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JARI Research Activities for Traffic Safety

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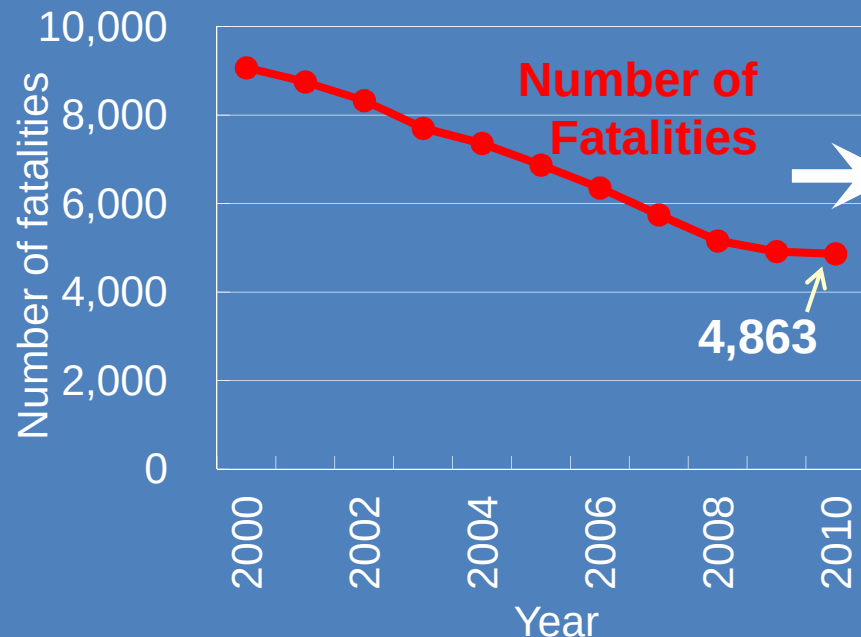


Current Trends of Traffic Accidents in Japan

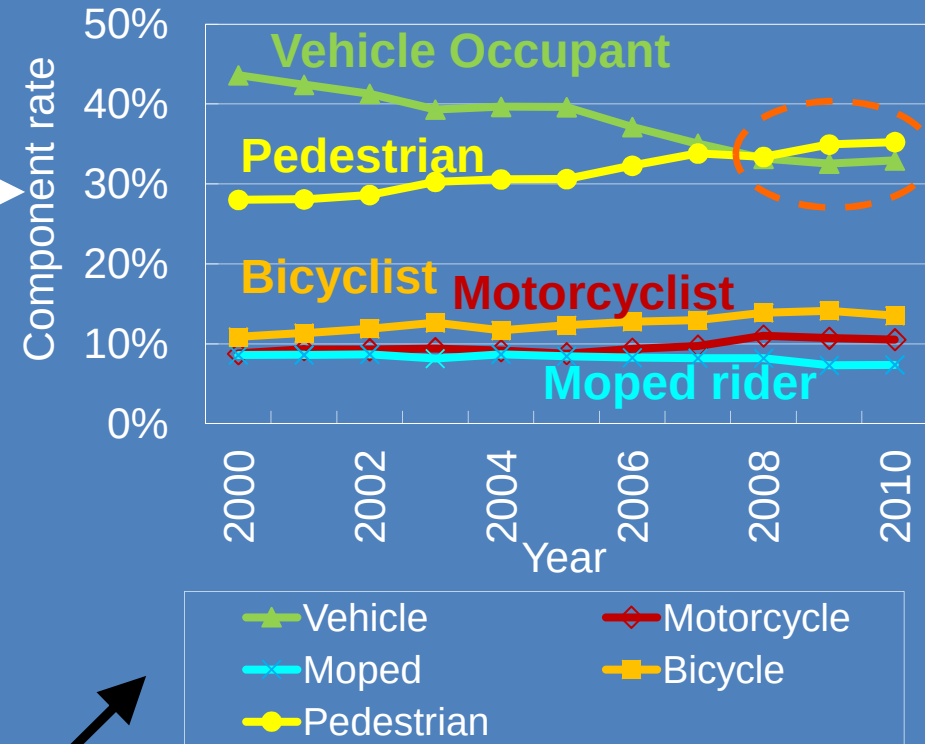


- The **number of fatalities** has been decreasing over the last 10 years in Japan.

Number of Fatalities



Details of Fatalities



- The percentage of **vehicle occupant** fatalities has decreased to 30%.
- The percentage of **pedestrian** fatalities has increased to above 30%.
- The percentage of **bicyclist** fatalities has been increasing steadily.

What can we do for traffic safety?

→ *Reduce accidents?*
Reduce severities? etc.

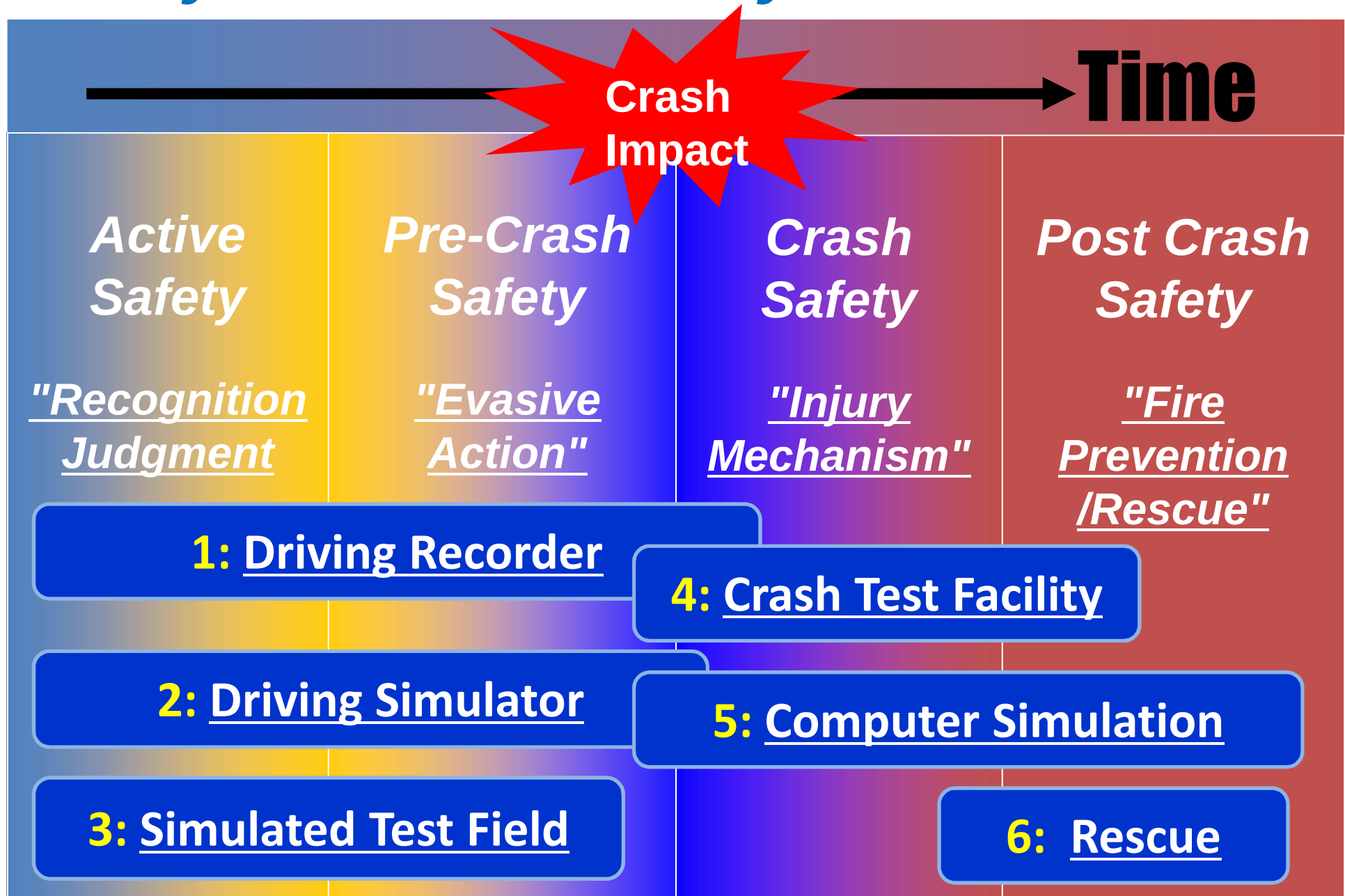
We must know what happens in real world accidents, first.

- Accident situations
 - Accident mechanisms
 - Injury mechanisms
 - Rescue/treatment issues
- etc.*

Our mission for traffic safety

- Accident analysis
- Dummy and computer models (FEM) based on human body and injury
- Test procedures and evaluation methods
- To predict the effectiveness of safety measures etc.

Safety Research / Safety Measures



1: Driving Recorder (DR)

DR Body

W201mm×D163mm×H88mm

CCD Camera

JARI Prototype “DR”

Sensors

XY accelerometer
(500 m/s²)

XY accelerometer
(20 m/s²)

Angular sensor
(300 deg/sec)

Recording Mechanism of DR (Event Recording Type)



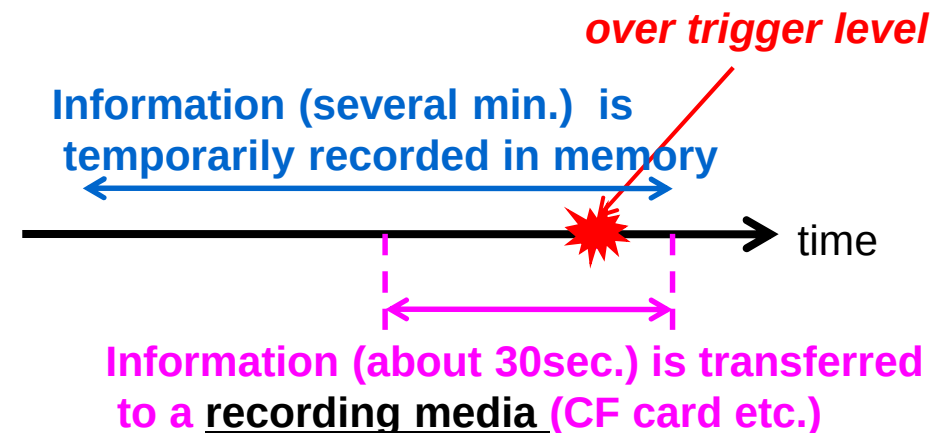
- Information is continuously being recorded and temporarily stored in the memory.
- When a large acceleration/deceleration change is detected, the system is triggered.
- The information around the time of the trigger is transferred to an external recording media.



camera on
windscreen



main body



64MB ~ 256MB
(10cases ~ 30cases)

Recorded Information of DR

- Video data
- Numerical data (acceleration, velocity ...)



