

VEHICLE CRASH TEST & ASEAN NCAP



4th Malaysian Workshop on Crash
Investigation and Injury Analysis

6th August 2015 @Hotel Bangi-Putrajaya

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Road Safety Scenario

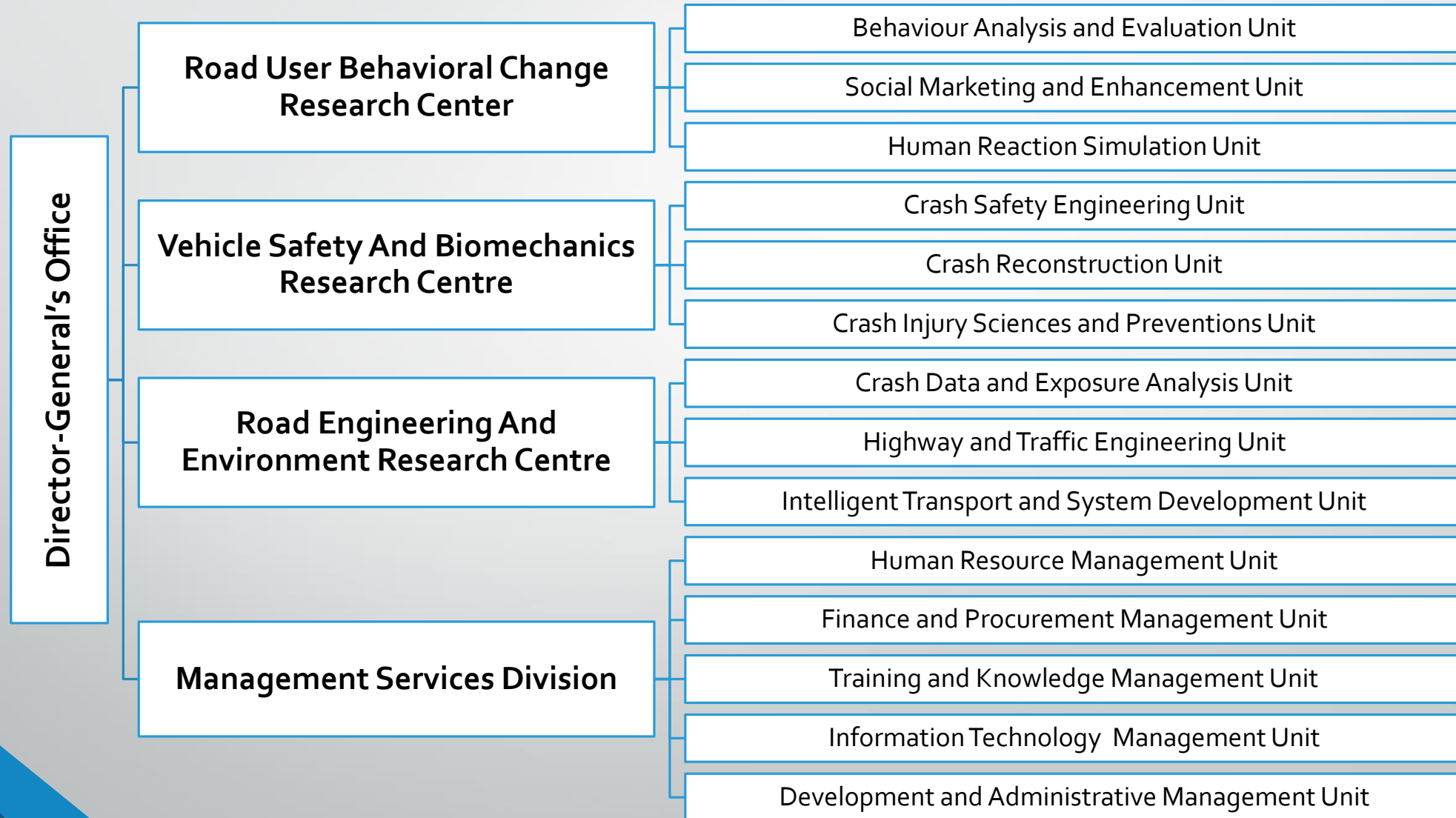


- **1.24 million** people killed every year due to the road crash.
- **92%** of the fatalities occurred in low and medium income countries.
- **Every 6 seconds**, someone is killed or injured on the world's road

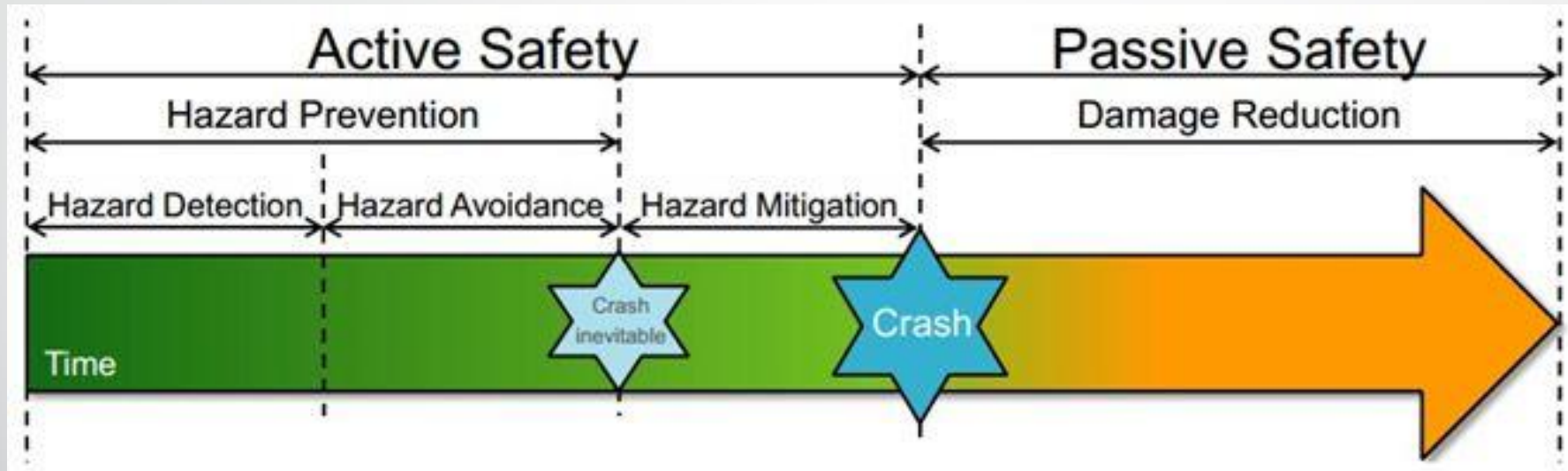
Safe System Approach



MIROS Strength



Crash Temporal Perspective for “Safe Vehicle”



