

# Japan Research Activities in the GTR-7 Phase 2 amendment

## Bio RID II seating proposal #4

### **JASIC/Japan**

**Rev3. Sept. 21-22. 2010**

**Rev.2 Dec. 8. 2009**

**Rev.1 Nov. 6. 2009**

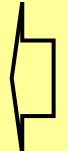

**Feb. 10-11.2009**



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1. Seating Condition Proposal
  2. Seating Procedure Proposal based on variation study
  3. Seating Procedure Proposal for smaller torso angle seat.
  4. Comparison between design torso angle and 25 degree fixed angle

# 1. Seating Condition Proposal

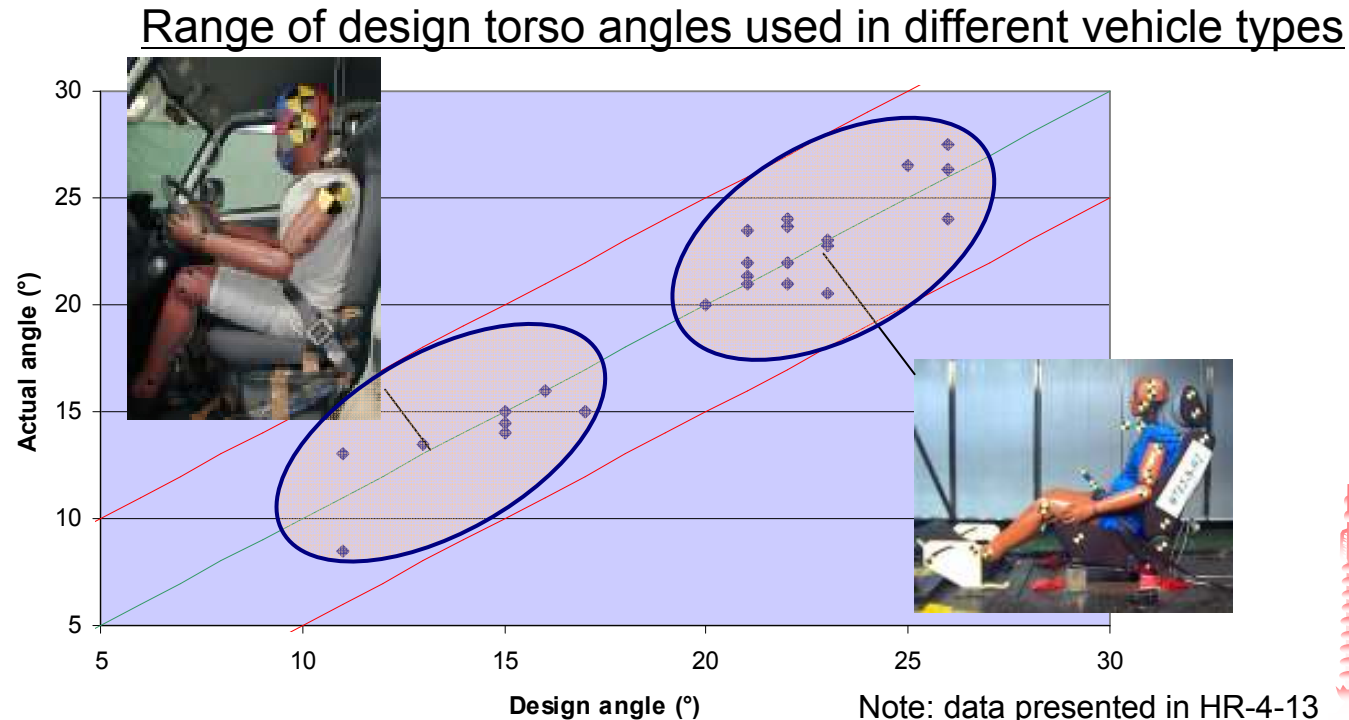
The dummy seating procedure should be modified from the IIWPG procedure as follows, as the actual seating angle is closer to the design torso angle. In addition, the dummy outputs are very sensitive to the static backset according to the simulation and test results.

- ① Seat torso angle:  
Design torso angle  25 degrees
- ② Backset tolerance:  
+/-2 mm  +/- 5 mm.
- ③ Special adjustment in the case of smaller torso angle seat



# ① Background of Design Torso Angle Proposal

Note: presented in HR-6-13



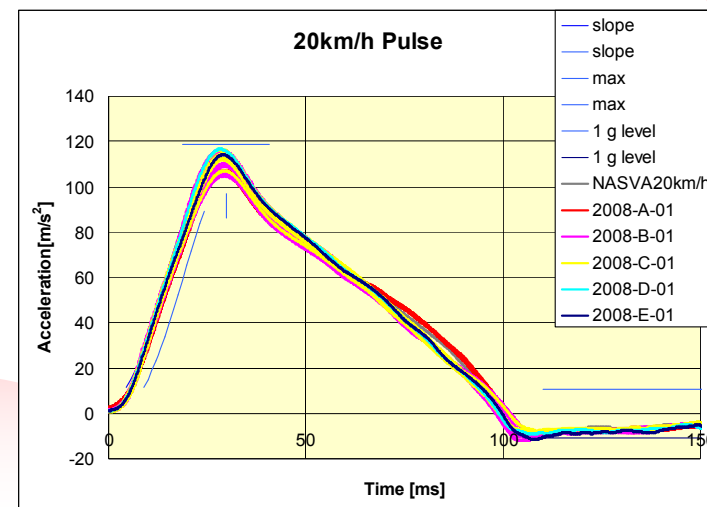
- Design torso angle is specified by typical driving posture for each type of vehicle and seating height. It is varied from 10° to 30° .
  - For certain seat designs, 25° bears no relation to the real world seating position and in some cases may not even be physically achievable
  - Advise the use of the procedure specified in ECE17 Annex 3
- All other safety tests, including vehicle crash tests, are conducted with the design torso angle.

