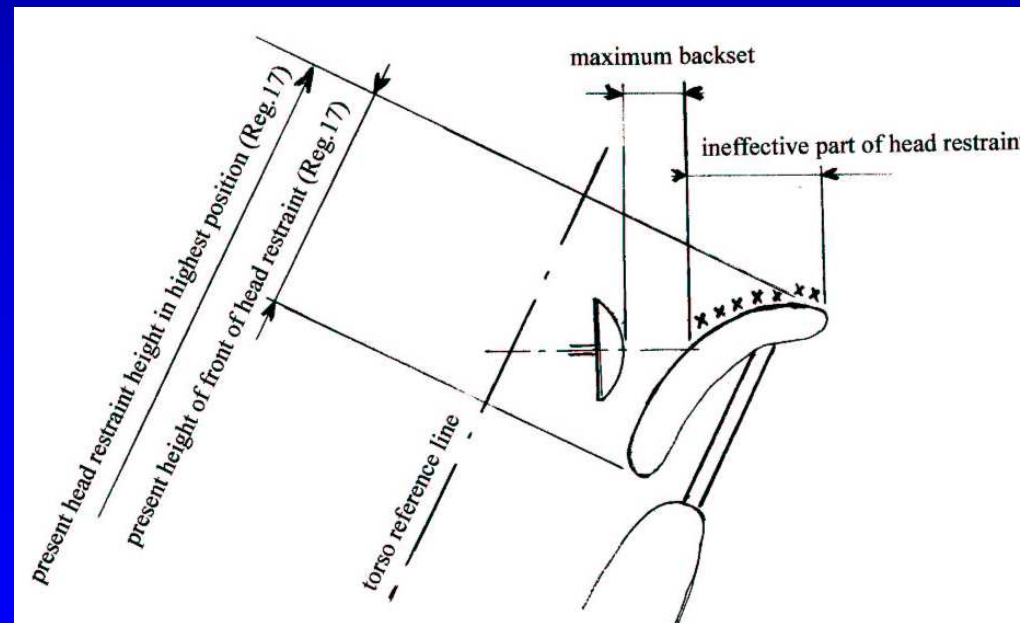
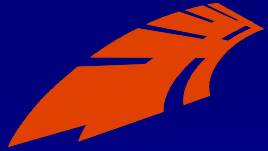


Head Restraints Static Height and Backset Measurement

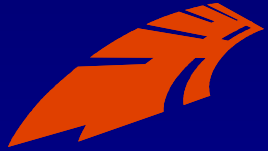
Hans Ammerlaan





Content

- Reasoning behind NL proposal for GTR7-01-03
- Comparison erect sitting height dummies versus human males
- Conclusions



Reasoning behind NL proposal for GTR7-01-03

- Within EEVC the method of UNECE Reg.17 Head Restraint Measurement Method has been taken on board as part of a Cost-benefit Analysis
- The published report “UK Cost-benefit Analysis: Enhanced Geometric Requirements for Vehicle Head Restraints” can be downloaded from www.eevc.org
- In its Appendix “Regulation 17 Head Restraint Measurement Method” it is explained by means of a series of five figures what serious errors can be made
- GTR7-01-03 shortly mentions this problem; these figures are reproduced here to illustrate the problem



Fig.1: UN-ECE Regulation 17 method for measuring head restraint height



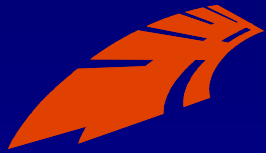


Figure 2: NHTSA conversion between RCAR and UN-ECE Reg. 17 head restraint height measurements

