Informal document **GRSP-53-16**
(53rd GRSP, 13-17 May 2013,
agenda item 2)

Gtr7 measuring method for effective head restraint height

short explanation with Annex 1

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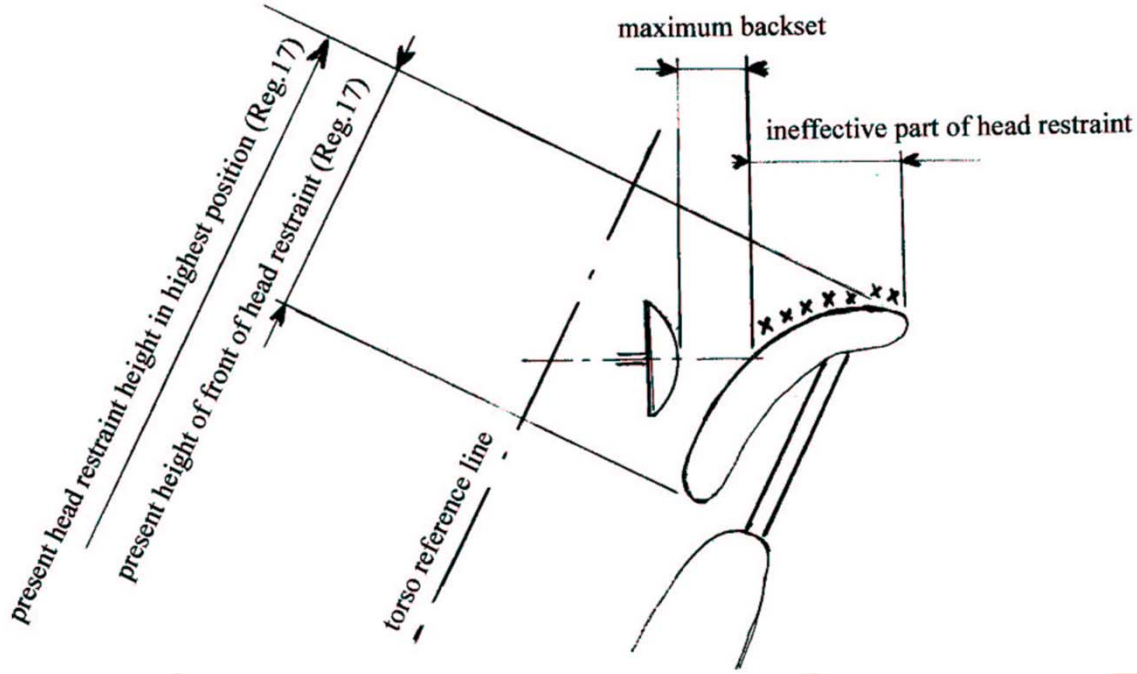
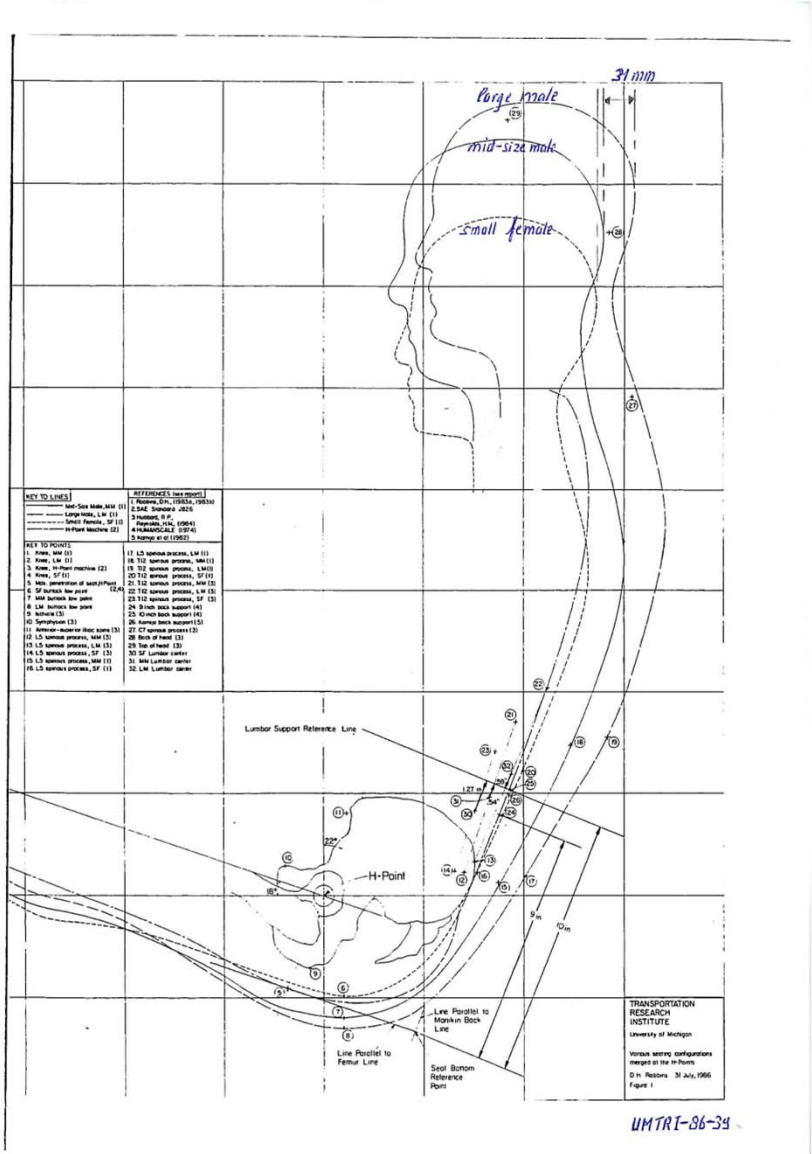
Concerns expressed in the rationale of gtr No.7 phase 1