Acceleration

Velocity

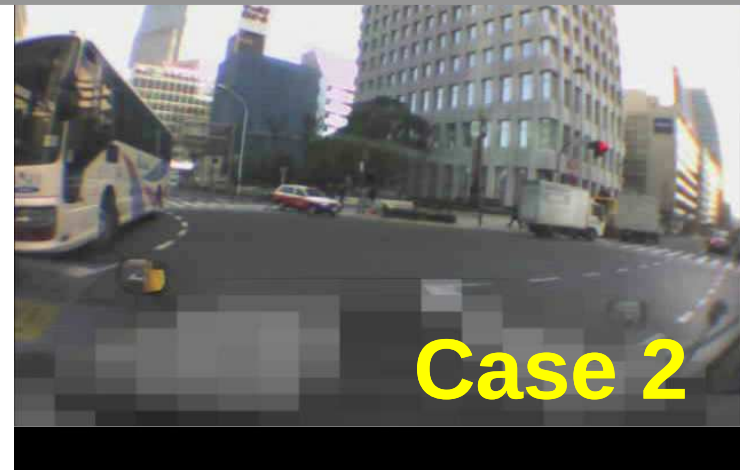
Examples of Recorded Conflict Situations

Blocked by forward right turn vehicle



Case 1

**Blocked by
oncoming right turn vehicle**



Case 2

Blocked by center divider



Case 3

Blocked by oncoming



Case 4

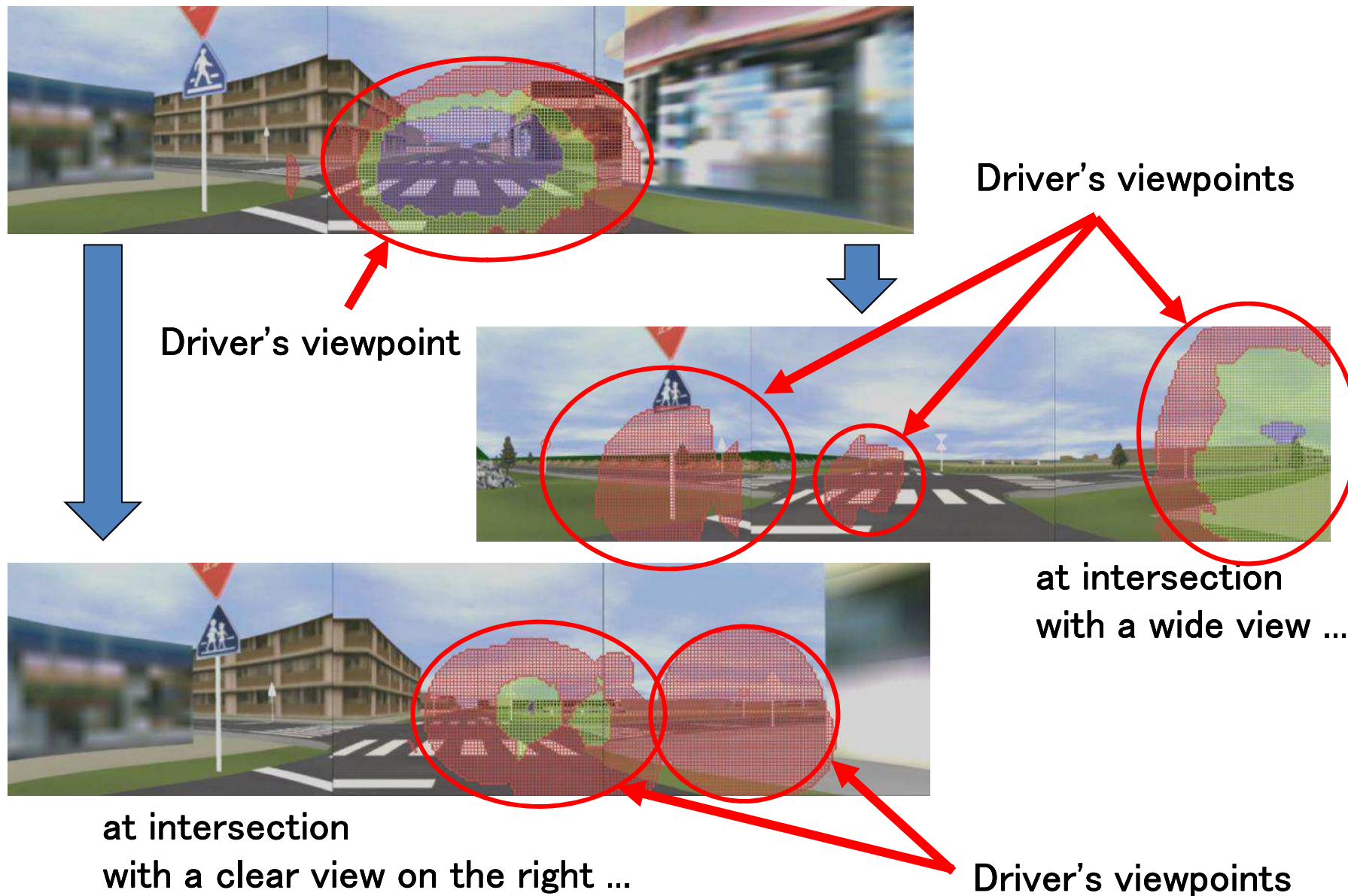
2: Driving Simulator (DS)

