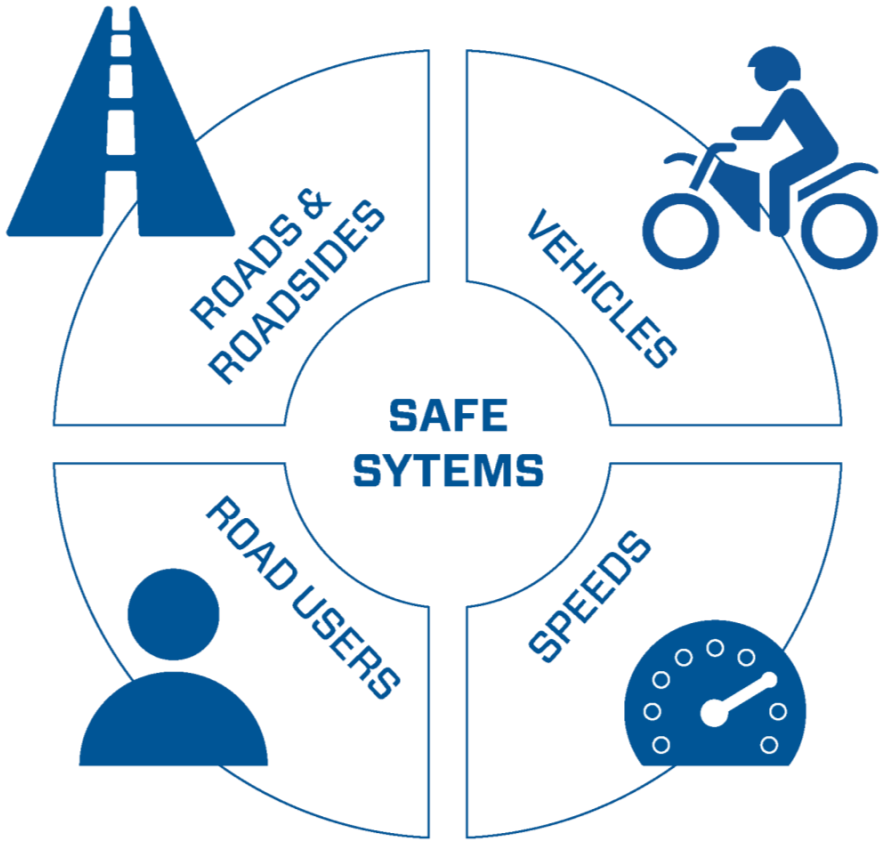


Source: Road Accidents in India 2022 by MoRTH

Safe System Approach to PTW Safety

Evidence based interventions

- Infrastructure and vehicle technology
- Education
- Enforcement

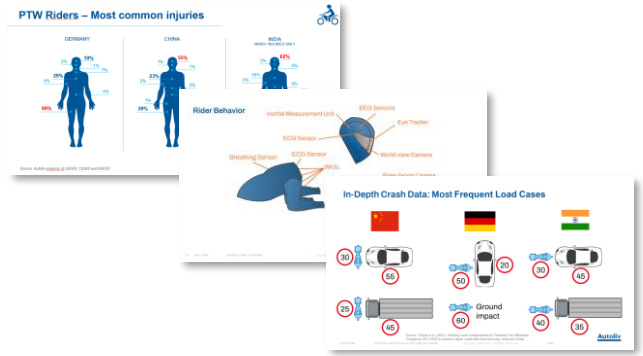


Autoliv's Real-life Safety Approach

Allows Us to Explore and Discover New Ways of Protecting People

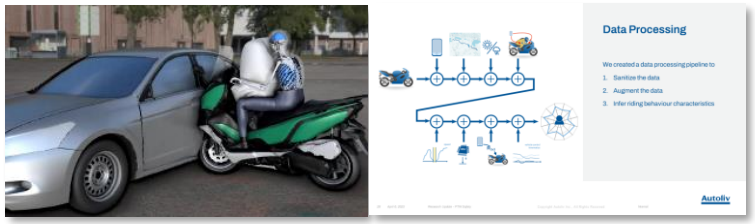
Test Methods / Validation

Real life data analysis

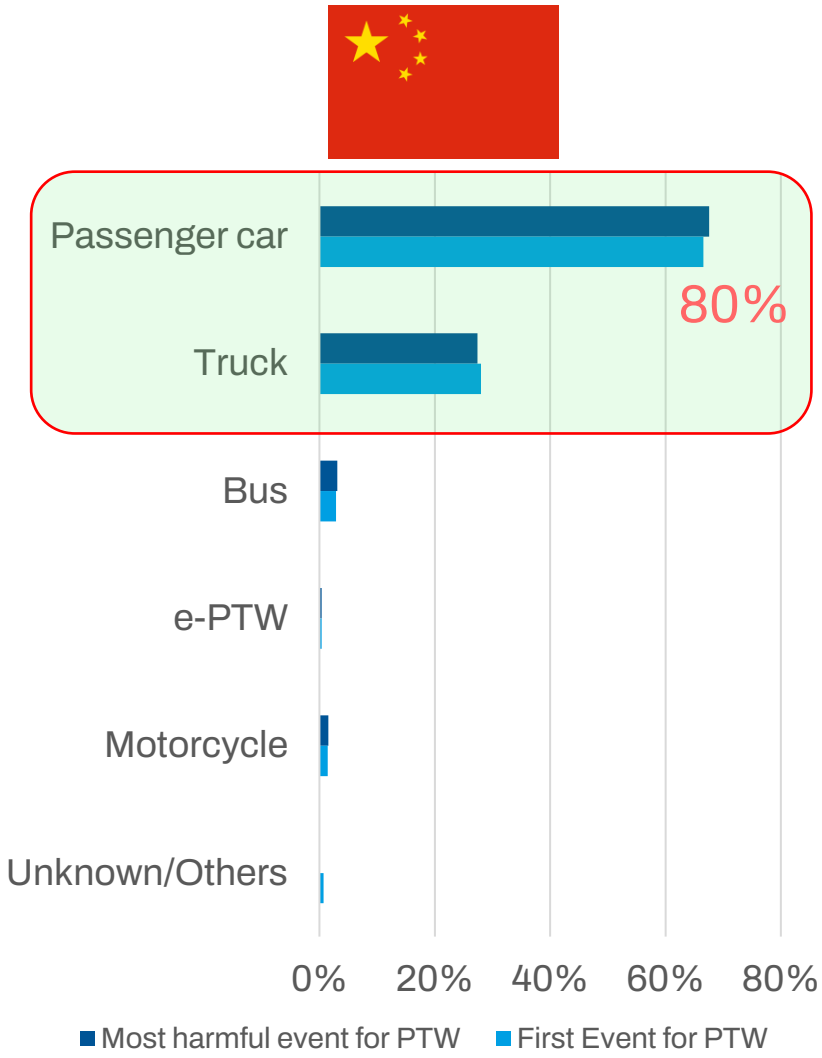


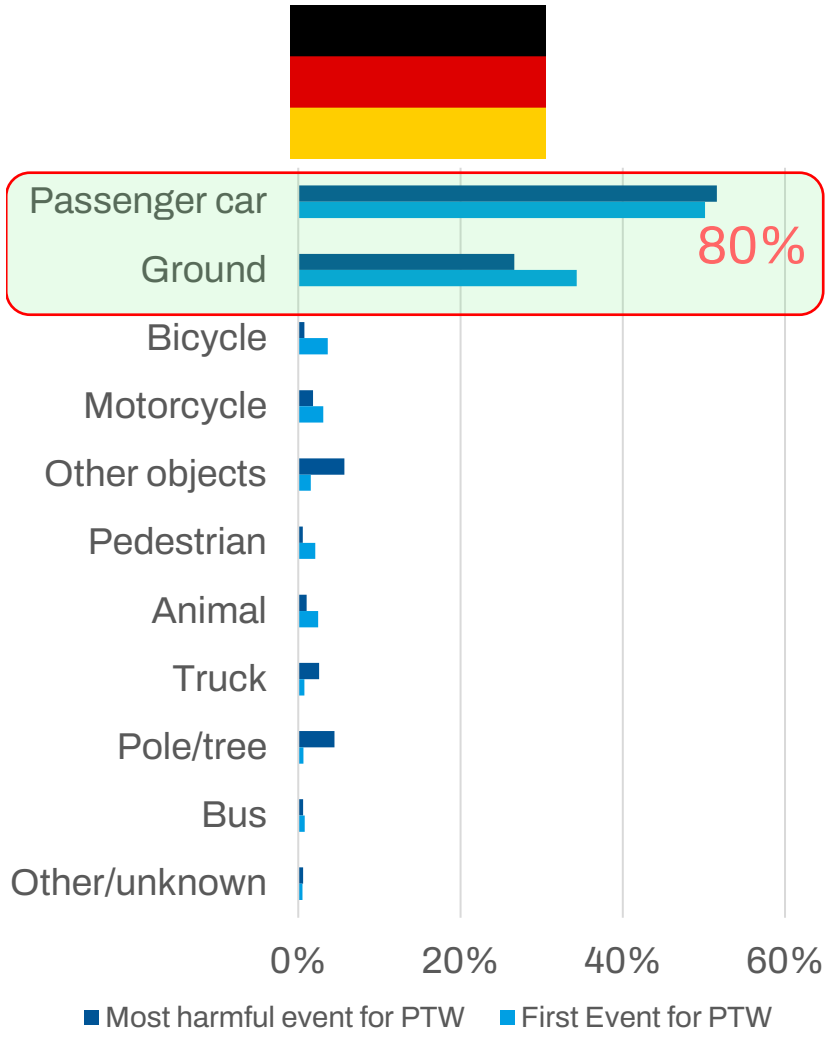
Devloping Solutions
On-vehicle | On-rider | Digital

