

Informal document **GRSP-54-28**
(54th GRSP, 17 - 20 December 2013,
agenda item 2)

Short Report

Status of GTR No. 7/BioRID TEG

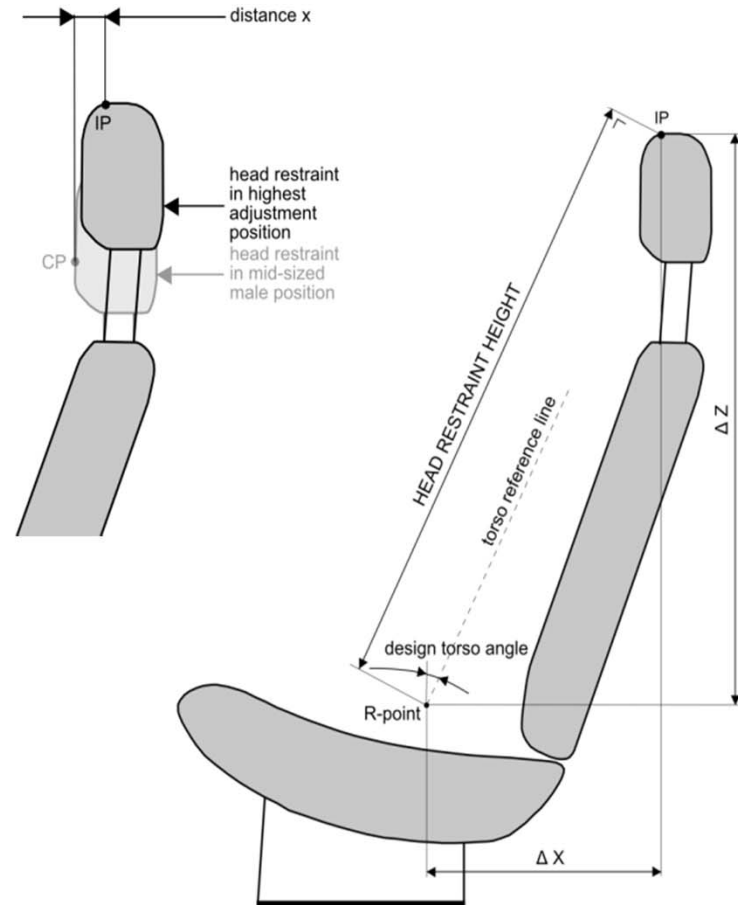
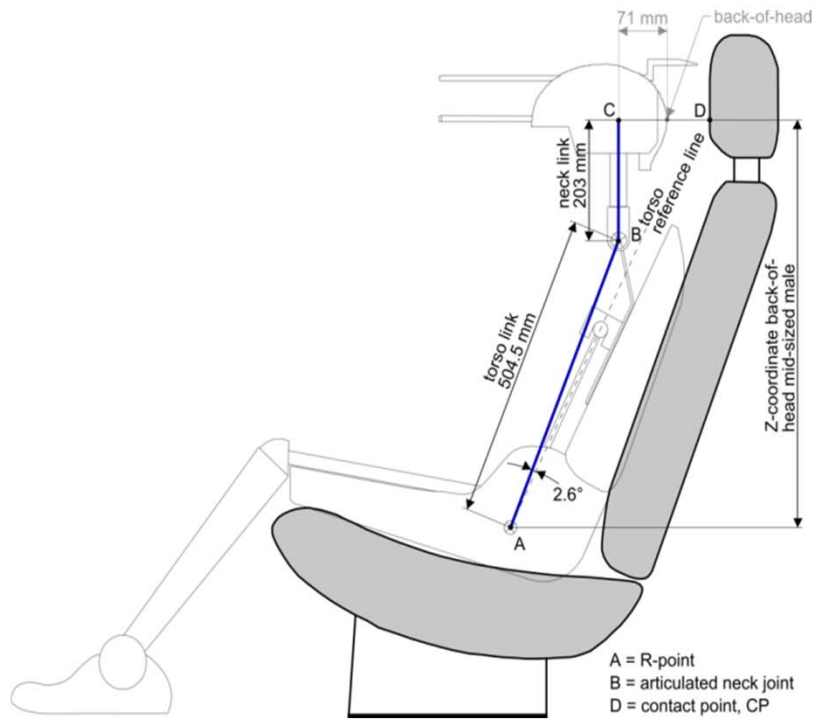
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For 54th GRSP 17th/20th December 2013
Geneva