Omnidirectional View DS with Motion



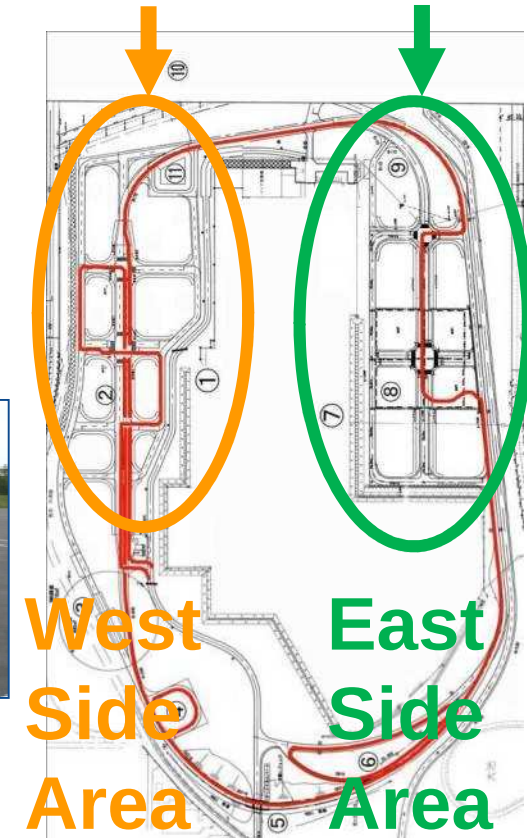
Opened in October, 2009

Driver's Viewpoint



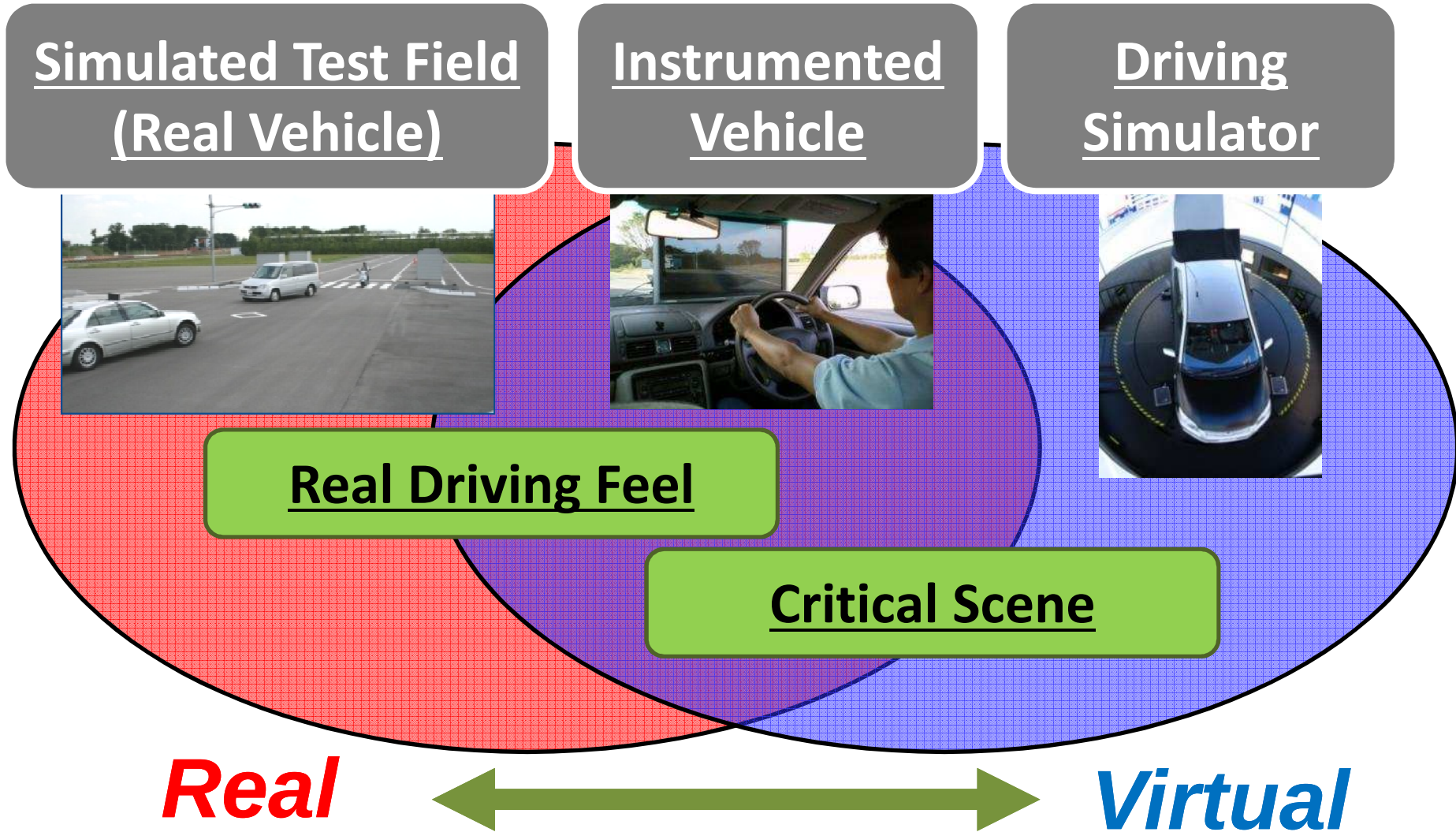
3: Simulated Test Field

Opened in August, 2008



Track Length : Approx. **1.8km**
Total Length: Approx. **4.5km**

Reproducing a Critical Scene



Test Car with a Monitor Screen

Experiment with Test Car
in Simulated Test Field

Test Car/DS Combination

Experiment
with DS



Driving Feel

Flexibility of
Scenario



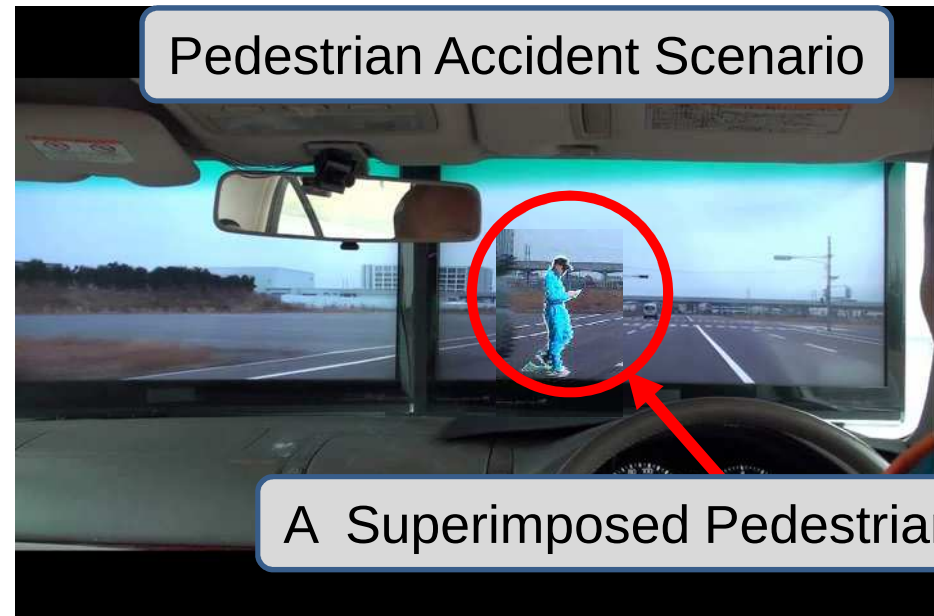
Example of a Test Car Experiment

37 inch Liquid Cristal Screens



Video Cameras

Pedestrian Accident Scenario



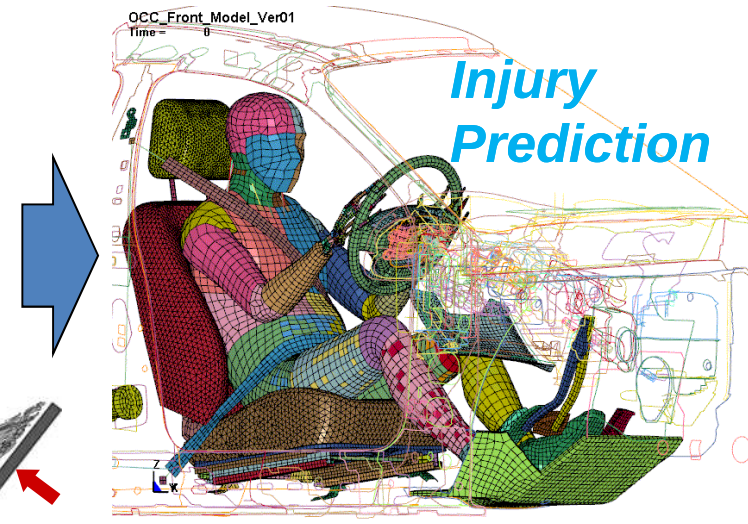
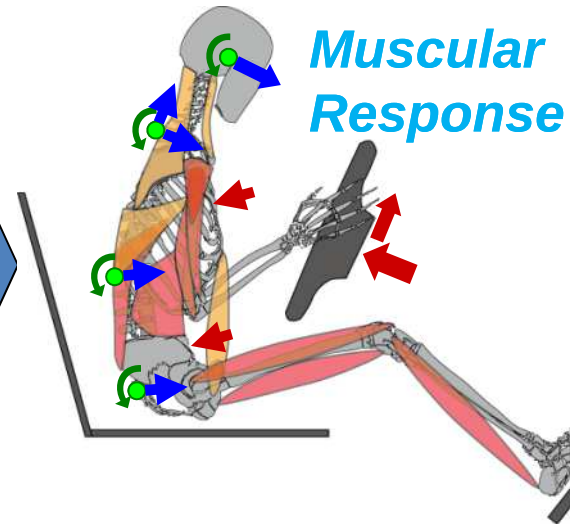
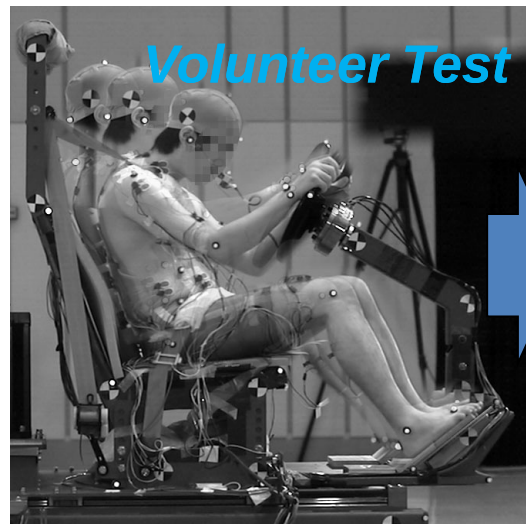
A Superimposed Pedestrian

Reaction in the Pre-Crash Phase



*According to accident data,
approx. 60% of drivers
take evasive actions in accidents.*

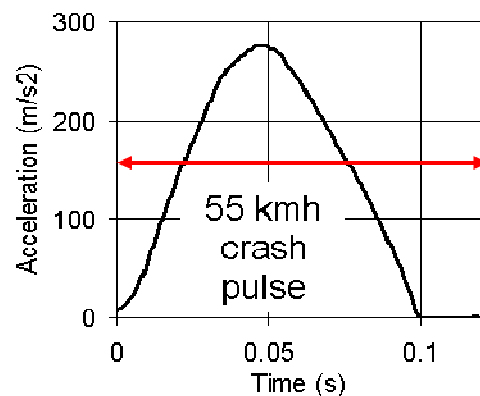
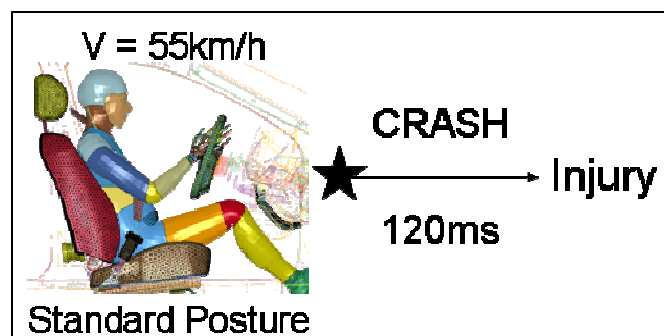
Injury Prediction Considering Influences from Seating Posture in the Pre-Crash Phase



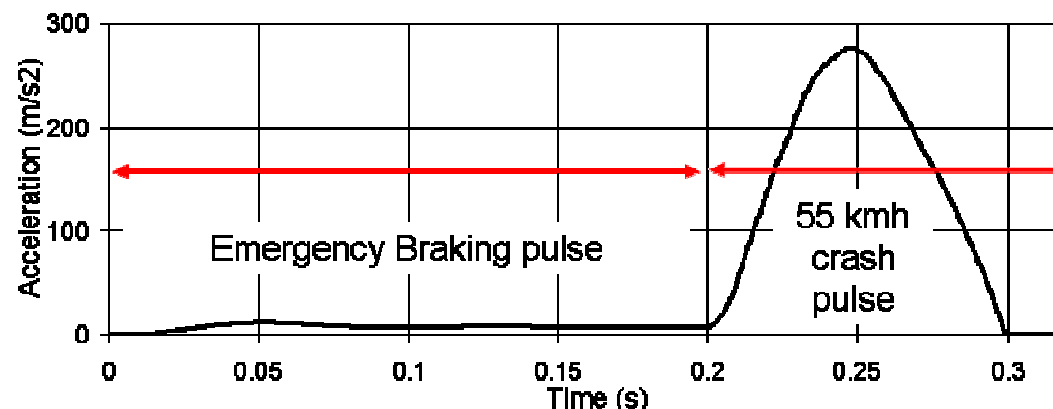
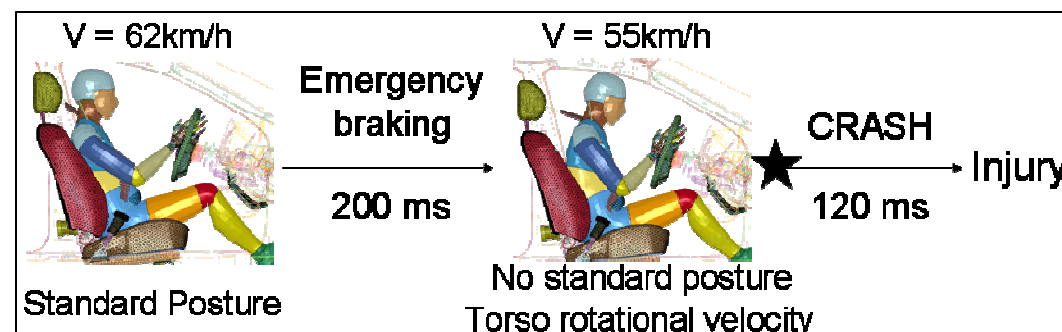
Comparison Between No Braking and Braking

A human FE model was placed in a vehicle interior model and two scenarios were simulated and compared.