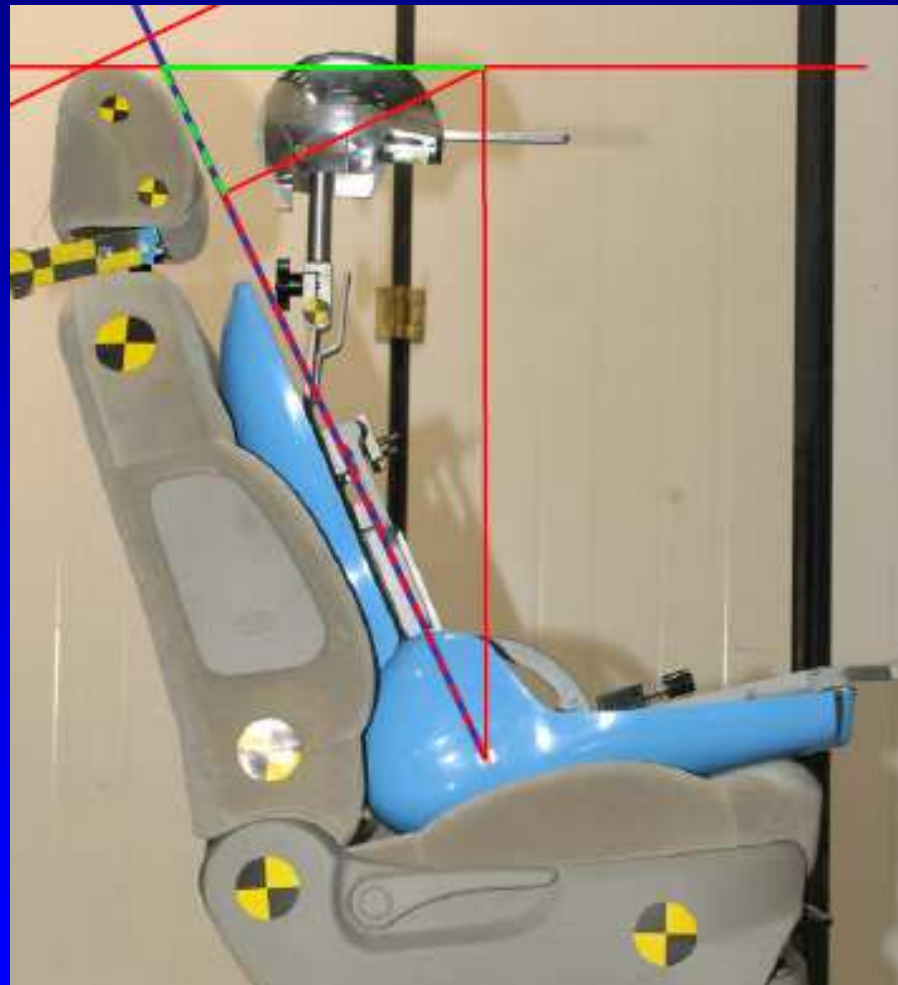
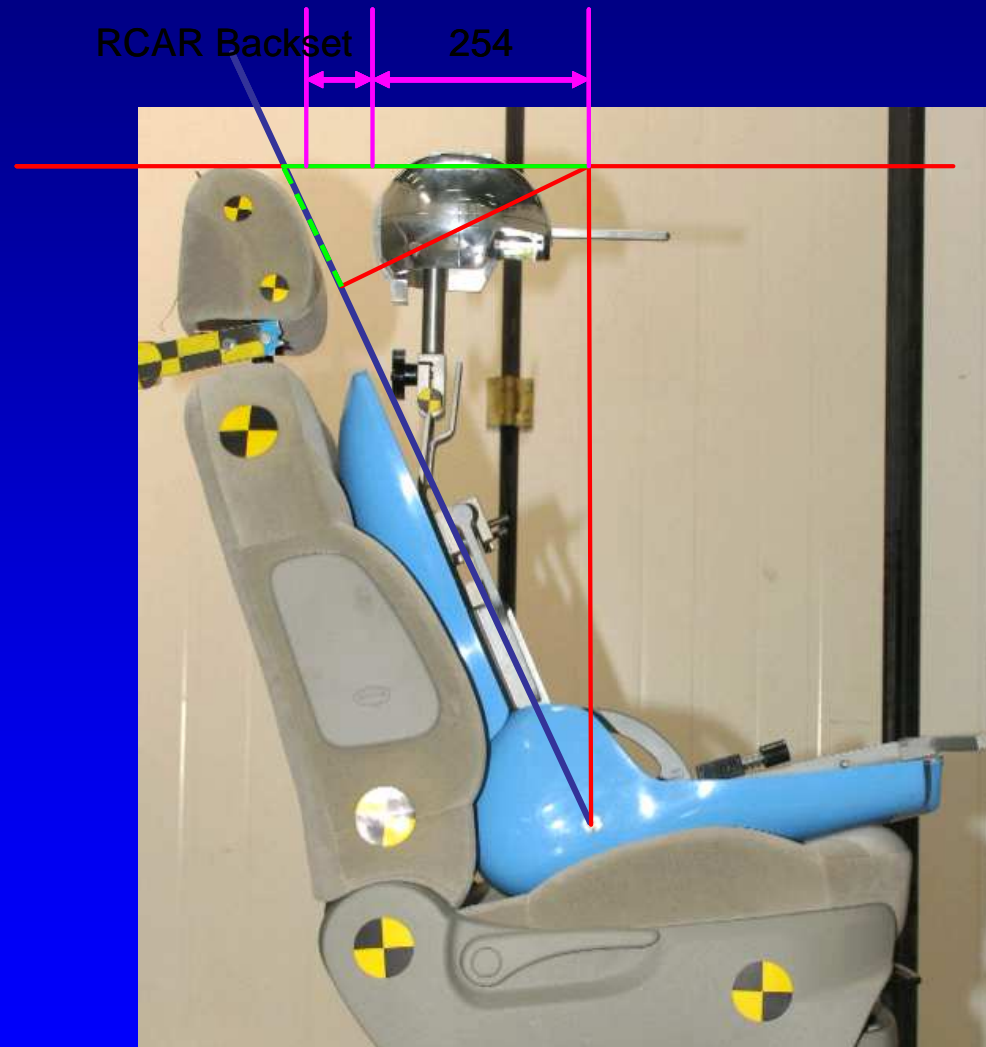




