Side Impact and Ease of Use Comparison between ISOFIX and LATCH

CLEPA Presentation to GRSP,

Informal Document GRSP- 35 -1 9

Geneva, May 2004

Objective of test programme

- To objectively assess the comparison between ISOFIX and LATCH in both side impact performance and consumer ease of use.

Contents

- ISOFIX Background
- Accidentology of children (University of Hannover & GDV Studies)
- Test Method & Reason for choosing it
- Definition of child restraint systems tested
  - ISOFIX seats, Off the shelves Latch seats
- Test Results & Videos
- Conclusions for sled tests
- Ease of use
  - Isofix , GDV investigations in Europe, 2003
  - Latch, Feedback from NHTSA meeting in USA (July 2003)

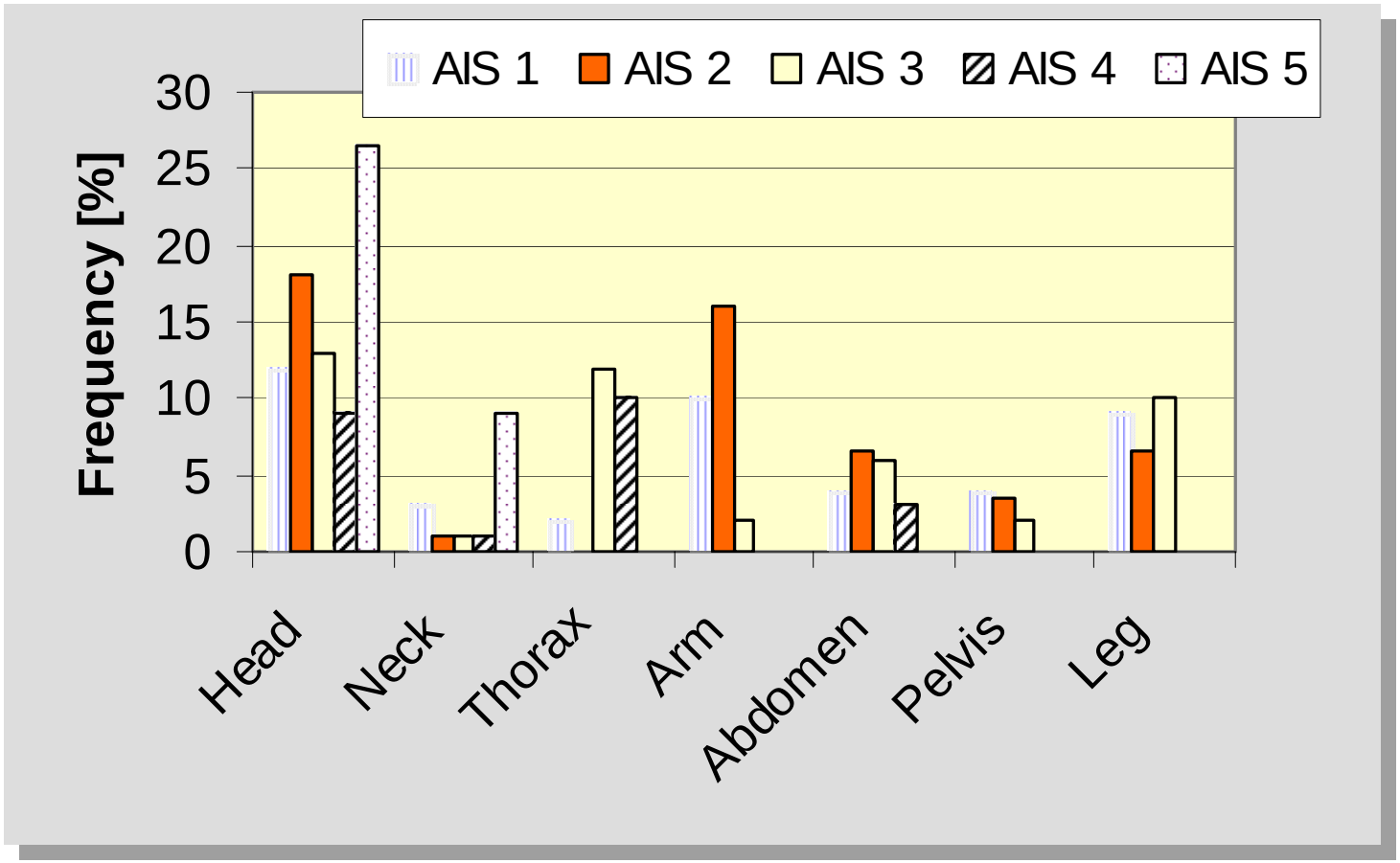
ISOFIX Background

- ISO 13216-1 ISOFIX originally developed to cover rigid attachments
- LATCH was introduced as short term technical spec covered in an annex to part 1