Scenario I: No braking



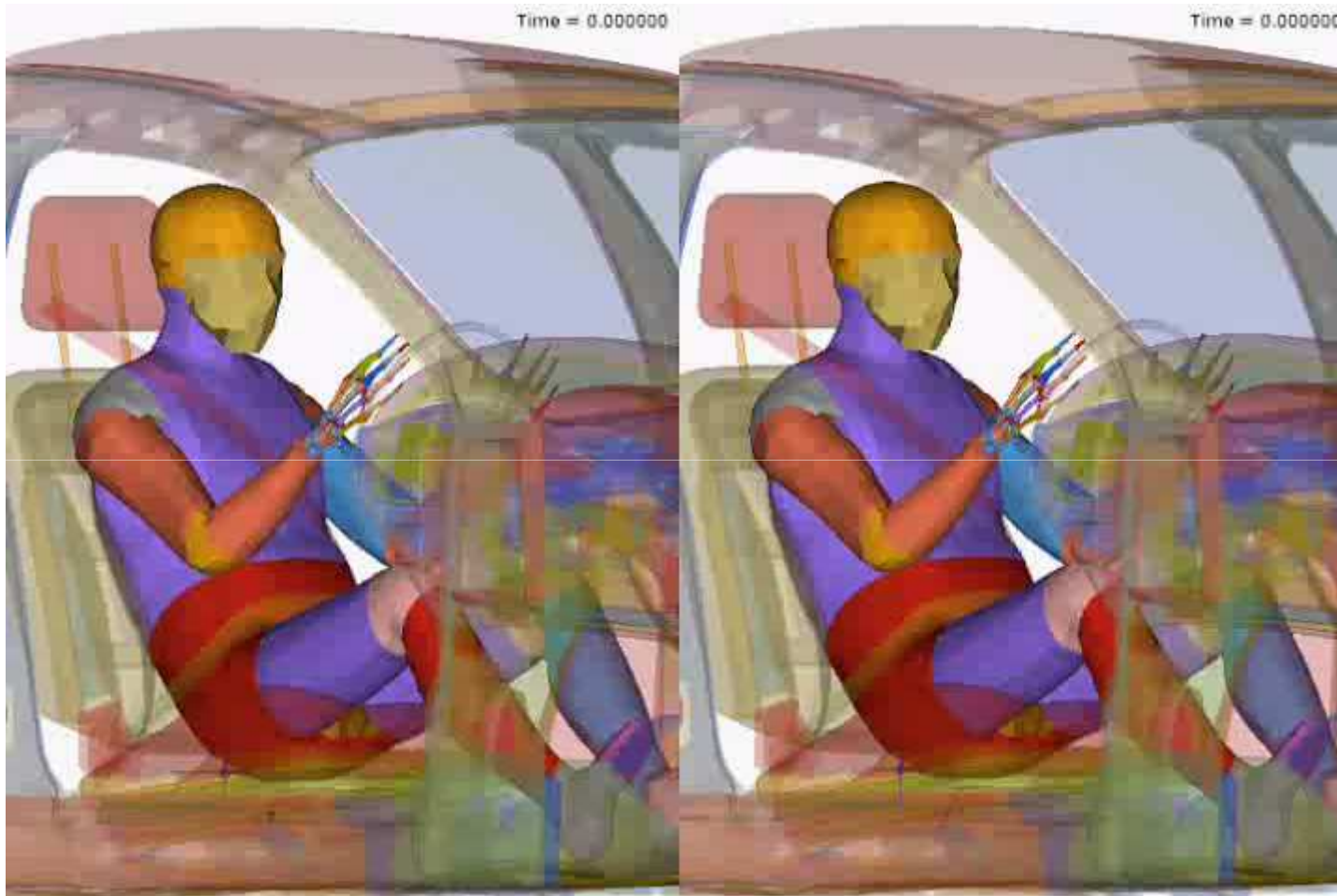
Scenario II: Pre-Impact braking



Simulated Scenario

No braking

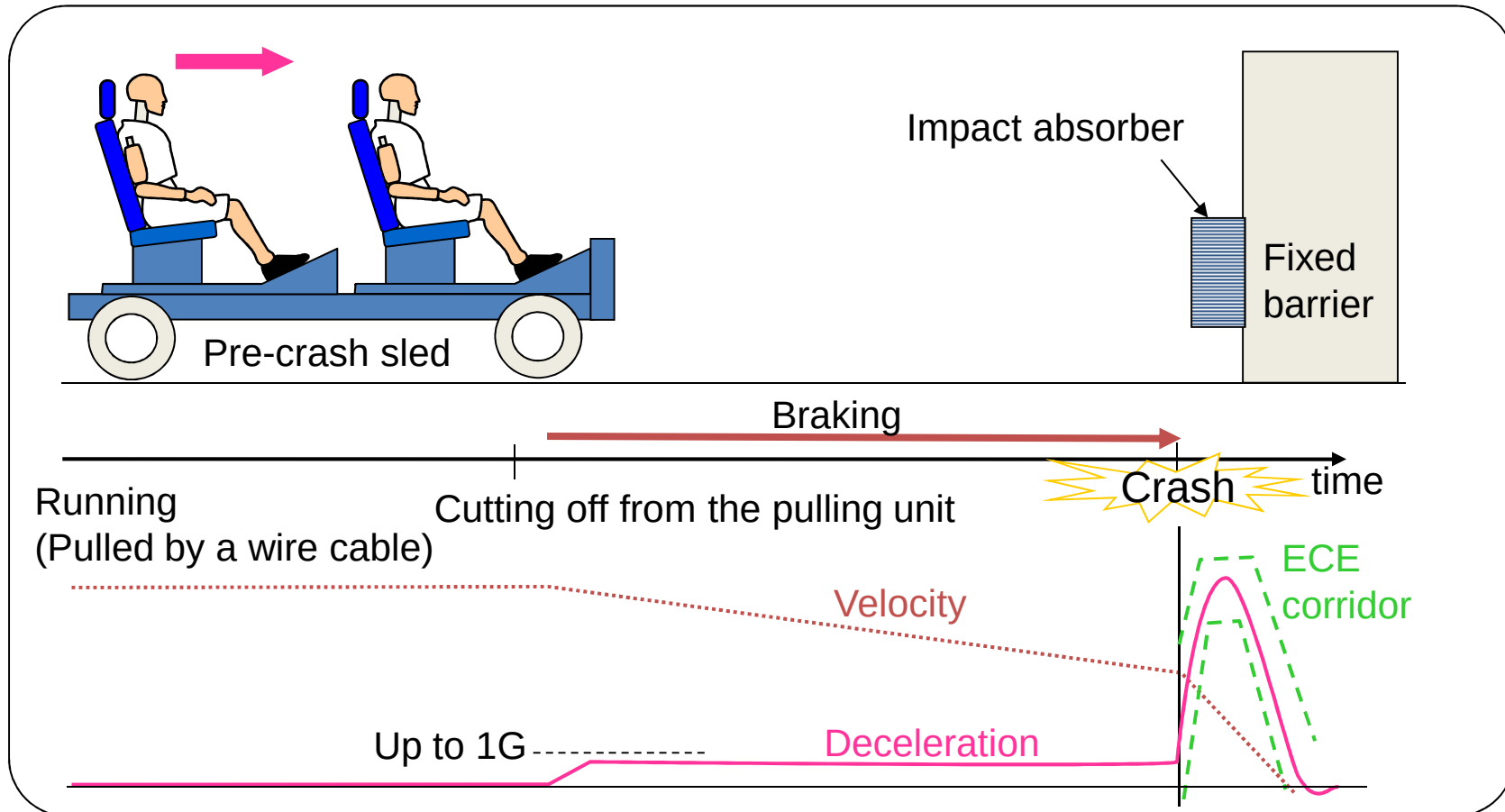
Pre-impact braking



120ms crash

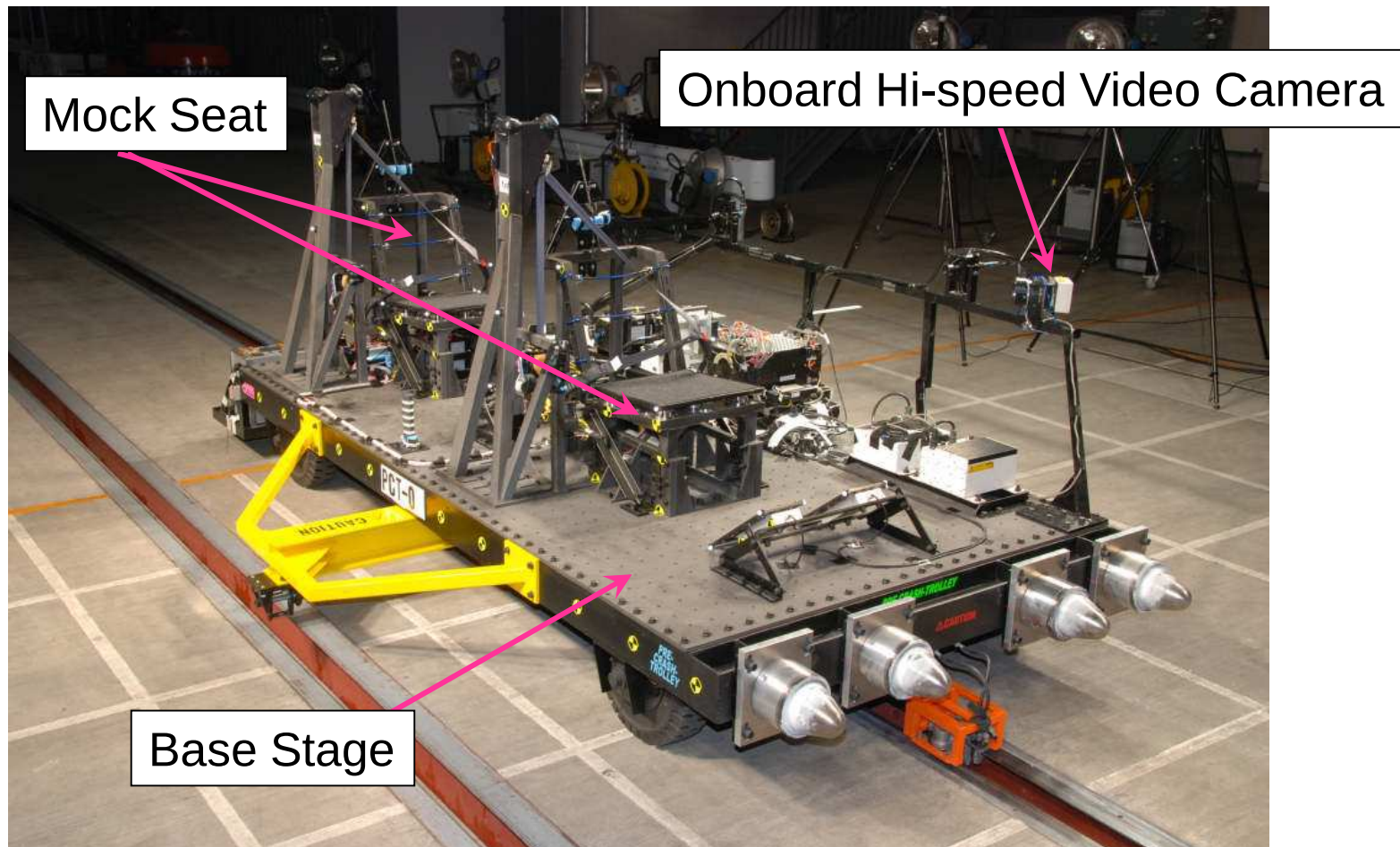
200ms braking + 120ms crash
After braking, the torso leans forward 15deg
and rotates with a velocity of 135deg/s