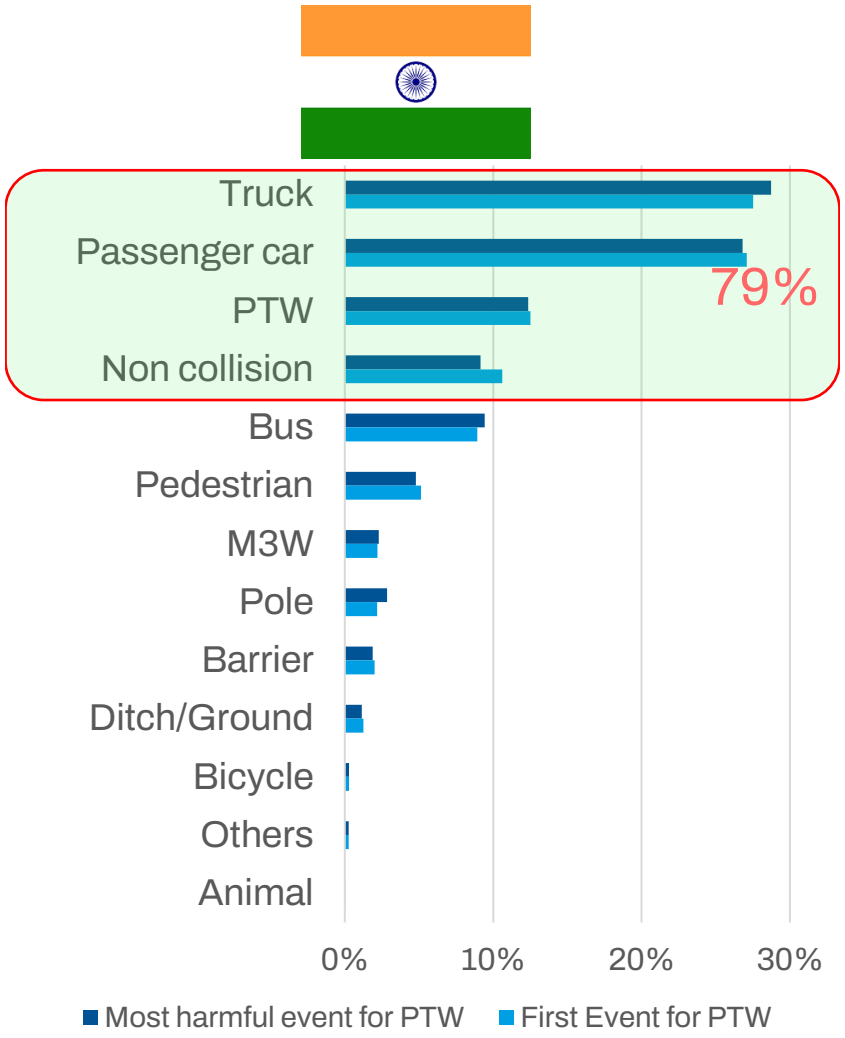
Injury and behavior assessment



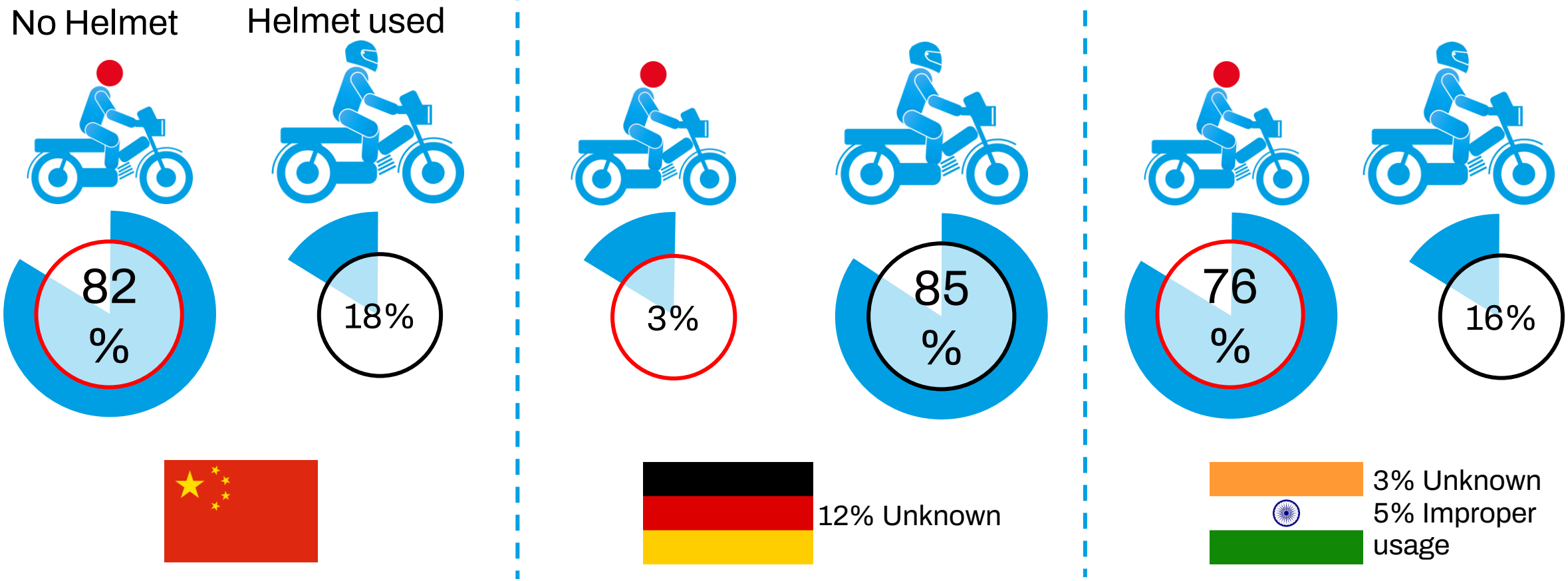
Collision partner



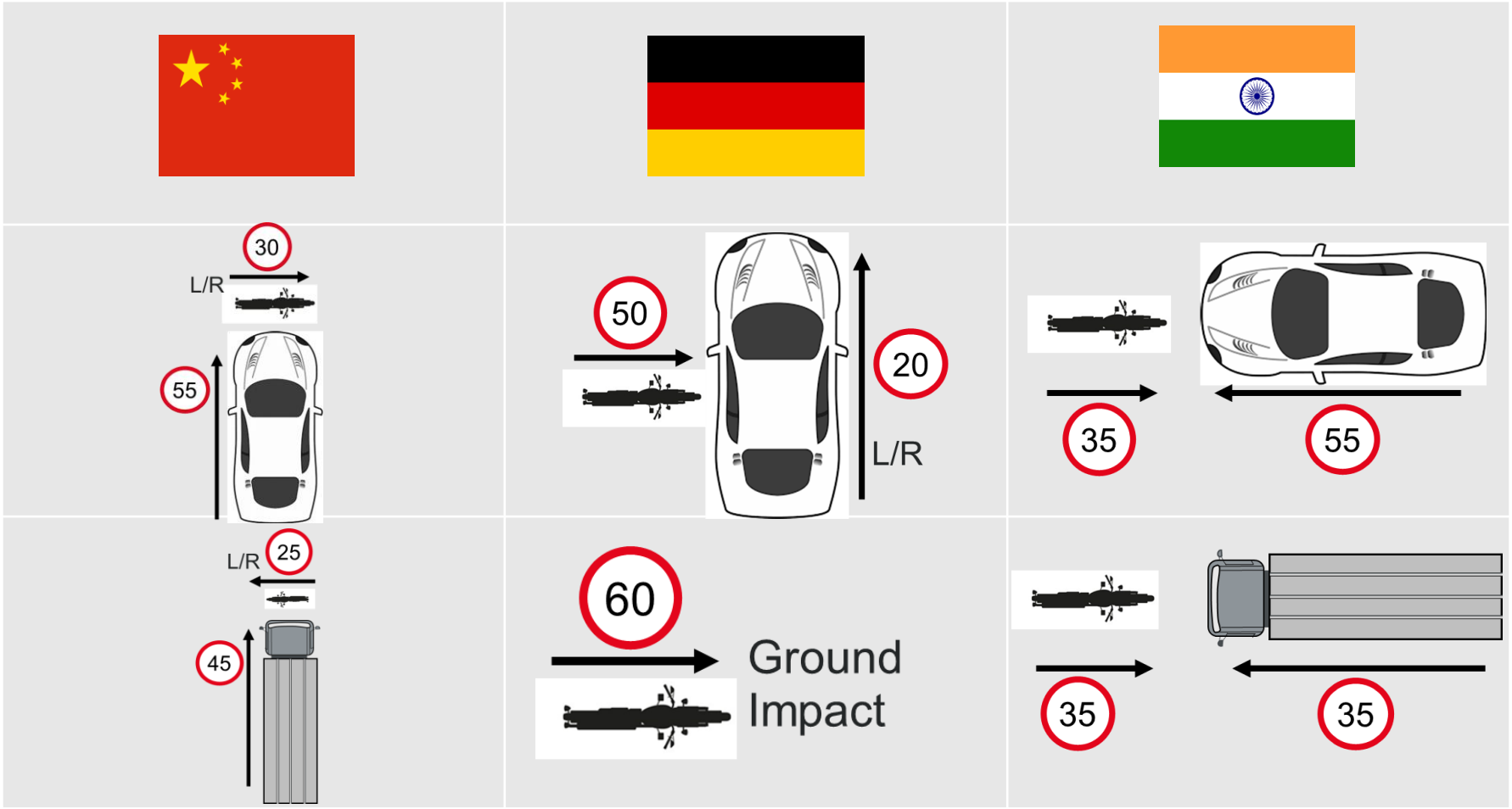




Helmet Usage – All PTW occupants



Most common scenario resulting in fatal and serious injuries



UN Performance Target: "By 2030, 100% of new (defined as produced, sold or imported) and used vehicles meet high quality safety standards, such as the recommended priority UN Regulations, Global Technical Regulations, or equivalent recognized national performance requirements."

