Introduction to Passive Safety

Vehicle Safety Course 2024

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Mitsubishi Motors Corporation

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1. What is Passive Safety?

“Passive Safety” means

the safety of in-crash. We can also say crash safety.

It is the opposite to “Active Safety”
which means safety before crash.

Active Safety

Passive Safety

“Passive Safety” covers

various types of vehicle crashes corresponding to the real world traffic accidents.

NCAPs evaluate ODB frontal, MDB side impact, etc.

ODB Frontal
(Offset Deformable Barrier)

MDB Side
(Moving deformable Barrier)

Pole Side

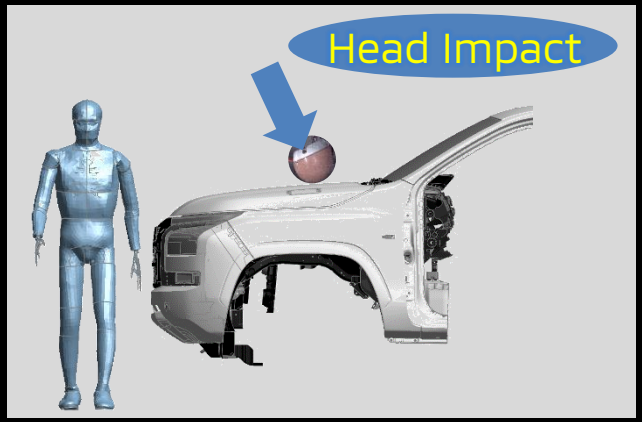
“Passive Safety” helps to reduce

injuries of adult, child occupants and vulnerable road users (VRU).

VRU includes pedestrians, cyclists and so on.

Adult Occupants

Child Occupants



Pedestrian (Head Impact)

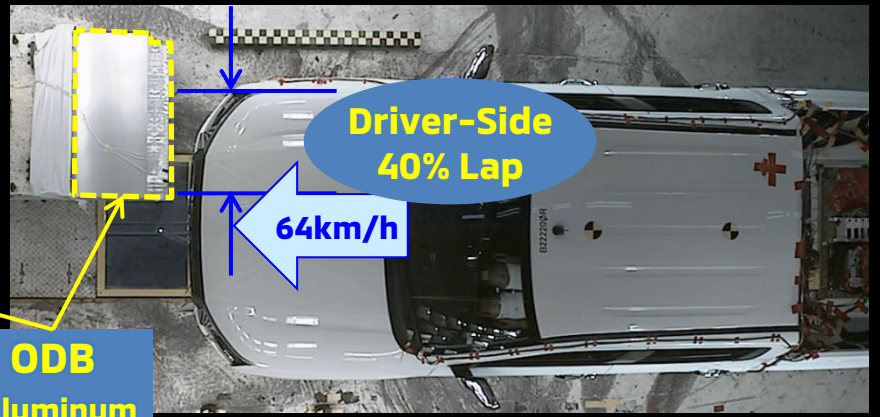
2. Crash Dynamics:
Shorter than a Blink of an Eye

ODB frontal crash is

one of the typical frontal crash tests.

It corresponds to head-on collision in the real world, using offset deformable barrier.

Right Side view



Top View

ODB
(Aluminum Honeycomb Barrier)

ODB frontal crash finishes

almost in 0.15 seconds.

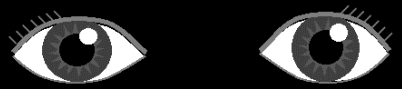
We say “150ms (milli seconds)”,
where “1ms” is equal to 1/1000 second.

150ms is shorter time than a blink of an eye.