Pre-Crash Sled Test



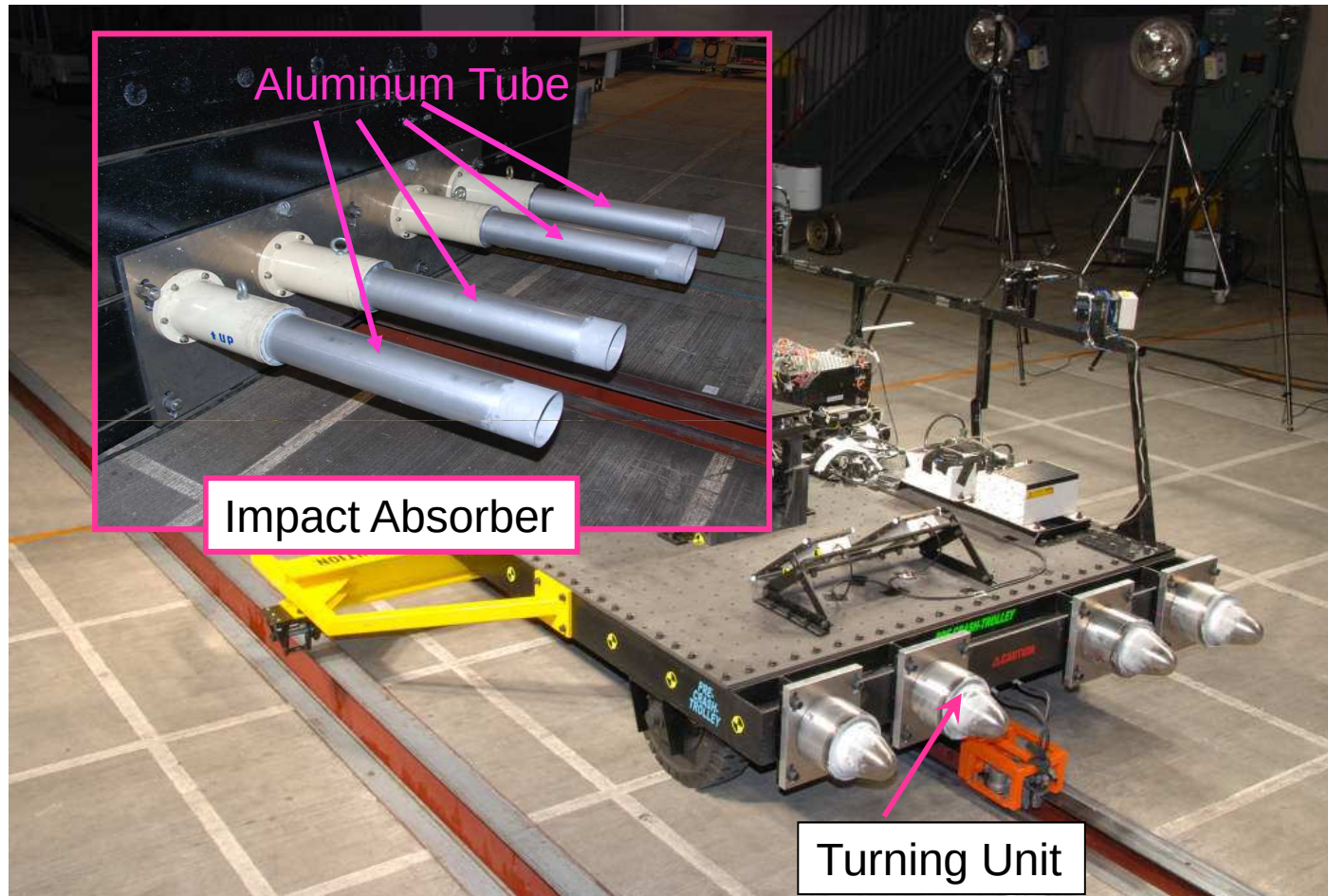
- Deceleration sled type
- Braking deceleration can be arbitrarily set to up to 1G
- Impact deceleration is inside the sled pulse corridor defined by ECE-44

Setup of a Pre-Crash Sled



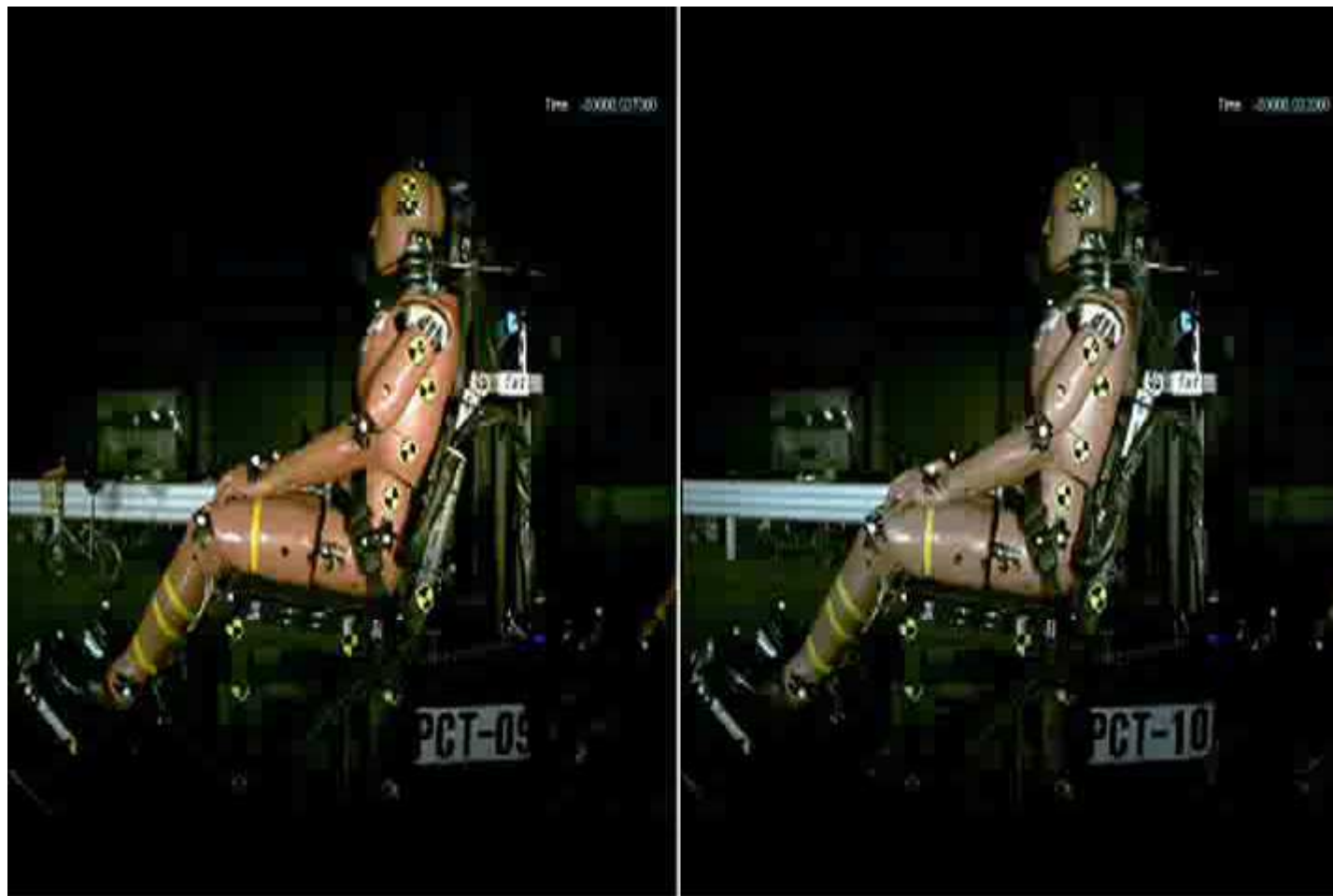
- Size of base stage : 1800 × 3500mm
- Mass of sled : 1911kg (including mock-seat and measurement devices : 2561kg)