## 2. Seating procedure variation effect study

JARI has conducted the following tests to confirm the effects of seating variation.

- Back set : +5mm +10mm
- H-point +5mm +10mm
- Pelvis angle: +2.5° -2.5°

Crash Pulse : Delta V 20km/h  
Seat : Passive-type seat



# Seating procedure variation effect study

## Variation effect summary

Test No.	HRCT	Hx Acc.	T1 Acc.	Upper FX	Upper FZ	Upper MY-Fix.	Upper MY-Ext.	Lower FX	Lower FZ	Lower MY-Fix.	Lower MY-Ext.	NIC	OC-T1
2008-B-01~05 (Ave.)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2008-B-06 (BS +5mm)	103.1	107.7	98.7	123.5	111.9	104.7	100.0	111.9	121.9	124.6	114.4	118.2	104.7
2008-B-07 (BS +10mm)	105.8	114.8	97.6	146.7	123.0	109.2	100.0	123.5	143.2	147.0	128.4	135.5	109.8
2008-B-08 (HP +5mm)	100.9	101.9	96.0	111.6	99.2	104.2	100.0	101.4	102.1	105.7	105.0	103.4	99.8
2008-B-09 (HP +10mm)	101.9	103.8	92.3	123.3	98.8	108.2	100.0	103.0	104.2	109.7	110.0	107.6	99.5
2008-B-10 (PA +2.5°)	97.7	100.2	89.8	106.5	101.7	103.3	100.0	102.7	105.4	103.2	102.8	89.6	96.3
2008-B-11 (PA -2.5°)	103.7	102.7	110.7	100.7	100.4	95.6	100.0	98.2	97.2	107.2	102.3	117.7	106.9

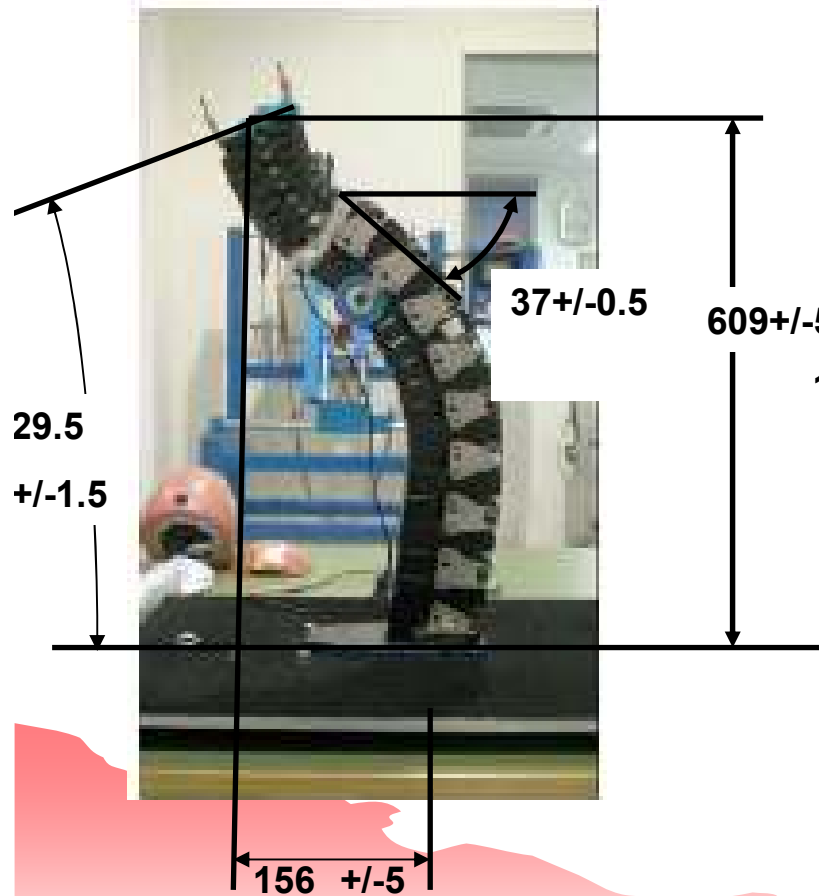
Unit :%    ±5    ±10    ±20    ±21~

### Conclusion

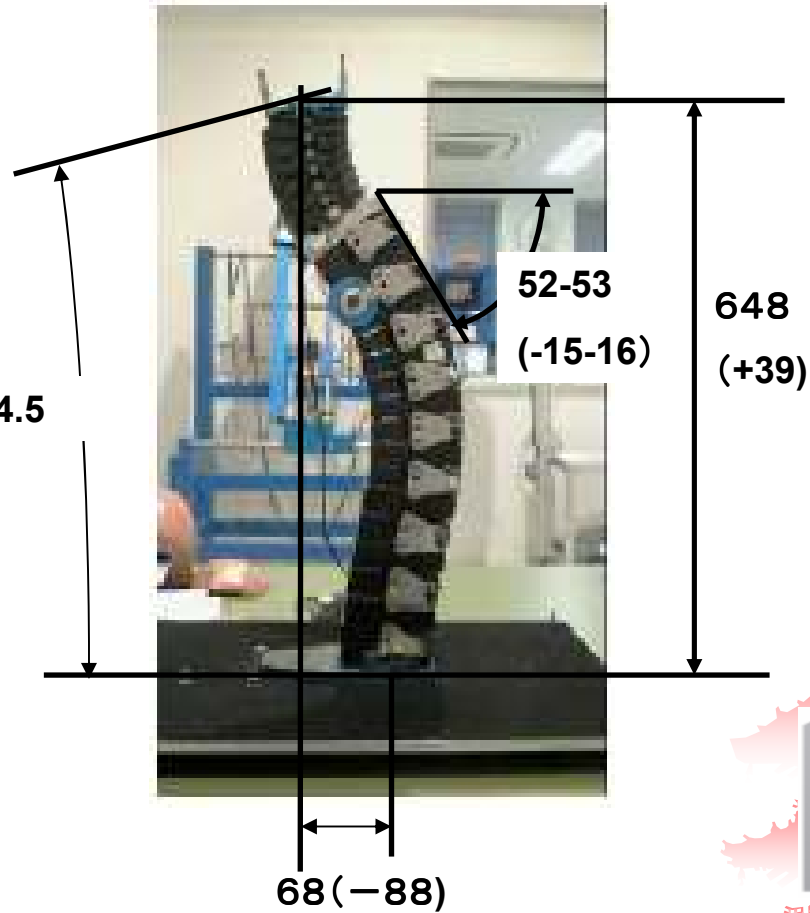
- Back set variation produces the greatest effect on all indicators.
- H-point variation is the second effect on all indicators.