0.15s = 150ms < A blink of an eye

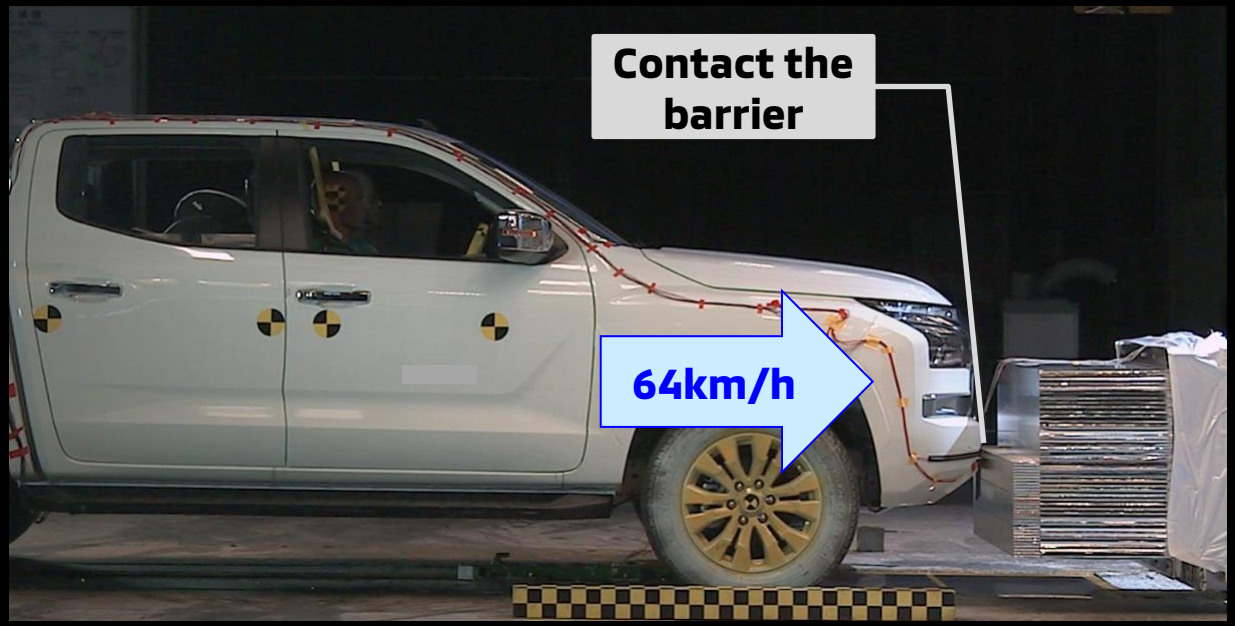
To see the dynamics in frontal crash,

the images from high-speed video cameras are useful.
These images are shown from next slide.
You can blink your eyes, of course.

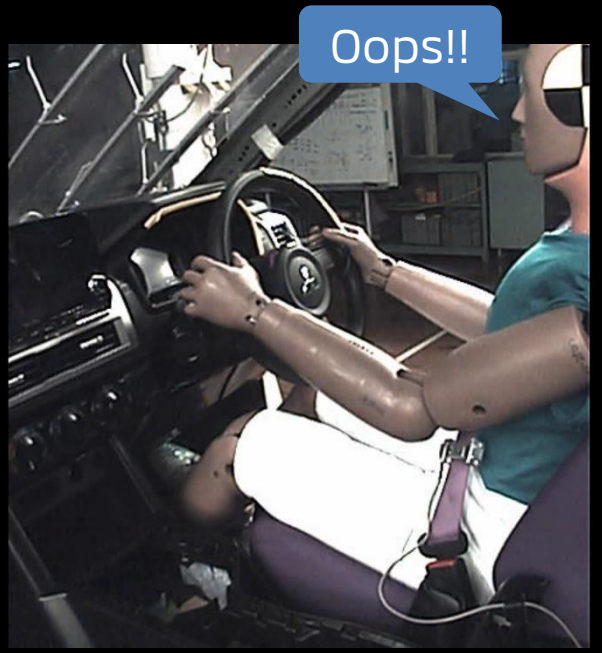


2. Crash Dynamics: Shorter than a Blink of Eyes

0ms: Vehicle contacts the barrier.