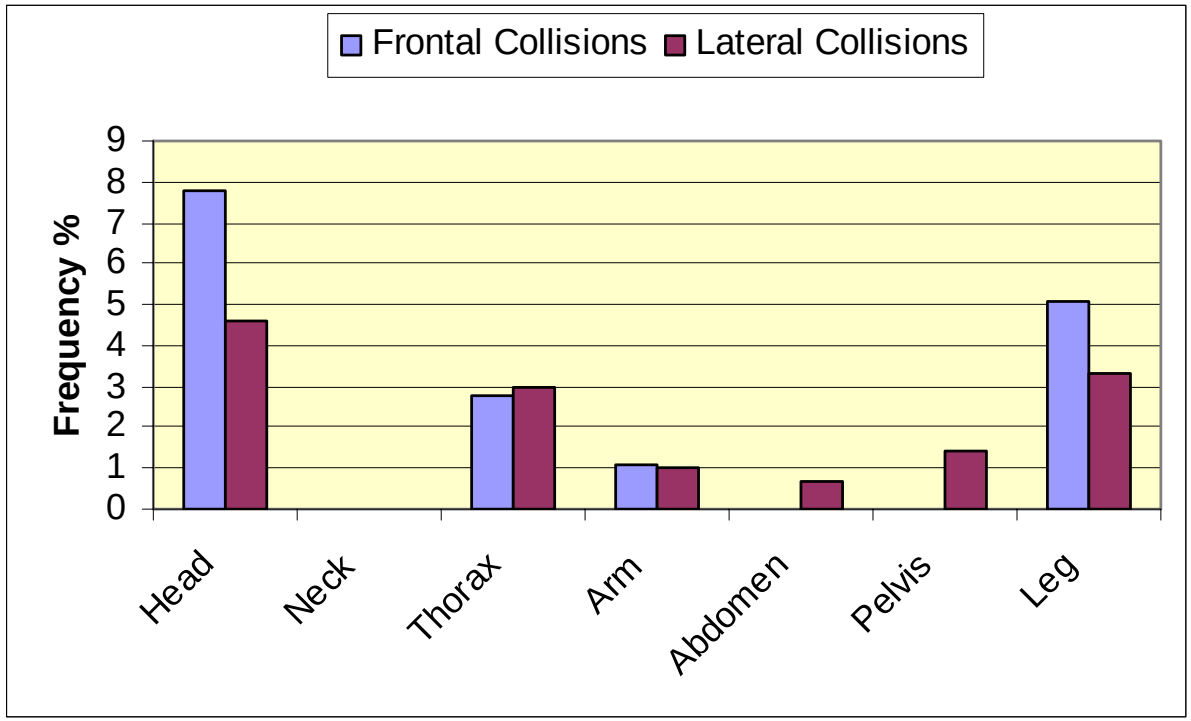
Flexible attachment

Accidentology

Side Impact - Injury Risk Per Body Region Langwieder, 1996



Comparison Frontal / Lateral Impacts Injuries MAIS 2-4



- Higher exposure in side impact for thorax, abdomen and pelvis
- Lesser exposure in side impact for the head, but very often severity is higher (Otte, Protection of Children in Cars, Cologne July 03).