### 3. Smaller Design Torso Angle seat seating trial

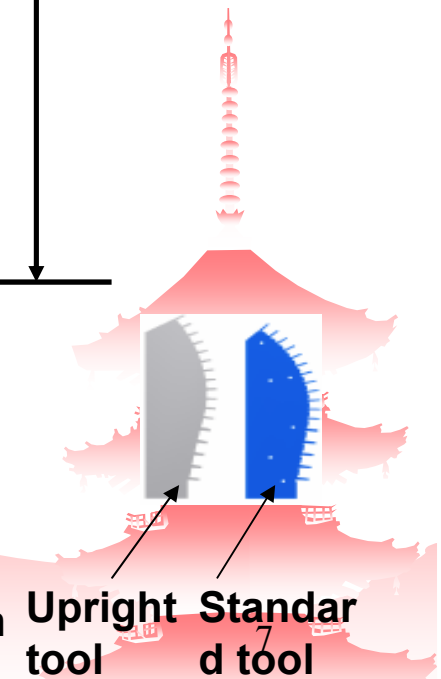
**Standard tool**



**Upright tool**

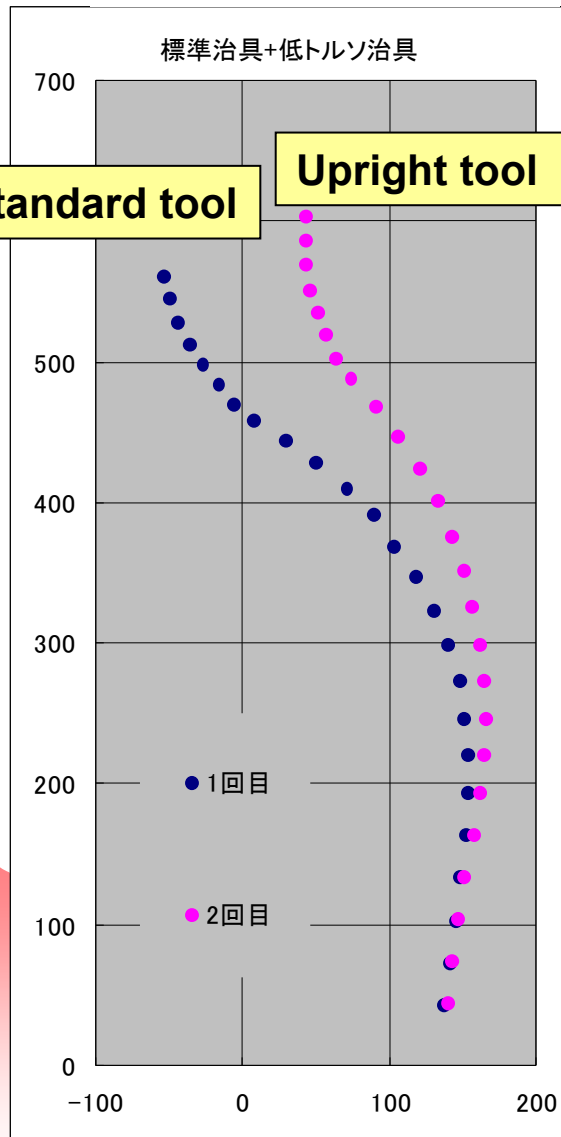


T2 angle of Upright tool is about 15 degree greater than standard tool

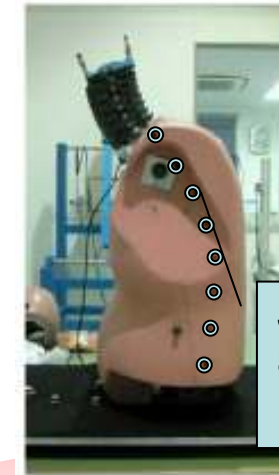
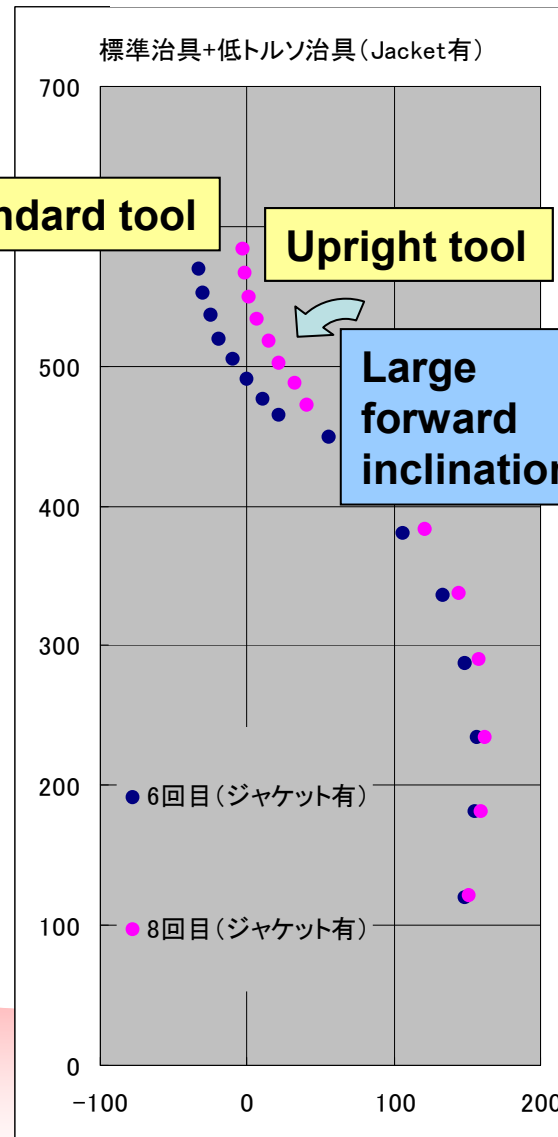