Global Plan for Decade of Action for Road Safety 2011-2020

The Decade was approved by the Moscow Ministerial in 2009 and UN General Assembly in 2010. It was launched by a global relay of events on 11th May. A Plan for the Decade has been prepared based on five pillars:

1. Building Management Capacity
2. Encouraging Safer User Behaviour
3. [Building Safer Vehicles](#)
4. Building Safer Roads
5. Improving Post Crash Care

Each pillar includes indicative and interim targets to progress towards the Decade's overall goal which is to 'stabilize and then reduce the level of road fatalities'. This requires a 50% reduction in the forecast level of fatalities by 2020 which could avoid 5 million deaths, 50 million injuries and save \$3 trillion in social costs.



Pillar 3: Safer vehicles

Encourage universal deployment of improved vehicle safety technologies for both passive and active safety through a combination of harmonization of relevant global standards, consumer information schemes and incentives to accelerate the uptake of new technologies.

Activity 1: Encourage Member States to apply and promulgate motor vehicle safety regulations as developed by the United Nation's World Forum for the Harmonization of Vehicle Regulations (WP 29).

Activity 2: Encourage implementation of new car assessment programmes in all regions of the world in order to increase the availability of consumer information about the safety performance of motor vehicles.

Activity 3: Encourage agreement to ensure that all new motor vehicles are equipped with seat-belts and anchorages that meet regulatory requirements and pass applicable crash test standards (as minimum safety features).

Activity 4: Encourage universal deployment of crash avoidance technologies with proven effectiveness such as Electronic Stability Control and Anti-Lock Braking Systems in motorcycles.

Activity 5: Encourage the use of fiscal and other incentives for motor vehicles that provide high levels of road user protection and discourage import and export of new or used cars that have reduced safety standards.

Activity 6: Encourage application of pedestrian protection regulations and increased research into safety technologies designed to reduce risks to vulnerable road users.

Activity 7: Encourage managers of governments and private sector fleets to purchase, operate and maintain vehicles that offer advanced safety technologies and high levels of occupant protection.

Why do we need NCAP in the region?

LATIN NCAP
PARA CARRROS
MAIS SEGUROS

GLOBAL NCAP
FOR SAFER CARS
www.globalncap.org

WE COMPARED...

Nissan Micra

Nissan March

EURO NCAP
FOR SAFER CARS
www.euroncap.com

LATIN NCAP
PARA AUTOS
MAIS SEGUROS

FOR SAFER CARS

Establishment of ASEAN NCAP

- Malaysian Vehicle Assessment Program (MyVAP) – non-destructive approach
- Proposal to Global NCAP during the NCAP Meeting in conjunction with 22nd Enhanced Safety of Vehicle (ESV) conference in Washington, USA (June 2011)
- MOU signing between MIROS and Global NCAP on 7th December 2011 at Delhi, India
- First ASEAN NCAP test on 24th May 2012 (Toyota Vios) in conjunction with Automotive Safety Week 2012: Southeast Asia



NCAPs Around the World



#	Est. year	Countries	#	Est. year	Countries
1	1959	USA	6	1999	South Korea
2	1978	USA	7	2006	China
3	1991	Japan	8	2010	South America
4	1992	Australia & New Zealand	9	2011	Southeast Asia countries
5	1997	FRA, GER, ITA, ESP, SWE, NED, UK (EU)			

ASEAN NCAP Organization

Steering Committee

(MIROS, AAM, AAS, AAP, AAC & RAAT) + (Global NCAP, Latin NCAP & Australasian NCAP – Observer)

Technical Committee

(MIROS, MAI, TGGS, UOP, Latin NCAP & Australasian NCAP)