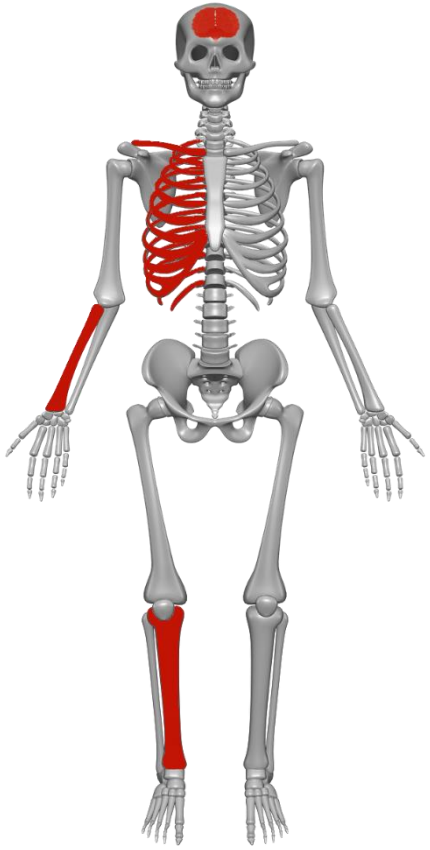
Next steps for India?
Examples from Europe

Most common Injuries

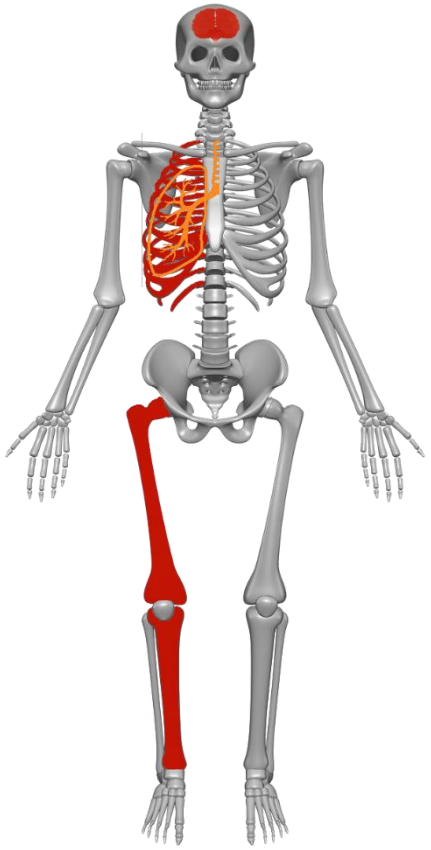
Gidion et al. (2021) Motorcyclist injuries: Analysis of German in-depth crash data to identify priorities for injury assessment and prevention. Accident Analysis & Prevention, 163 (2021). https://doi.org/10.1016/j.aap.2021.106463

Top 5 AIS2+ injuries

- Cerebral concussion (9.61%),
- Tibia fracture (6.30%),
- Radius fracture (5.79),
- Clavicle fracture (5.48%),
- Rib Cage (4.93%)



Top 5 AIS2+ injuries



Top 5 AIS3+ injuries

Top 5 AIS3+ injuries

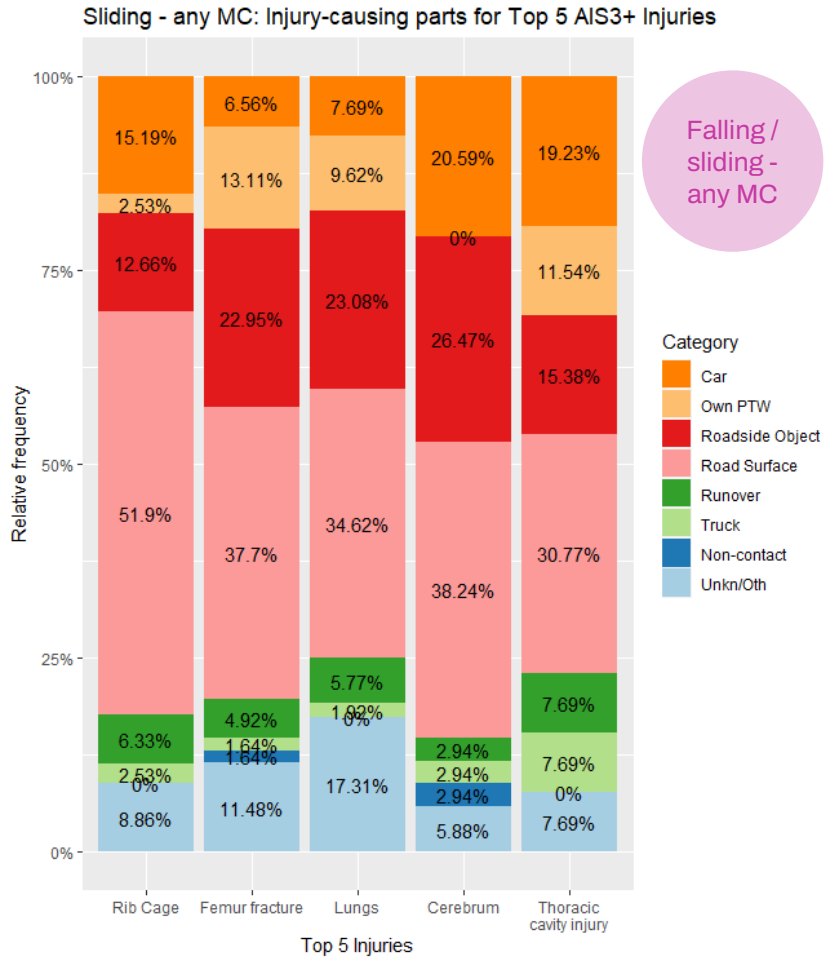
- Femur fracture (17.15%),
- Rib Cage (12.99%),
- Lungs (8.91%),
- Tibia fracture (7.05%),
- Cerebrum (6.68%)