# Spine Pin and Point Measurement Result

## Without Jacket



## With Jacket



Jacket attachment bolts restriction



# Seating Trial Result

- Dummy head angle and backset are improved with upright tool.
- In the case of about 14 degree torso angle, head can maintain laterally level, however, backset is little bit smaller than target, 112mm.

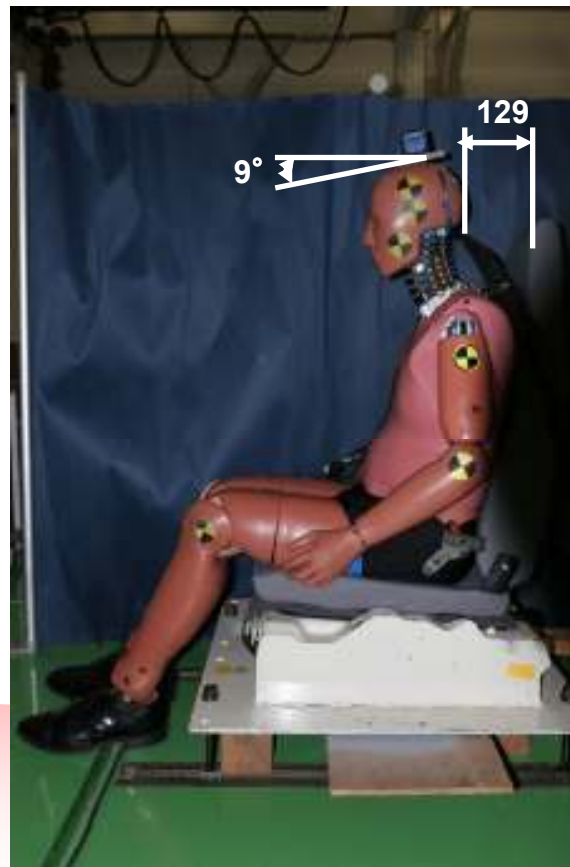
## Standard tool

with 10 degree torso angle



## Upright tool

with 10 degree torso angle



## Upright tool

with about 14 degree torso angle condition

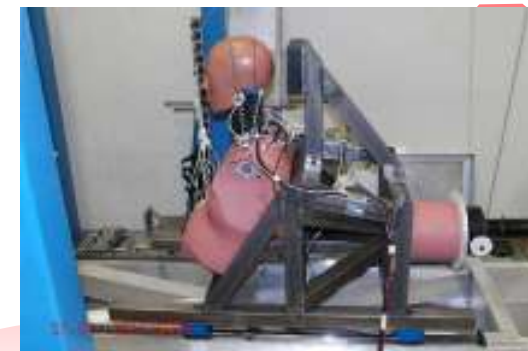
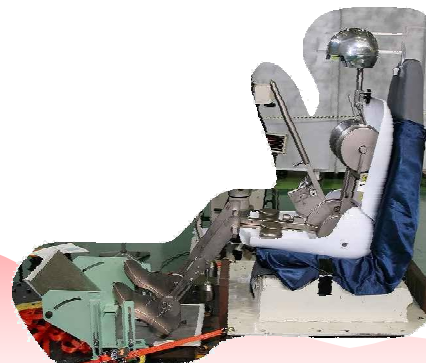


# SUMMARY of Smaller Design Torso Angle seat seating trial

- ◆ The spine and jacket are able to install without any conflict.
- ◆ T2 angle of Upright tool is about 15 degree greater than standard tool
- ◆ Large forward inclination is occurred due to the jacket attachment bolts restriction
- ◆ Dummy head angle and backset is improved for 10 degree torso angle seat with upright tool, However, head angle is still tilted due to jacket restriction.
- ◆ In the case of about 14 degree torso angle, head can maintain laterally level, however, backset is 16mm smaller than target value.