WG

Frontal Impact

WG

Side Impact

WG

Child Safety

WG

Safety Assist

Support from Related Parties



Stakeholders



GLOBAL NCAP
www.globalncap.org



FIA Foundation
for the Automobile and Society

Financial Support



Technical Support



Program Advisory

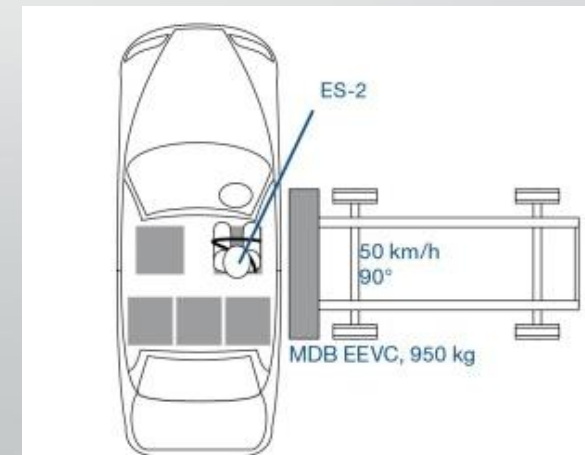
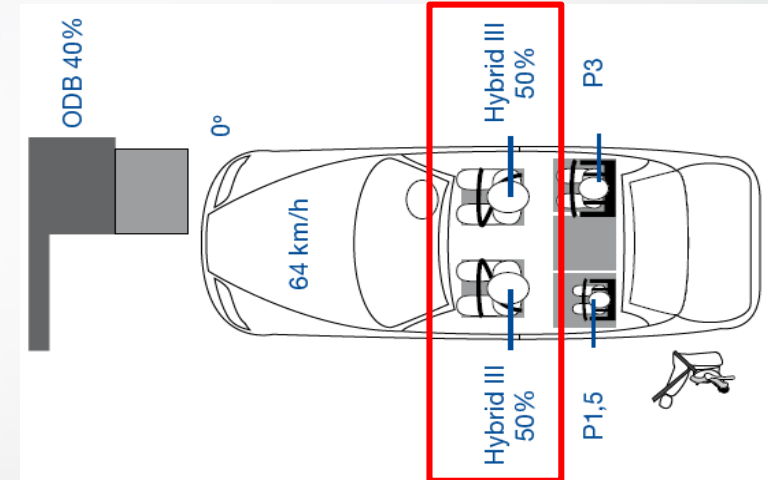
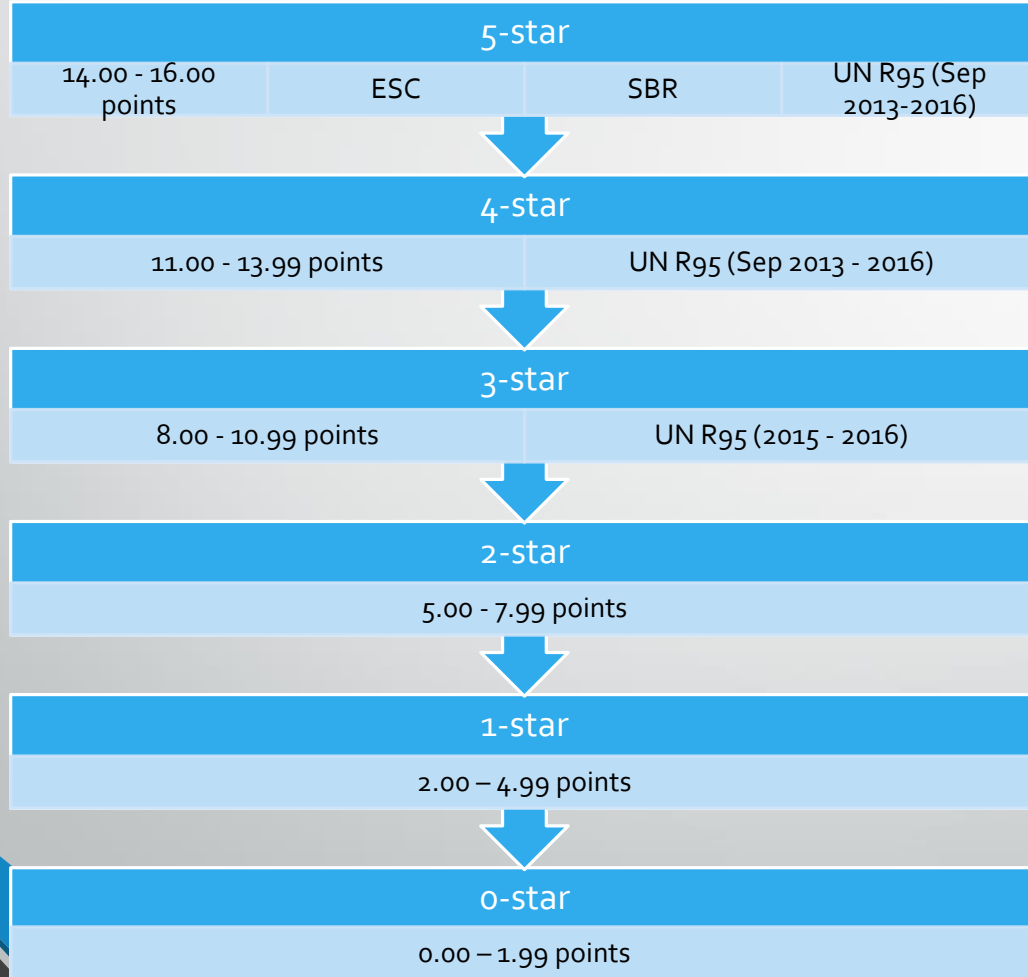
ASEAN NCAP Rating (2012-2016)





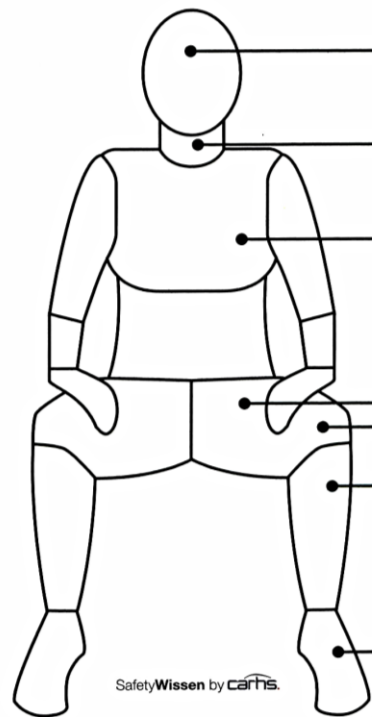
Adult Occupant Protection

AOP Rating



Each Body region gets the colour according to its assessment, i.e. points derived from the load minus modifier.