GTR No. 7 Workshop on 16th of July 2013 @BASt, Bergisch Gladbach

- On the workshop in March 2013 a procedure for measuring effective head restraint height and backset based on the R-point without the use of the HRMD was explored and agreed (see next slides).
- Aim of the July workshop was to define a procedure how to position the BioRID without the use of the HRMD.
- The aim of the second day was to draft some new text mainly related to Annex 9 of the draft GTR.
- As offered in the last official GTR 7 meeting held in April 2013 at OICA in Paris, OICA presented a proposal for a procedure for BioRID seating which served as a basis for the workshop.

Concept of measuring effective HR height



CP: contact point

IP: intersection point

Distance x: function of design torso angle

Test procedure for effective head restraint height I

The Torso & Neck Link concept expressed in goniometric formulas

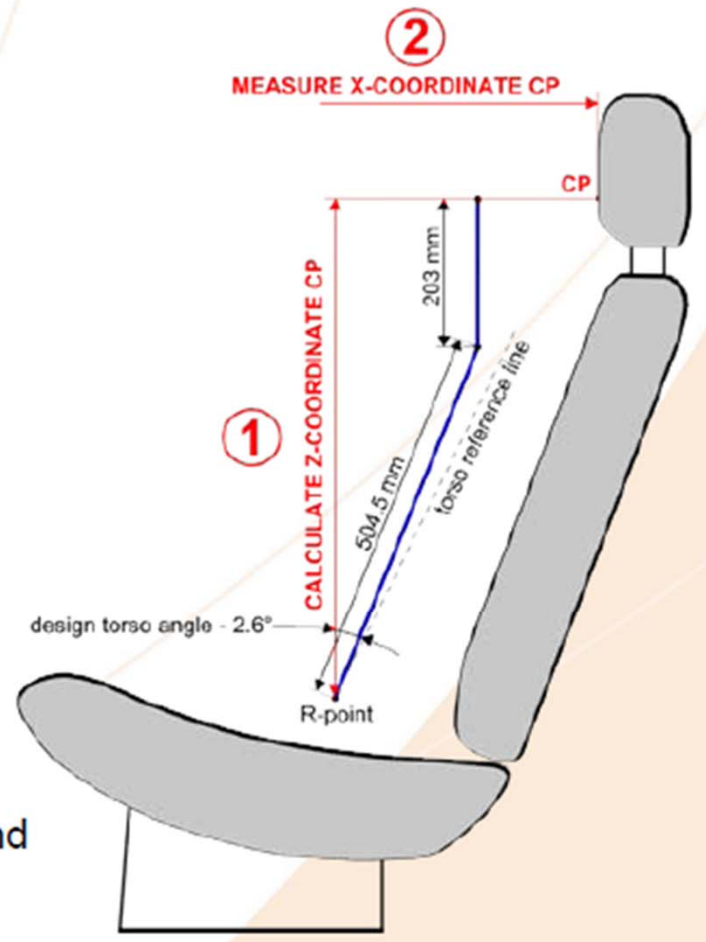
With head restraint set in mid-sized position,
the measuring of Contact Point CP:

Available are:

- the coordinates of the R-point,
- A design torso angle, and
- dimensions of a mid-sized Torso & Neck Link.

Needed actions:

- 1) calculate Z-coordinate CP =
 $504.5 * \text{COS}(\text{design torso angle} - 2.6^\circ) + 203$
(instead of calculation, a table will be provided),
- 2) mark this point on the head restraint surface and
measure X-coordinate CP.