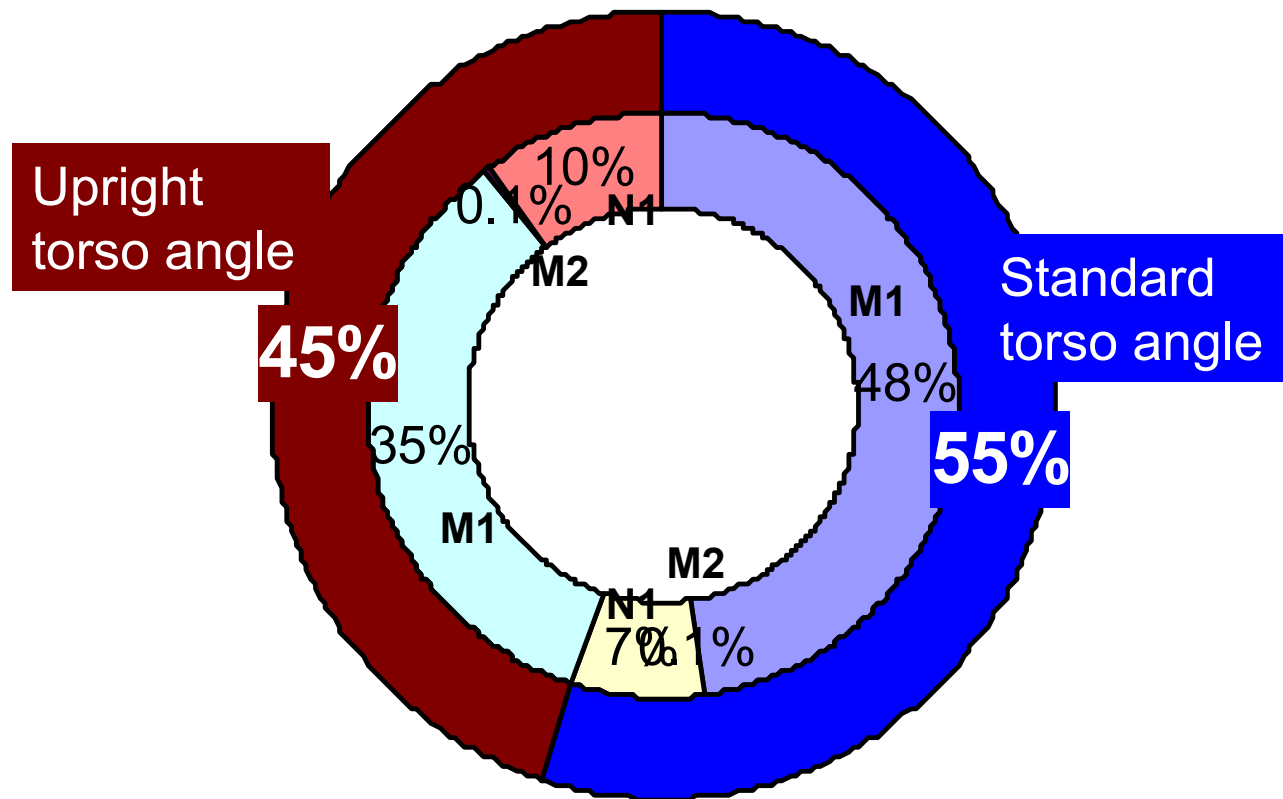
## DISCUSSION of Smaller Design Torso Angle seat seating trial

- The upright tool human scientific background and target dimension, including seating backset, are need to verify.
- Jacket and calibration tool modification are need to study.
- Development & research schedule is also need to study. If necessary tentative alternative solution need to study, for example static backset option etc.



# Upright torso seat Fleet ratio

The front seat torso angle is upright (less than 20°) in 45% of vehicles on the market. Therefore, it is difficult to appropriately evaluate all the seats by dynamic testing unless the upright dummy is established.



# 4. Comparison between design torso angle and 25 degree fixed angle

## Evaluation Method

Compare with the same seat evaluation indicator variation between JNCAP test with design torso angle and IIHS test with 25 degree fixed torso angle.

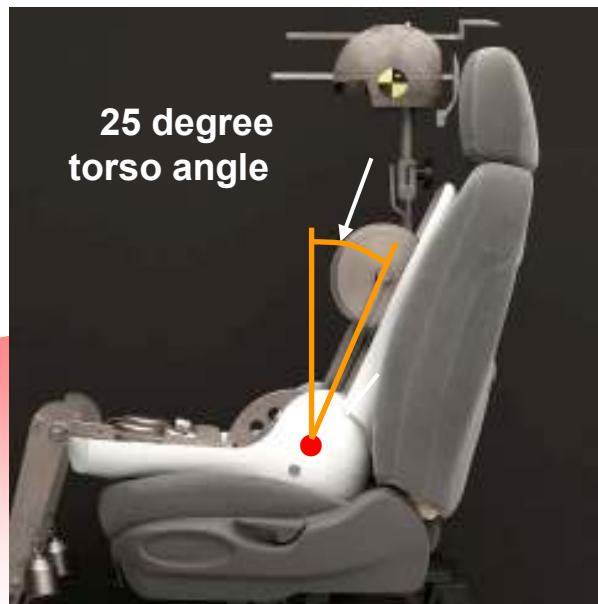
INSURANCE INSTITUTE FOR HIGHWAY SAFETY

Sled pulse  
Delta-V: 16 [km/h]