- 4,00 points
- 2,67 – 3,99 points
- 1,33 – 2,66 points
- 0,01 – 1,32 points
- 0,00 points



Airbag	
Modifier	Airbag Deployment Modifier for incomplete unfolding of any Airbag (-1 Point)

Head	
4 points	HIC 36 < 650; a_{rms} < 72 g
0 points	HIC 36 > 1000; a_{rms} > 88 g
Modifier	unstable airbag contact (-1 point), Steering column displacement (-1 point)

Neck	
4 points	$M_{\text{extension}}$ < 42 Nm Tension: < 2,7 kN @ 0 ms < 2,3 kN @ 35 ms < 1,1 kN @ 60 ms Shearing: < 1,9 kN @ 0 ms < 1,2 kN @ 25 – 30 ms < 1,1 kN @ 45 ms
	$M_{\text{extension}}$ > 57 Nm Tension: > 3,3 kN @ 0 ms > 2,9 kN @ 35 ms > 1,1 kN @ 60 ms Shearing: > 3,1 kN @ 0 ms > 1,5 kN @ 25 – 35 ms > 1,1 kN @ 45 ms
0 points	

Chest	
4 points	Deflection < 22 mm; VC < 0,5 m/s
0 points	Deflection > 50 mm; VC > 1,0 m/s
Modifier	Deformation A-Pillar (-2 points) Compartment deformed (-1 point) Contact with steering wheel (-1 point)

Femur	
4 points	Compression force < 3,8 kN
0 points	Compression force > 9,07 kN > 7,56 kN @ 10 ms

Knee	
4 points	Displacement < 6 mm
0 points	Displacement > 15 mm
Modifier	Variable contact (-1 point) Concentrated Loading (-1 point)

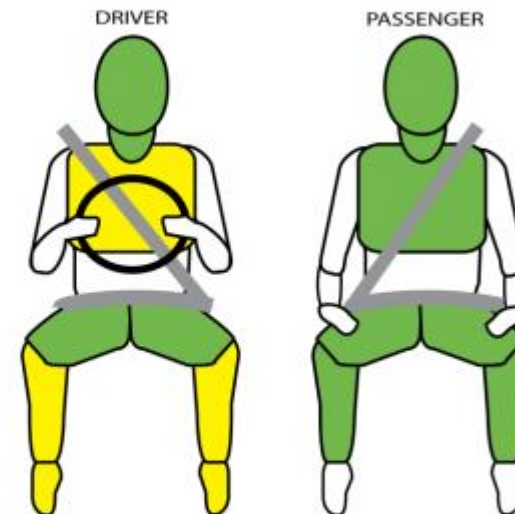
Tibia	
4 points	TI < 0,4; Compression force < 2 kN
0 points	TI > 1,3; Compression force > 8 kN
Modifier	z-displacement of worst pedal (-1 point)

Foot	
4 points	x-displacement braking pedal < 100 mm
0 points	x-displacement braking pedal > 200 mm
Modifier	footwell intrusion (-1 point) blocked pedal (-1 point)

Source: SafetyWissen

AOP POINTS 14.07

- GOOD
- ADEQUATE
- MARGINAL
- WEAK
- POOR

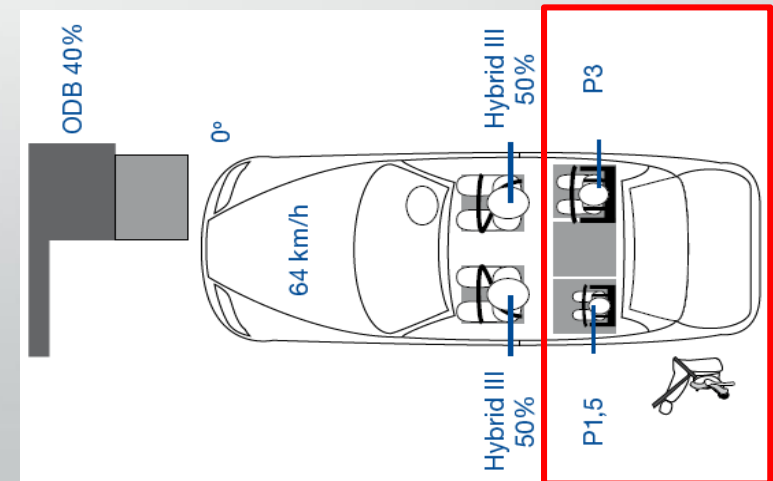
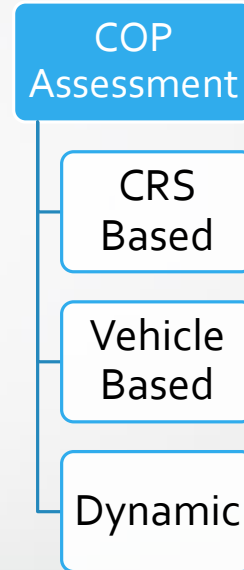
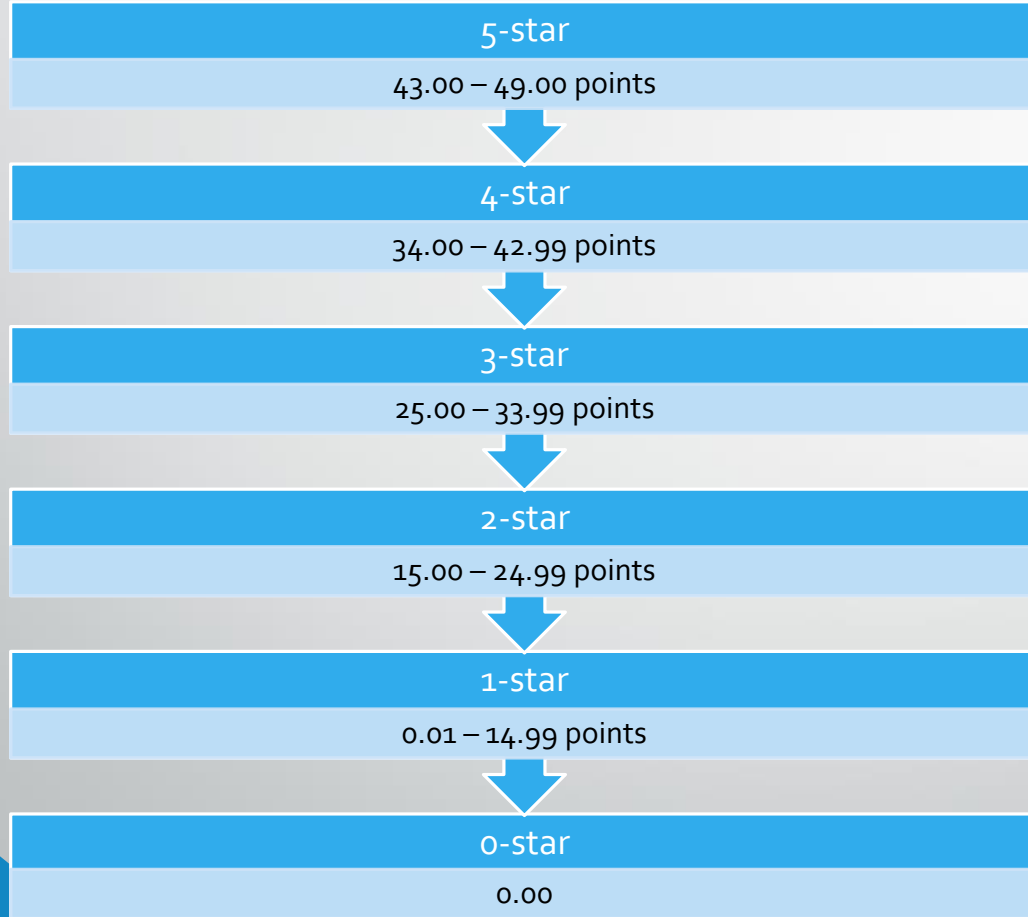