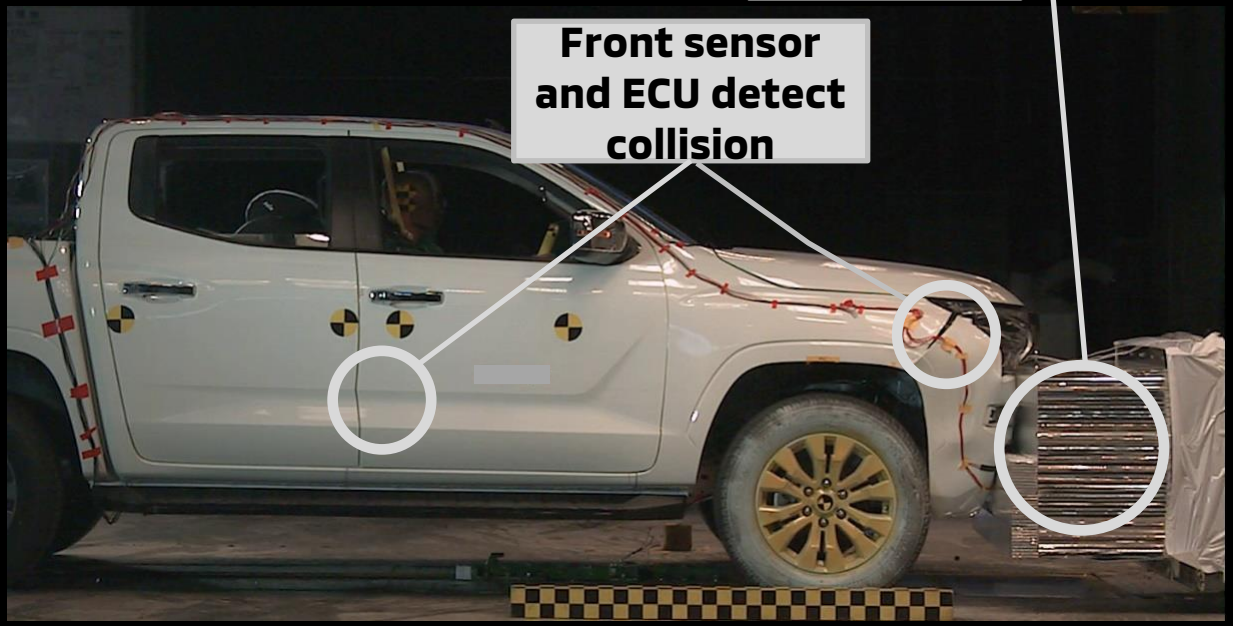
Vehicle



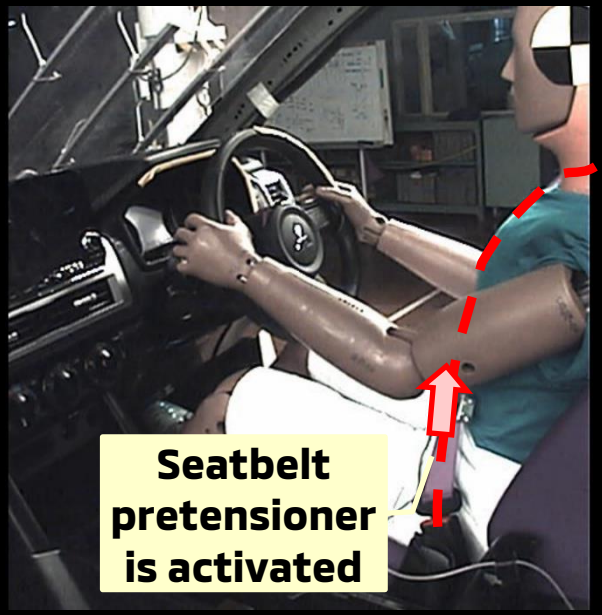
Occupant

2. Crash Dynamics: Shorter than a Blink of Eyes

15ms: With airbag sensor ON, pretensioner is activated.



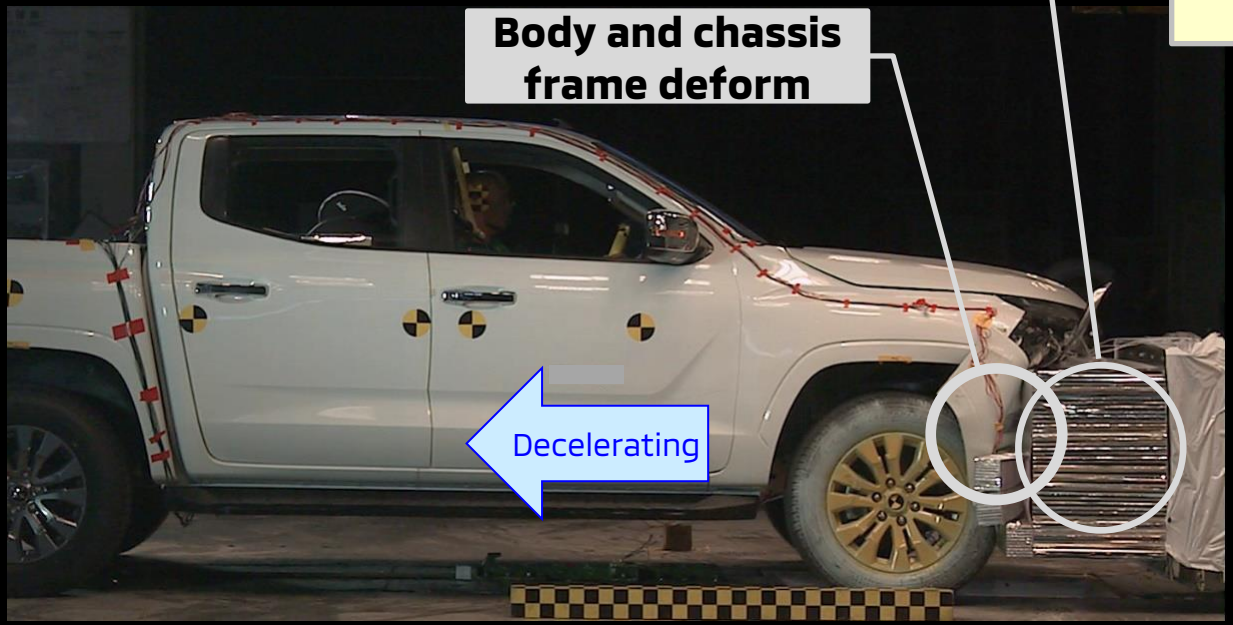
Vehicle



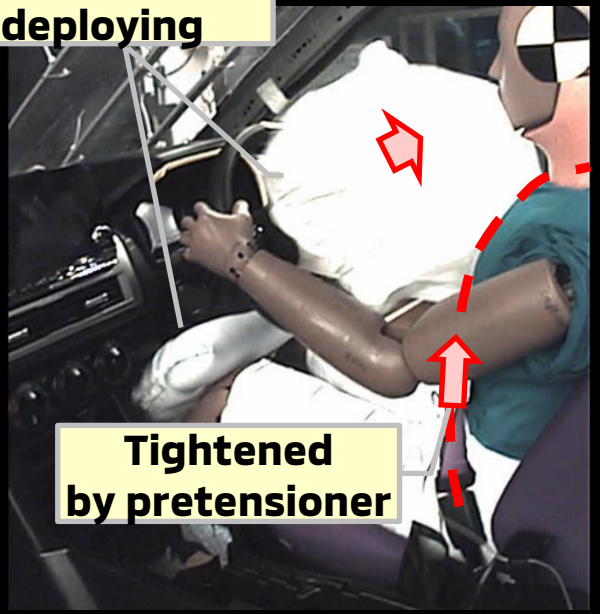
Occupant

2. Crash Dynamics: Shorter than a Blink of Eyes

30ms: With seatbelt tightened, airbags are deploying.