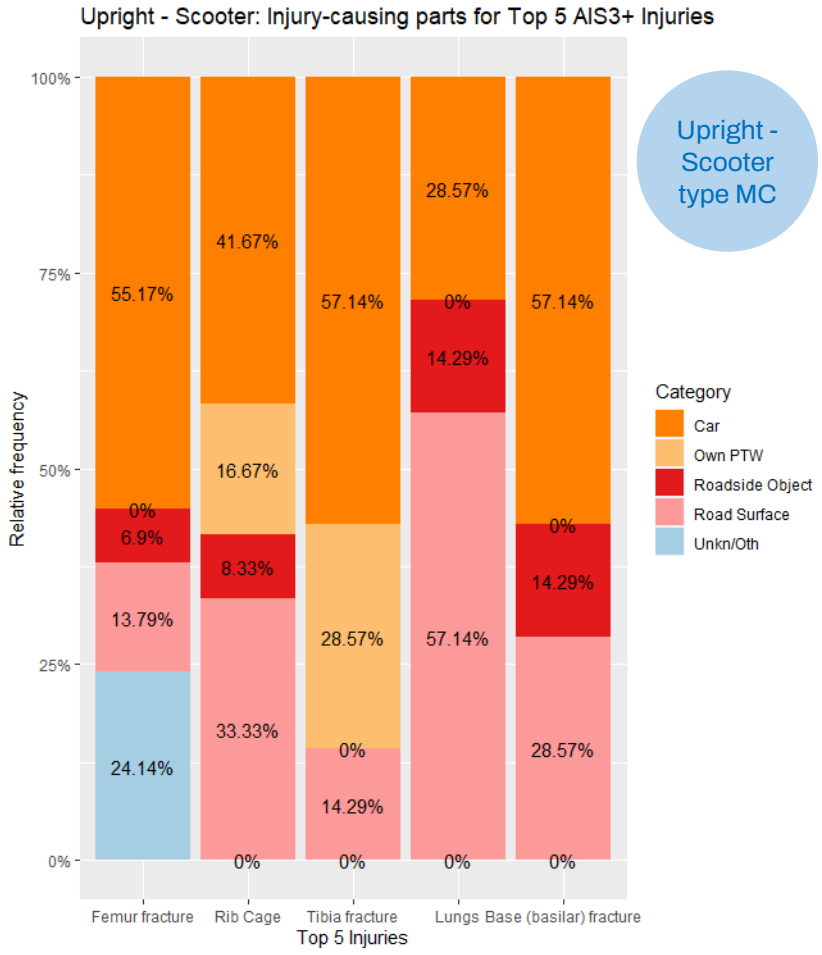
Top 5 AIS3+ Injuries by group

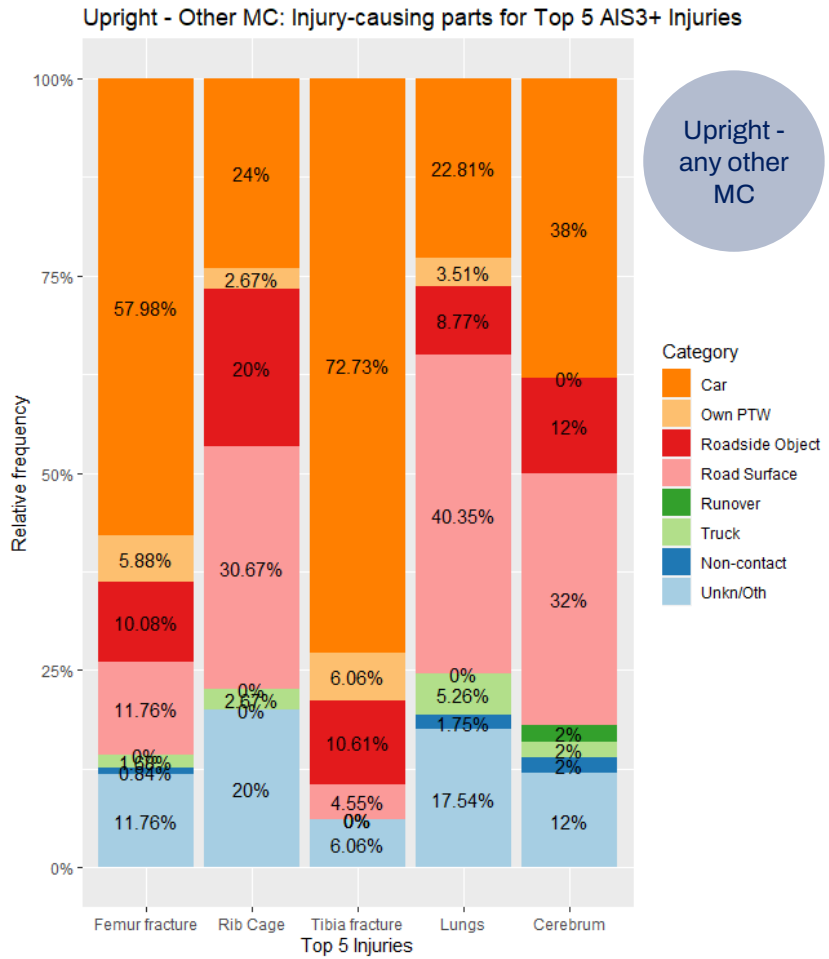
Falling / sliding - any MC	Upright - Scooter type MC	Upright - any other MC
1. [Fracture to the] rib cage 17.2%	1. Femur fracture 28.9%	1. Femur fracture 16.5%
2. Femur fracture 13.0%	2. [Fracture to the] rib cage 12.5%	2. [Fracture to the] rib cage 11.1%
3. [Injury to] lungs 11.3%	3. Tibia fracture 7.7%	3. Tibia fracture 9.3%
4. Cerebrum 7.2%	4. [Injury to] lungs 6.7%	4. [Injury to] lungs 8.0%
5. Thoracic cavity injury 5.7%	Base (basilar) fracture 6.7%	5. Cerebrum 7.2%

Carroll J, Gidion F, Rizzi M and Lubbe N (2022) Do motorcyclist injuries depend on motorcycle and crash types? An analysis based on the German In-Depth Accident Study. Proceedings of the 14th International Motorcycle Conference 2022. 3-4 October 2022, Cologne, Germany.