• The measurement of the head restraint height taken as shown above does not address the effective height of the head restraint.

• In the case of extremely contoured head restraints, the height of the surface that the head would contact is less than the measured height.

Anthropometry / position of back-of-head in the 1980's



UMTRI-86-39 study, merged H-points of the small female, mid-sized male and large male (known from the UMTRI-83-53-1).

It was found that the back-of-head of the large male, compared to the mid-sized male, is a "distance x" (being 31 mm) more rearward.

However this result is reached with:

- a chosen seatback angle,
- a large male dating from the 1980's, so not representing the nowadays large male car occupant.

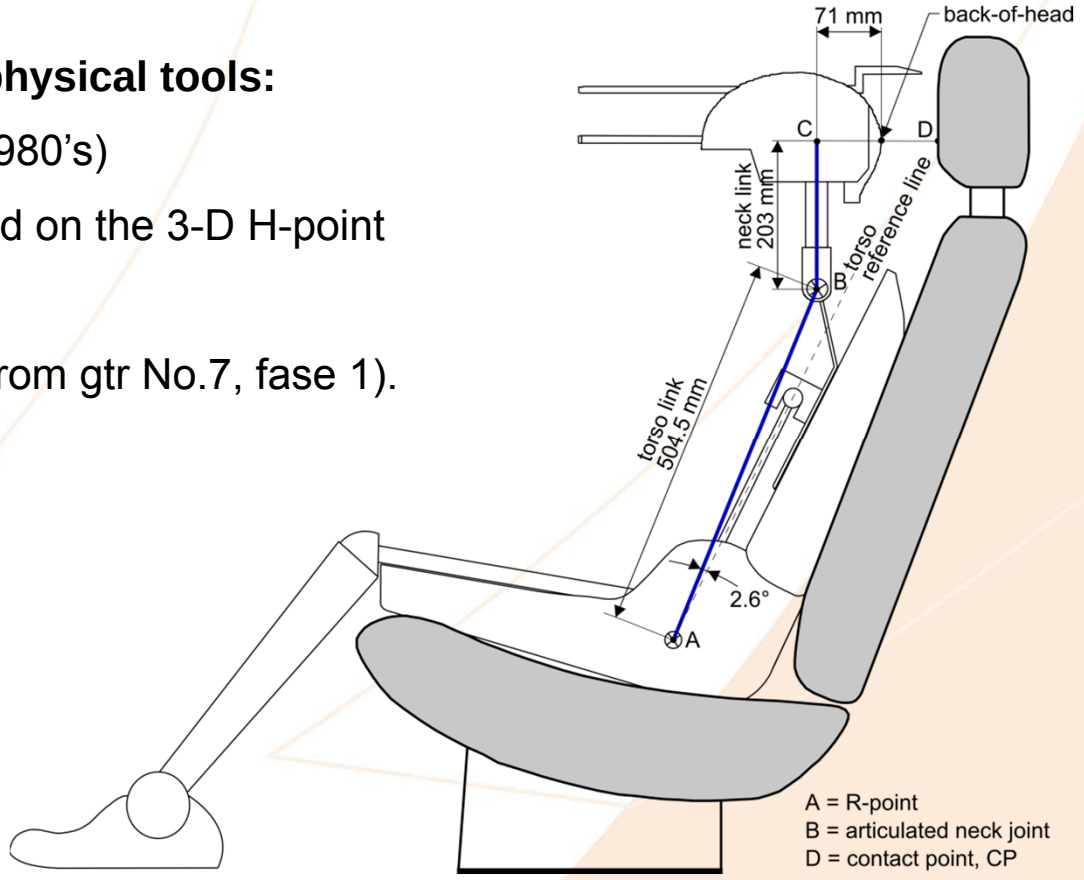
Physical tools for positioning of back-of-head

Combined in one picture two physical tools:

(both for mid-sized male of the 1980's)

• the HRMD (from ICBC) mounted on the 3-D H-point machine,

• the Torso & Neck Link (known from gtr No.7, fase 1).