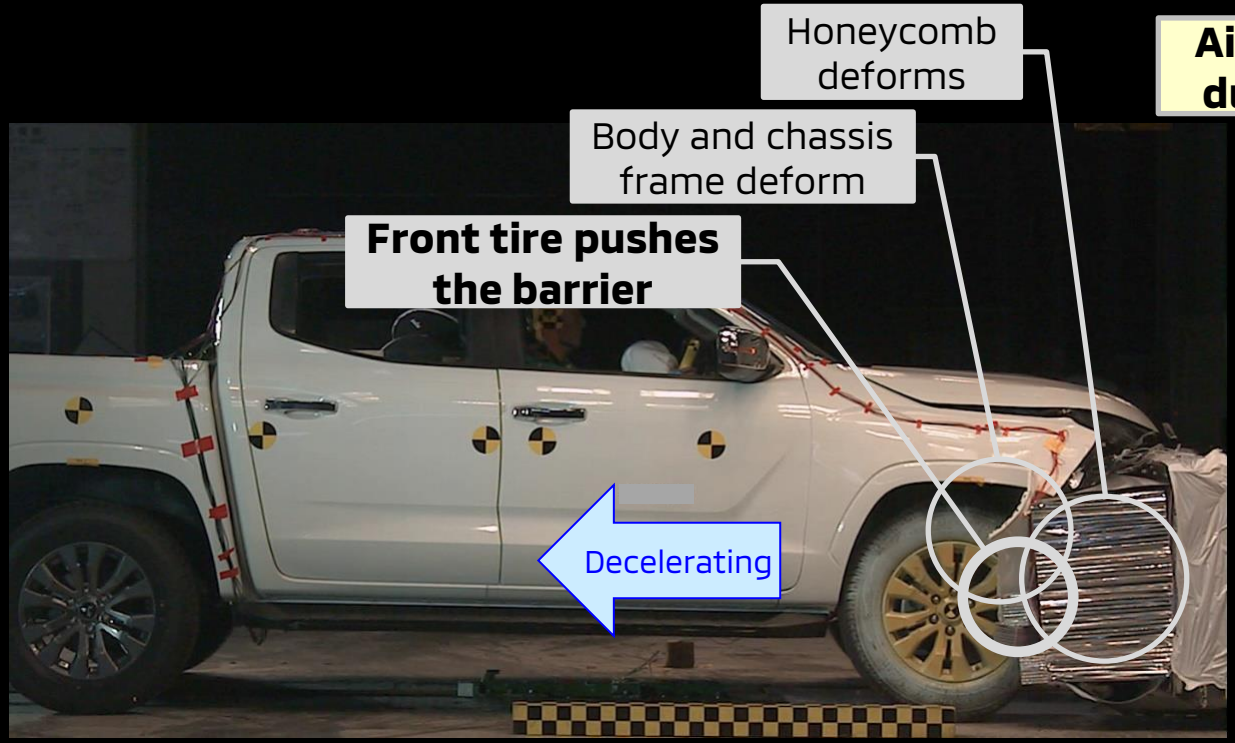
Vehicle



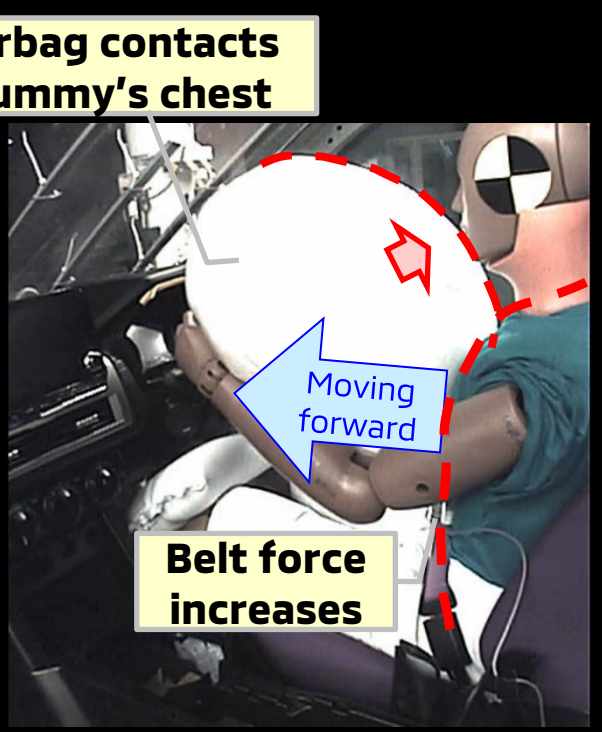
Occupant

2. Crash Dynamics: Shorter than a Blink of Eyes

45ms: With belt force increasing, airbag contacts the chest.