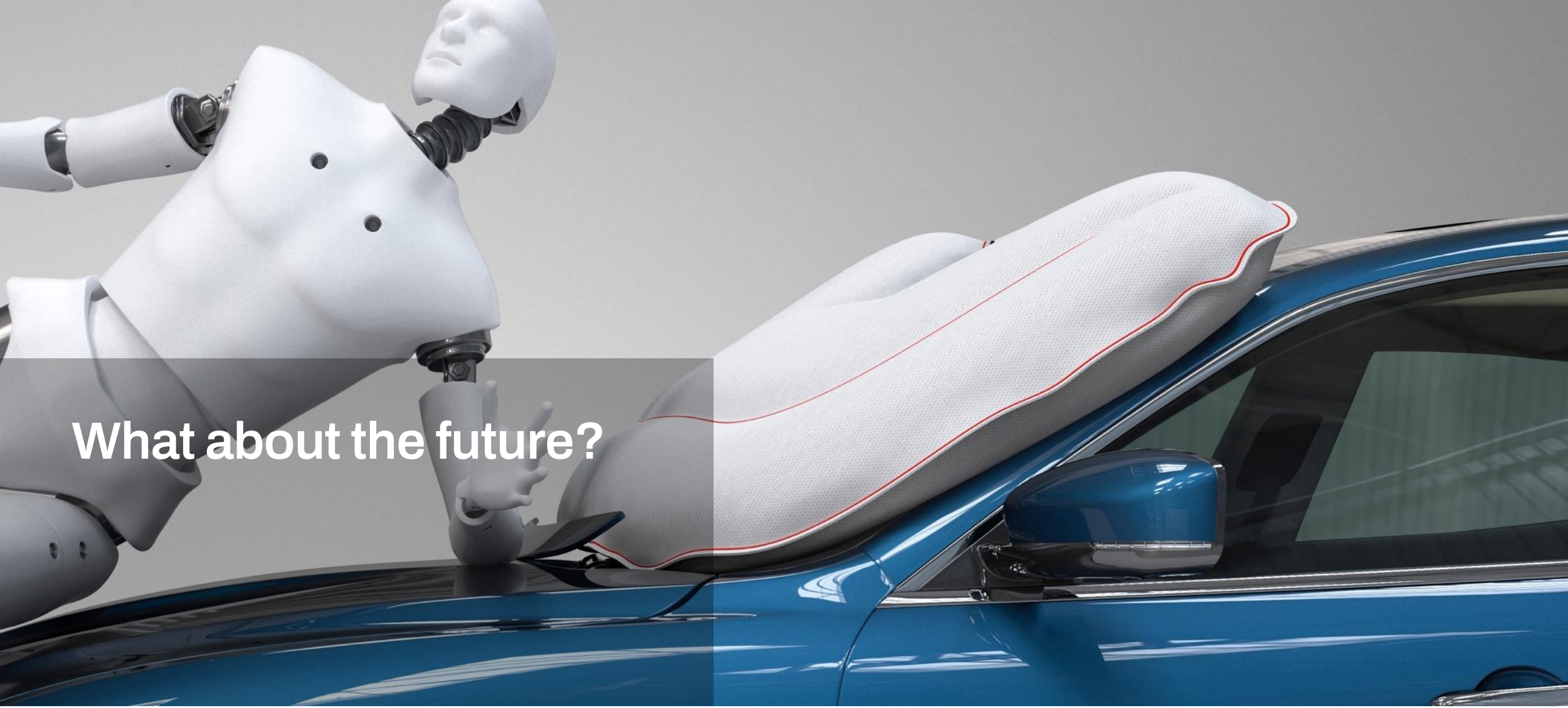
Injury-causing part for Top 5 AIS3+ Injuries by group