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Test procedure for effective head restraint height I

The Torso & Neck Link concept expressed in goniometric formulas

With head restraint set in its highest position,
the measuring of Intersection Point IP:

Available are:

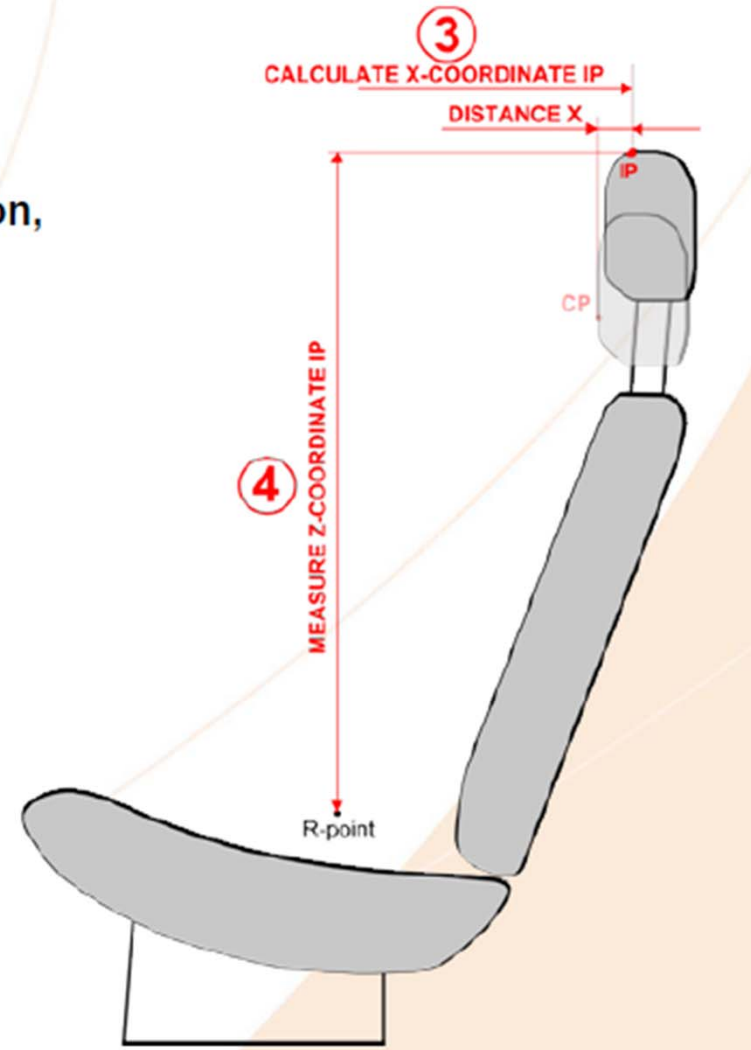
➤ The table providing also “distance X”

Needed actions:

3) calculate X-coordinate IP =

Measured X-coordinate CP + “distance x”,

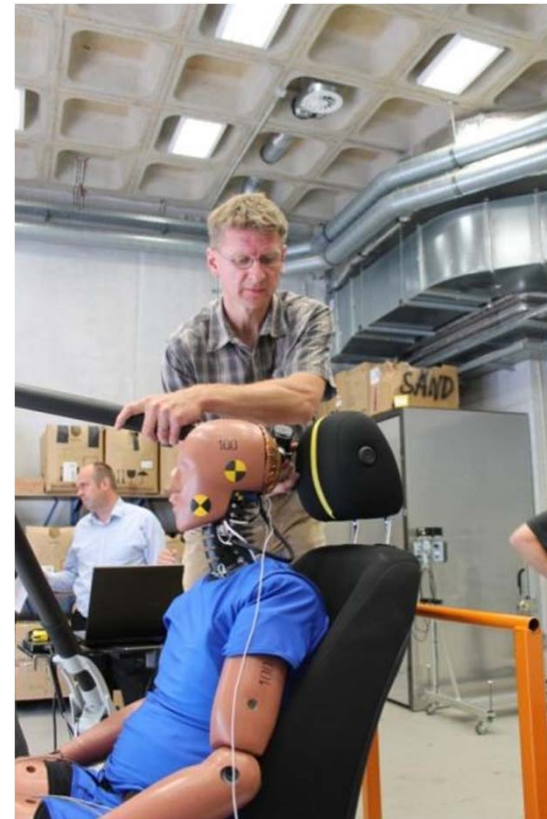
4) mark this point on the HR and measure Z-coordinate IP.