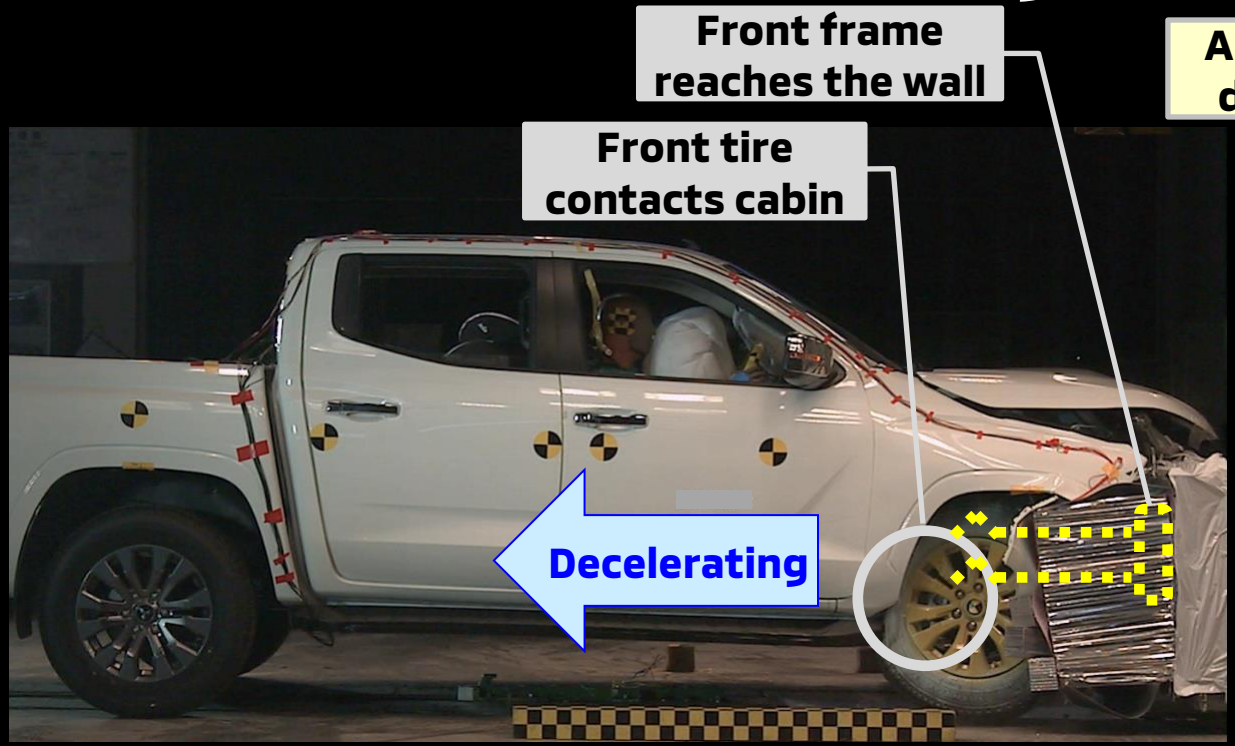
Vehicle



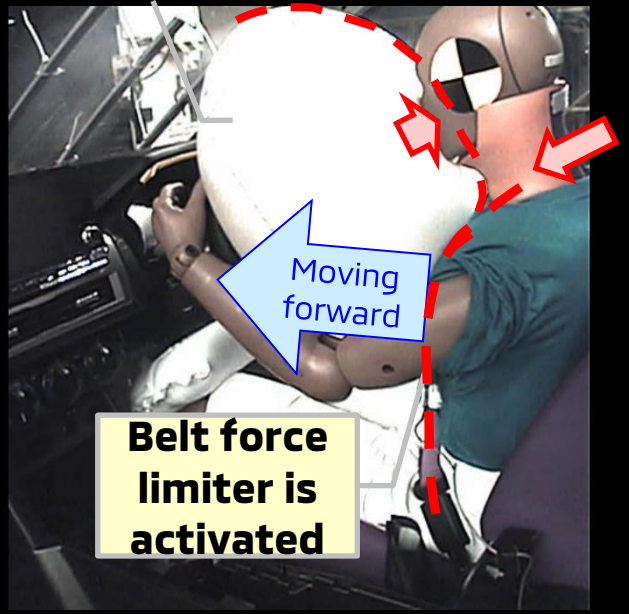
Occupant

2. Crash Dynamics: Shorter than a Blink of Eyes

60ms: With force limiter working, airbag contacts the head.