Impact Absorber of a Pre-Crash Sled



Impact deceleration: Aluminum tubes are deformed with the turning units

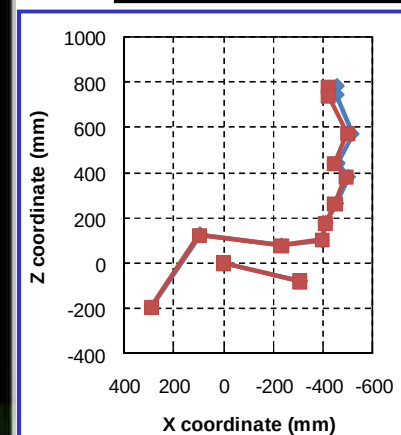
An Example of a Pre-Crash Sled Test



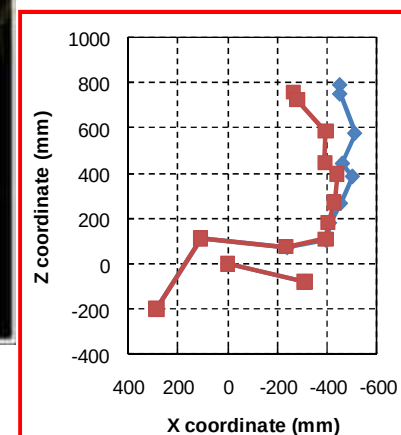
Motorized Seatbelt

Regular Seatbelt

— Initial Position
— Crash Timing

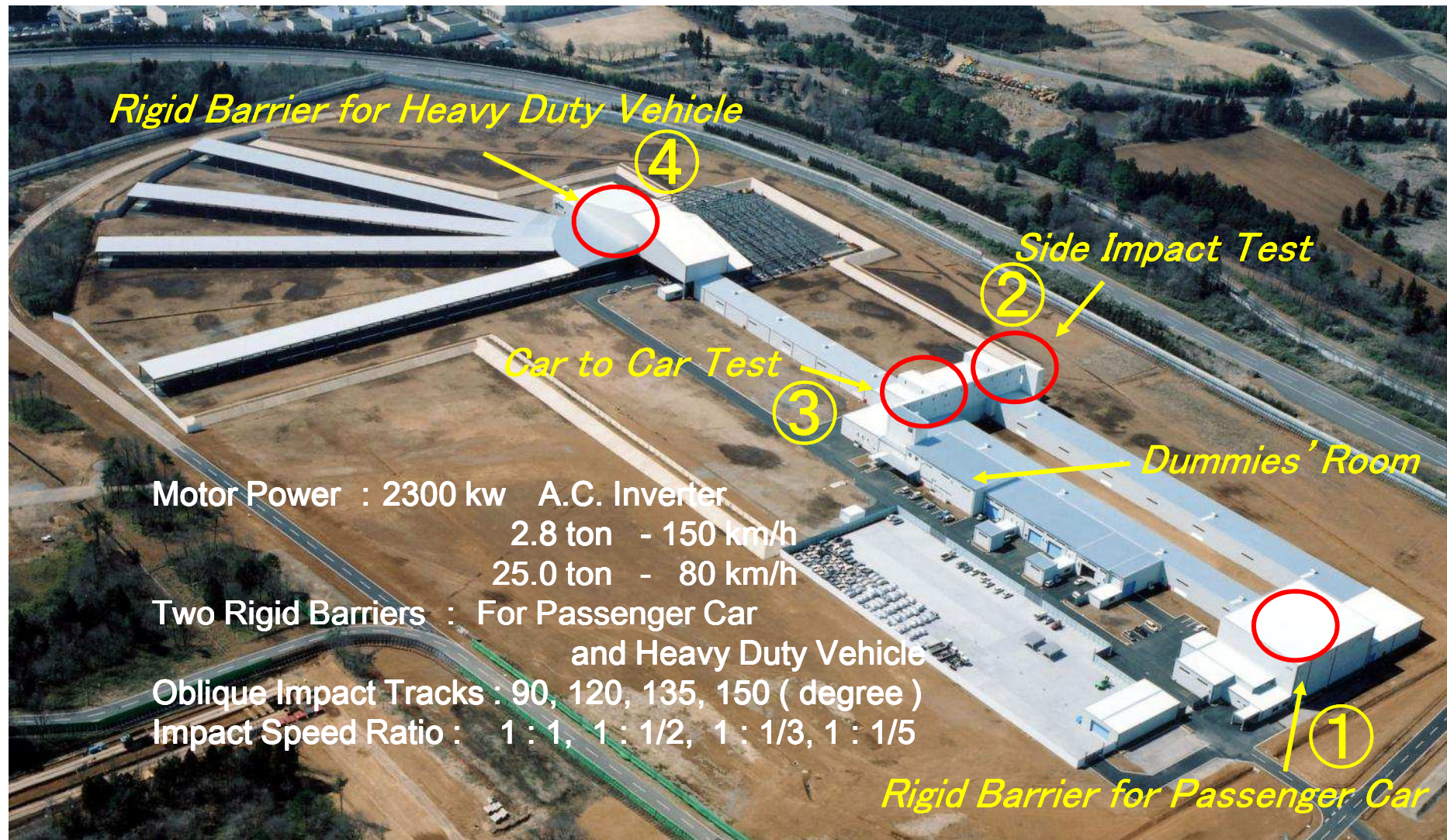


Motorized Seatbelt



Regular Seatbelt

4: Crash Test Facility

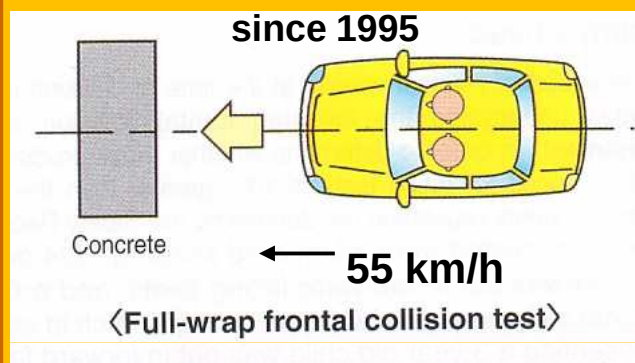


J-NCAP

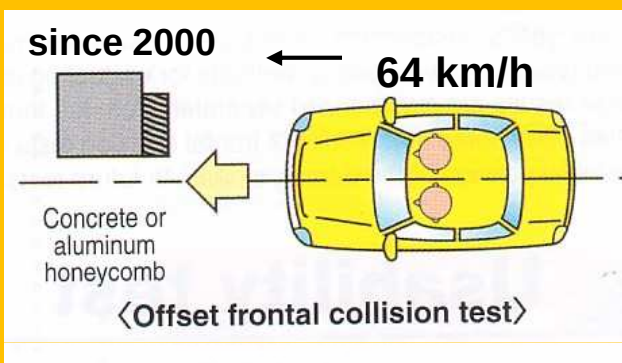
(Japanese New Car Assessment Program)



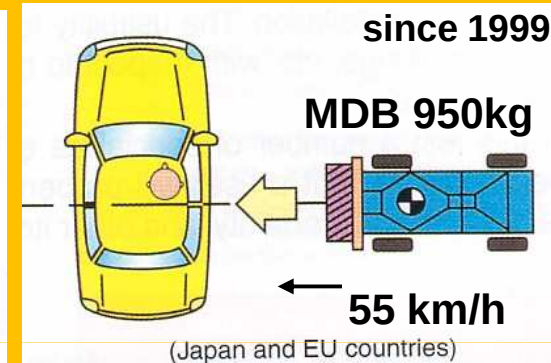
Full-Wrap Frontal Test



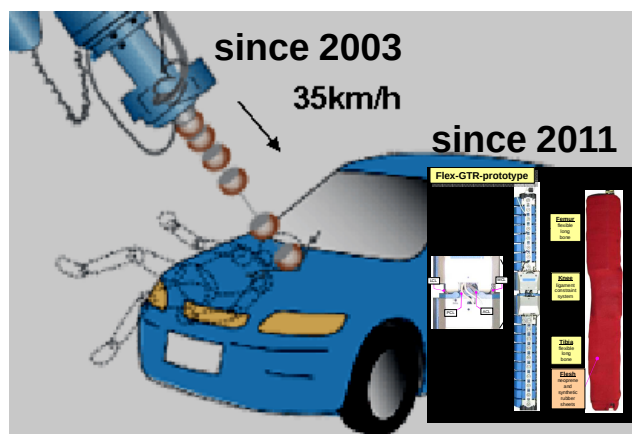
Offset Frontal Test



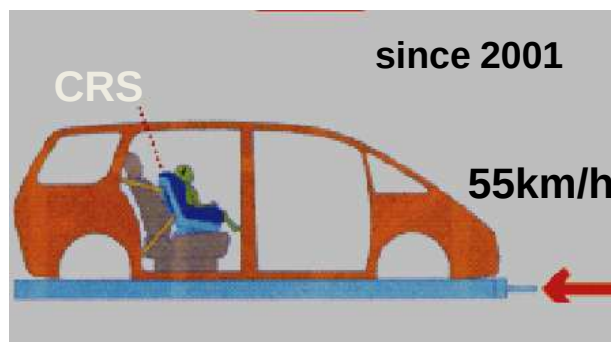
Side Impact Test



Pedestrian Test



Child Seat Test (CRS)