MODIFIER Footwell rupture

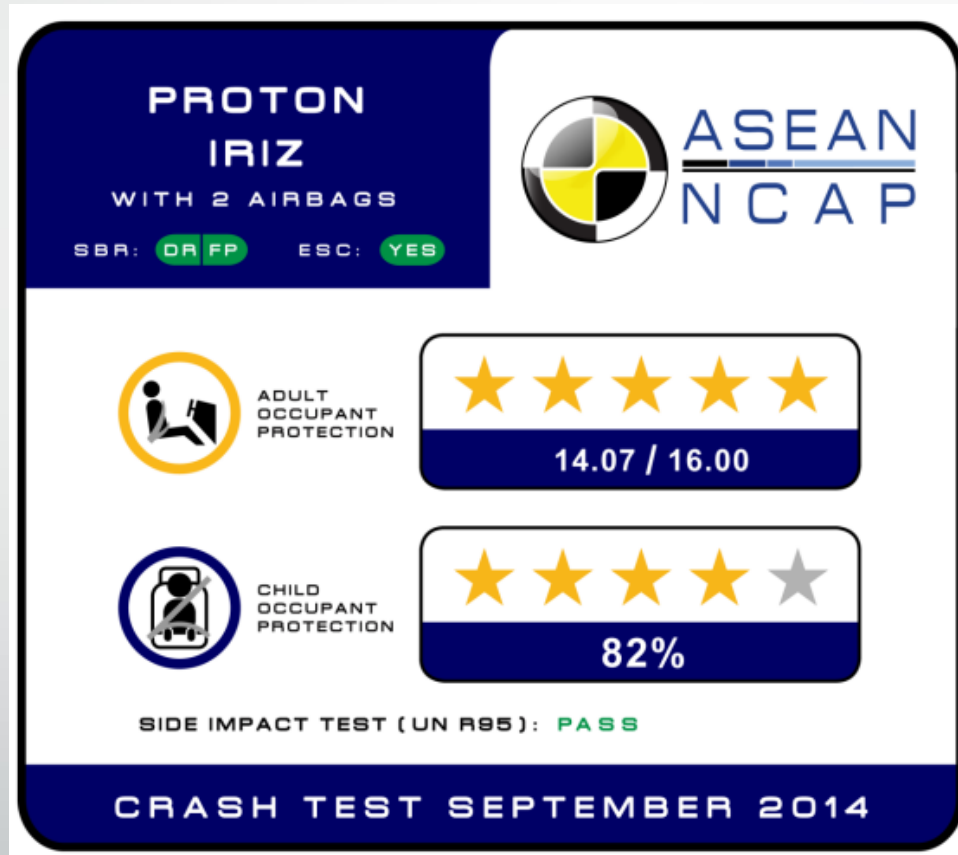


Child Occupant Protection

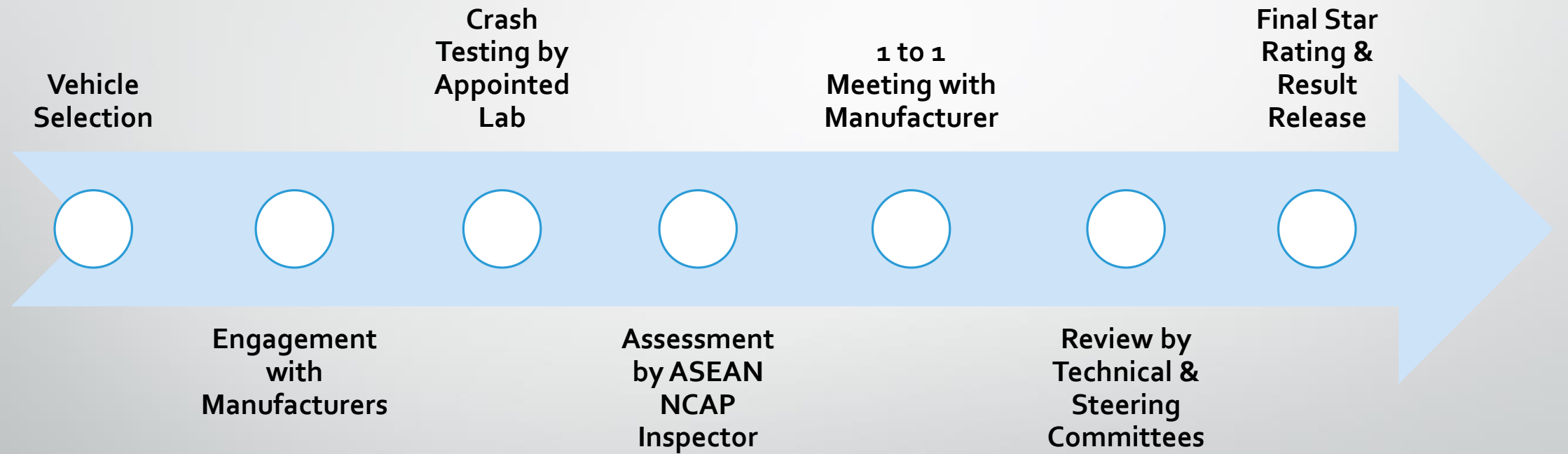
COP Rating



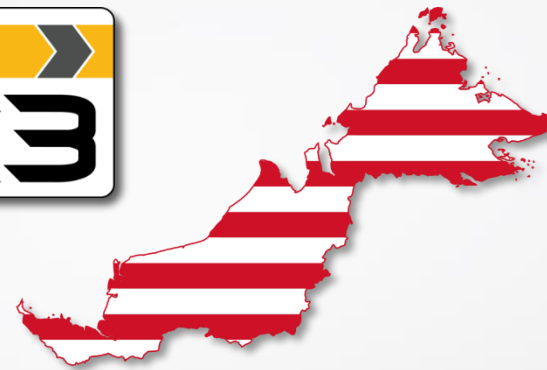
Sample Rating Plate



ASEAN NCAP Flow



Test Laboratories



KATRI



MIROS PC₃ ASEAN's 1st Crash Lab



Frontal Offset Testing

Vehicle
Specification
Checking

Vehicle Mass
Calculation

Vehicle Marking
& Routing

Compartment
Setup

H-Point
Positioning

Dummy &
Instrumentation

CRS Preparation

Barrier & Camera
Preparation

Soaking

Dummy Painting

Final Checking

CRASH TEST

Post Crash
Assessment

Vehicle Specification Checking

- **Delivery information** e.g. date, representative present, etc.
- **Vehicle specifications** e.g. variant, body type, VIN, transmission type, etc.
- **Safety-related features** e.g. seatbelt type, airbag, top tether anchorage, etc.