Side Impact Comparison

ISO DIS 14646 (moving panel method) is as yet unconfirmed

- Consumer tests in Europe use a number of similar but different methods
- Sled based test method used is based on an approximation of Consumer tests

Test Method

- R44 bench rotated 80 degrees.
  - To get lateral as well as forward motion of the dummy (situation more critical than with 90° pure lateral set up)
- Rigid fixed door panel height 500 mm above CR and 300 mm from centreline of ISOFIX anchorage bars
  - No padding on the door

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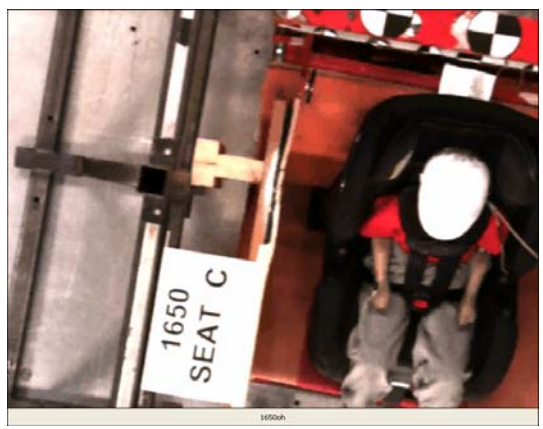
Test Method

- Sled velocity 25 kph, peak deceleration 15.25 g +/- .25 g
  - According to ISO draft
- ISOFIX installed as R44-03 annex 21 para 1.3 (new).
  - 25 mm spacer
  - Harness set up force 250 N
- LATCH tension 50N
- Top Tether anchorage:- R44-03 Point G2 offset to worst case position (intrusion side to minimise the top tether effect.



Test Configurations and Recorded Parameters

- Tests conducted both with and without Top Tether strap
- Seats A, B, C and E off shelf FMVSS 213 LATCH products (2 off each)
- Seats D – ECE 44 Specific Vehicle approved Rigid ISOFIX (2 off)
- D1 & D2 seats as D above but LATCH equipped

Pre_test Photographs of Latch seats tested

A, Latch, w. TT

A, Latch, w/o TT

B, Latch, w. TT

B, Latch, w/o TT

C, Latch , w. TT

C, Latch, w/o TT

Pre_test Photographs of Latch seats, cont.

D1, Latch, w. TT

D2, Latch, w/o TT

E, Latch, w. TT

E, Latch, w/o TT

Pre_test Photographs of Isofix seat D

D, Isofix, w. TT

D, Isofix, w.o TT

Seat D is an Isofix child restraint , specific approved according to ECE44

Test Configurations and Recorded Injury Criteria

- ATD used TNO P3 (accepted for relative comparison, as not biofidelic in side impact)
- Head containment (EuroNCAP Protocol)
- HIC – Limit 1000
- Head A resultant Limit 80g
- Chest A resultant Max
- Chest A resultant 55g & 3 ms Exceedence