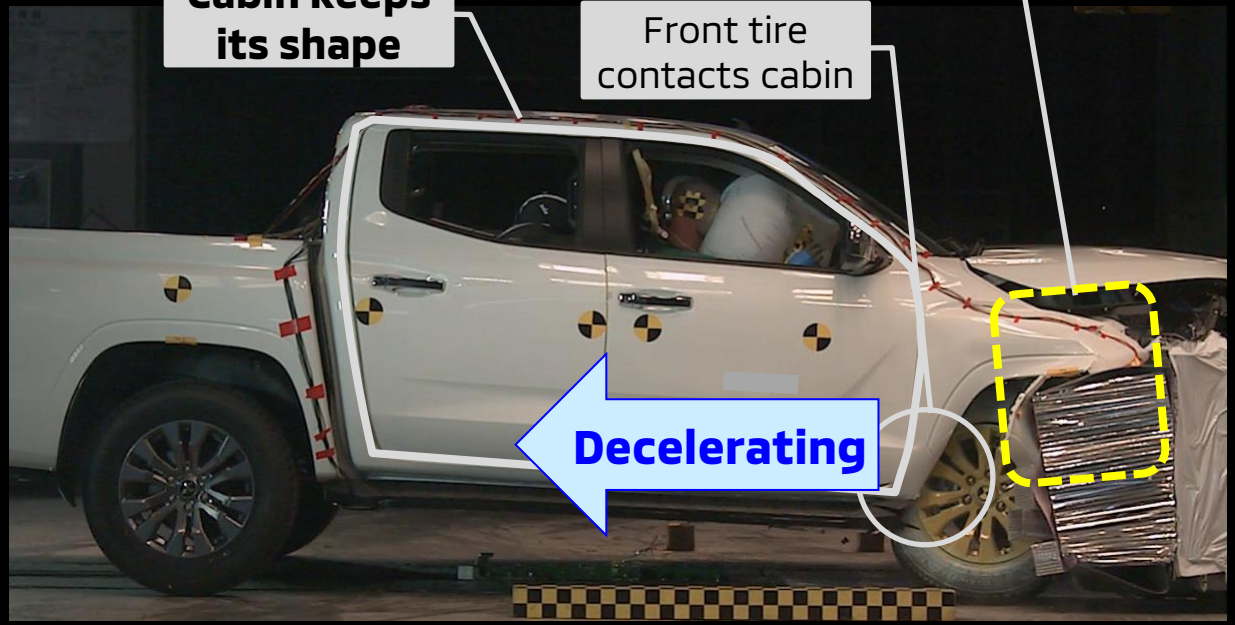
Vehicle



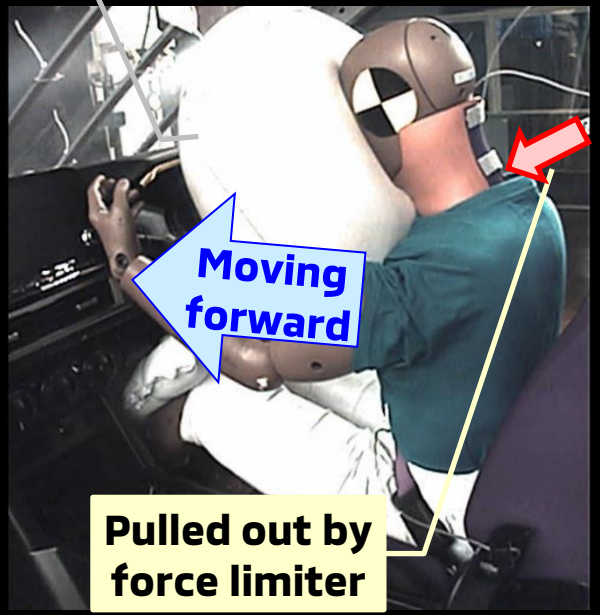
Occupant

2. Crash Dynamics: Shorter than a Blink of Eyes

75ms: Force limiter helps not to increase occupant injury.