- **Manufacturer-specified settings** e.g. fuel tank capacity, unladen kerb weight, recommended H-point, CRS make & model, expected test mass, recommended towing.

Vehicle Mass Calculation

UNLADEN MASS

[Received test weight + 100%
fuel]

- Calculate mass of fuel in full tank = Fuel tank capacity (L) x 0.745 kg/L for petrol or 0.84 kg/L for diesel
- Substitute fuel weight with water = Fuel mass/ water density (1kg/L)

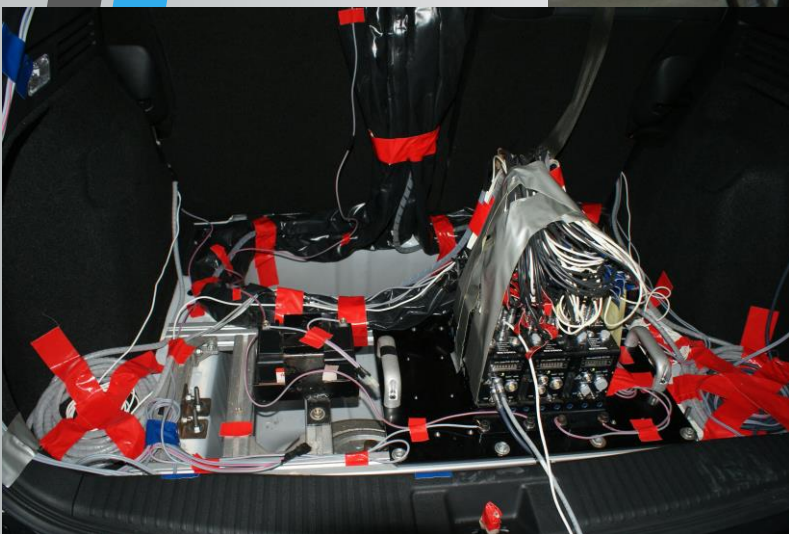
LADEN MASS

[Unladen Mass - 10% fuel + 2
Hybrid III 50th + 2 CRS + P1.5 + P3
+ 36 kg luggage]

- Remove 10% of fuel mass
- Place 88 kg ballast on both Driver and FP seats (simulate Hybrid III 50th Dummy)
- Fit CRS & ballast (11 kg – P1.5) behind FP seat
- Fit CRS & ballast (15 kg – P3) behind Driver seat
- Evenly distribute 36 kg of ballast in luggage compartment (including DAS, battery, etc.)