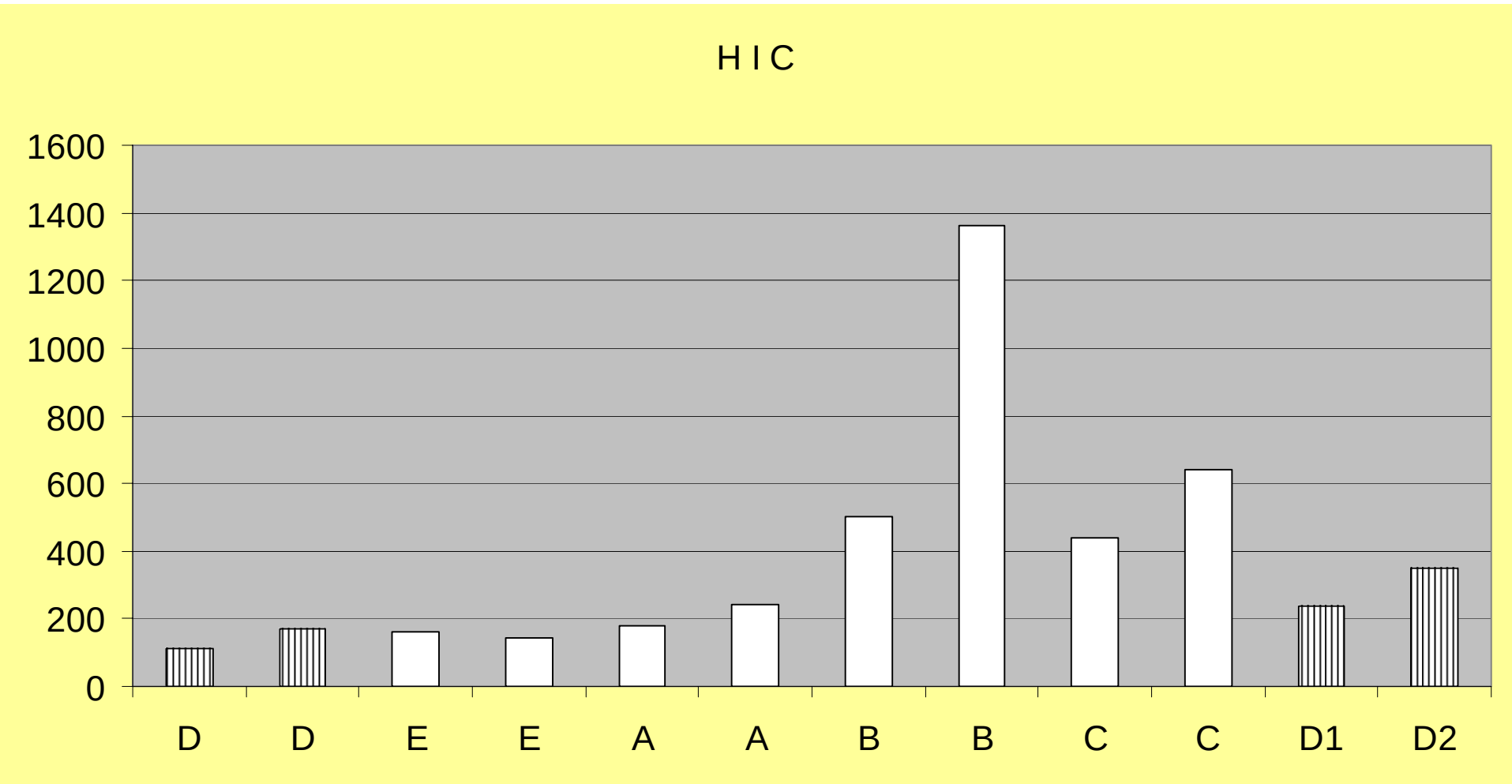
Test Results

Test Results*

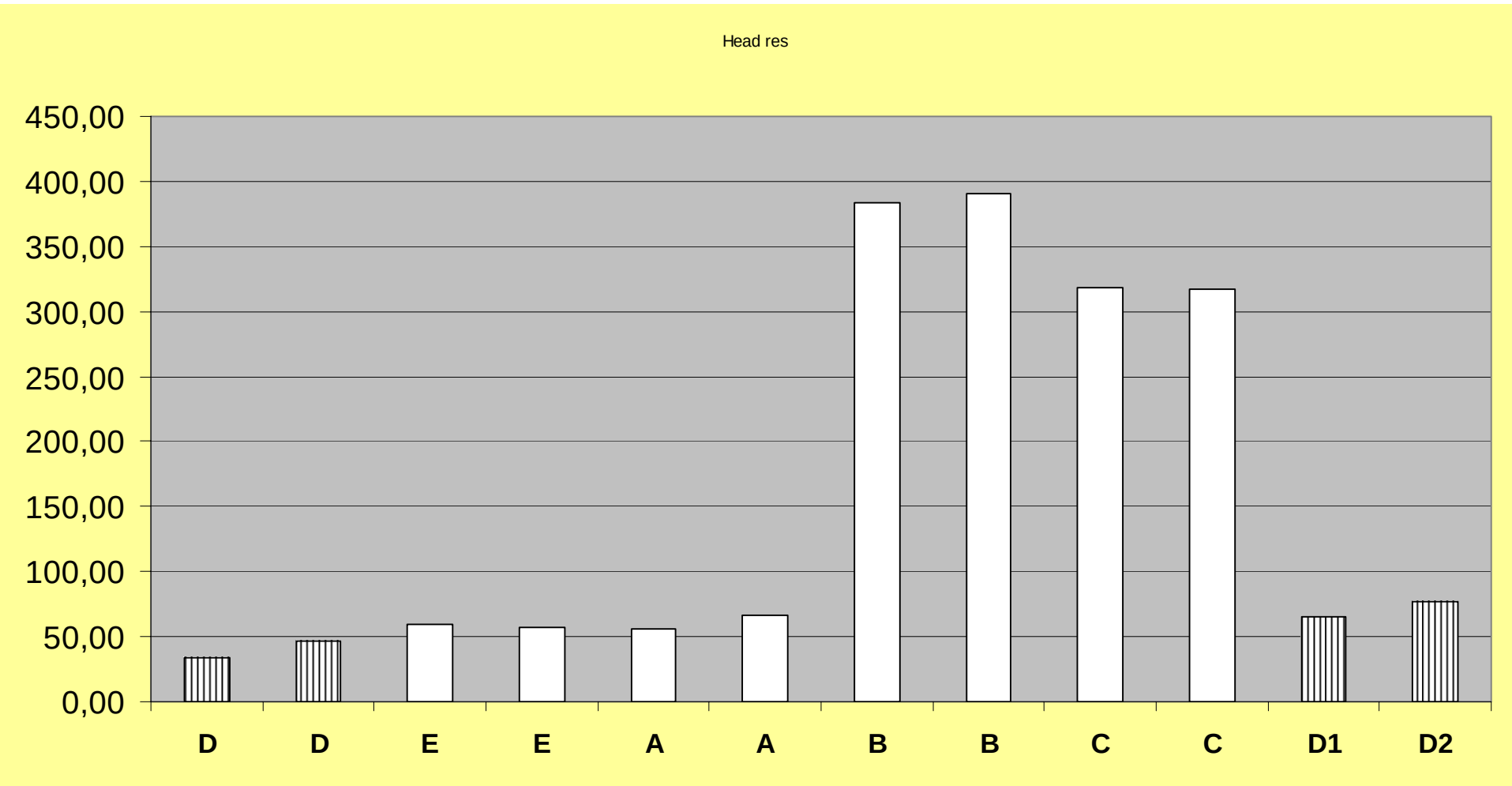
CRS Seat	TD		TT	Head contained	HIC	Head res	Chest resultant	Time ms*
A	P3	LATCH	Yes	No	178	55.81	95.46	8.29
A	P3	LATCH	No	No	244	66.35	104.79	6.83
B	P3	LATCH	Yes	No	500	383.71	89.08	6.38
B	P3	LATCH	No	No	1361	390.00	119.00	6.53
C	P3	LATCH	Yes	No	441	318.08	95.67	5.92
C	P3	LATCH	No	No	642	316.94	101.34	6.40
D	P3	Rigid	Yes	Yes	114	33.98	26.43	0.00
D	P3	Rigid	No	Yes	172	46.64	30.67	0.00
D1	P3	LATCH	Yes	No	236	65.86	59.29	3.34
D2	P3	LATCH	No	Yes	350	76.91	84.15	6.87
E	P3	LATCH	Yes	Yes	163	59.08	97.09	5.29
E	P3	LATCH	No	Yes	142	57.09	91.55	6.88