Anthropometry / X-position of back-of-head nowadays people

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(design torso angle - 2.6)+71	504.5*cos(design torso angle - 2.6)+203	593*sin(design torso angle - 2.6)+76	88.5* sin(design torso angle- 2.6)+5
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

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,
- the design torso angle, and
- the dimensions of the mid-sized Torso & Neck Link.

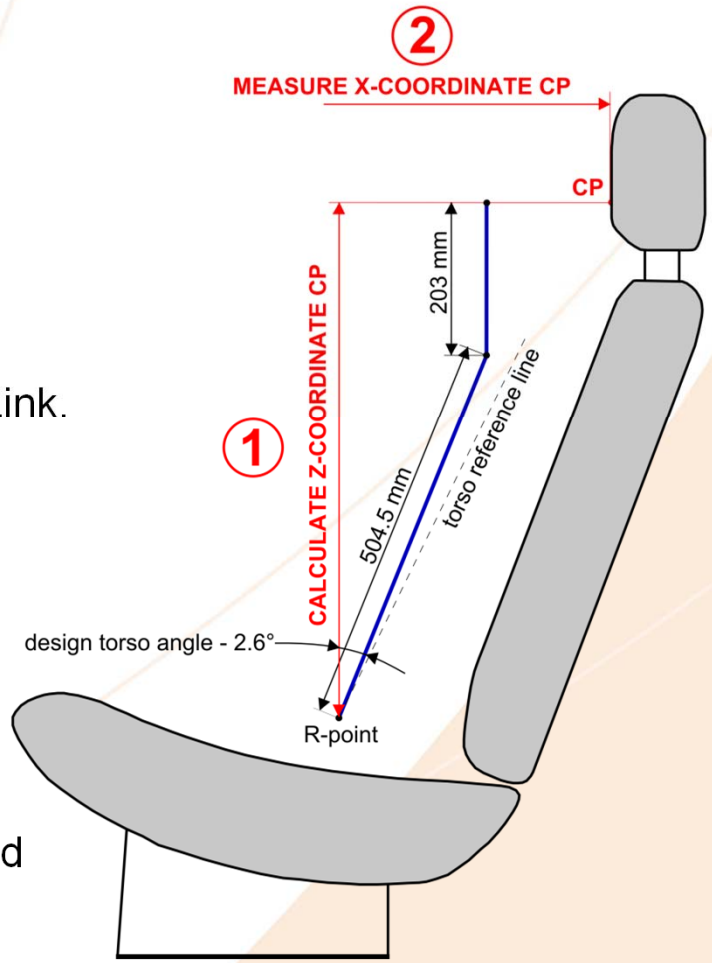
Needed actions:

1) calculate Z-coordinate CP =

504.5 * COS(design torso angle – 2.6º) + 203

(instead of calculation, a table will be provided),

2) mark this point on the head restraint surface and measure X-coordinate CP.



Test procedure for effective head restraint height II

the Torso & Neck Link concept expressed in goniometric formulas

With head restraint set in its highest position,

the measuring of Intersection Point IP:

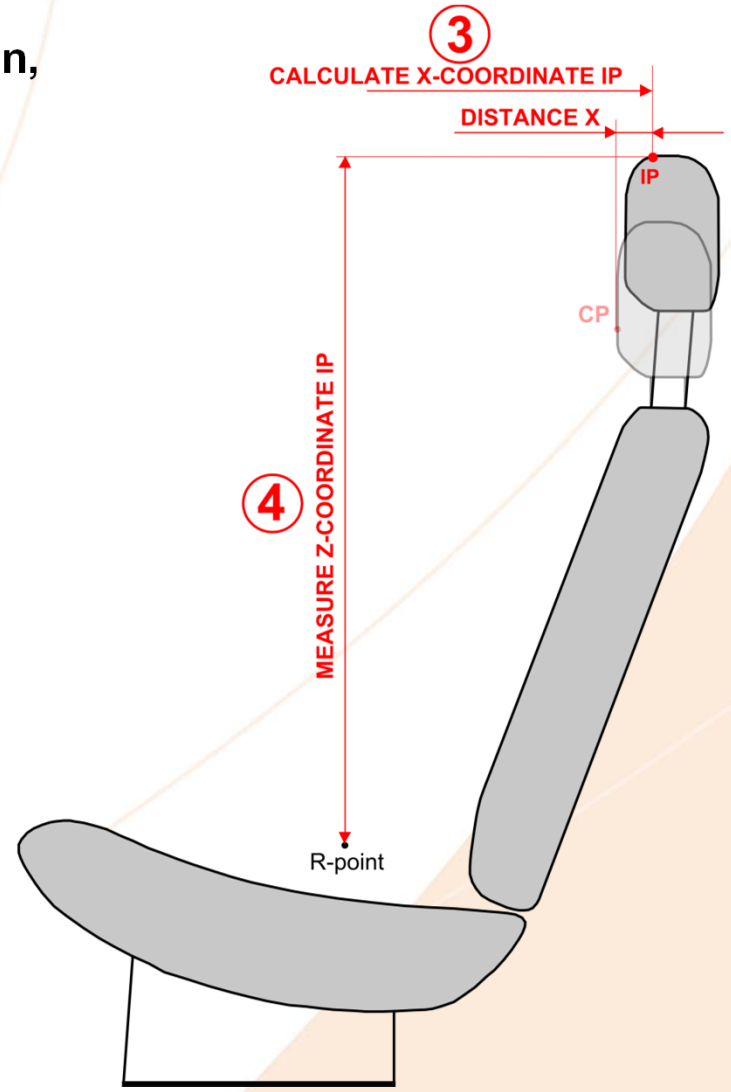
Available are:

- the X-coordinate CP
- the table providing the “distance X” which depends of the design torso angle

Needed actions:

3) calculate X-coordinate IP = measured X-coordinate CP + “distance x”,

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



Test procedure for effective head restraint height III

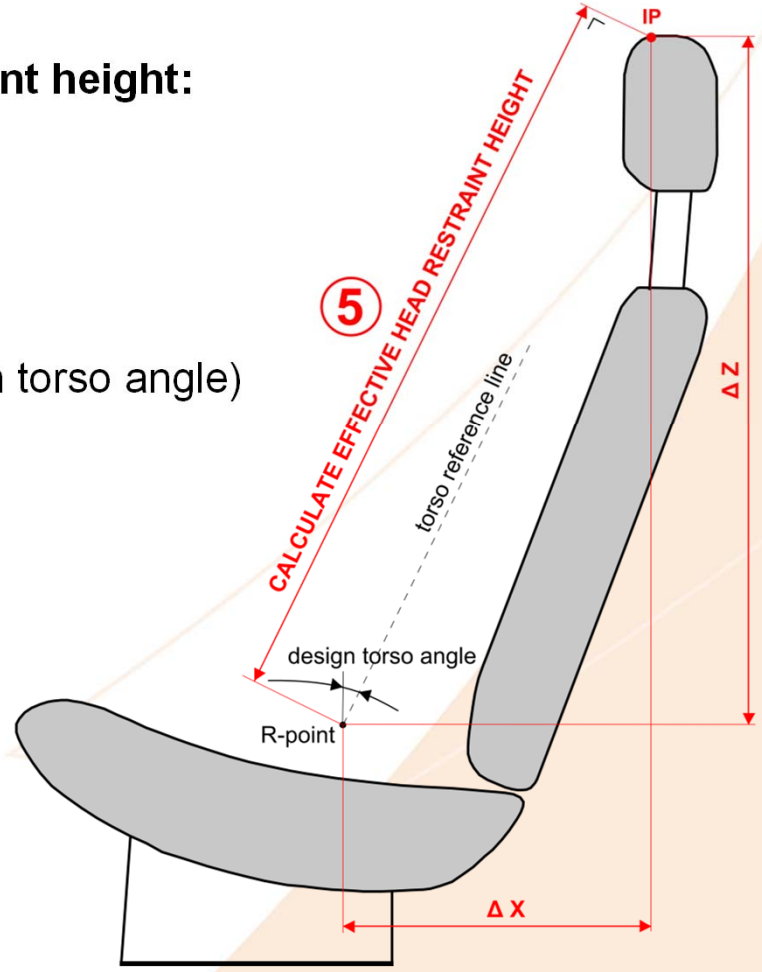
the Torso & Neck Link concept expressed in goniometric formulas

Calculation of the highest effective head restaint height:

Needed final action:

5) Calculate effective head restaint height =

Δ X * SIN(design torso angle) + Δ Z * COS(design torso angle)



Thank you for your attention