4th meeting of the Informal Group on Pedestrian Safety

15th & 16th, May 2003, Tokyo Japan

PASSIVE SAFETY ENGINEERING

Applus

Tokyo, 16th May 2003

Euro NCAP data - used in this study

EURO NCAP
www.euroncap.com

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Euro NCAP phases 10, 11 and 11+

Total of 39 vehicles, including all categories

Executive Cars: Mercedes-Benz E-Class, Peugeot 607, Renault Vel Satis ***Large Family Cars*** Jaguar X-Type, Nissan Primera, Proton Impian, Saab 9-3, Subaru Legacy, Toyota Avensis, Opel Vectra ***Large SUVs:*** Range Rover,BMW X5, Hyundai Santa Fe,Jeep Cherokee, Mercedes-Benz M-Class, Suzuki Grand Vitara, Opel Frontera ***Mini MPVs:*** Chrysler PT Cruiser, Mercedes-Benz Vaneo, Opel Meriva ***MPVs:*** Peugeot 807 ***Roadsters:*** Audi TT Roadster, Honda S2000, Mazda MX-5, Mercedes-Benz SLK, MG TF ***Small Family Cars:*** Renault Mégane, Toyota Corolla ***Small SUVs:*** Honda CR-V, Land Rover Freelander, Mitsubishi Pajero Pinin, Nissan X-Trail ***Superminis:*** Audi A2, BMW Mini, Citroën C3, Ford Fiesta, SEAT Ibiza, Opel Corsa, Volkswagen Polo.

Note: Euro NCAP selected cars are top selling versions of cars in the European market. These do not necessarily correspond to the best or the worst case of each vehicle model.

Euro NCAP data - used in this study

Euro NCAP phases 10, 11 and 11+; from the introduction of new impact area definition, testing and assessment protocols (January 2002)

Until phase 9

From phase 10

Euro NCAP data - test methods

Child Headform:

free flight test

mass 2,5 kg

diameter 130 mm

impact angle 50°

impact speed 40 km/h

Adult Headform:

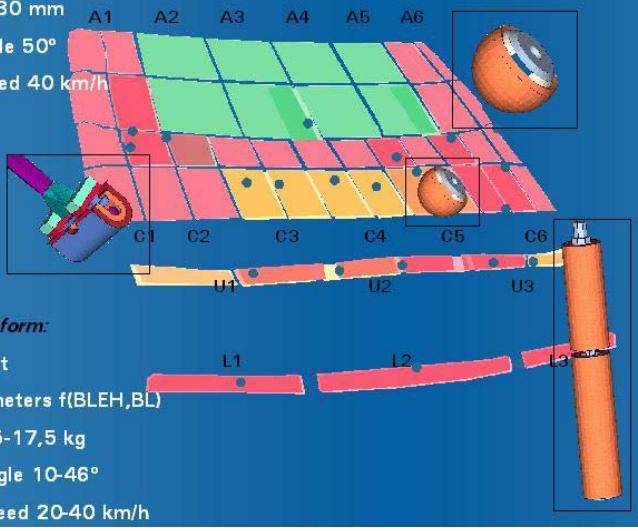
free flight test

mass 4,8 kg

diameter 165 mm

impact angle 65°

impact speed 40 km/h



Upper Legform:

guided test

test parameters f(BLEH,BL)

mass 10,5-17,5 kg

impact angle 10-46°

impact speed 20-40 km/h

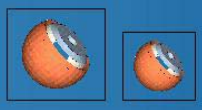
Legform:

free flight test

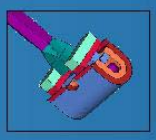
mass 13,4 kg

impact speed 40 km/h

Euro NCAP data - assessment method



Headform test: HIC < 1000 1000 - 1350 > 1350 (35%)



Upper Legform test:

Bending Moment (Nm) < 300 300 - 380 > 380 (27%)

Sum of Forces (kN) < 5 5 - 6 > 6 (20%)

Legform test:

Tibia Deceleration (g's) < 150 150 - 200 > 200 (33%)

Knee Shear Displacement (mm) < 6 6 - 7 > 7 (17%)

Knee Bending Angle (°) < 15 15 - 20 > 20 (33%)

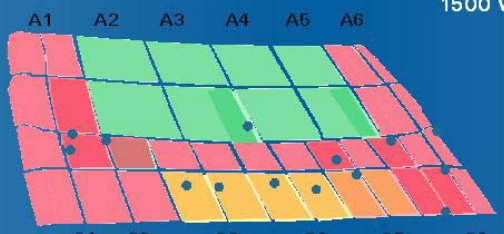
(XX%) indicates difference from red to green in %

Points distribution :

2 points green area, 2-0 points yellow area (linear interpolation), 0 points red area

Euro NCAP data - impact areas

Adult Head Impact Area:
1500 WAL - 2100 WAL



Child Head Impact Area:
1000 WAL - 1500 WAL

Upper Legform:

Bonnet leading edge

Legform:

Bumper reference line

Euro NCAP data - identification of best performing cars on child headform impact area

Model	Child Headform Assessment Sum	Phase	Category	Total Scoring	Total Rating
SEAT Ibiza	6,99	11	Supermini	14 points	2 stars
Honda CR-V	6,20	10	Small SUV	19 points	3 stars
Toyota Corolla	5,30	11	Small Family Car	11 points	2 stars

(No. of vehicles with a child headform assessment sum = 0) = 9

(Average no. of points in the child headform assessment sum) = 1,78

Identification of differences: Euro NCAP data / EC Directive phase I child headform impact area