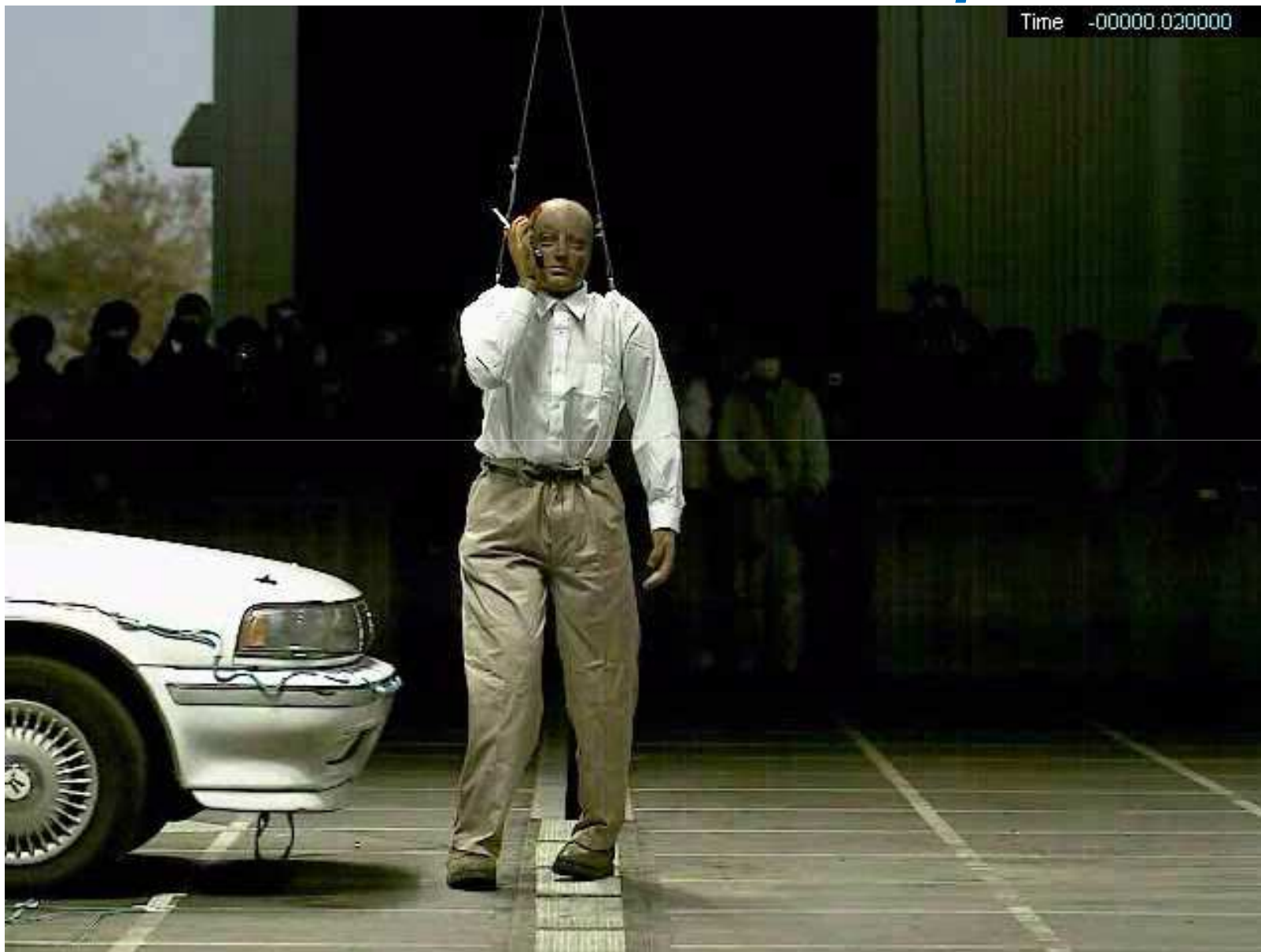
Rear Impact Test



Crash Tests in Our Facility



40km/h Car-to-Pedestrian Impact

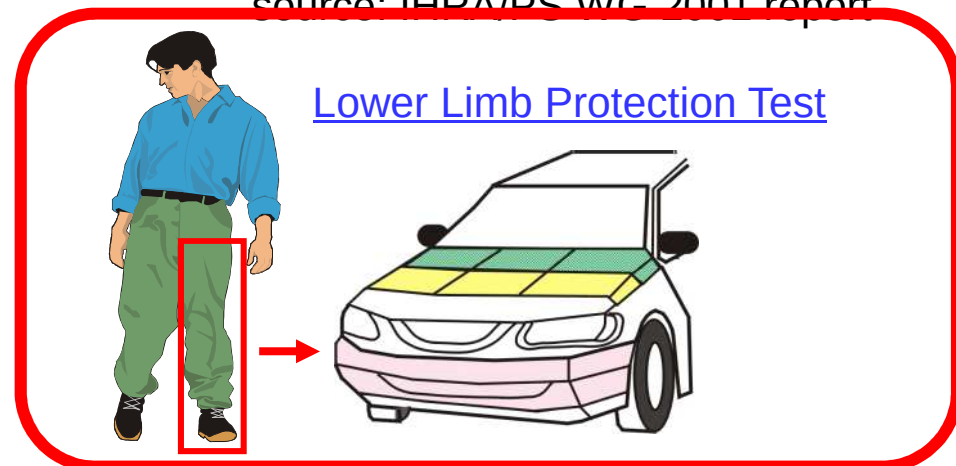
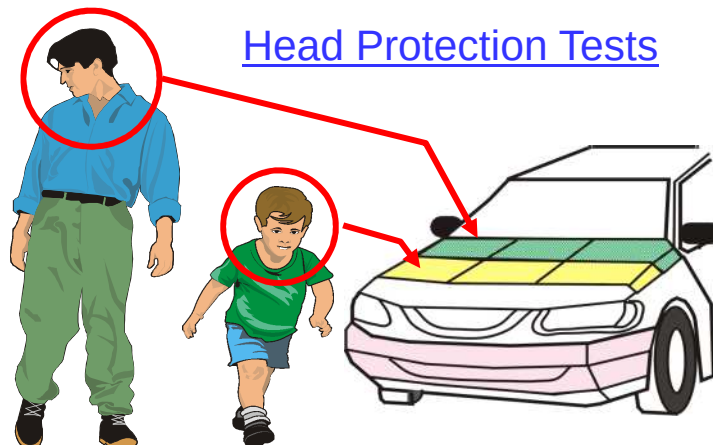


Car - Pedestrian Accidents

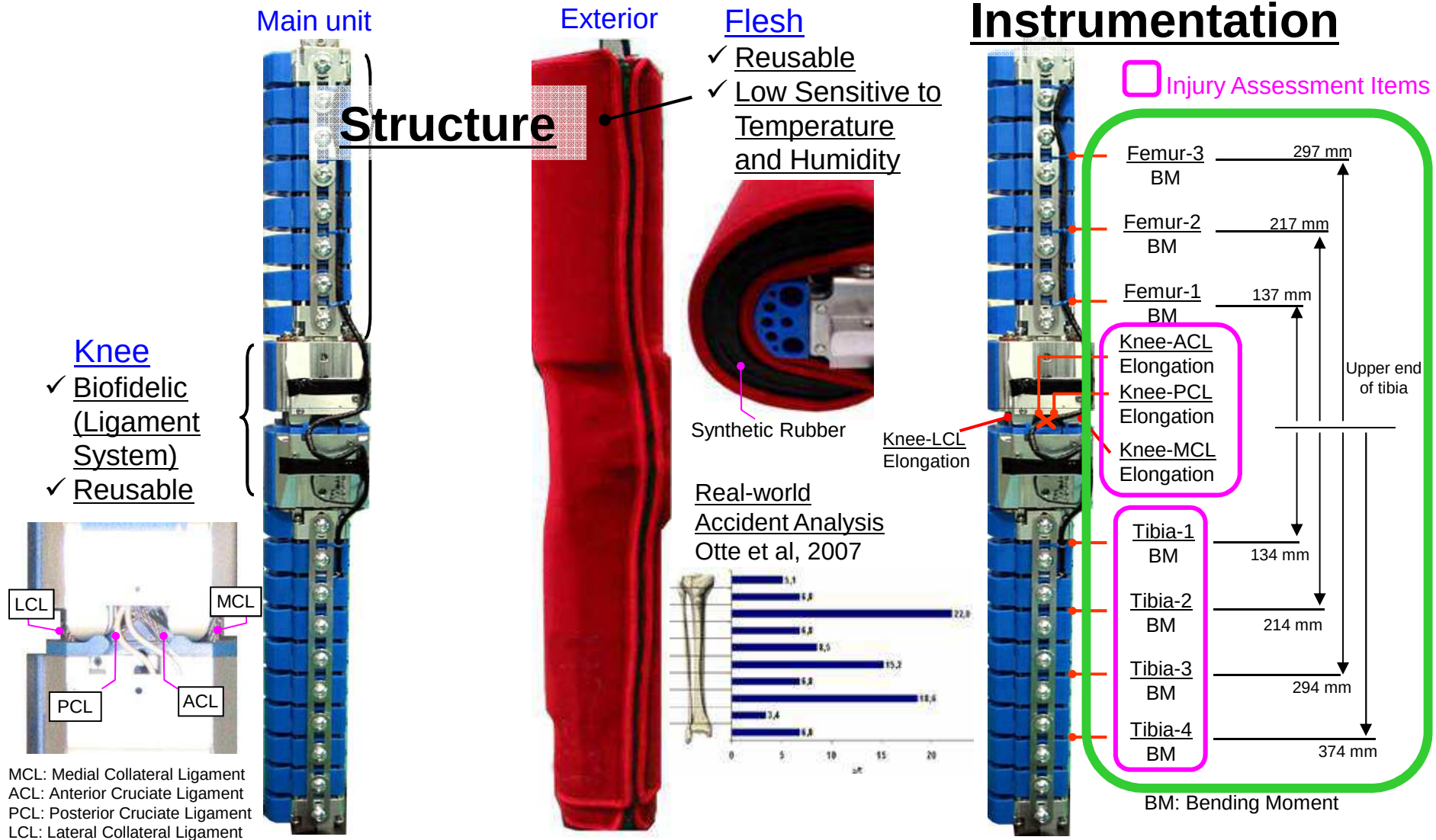
Injured Body Regions of Pedestrians in Car-Pedestrian Accidents (USA, Germany, Japan, and Australia : All Age Groups : AIS 2-6)

Body Region	USA (1994-1999)	Germany (1985-1998)	Japan (1987-1998)	Australia (1999-2000)	All Contries
Head	32.7%	29.9%	28.9%	39.3%	31.4%
Face	3.7%	5.2%	2.2%	3.7%	4.2%
Neck	0.0%	1.7%	4.7%	3.1%	1.4%
Chest	9.4%	11.7%	8.6%	10.4%	10.3%
Abdomen	7.7%	3.4%	4.7%	4.9%	5.4%
Pelvis	5.3%	7.9%	4.4%	4.9%	6.3%
Arms	7.9%	8.2%	9.2%	8.0%	8.2%
Lower Limbs	33.3%	31.6%	37.2%	25.8%	32.6%
Unknown	0.0%	0.4%	0.0%	0.0%	0.2%
TOTAL	100%	100%	100%	100%	100%