Figure 3: Underestimation error in backset conversion



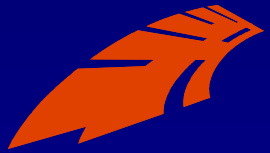
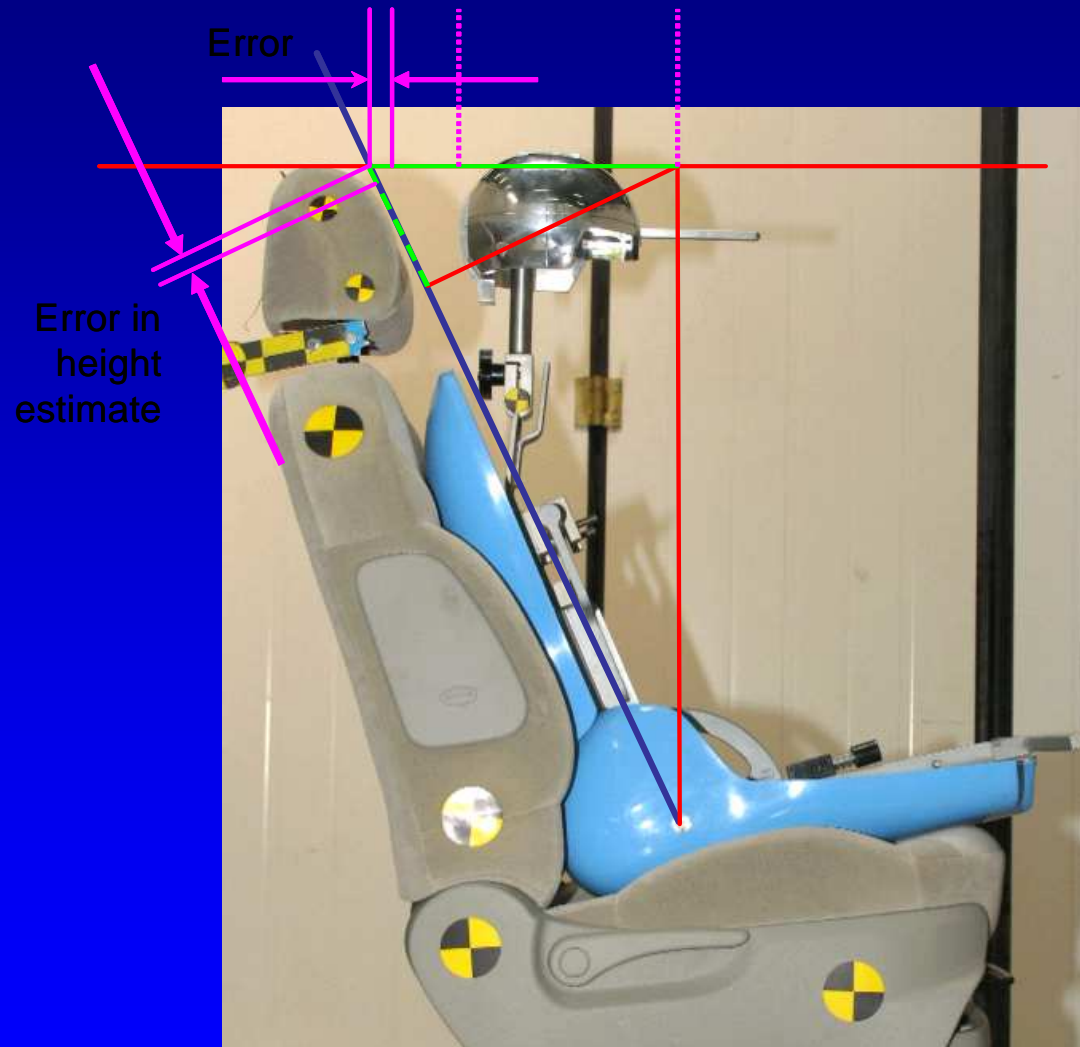