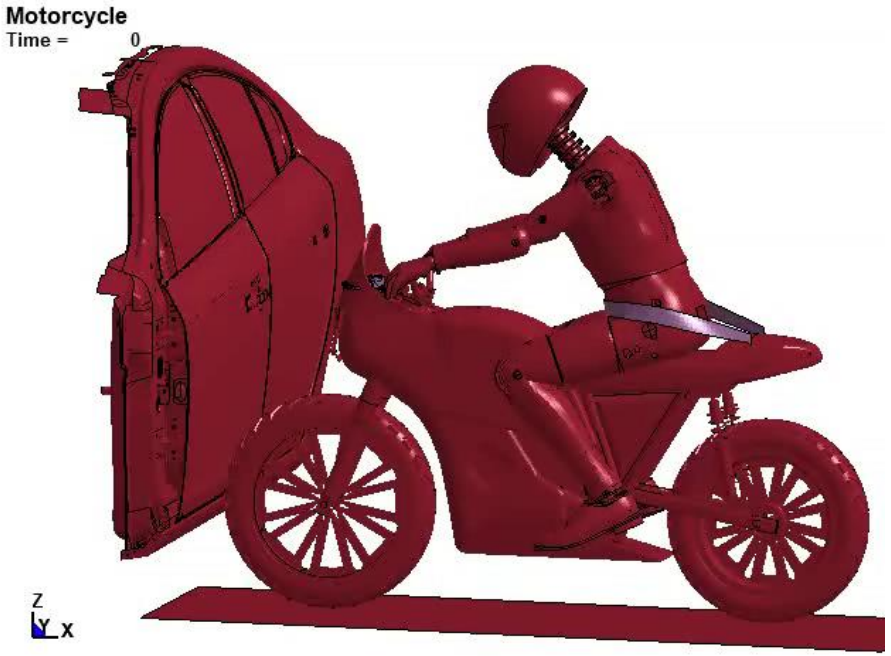


Autoliv

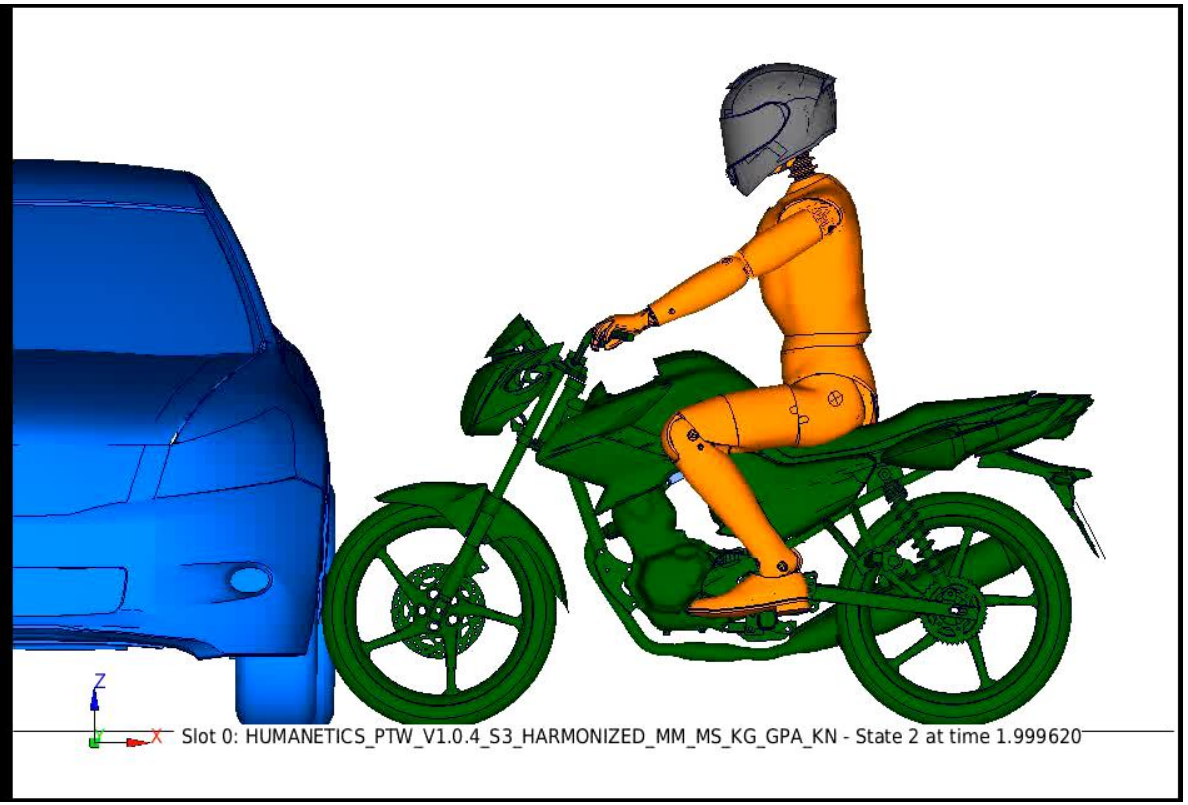


What about the future?

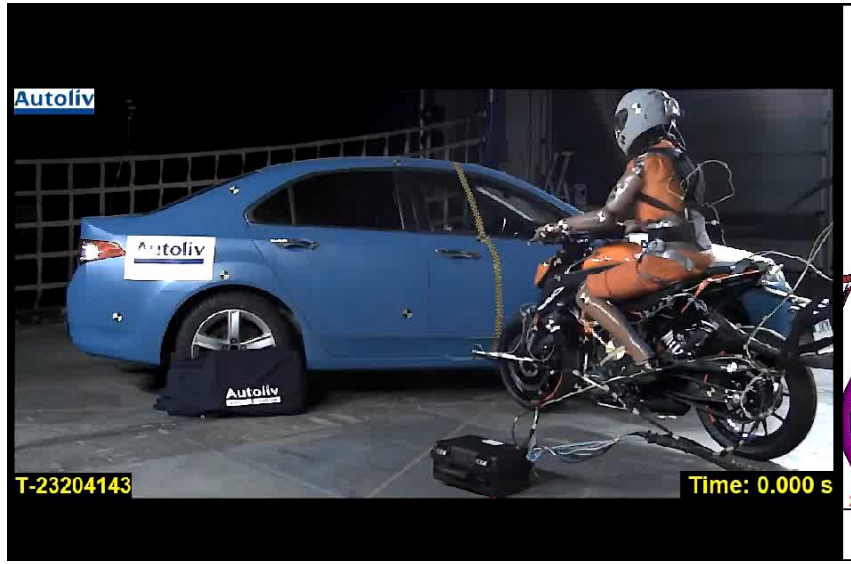
Available tools for Injury Assessment
MATD, PTW Dummy, Human Body Model