source: JHRA/PS WG 2001 report

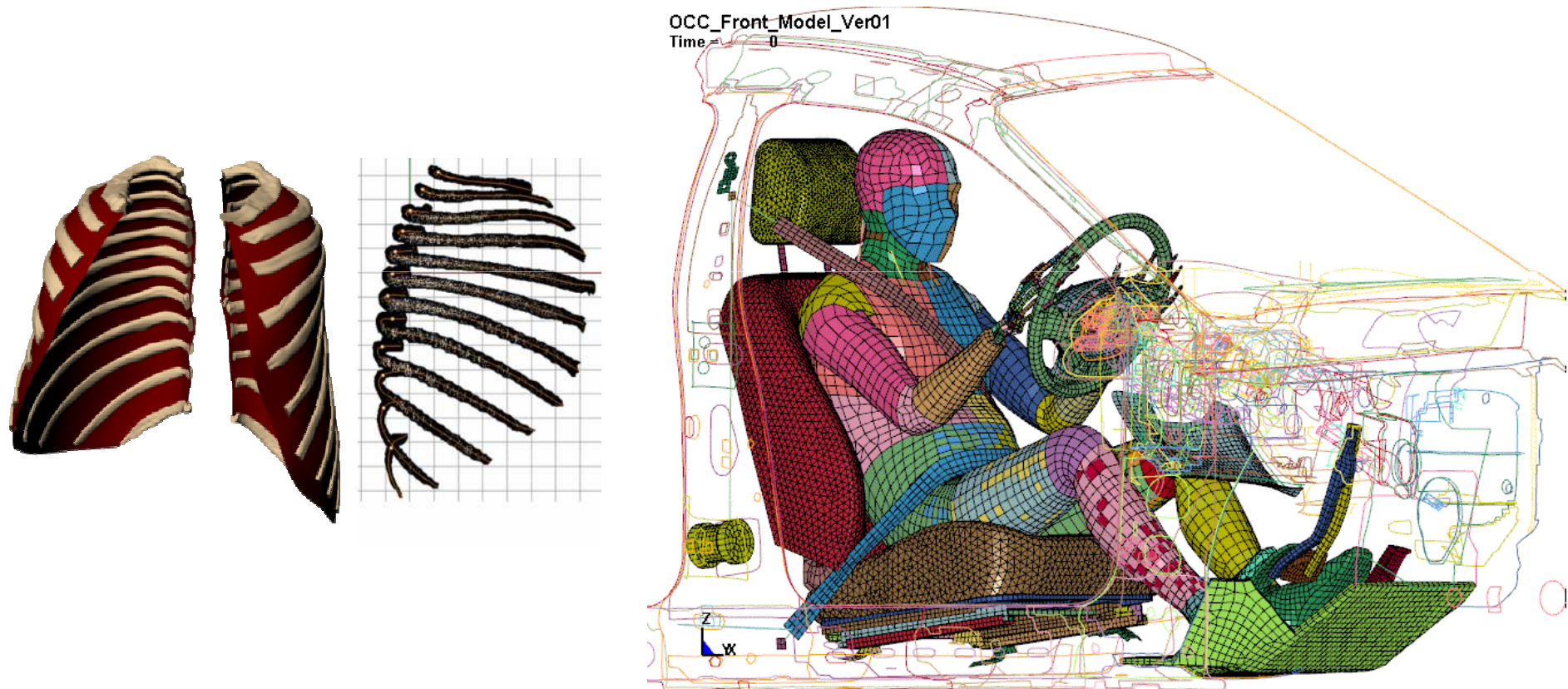


Pedestrian Legform Impactor

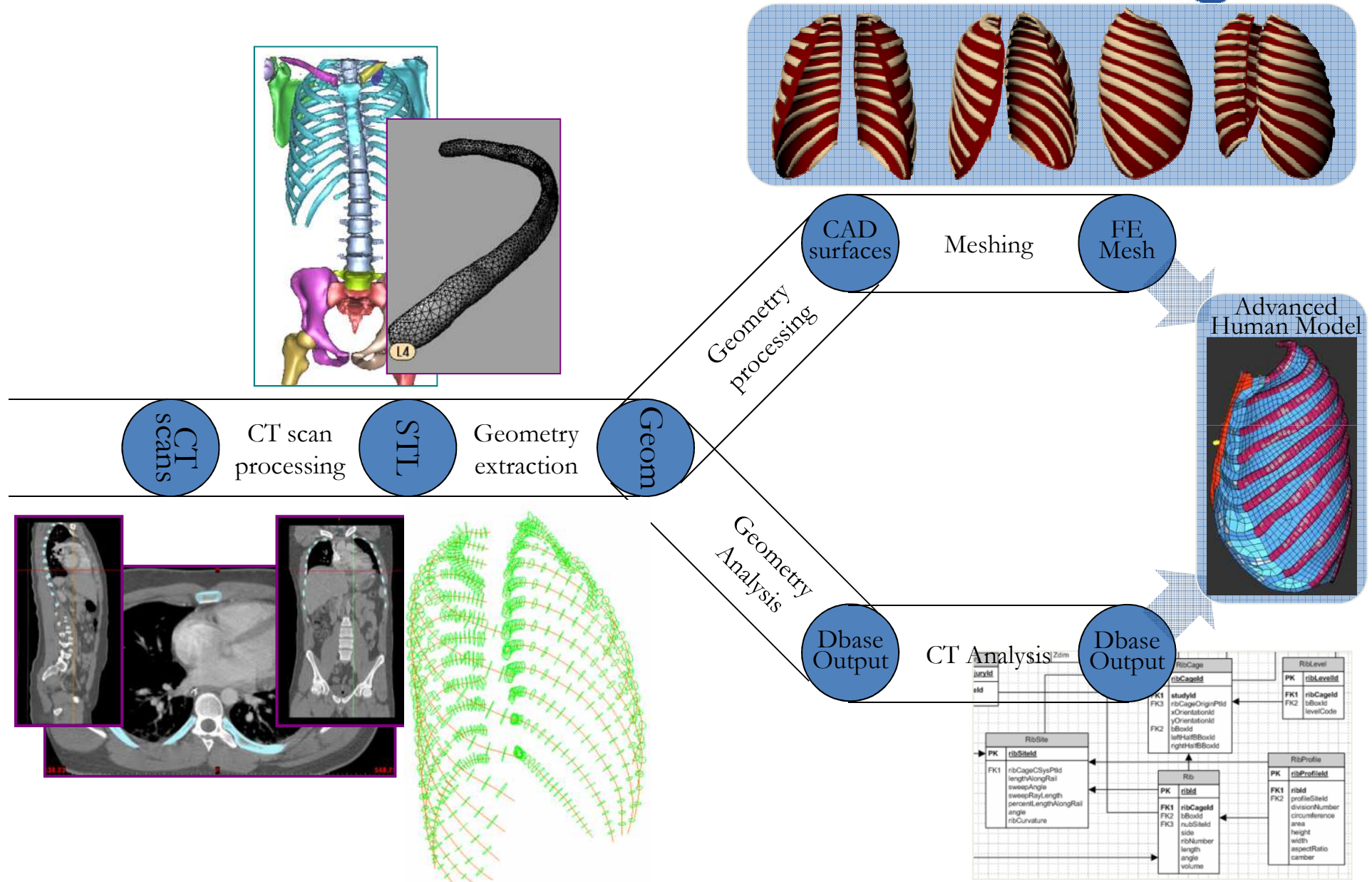


→ **Worldwide Regulation**

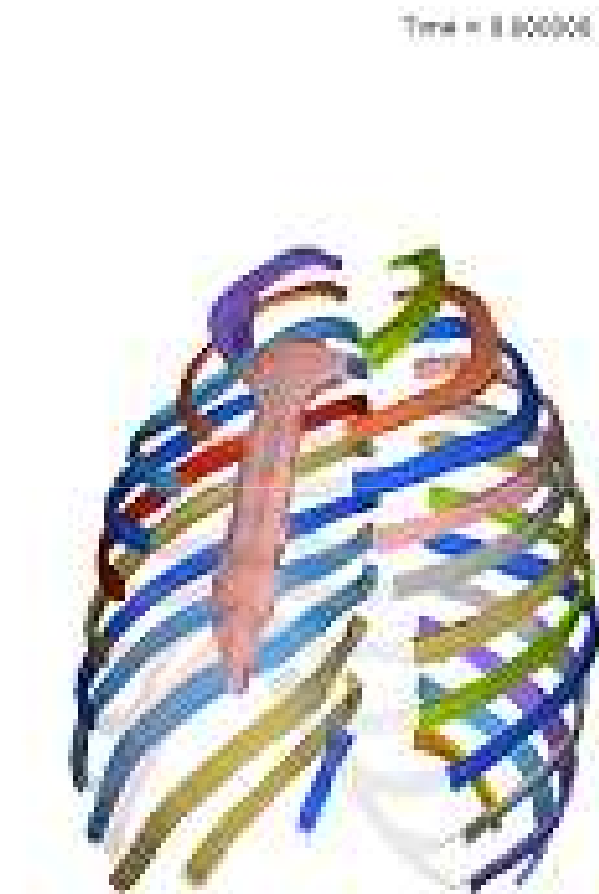
5: Computer Simulation



Human Model Development



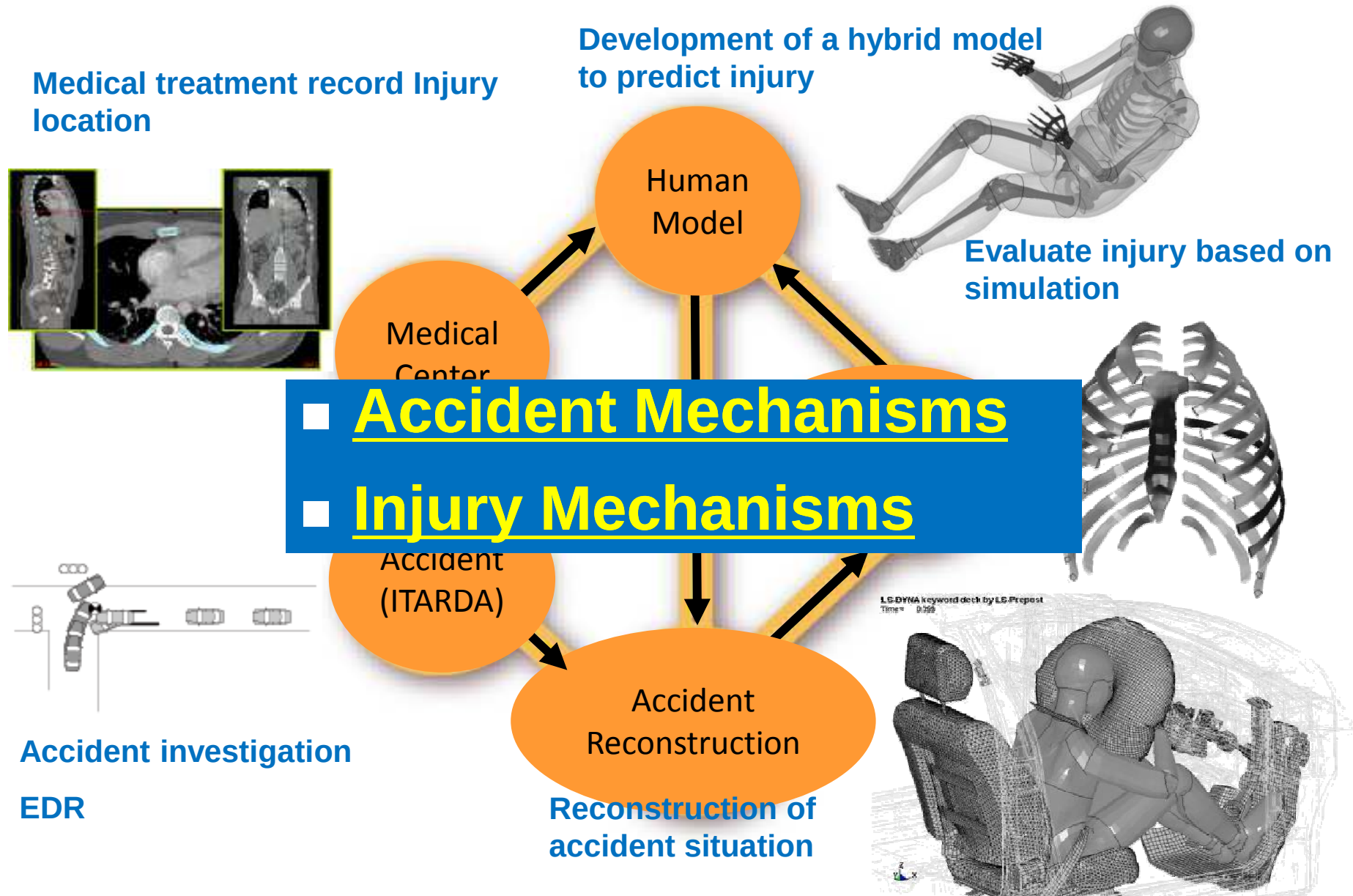
Prediction of Occupant Motions



6: Rescue



**For better approaches
and faster rescue**





***Let's work together
to improve traffic
safety.***

- *Accident analysis*
 - *Test procedures / Evaluation methods*
 - *Training / Joint experiments*
 - *Collaboration study*
- etc.*



Thank you for your attention.



**If you have any comments and questions,
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