Euro NCAP:

free flight test

mass 2,5 kg

diameter 130 mm

angle 50°

speed 40 km/h

impact area in between 1000 WAL - 1500 WAL

HIC < 1000 1000 - 1350 > 1350

Differences to be examined

EC Directive Phase I:

free flight test

mass 3,5 kg

diameter 165 mm

angle 50°

speed 35 km/h

impact area according WG17 procedure

(Bonnet Rear Reference Line)

HIC < 1000 (2/3 of the total area)

< 2000 rest of the area

D1. Impactor and test speed

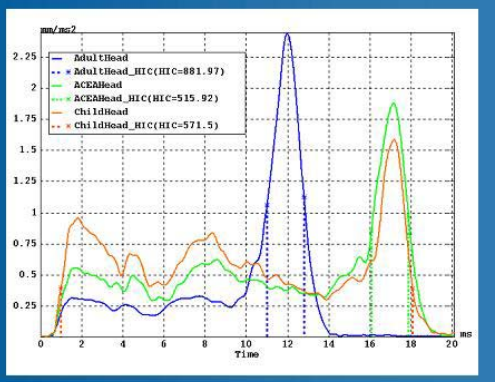
D2. Impact area

Examination of D1: Euro NCAP data / EC Directive phase I child headform impact area D1. Impactor and test speed

Impact energy (Euro NCAP) x 1.07 = Impact energy (EC Directive Phase I)

Using the 3,5 kg impactor the deformation path and possibility of contacting a rigid structure will increase.

If a rigid structure is not contacted, results from the 2,5 kg impactor could be used as a reference to predict results using the 3,5 kg. Differences in HIC maybe around 10 %.



Regarding D1. Impactor and test speed

Results of Euro NCAP tests could be used as a reference, taking into account the differences in terms of energy and possibly deformation

Examination of D2: Euro NCAP data / EC Directive phase I child headform impact area D2. Impact area

Regarding D2. Impact area

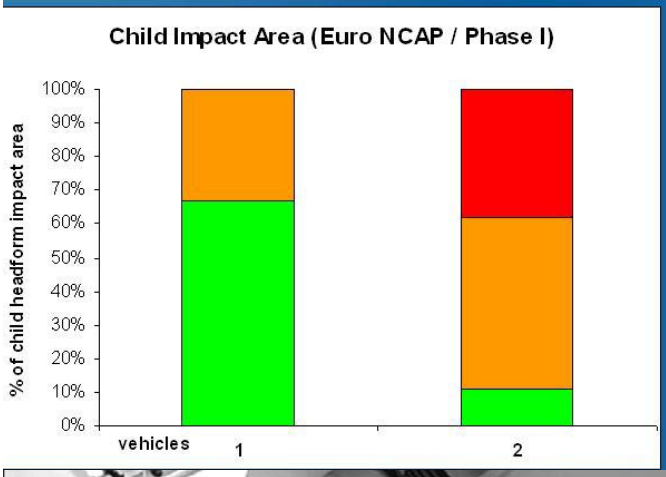
An examination of each vehicle model should be done to evaluate the influence of the redefinition of the upper limit of the area (1500 WAL / Bonnet rear reference line)

In the SEAT Ibiza, Euro NCAP impacted zones A2c, A4c, A5d will be included in the phase I child headform impact area.

Based on the results of the adult headfrom, none of the impacted zones will be below a value of HIC of 1000 when tested with the child headform (3,5 kg)

Interpolation: Euro NCAP data / EC Directive phase I child headform impact area

HIC < 1000 1000 - 2000 > 2000



Vehicle 1 - Meets the requirements of phase I regarding child headform impact area - Target

Vehicle 2 - Best Child Headform Assessment Sum (from phase 10, 11 and 11+) - SEAT Ibiza

Euro NCAP data / EC Directive phase I child headform impact area

Conclusions, child headform impact area:

A methodology has been developed to study Euro NCAP data and determine if the requirements of the EC Directive for phase I would be met. This methodology could be used to exploit more in-depth the available and incoming (phase 12) data and determine trends.

Current vehicles are still far to meet the proposed future legal requirements. Simple design changes on the best scoring vehicles will put them in a situation very close to meet the proposed requirements for phase I.

Euro NCAP data - identification of best performance legform impact area

Model	Legform Assessment Sum	Phase	Category	Total Scoring	Total Rating
MG TF	5,84	11+	Roadster	19 points	3 stars
Honda CR-V	4,54	10	Small SUV	19 points	3 stars
Nissan X-Trail	2,00	11	Small SUV	10 points	2 stars

(No. of vehicles with a legform assessment sum =0) = 34 (total sample 39)

(Average no. of points in the legform assessment sum) =0.37

Identification of differences: Euro NCAP data / EC Directive phase I legform impact area

Euro_NCAP:

free flight test

WG17 legform

mass 13,4 kg

speed 40 km/h

Bumper reference line

Tibia Deceleration (g) <150 150 - 200 >200

Knee Shear Displacement (mm) <6 6 - 7 >7

Knee Bending Angle (°) <15 15 - 20 >20

Differences to be examined

Proposed Directive Phase I:

free flight test

WG17 legform

mass 13,4 kg

speed 40 km/h

Bumper reference line

Tibia Deceleration (g) <200

Knee Shear Displacement (mm) <6

Knee Bending Angle (°) <21

Same test method and impact area. Only differences in assessment method. No need for examining differences

Euro NCAP data / EC Directive phase I legform impact area

Two vehicles, MG TF and Honda CR-V, first and second best Legform Assessment Sum (from phase 10, 11 and 11+) are already meeting the requirements of the EC Directive phase I

Euro NCAP data / EC Directive phase I legform impact area

Conclusions, legform impact area:

Is it possible to use Euro NCAP data to determine if the current vehicle models are meeting the requirements of the EC Directive phase I and WG17

The majority of vehicles are performing very badly. Solutions are available and must be incorporated to vehicles.