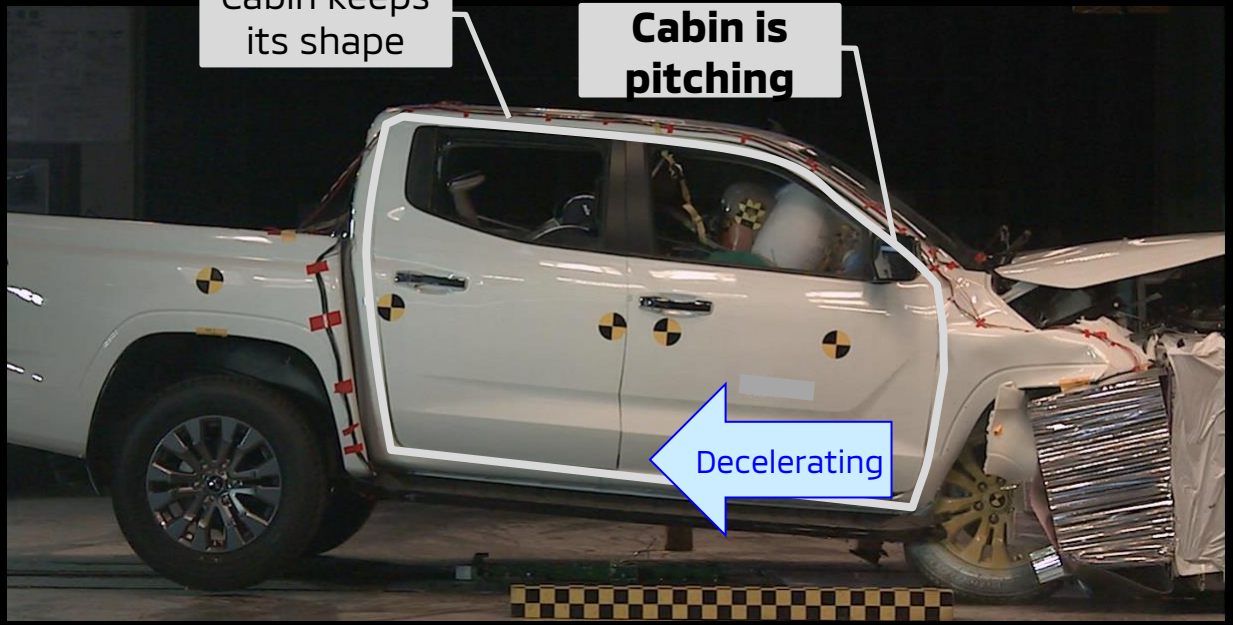
Vehicle



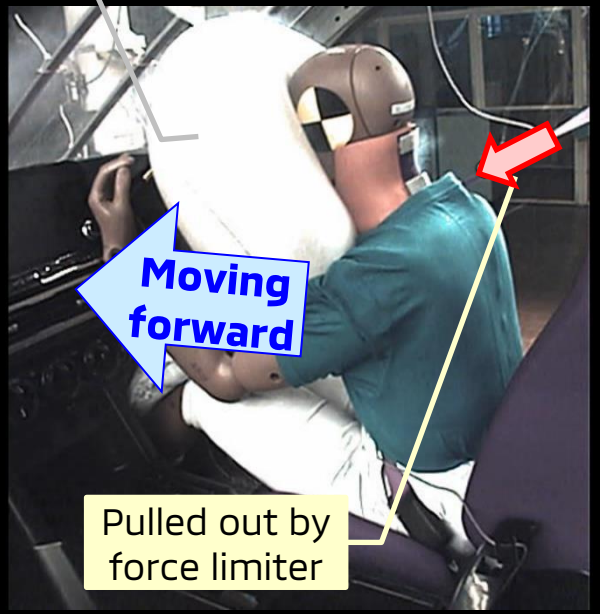
Occupant

2. Crash Dynamics: Shorter than a Blink of Eyes

90ms: Belt Force limiter continues to be effective.



Vehicle

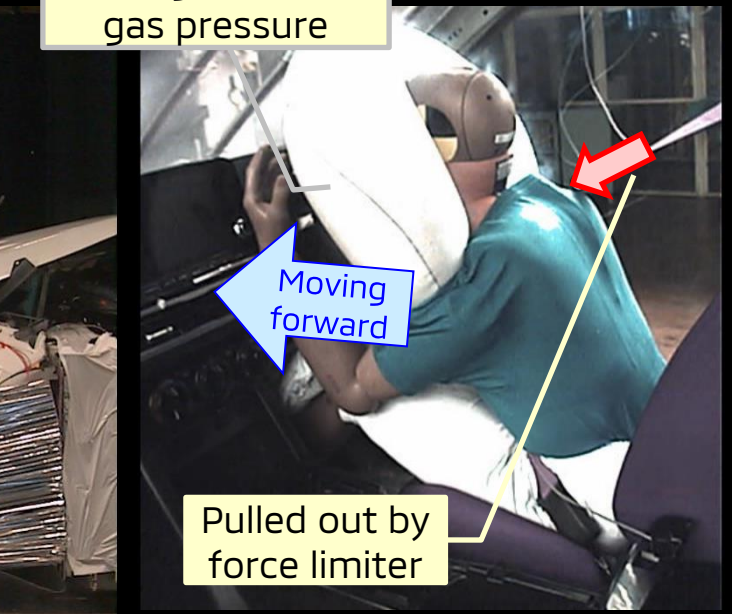


Occupant

2. Crash Dynamics: Shorter than a Blink of Eyes

105ms: Adequate force helps to prevent hard contact.

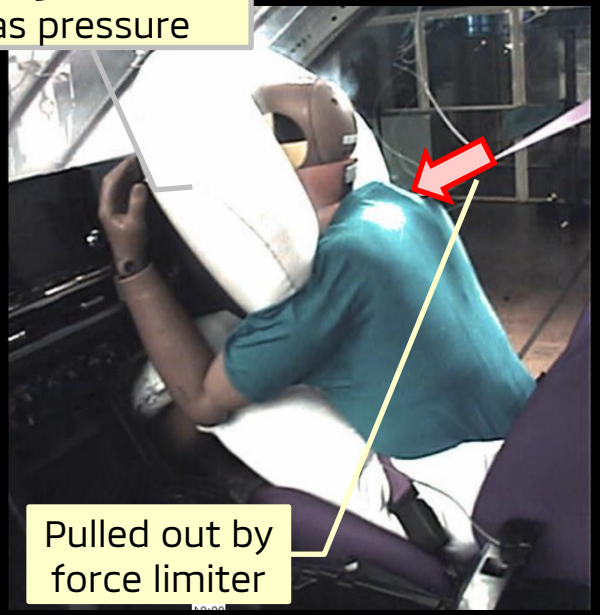
Vehicle



Occupant

120ms: Vehicle displacement reaches its maximum and cabin starts rebounding.