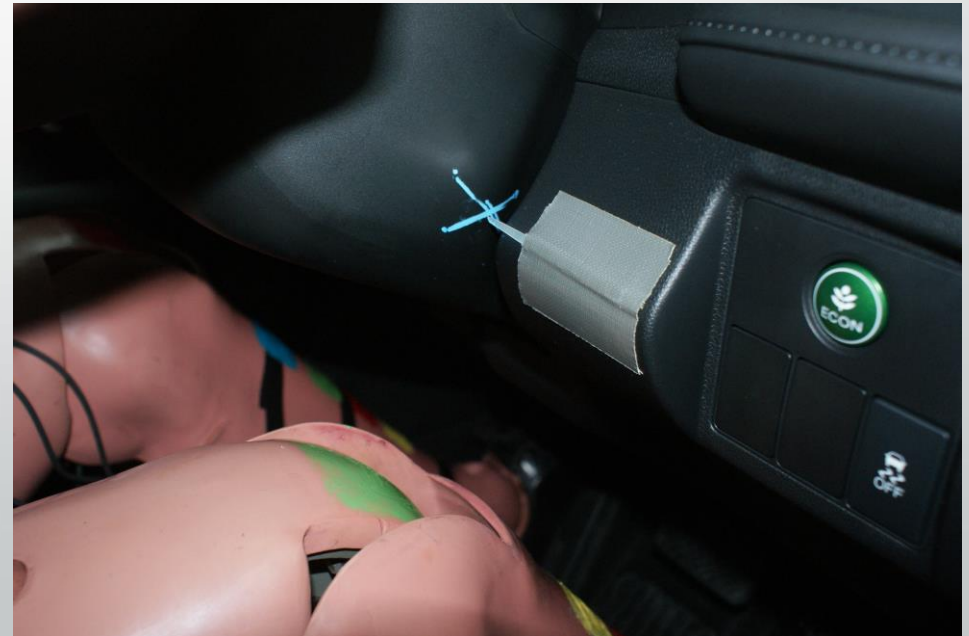


Vehicle Marking & Routing



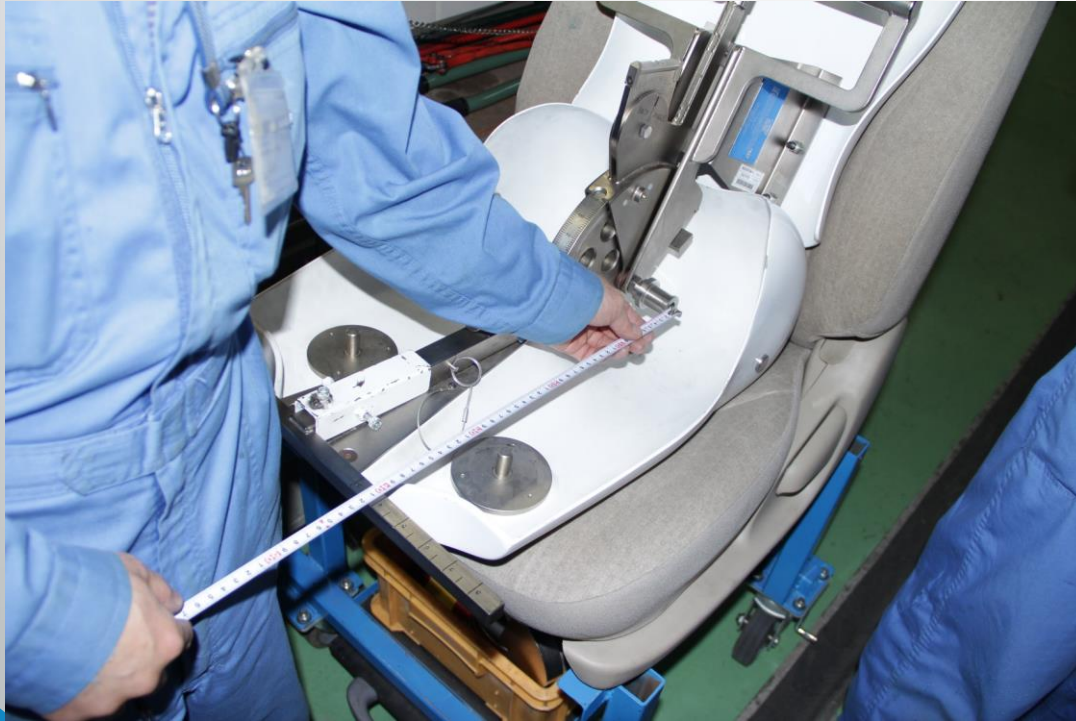
Compartment Setup

- **Seat adjustments** (fore/aft, height, base tilt, lumbar support, head restraint, armrest)
- **Steering wheel adjustments** (horizontal & vertical)
- **Seatbelt upper anchorage**



H-Point Positioning

- **Driver & Front Passenger H-point** (based on H-point machine/
manufacturer setting)



Dummy & Instrumentation

- **Dummy**

- Hybrid III 50th
- P₃
- P_{1.5}

Calibration, physical checking & 1G

- **Transducer**

- Accelerometer (G)
- Load Cell (Force & Moment)
- Potentiometer (Distance)

Calibration & functionality testing

- **Data Acquisition System**

- High G rated
- Sampling rate (at least 20kHz)

Calibration & battery life span

CRS Preparation

- **CRS Information:**
 - CRS make & model (e.g. Britax Duo Plus)
 - Rearward or forward facing
 - Installation method (seatbelt, top tether, ISOFIX)
- **Child Dummy Installation:**
 - Dummy 1G
 - Spacer between dummy back and CRS
 - Apply $250\text{N} \pm 50\text{N}$ tension to harness
- **Head Excursion Line**
 - Forward facing only
 - Cr point using Gabarit -> 550mm



Barrier & Camera Preparation

- **Offset deformable barrier** (40% of test vehicle and 200mm \pm 5mm from the ground; mounting of pin mark to check alignment mark after test)
- **Off-board high speed cameras** (crash area – side (4), top (1), front (1))
- **DSLR camera** (crash area - still photo)
- **On-board high speed cameras** (in the test vehicle - P1.5 & P3)



Soaking

- At least 4 hours before test
- Temperature stabilized between 19 to 22 degrees
- If not properly soaked, it may influence the injury result particularly on chest reading



Dummy Painting



Final Checking

Test area
secured

Tow
attachment

Dummies
correct
position

Seatbelts/
harnesses
fastened

Windows
down

Ignition ON

Airbag
warning light

Transmission
to neutral

Parking brake
disengaged

Vehicle
battery
voltage

DAS full
charging

Trigger
checking

All equipment
and obstacles
removed

Bonnet and
boot closed

Vehicle doors
closed but not
locked

Post-Crash

- Speed accuracy (64 ± 1 kph)
- Alignment accuracy (lateral within ± 20 mm)
- Data retrieval & analysis:
 - Videos
 - Dummy injuries
- All data will be provided to ASEAN NCAP Inspector for further assessment
- Modifier assessment by ASEAN NCAP Inspector
- Preliminary rating



T+: -419.133 ms
Durat: 1.4 s



T+: -83.907 ms
Durat: 0.660 s

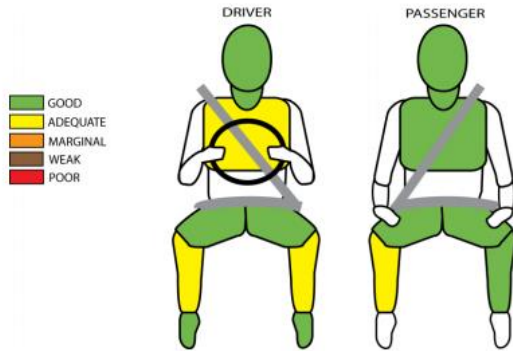


T+: -165.856 ms
Durat: 0.890 s



ADULT
OCCUPANT
PROTECTION

AOP POINTS **15.21**



MODIFIER **No modifier**



CHILD
OCCUPANT
PROTECTION

COP Compliance **73 %**

CRS TYPE	P3	P1.5
ATTACHMENT	ISOFIX + Top Tether	ISOFIX
BRAND	Britax Duo Plus [Honda Genuine]	Britax Baby Safe Plus SHR II [Honda Genuine] Britax Baby Safe ISOFIX Base