Japan New Car Assessment Program  
**JNCAP**

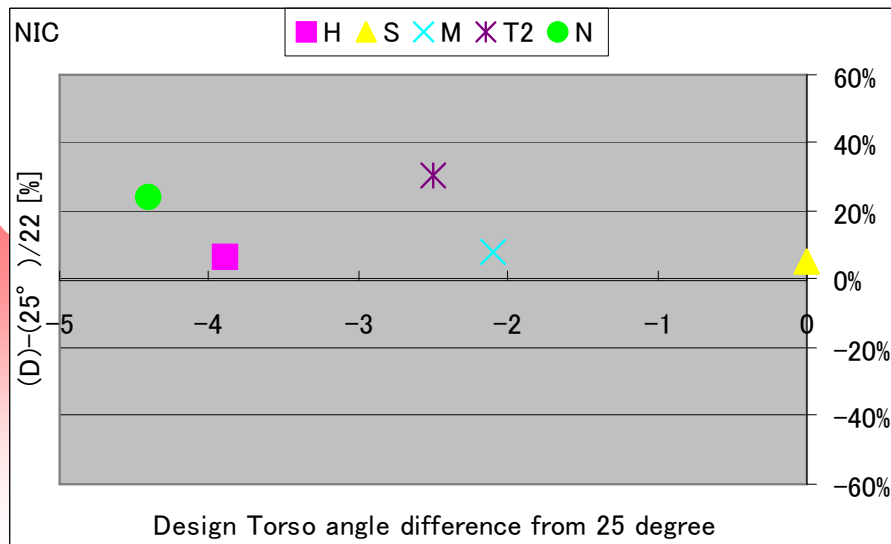
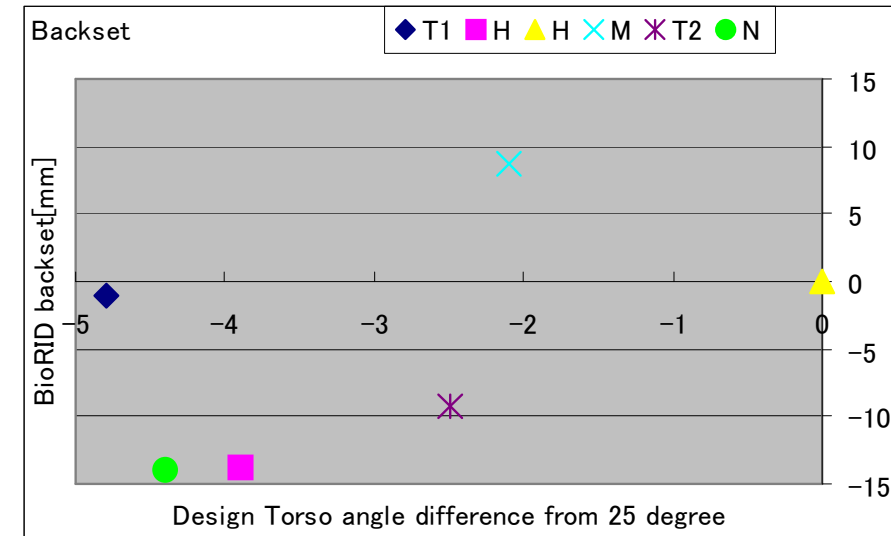
Sled pulse  
Delta-V: 17.6 [km/h]



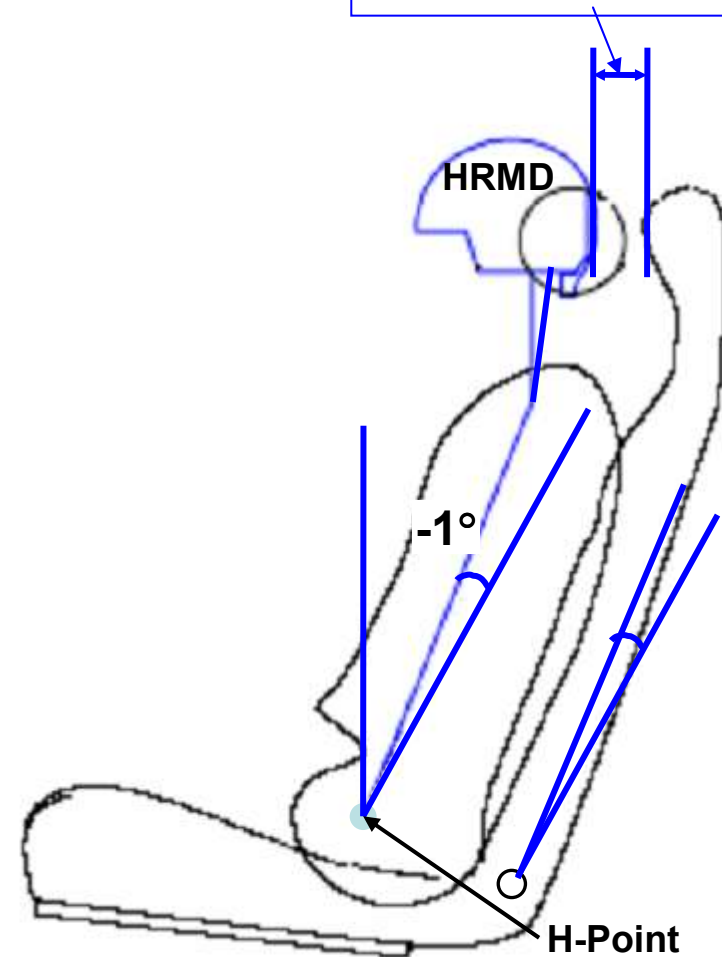
Indicator	target value
NIC	22
Upper Fx	620
Upper Fz	950
Upper My(Flx.)	32
Upper My(Ext.)	32
Lower Fx	620
Lower Fz	1075
Lower My(Flx.)	32
Lower My(Ext.)	32

# 4. Comparison between design torso angle and 25 degree fixed angle

**No clear significant difference was seen in evaluation indicators between 25° fixed angle and standard torso angle in seats with a design torso angle of 20° or more .**