Source: GTR7-08-03e.pdf (Hans Ammerlaan, RDW)

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Impressions I



Fotos: B. Lorenz

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Impressions II



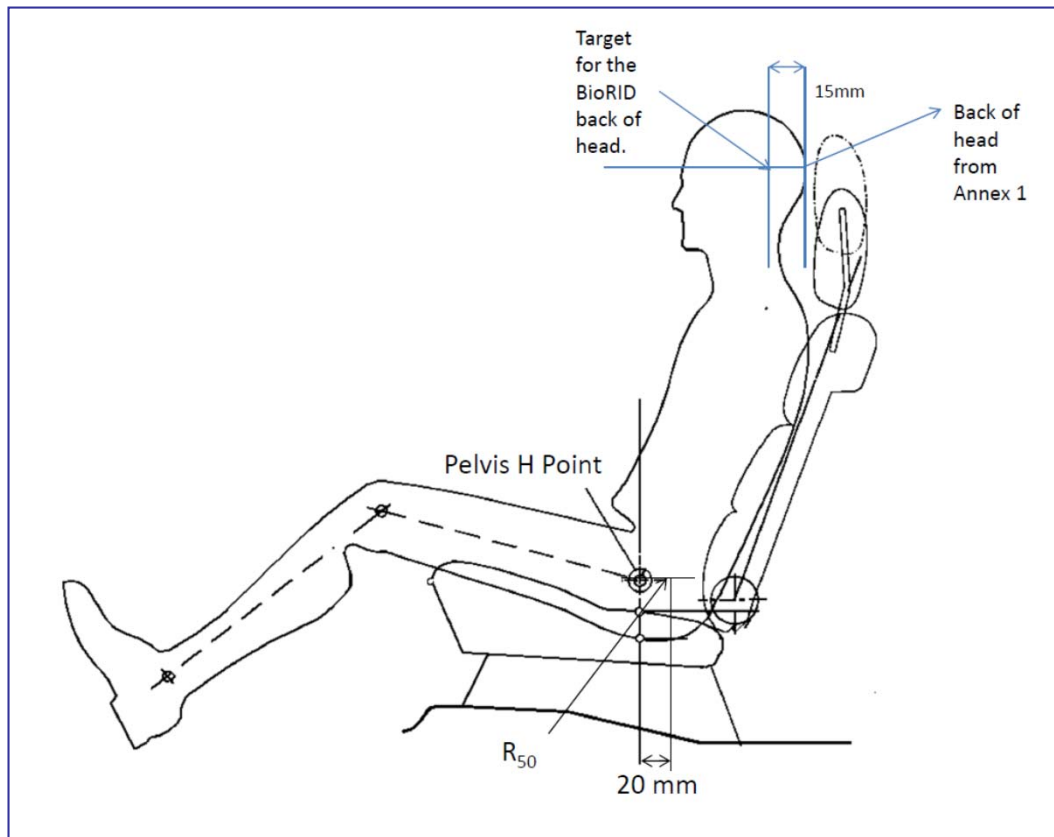
Fotos: B. Lorenz

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- Difference between the static measurements and the dynamic test is the position of the seat.
- A new „reference point“ is needed as basis for a similar procedure as agreed for the static one

-> Introduction of the „R₅₀ point“

Introduction of the „R₅₀ point“



- Introduction of a new “designated H-point” for mid-size male seating position “R₅₀”.
- This data is provided by the manufacturer, allowing the seat to be adjusted to this point.
- Note: static measurement is made in a different seat set-up than for the dynamic test.
- “R₅₀“tolerance is checked by the H-point machine. If it lies within the 50 mm box it is this is the designated design point.