CHILD OCCUPANT PROTECTION				
Dynamic Test (max. 24)	CRS Based Assessment (max. 12)	Vehicle Based Assessment (max. 13)	TOTAL (max. 49)	Compliance (%)
18.54	12	5	35.54	73

HONDA HR-V
WITH 2 AIRBAGS

SBR: DR FP ESC: YES

ADULT OCCUPANT PROTECTION
★★★★★
 15.21 / 16.00

CHILD OCCUPANT PROTECTION
★★★★☆
 73%

SIDE IMPACT TEST (UN R95): **PASS**

CRASH TEST MAY 2015



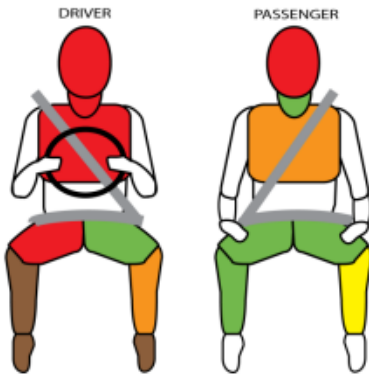
Kia Picanto NAB



ADULT OCCUPANT PROTECTION

AOP POINTS **0.40**

- GOOD
- ADEQUATE
- MARGINAL
- WEAK
- POOR



MODIFIER Integrity of passenger compartment; Variable contact & concentrated loading for driver's right knee; Blocked brake pedal.

CHILD OCCUPANT PROTECTION				
Dynamic Test (max. 24)	CRS Based Assessment (max. 12)	Vehicle Based Assessment (max. 13)	TOTAL (max. 49)	Compliance (%)
0.97	12	1	13.97	29

KIA PICANTO
WITHOUT AIRBAG

SBR: DR FP ESC: NO

ADULT OCCUPANT PROTECTION

★ ★ ★ ★ ★

0.40 / 16.00

CHILD OCCUPANT PROTECTION

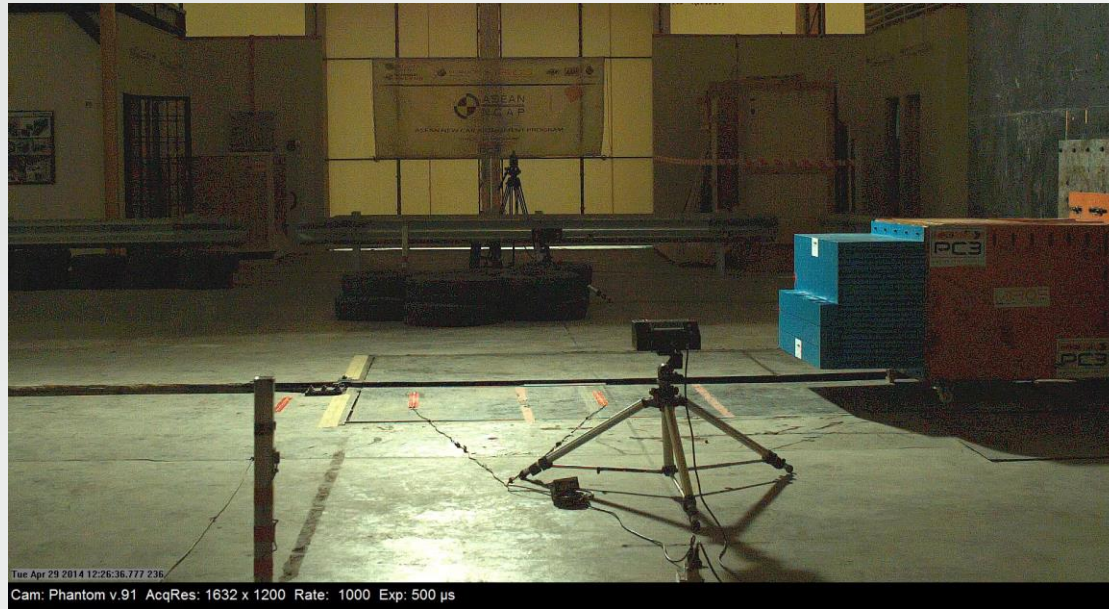
★ ★ ★ ★ ★

29%

SIDE IMPACT TEST (UN R95): NOT TESTED

CRASH TEST APRIL 2014





ASEAN NCAP Achievements



39 cars assessed until July 2015

More than 1000 days since May 2012

Most affordable 4-star car
[USD 8,000 = ~MYR28,000]



Dual airbag, ISOFIX & Top Tether standard for all variant.

ASEAN NCAP

18 manufacturers from Top 20

Most affordable 5-star car
[USD 13,000 = ~MYR46,000]



ESC, Minimum dual airbag, ISOFIX & Top Tether standard for all variant.

2 + 1 crash laboratory



Majority of ASEAN Brands Involved



ASEAN NCAP Strategic Approaches

Develop Reliable Road Accident Databases

Establish Effective Communications Towards Consumers and Stakeholders

Encourage Fitment of Crash Avoidance Technologies

Promote Safer Vehicles and Child Restraint System

Remove Non-Safe Vehicles from the System

Improve Safety Beyond Rating

ASEAN NCAP Roadmap 2017-2020

- Significant change from the existing requirement
- Dual rating to single rating
- No more pre-requisites
- AOP (50%), COP (25%) & Safety Assist (25%)
- HPT, ESC, ABS, SBR, BSD, advanced SATs
- Fitment Rating System; applies for all ASEAN countries
- Will be officially released in the AASF 2015/003 on 22nd Sep 2015

THANK YOU FOR YOUR
ATTENTION!

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www.aseancap.org