Figure 4: Effect of backset error on height estimation



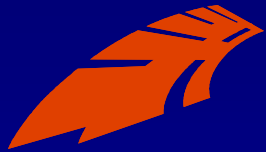
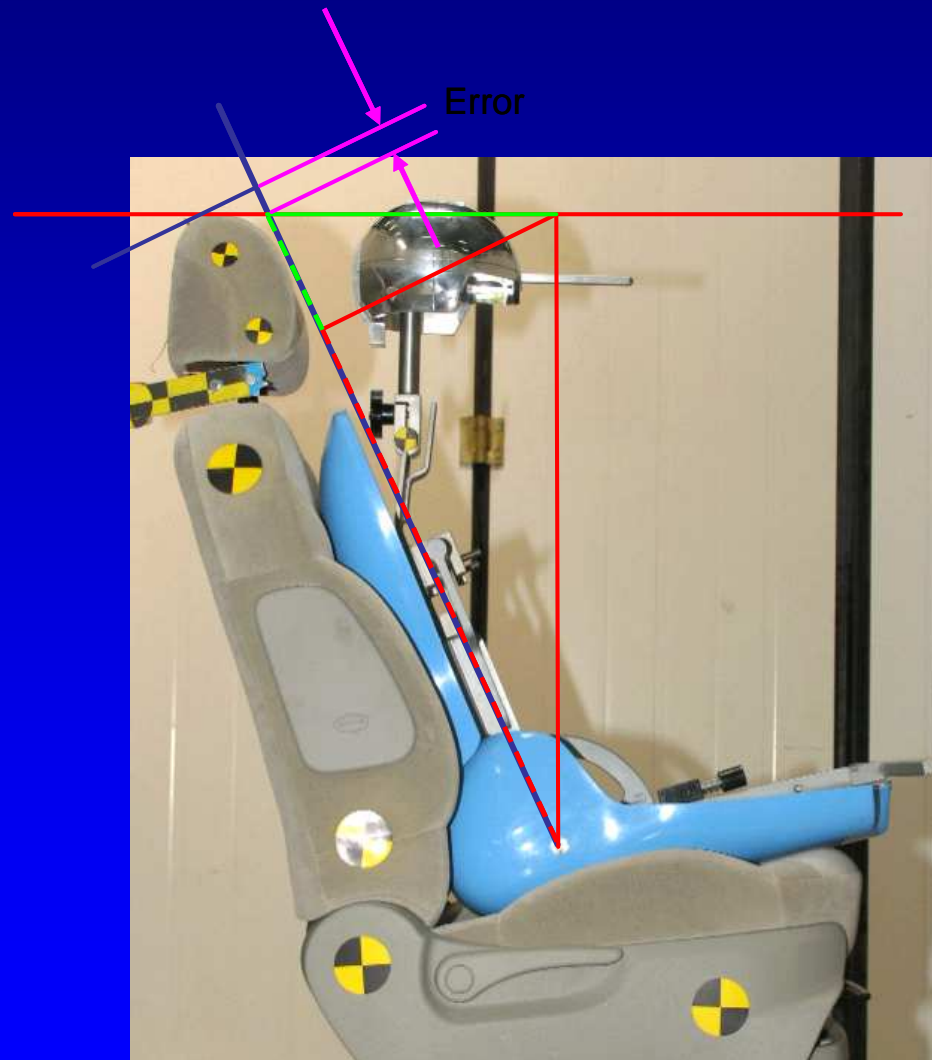