Vehicle

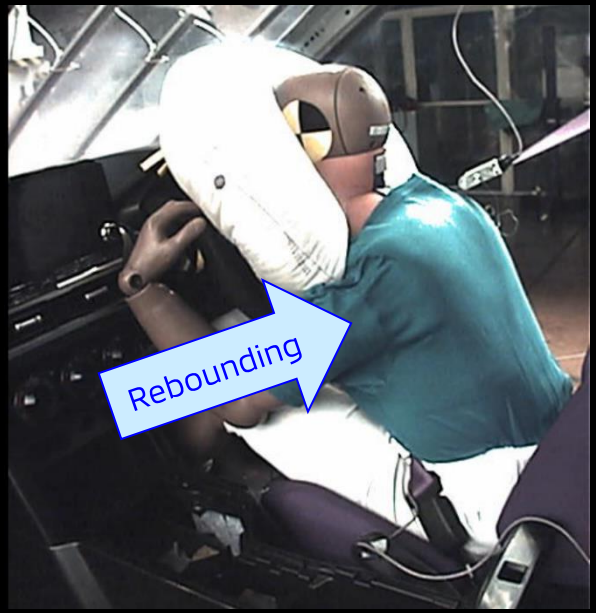


Occupant

2. Crash Dynamics: Shorter than a Blink of Eyes

135ms: Restraint force are released, occupant is in rebound.

Vehicle



Occupant

2. Crash Dynamics: Shorter than a Blink of Eyes

150ms: Crash phenomenon almost finishes.

Vehicle

Occupant

“Passive Safety” considers that

increasing restraint force in early timing, keeping it not to exceed occupant tolerance and avoiding hard contact in the cabin.

Each component behavior

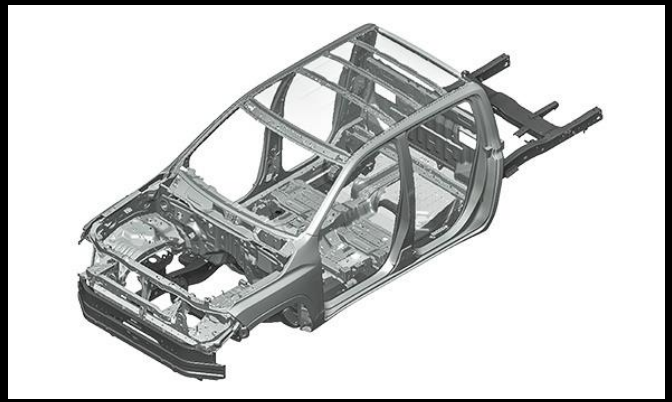
	Early Stage		Middle Stage	Last Stage
Body and chassis	Adequately deform in front		Keep cabin’s shape	Rebounds
Seatbelt	Tightened	Increases force	Limits force	Release force
SRS Airbags	Deploy	Inflate and contact	Restraint head & chest	

3. Proper use of Safety Components

Body and chassis, SRS Airbags

are both basic safety technologies.

Note that they are designed under the premise that seatbelts are properly fastened.



Body and Chassis

SRS Airbags

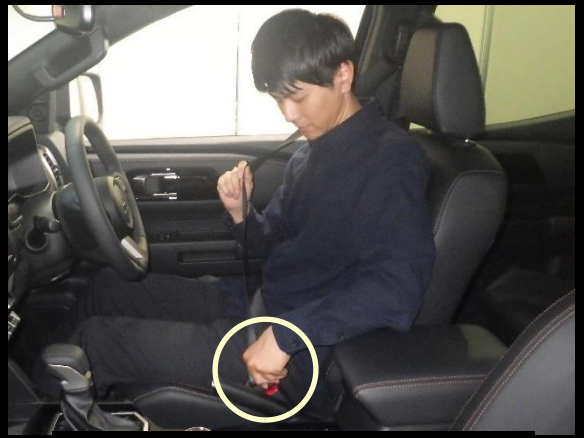
SRS = **Supplemental** Restraint System

Seatbelt is

one of the most essential safety components.

Before you drive, fasten seatbelts properly for your own and all passengers as well.

Set adjustable anchor height



Buckle without twist

Remove slack with fingers

Again,

the use of all seatbelts, head restraints, and child restraints are very important.

Reconfirm proper way to use them by owner's manuals.

Fasten front & rear seatbelts

Set head restraint height

Use child restraints

Also, when you drive,

take care of other vehicles and VRU
i.e., pedestrians, cyclists and motorcyclists.

Confirm with the eyes

Care of pedestrian

Confirm again

Enjoy your drive!

MITSUBISHI MOTORS
Drive your Ambition

Thank you all very much!