* Should be considered as relative numbers and not absolute numbers

HIC

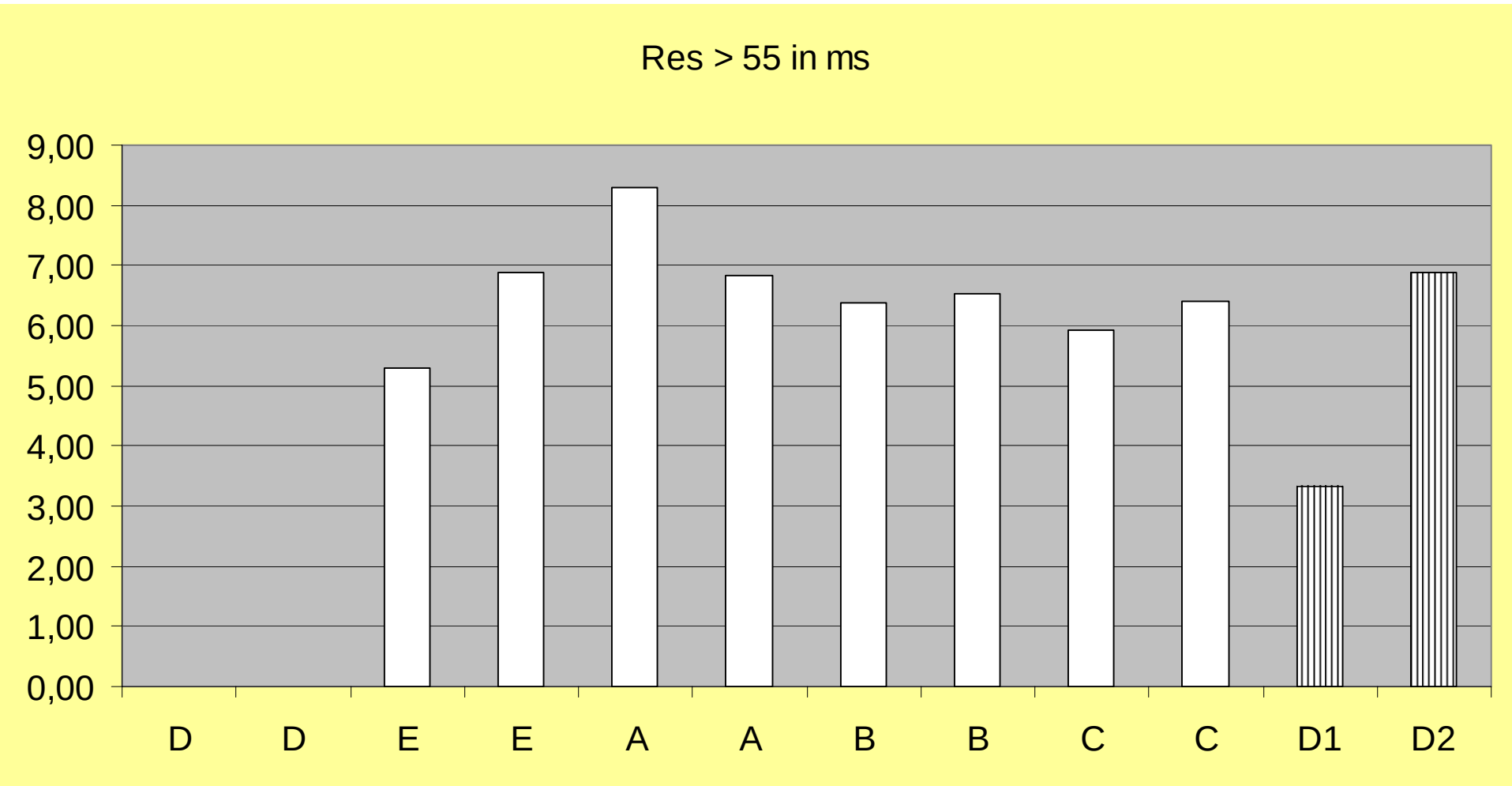


Head Resultant Acceleration (G)



3ms Chest Resultant Acceleration (G)

Exceedence of Chest 3ms Acceleration (ms)



Test Video

AVI test 1642 Rigid ISOFIX

AVI test 1651 LATCH

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Major Difference Between Rigid & Latch Attachment

- Transverse and rotational movement of entire seat assembly (note the base) towards the impacted side with Latch
- Head containment reduced (same basic product) with Latch by increased side movement and rotation about vertical axis

Conclusions

- For all measured criteria
  - Rigid ISOFIX results are superior to LATCH
  - Only Rigid ISOFIX met all three criteria limits.
  - The Rigid ISOFIX product performance deteriorated when installed by the LATCH device that showed best LATCH performance
- Request to Regulation Authority
  - To introduce Isofix as the standard for child seat attachment, since it gives lower injury numbers in side impact.

Ease of Use

- Rigid ISOFIX was just introduced in R44 as a Universal system, in-depth analysis of ease of use is however available (GDV, 2003)

- LATCH experience in the USA covers wide use
  - Feedback from NHTSA meeting Docket No NHTSA 2003 15998-1

Field Experience with Rigid ISOFIX GDV 2003 Survey

- 1/ Installation of Group 1 ISOFIX Seat
- 2/ Installation of Group O+ ISOFIX (Frame and baby seat)
- 3/ Comparison of installation ISOFIX / Conventional Seat

GDV ISOFIX Ease of Use Study

- Group 1 ISOFIX
  - 100 persons
    - Correct installation 97, 3 incorrect (1 case unable to lock , 2 cases one side locked)
- Group 0+
  - 20 persons, seat correctly installed 15 OK and 5 non OK
- ISOFIX / Conventional
  - 120 persons : On ISOFIX
    - 84% Isofix easier
    - 81¨% greater stability 82 % better protection feeling
    - 75% found additional mass acceptable

NHTSA LATCH consumer feedback - Summary

- LATCH straps routed through the wrong belt path opening
- LATCH interference during seat belt installation
- The lower anchor strap adjuster hitting perpendicular to belt path so that the belt will not stay tight
- It is difficult to loosen LATCH straps once they are tightened

Thank You