Annex 1 Head - Position Table

<p style="text-align: center;">HEAD POSITION TABLE Location of the back-of-head of two designated males in automotive posture with respect to the R-point at several design torso angles, and their in-between "distance x"</p>				
Design torso angle	X-coordinate of back-of-head calculated for the mid-sized male	Z-coordinate of back-of-head calculated for the mid-sized male	X-coordinate of back-of-head calculated for large male ¹	"Distance x": distance between X-coordinates of back-of-head of both males
	$504.5 * \sin(\text{design torso angle} - 2.6) + 71$	$504.5 * \cos(\text{design torso angle} - 2.6) + 203$	$593 * \sin(\text{design torso angle} - 2.6) + 76$	$88.5 * \sin(\text{design torso angle} - 2.6) + 5$
5	92	707	101	9
6	101	707	111	10
7	110	706	121	12
8	118	705	132	13
9	127	704	142	15
10	136	703	152	16
11	145	702	163	18
12	153	701	173	19
13	162	699	183	21
14	171	698	193	22
15	179	696	203	24
16	188	694	213	26
17	196	692	223	27
18	205	689	233	29
19	213	687	243	30
20	222	684	253	31
21	230	682	263	33
22	239	679	273	34
23	247	676	283	36
24	255	673	292	37
25	263	669	302	39
26	271	666	312	40
27	279	662	321	42
28	287	659	330	43
29	295	655	340	44
30	303	651	349	46

Introduction of the „R₅₀ point“

- The BioRID H-point is located 20 mm forward of the “R₅₀ point”
- Based on the “R₅₀ point” Annex 1 table shall be applied which provides the target back of the head.
- Based on the experience from the BioRID user group and current practice in NCAP subtract 15 mm from figure given for the backset taken from the Annex 1 table.

Note: The group was well aware that most experience with the BioRID in dynamic testing is based on 25 degrees design angle as used at IIHS and Euro NCAP.

However, JNCAP uses the BioRID for a range of design torso angles. Based on the available expert knowledge the group recommends to limit the use of the BioRID to torso angles between 20-30 degrees.

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Issues discovered during the workshop

- At 20 degree torso angle it seems not possible/difficult to meet the back of head and head level requirement at the same time. However, the introduction of a reasonable angle tolerance of the head might solve the problem.
- The different definition of the pelvis angle in the draft gtr (torso angle plus $1.5 \pm 2.5^\circ$) and Euro NCAP ($26.5^\circ \pm 2.5^\circ$), which gives the same value for 25° angle, was discussed.
- -> JASIC will review JNCAP data to look at the issue of the BioRID pelvic angle and the head leveling

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As a result of the workshop the group recommends the following BioRID set up priority procedure:

1 – Verify H-point to R_{50} , using SAE 3 H-point machine.

2 – Position BioRID checking in order of:

- BioRID H-point location forward +20mm
- Pelvis angle
- Back of head coordinate subtract -15mm.
- Level Head, if possible.

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Further actions:

- JASIC shall review JNCAP data to look at the issue of the BioRID pelvic angle and the head levelling which it was noted was a resultant of using BioRID at angles below 25 to 20 degrees and that this was an issue that would need to be addressed regardless of the BioRID set up procedure used.
- OICA agreed to review specific wording in the text to provide improvements as noted in the dual pane document.
- JASIC to provide information on using the torso design angle, using JNCAP information
- During the workshop(s) the seat design angle was used for the static as well as for the dynamic procedure. It was the feeling of the group that a confirmation by the GTR group is needed that this was the correct way forward.

Conclusion

- Workshop was enjoyable, constructive and successful. All participants have been very supportive!
 - Concept based on the „R₅₀ point“ worked for the positioning of the BioRID
 - New text for GTR Annex 9 proposed
- > HRMD no longer needed for static assessment and BioRID positioning!

Issues to be solved / under discussion

- Injury Criteria / Seat performance Criteria: proposals made by NHTSA, Japan, Chalmers/Folksam at the September Gothenburg meeting; cadaver testing and data analysis at VRTC ongoing (delayed due to governmental shut-down)
- Certification procedure: current procedure does not discriminate between the dummies used during the R&R series (refurbished dummies)
- Proposals for new/updated certification test made by Humanetics at the Gothenburg meeting (9th/10th September 2013) *)

*) Available for download on the UNECE GTR no. 7 website:
<https://www2.unece.org/wiki/display/trans/GTR7+14th+Meeting>

Harmonization of Drawings (Humanetics)

Procedures for Assembly, Disassembly, and Inspection (PADI) of the BioRID II Rear Impact Crash Test Dummy