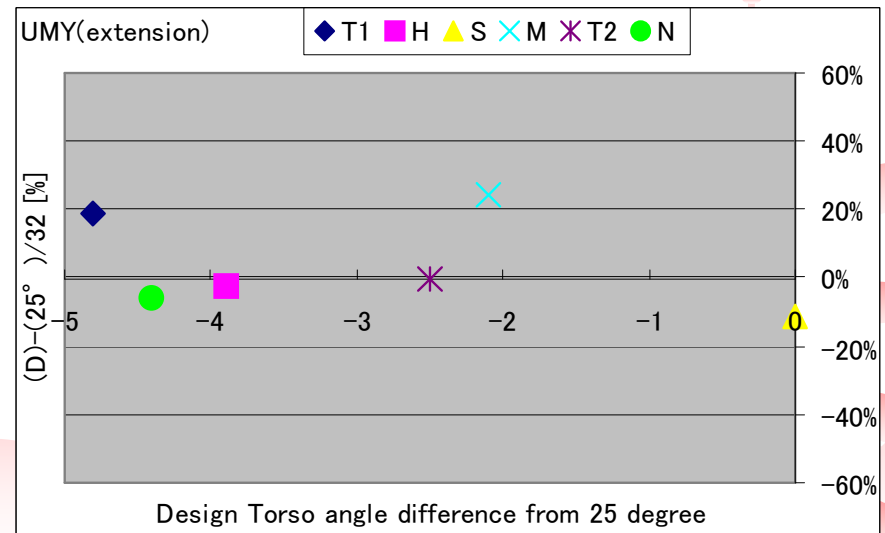
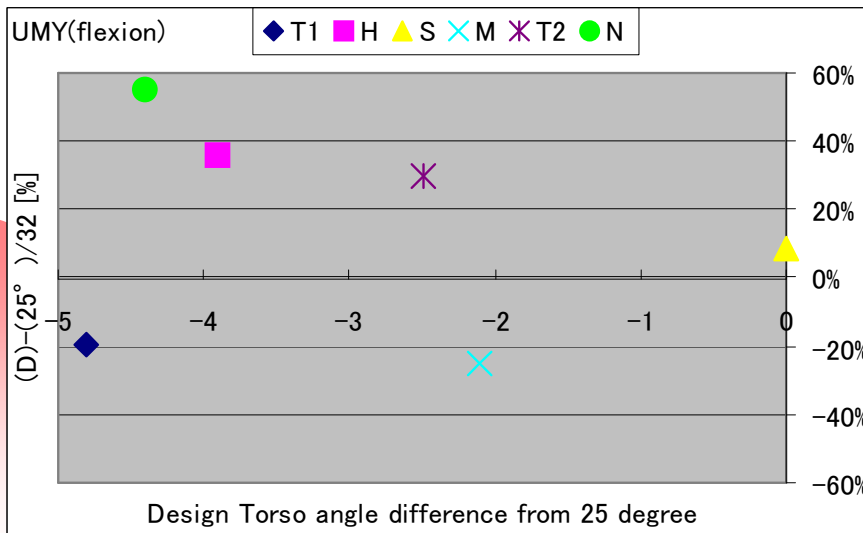
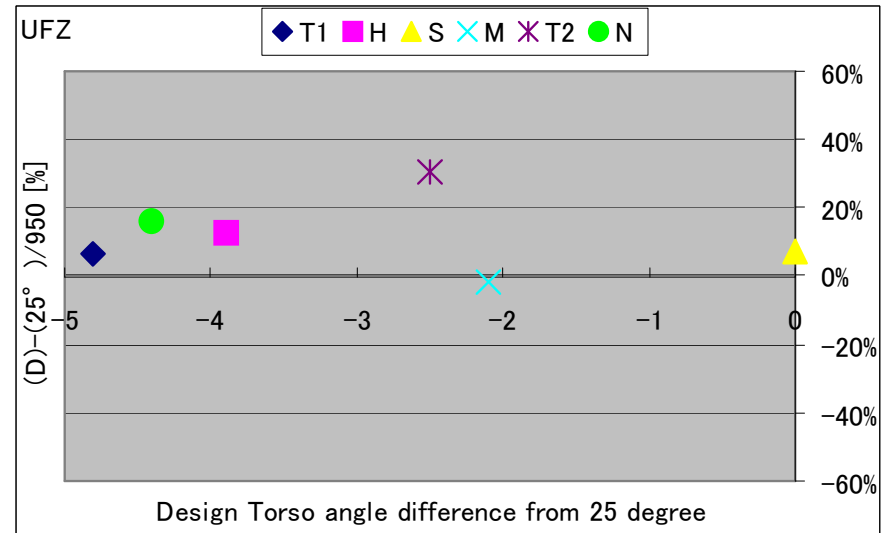
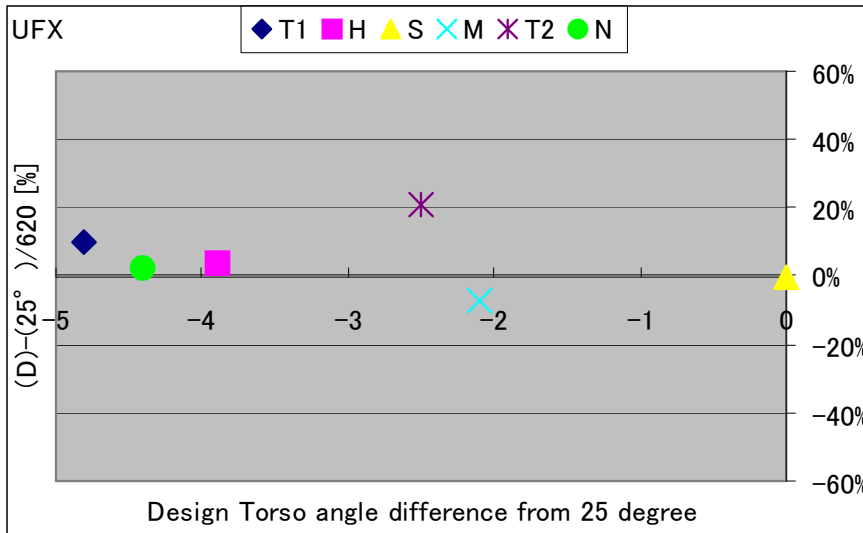