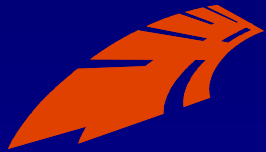
Figure 5: Additional error arising through inclined line defining the top of the head restraint





Erect sitting height dummies versus human males

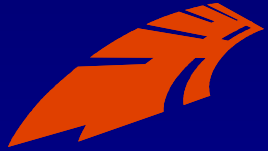
		Erect sitting height			
		Percentile			
		5	20	50	95
Dummies	UMTRI			911	
	Hybrid III			884	
	BIORID			884	
	RID3D			909	
Males	Caesar USA			928	994
	Caesar NL	882	912	949	1016



Erect sitting height dummies versus human males

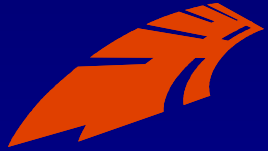
		UMTRI-83-53-1 Dec.'83	Hybrid III	BIORID	RID3D	Caesar data USA male population 2000	Caesar data NL male population updated to 2004		
		http://deepblue.lib.umich.edu/	www.ftss.com	www.radenton.com	TNO	www.nedscan.nl	www.nedscan.nl		
.. th % ile male	Standing height	Erect sitting height	Erect sitting height	Erect sitting height	Erect sitting height	Standing height	Erect sitting height	Standing height	Erect sitting height
1							829		860
5							862		882
10							876		896
20							894		912
25							901		916
30							906		924
40							917		940
50	1751	911	884	884	909	1777	928	1818	949
60							937		960
70							949		971
75							954		976
80							960		982
90							977		1001
95			935			1913	994	1971	1016
99							1022		1052

All measurements in mm



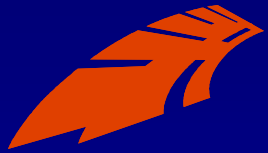
Conclusions (1):

- The goal of a head restraint with an appropriate height is not only reached through taking account of Anthropometry
- The present UNECE Reg.17 static height measurement method (which is also in gtr7) simply measures this height to the top of the head restraint, without relating this measurement to the fact whether this height is too far backwards or not
- So the present method could easily over-estimate the height that effectively is protecting people, because the top could mean the backmost corner of the head restraint (the total error of the shown seat is 48 mm)
- Therefore the NL doc. GTR7-01-03 proposes to link the following three measurements:
 - the measurement of head restraint height (above the R-point)
 - the measurement of backset
 - the measurement of the height of the front contact surface of the head restraint (measured on the median longitudinal plane) in order to provide an appropriate catching zone



Conclusions (2):

- The option of using the 3-D-H machine equipped with the HRMD-probe (this combination should represent the UMTR mid-sized male, see UMTRI-83-53-1) causes difficulties
- Using a Coordinate Measuring Machine (in combination with a semi-spherical headform probe) will exclude non-biofidelic interaction caused by the 3-D-H machine, and can easily provide data with regard to the head restraint height in combination with its backset (values can be related to the R-point)
- The advantage of using the method with the Coordinate Measuring Machine is that also backset can be checked for people taller than a mid-sized male that originates from more than 25 years ago!



Thank you for your attention