November 2010

- ✓ Draft drawing package available on UNECE website http://www.unece.org/trans/main/wp29/wp29wgs/wp29grsp/gtr7phase2_3_drawing_package.html
- Draft PADI available on UNECE website (TEGID-23)
- Check list included in PADI to check for correct build level

Appendix E – BioRID II Design Checklist

BioRID II Design Checklist		✓
	VERIFY THE SKULL CAP IS FOR BIORID, AND THAT IT HAS THE CORRECT SIZE CABLE CLEARANCE SLOT. <small>REFER TO CTR-09-01-001-001</small>	
	VERIFY SKULL AND CAP CONTAINS ERROR PROOFING PIN-HOLE CONNECTION. <small>REFER TO CTR-09-01-001-001-001-001</small>	
	VERIFY THE CORRECT SIZE HOLES IN THE HEAD TO CLEAR THE FRONT CABLE ADJUSTERS (12.7 MM). <small>REFER TO CTR-09-01-001-001</small>	
	VERIFY THE CORRECT HEAD IS INSTALLED (NON-SKULL CAP LOAD CELL VERSION). <small>REFER TO CTR-09-01-001-001</small>	

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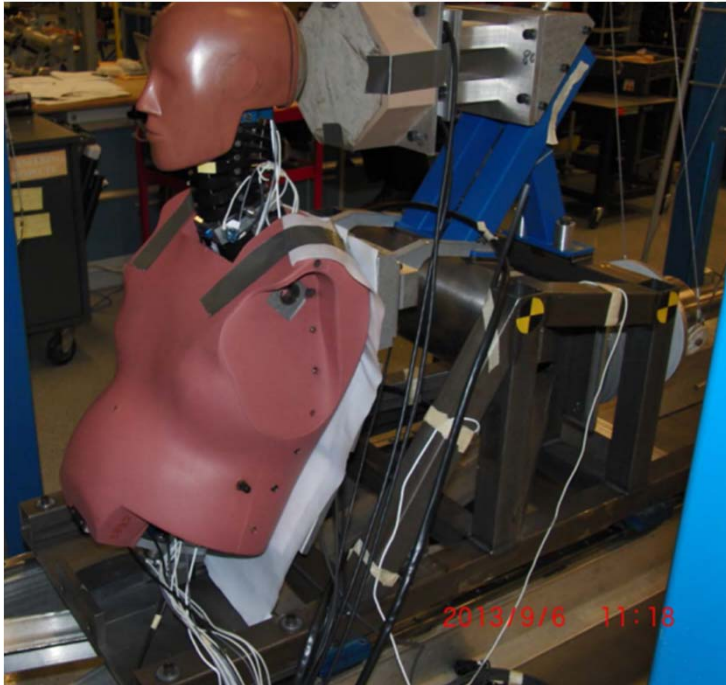
All dummy specifications need to be included into UN Mutual Resolution No. 1 (M.R.1)

M.R.1: „Concerning the description and performance of test tools and devices necessary for the assessment of compliance of wheeled vehicles, equipment and parts according to the technical prescriptions specified in UN Regulations and UN Global Technical Regulations”

New way of defining test tools for regulation!

Link to M.R.1: <http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html>

New Certification Test – Mini Sled with Seat Back and with Head Restraint



Multi-segment full back support

- Base of spine can translate X and rotate Y
- Double teflon between dummy & sled to reduce friction
- Fairly stiff head restraint surface
- Same pendulum and energy transfer device