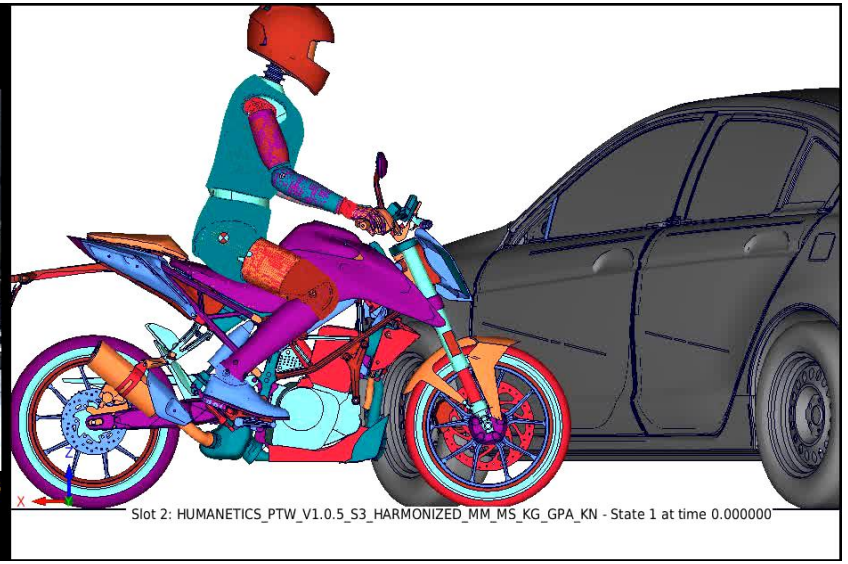


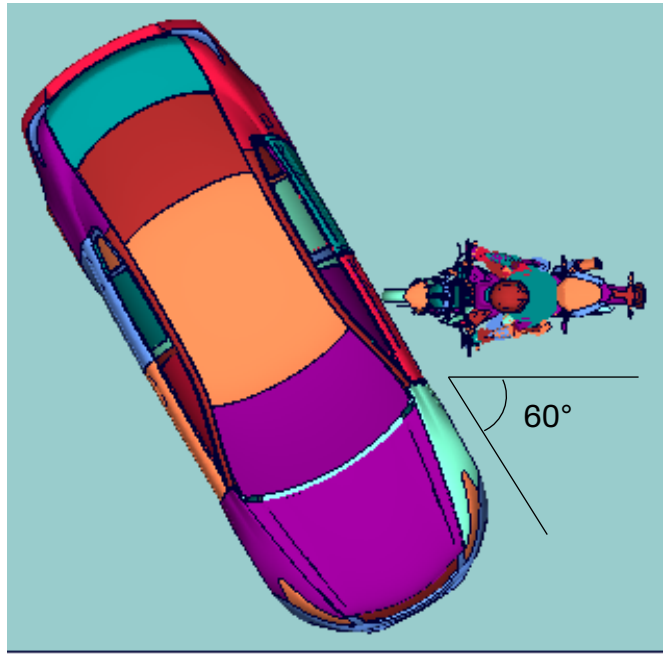
Available tools



Available tools

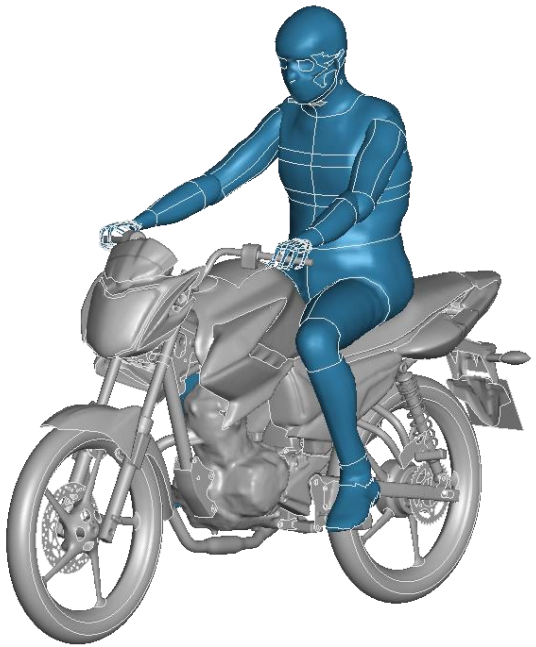




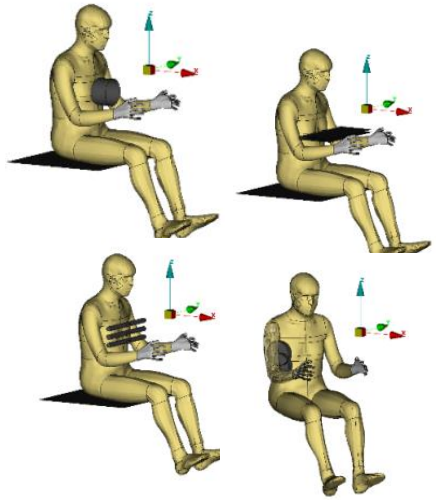


Motorcycle Rider Model, the SAFER HBM

Sitting posture study



Body region level validation



Lundin, Iraeus & Pipkorn, *IRCOBI, 2023*

Van Meter et al, *IRCOBI, 2023*

Whole body level validation

Autoliv

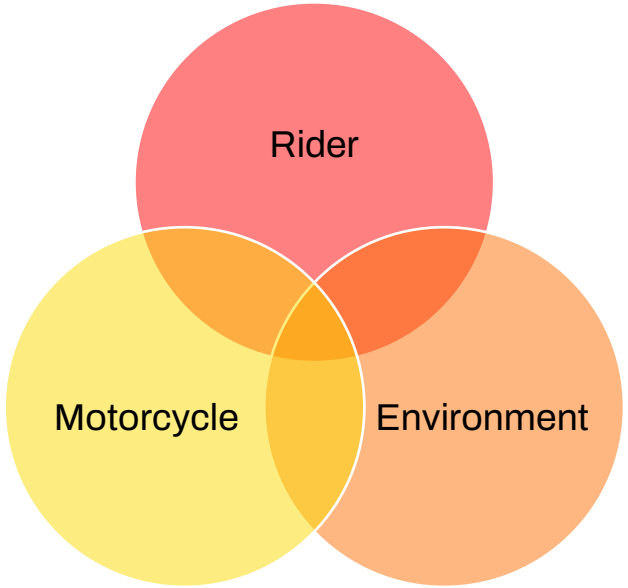
BETA SIMULATION SOLUTIONS

Mips

Autoliv

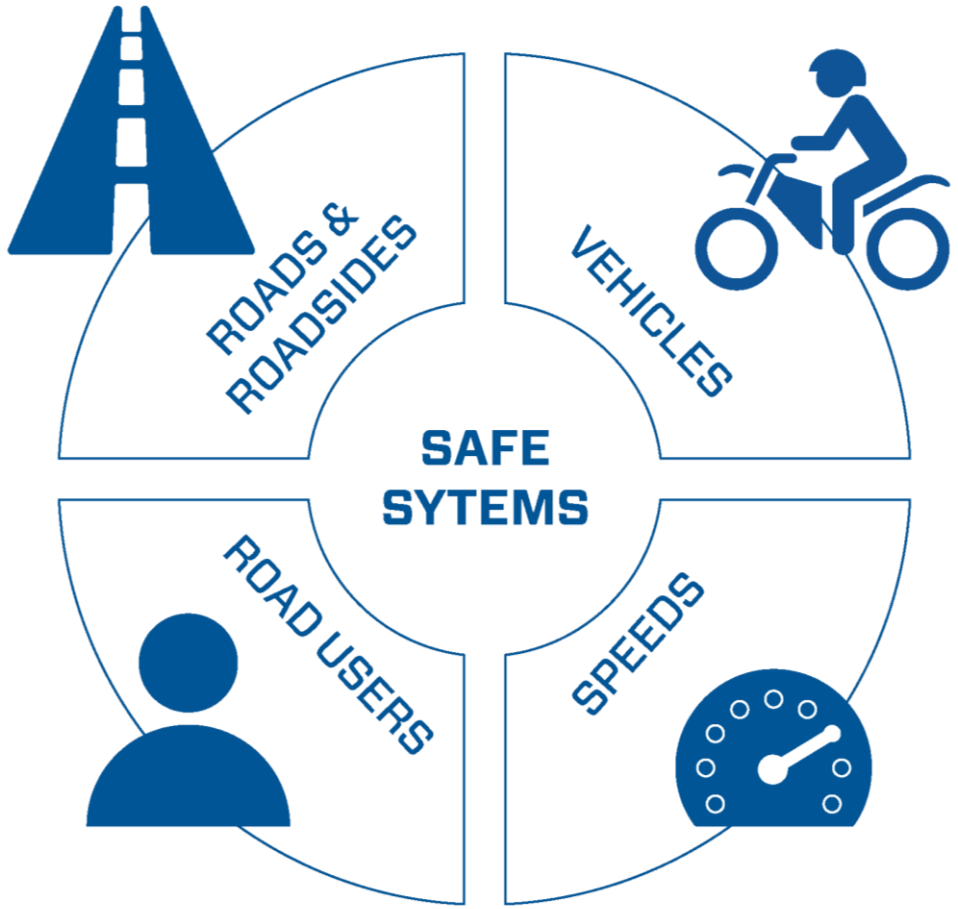
On-going Work

- Instrumentation of motorcycles/bikes in Sweden and India, to collect data related to the riding behavior



Examples of countermeasures

- Infrastructural solutions (physical & virtual)
- AEB
- Protective Equipment
- Post crash emergency care



Autoliv is taking a holistic approach to Motorcycle Safety

There is no single solution that prevents all motorcycle injures for the multitude of crash situations observed with motorcycle riders.

Autoliv identify the most severe injures sustained by motorcycle riders, and based on their frequency we prioritize and seek associated injury-causing mechanisms so that we can reproduce them in virtual and physical testing. From there, we develop appropriate countermeasures that we currently classify as:

On-Vehicle safety solutions

Airbag System for Motorcycle/Scooter

Digital Solutions

On-Rider safety solutions

Airbag Systems for Wearables

Airbag Systems for Helmets