$$203 \times \sin 1 = -3.5 \text{mm}$$



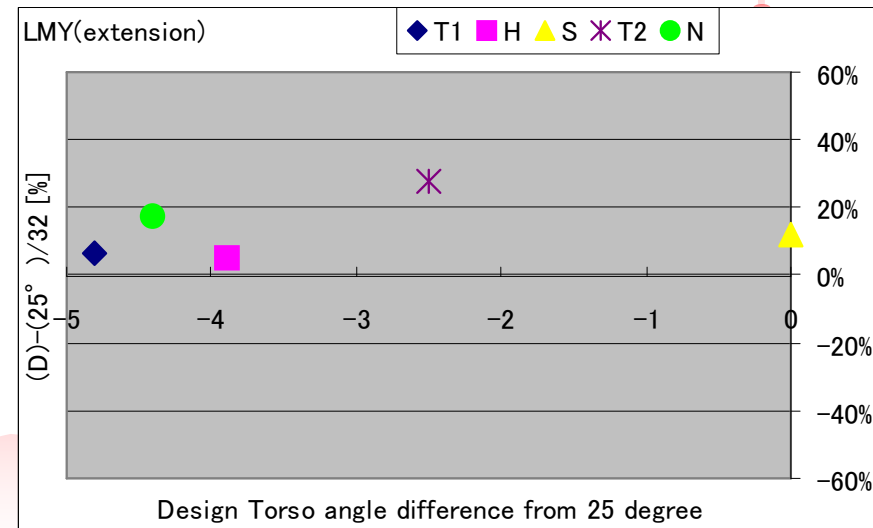
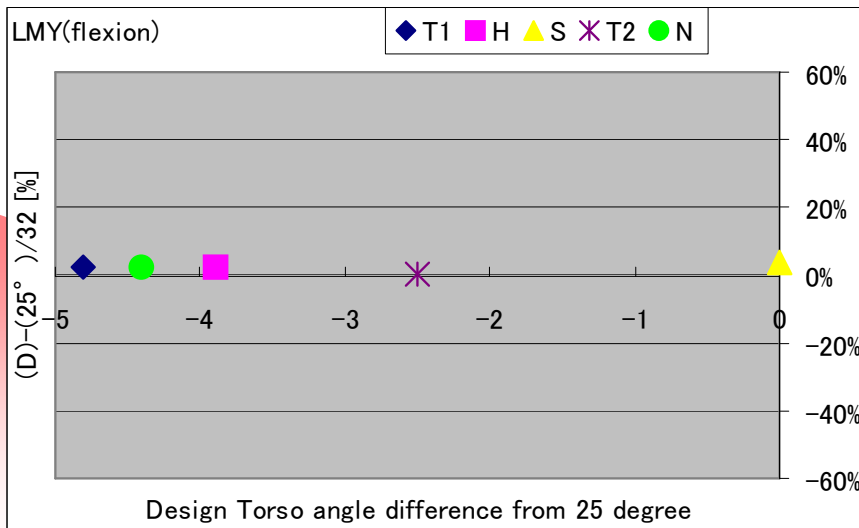
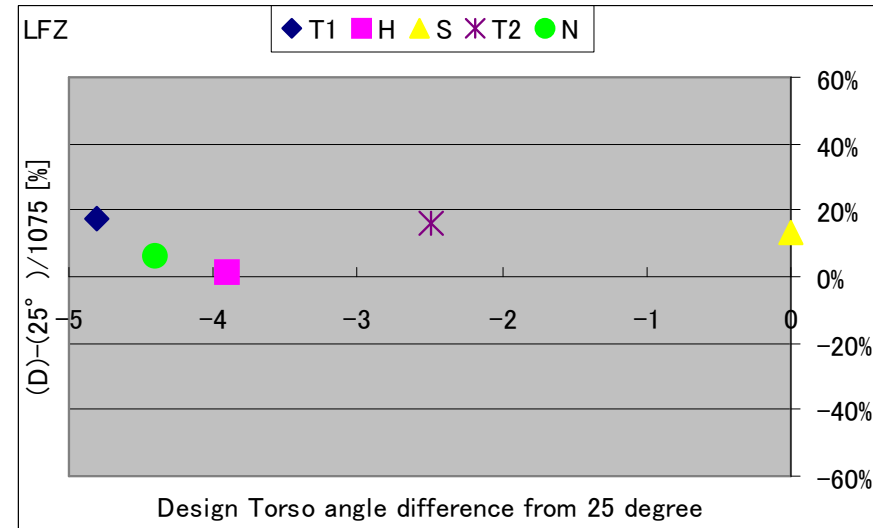
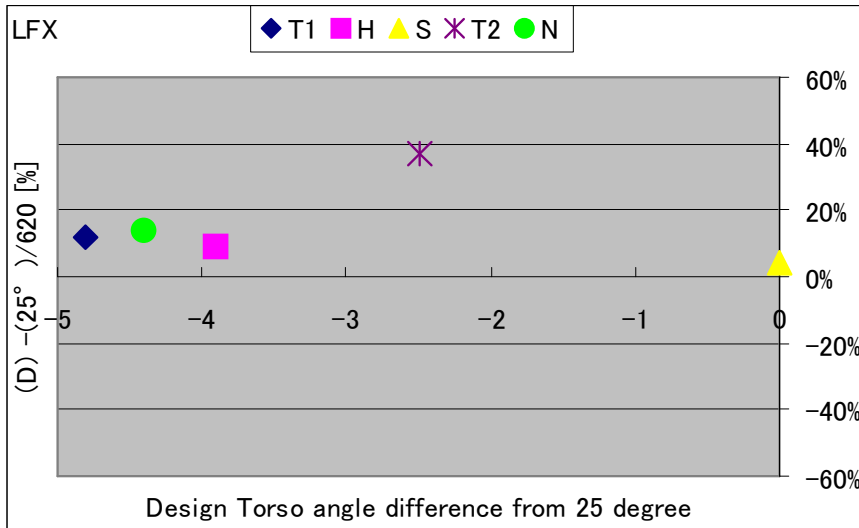
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## SUMMARY

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- ◆ To evaluate dummy seating in the actual driving position as well as in the same position as in other crash forms, the standard design torso angle should be used.
- ◆ Dummy head angle and backset is improved for 10 degree torso angle seat with upright tool, However, head angle is still tilted due to jacket restriction. Therefore, this tool introduction was proposed to postpone to Phae2 (step2 ).
- ◆ In Japan, the standard design torso angle is upright (less than  $20^{\circ}$  ) in about half (45%) of vehicles on the market; it is difficult to evaluate them only by dynamic testing, and the static backset option is necessary.
- ◆ No significant difference was seen in the effect on the dynamic evaluation between standard design torso angle ( $20^{\circ}$  or more) and  $25^{\circ}$  fixed angle.

Thank you for your attention !