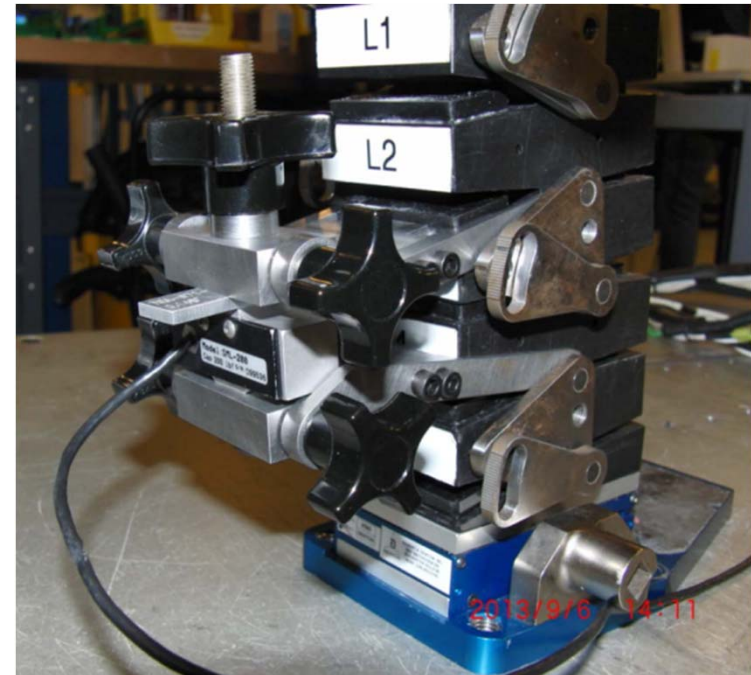


Source: GTR7-14-08, Humanetics

New Test – Bumper Compression on Spine

Probably

- An absolutely necessary test for maintaining dummy
- Can be an inspection test to be done as part of maintenance rather than a certification test As long as mini-sled with back support proves to detect dummy differences adequately
- Currently doing R&R testing to verify procedure works properly



Further work

- Confirm R&R (within 1 lab and between labs)
- Finish building parts for all vertebra locations
- Collect test data Dummies 0054, 0068, 0077, 0100 from
- Various bumper stiffnesses going into mini-sled with back support work
- Establish corridors on R&R dummies (and/or similar bumpers)

New Test – Jacket only Impact

- Detailed study done on 04 R&R jackets
- Excluding original R&R jackets that gave differences
- Lab to lab variation testing R&R jackets
- Checking practicality of production to corridors
- Some possible sources of test variation

- Conclusions reached and recommendations made for parameters, corridors and test improvements



New Test – Pelvis Bottom

Detailed study done on

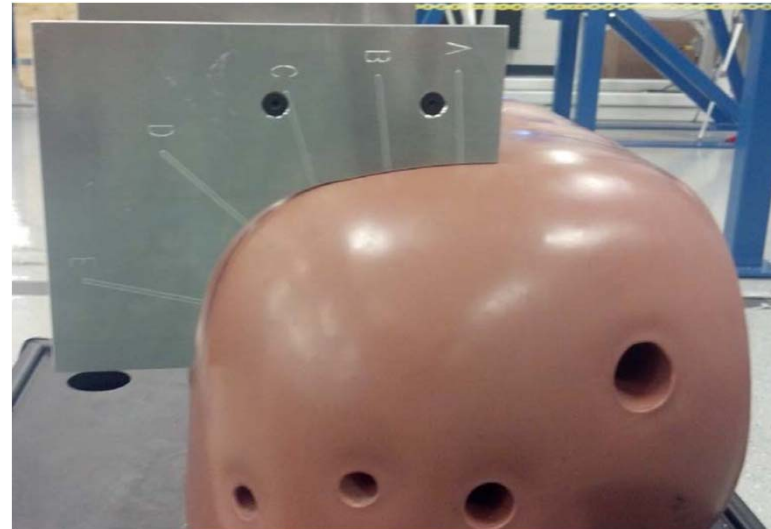
- 4 R&R pelvises, back and bottom
- Excluding original R&R pelvises that gave differences
- Lab to lab variation testing R&R pelvises
- Checking practicality of production to corridors
- oome possible sources of test variation

Conclusions reached and recommendations made for test to use, parameters, corridors and test improvements

Only bottom of pelvis test needed



New Test – Pelvis Shape Check



Inspection test to make sure pelvis has not shrunk too much

- Plate with 5 locations for each side
- Measure pelvis offset with a steel ruler
 - Rough check to catch gross deformations
 - If we can eventually set limits, a go/no go gage could be used

Just starting to work with this

- Need to test multiple old pelvises
- Verify R&R is sufficient
- Set corridors

Thank you for your attention!

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