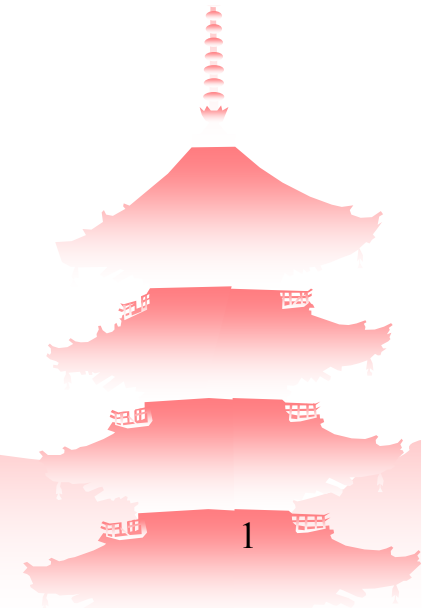

gtr No.7 Phase 2 Dynamic Evaluate Condition and Criteria Proposal

JASIC/Japan
Sept. 21-22. 2010



Objective

Based on the TOR approved in ECE/TRANS/WP.29/2009/130, we aim to submit the formal document to GRSP in May 2011. The following are what are technically possible to be proposed to GRSP in December 2010:

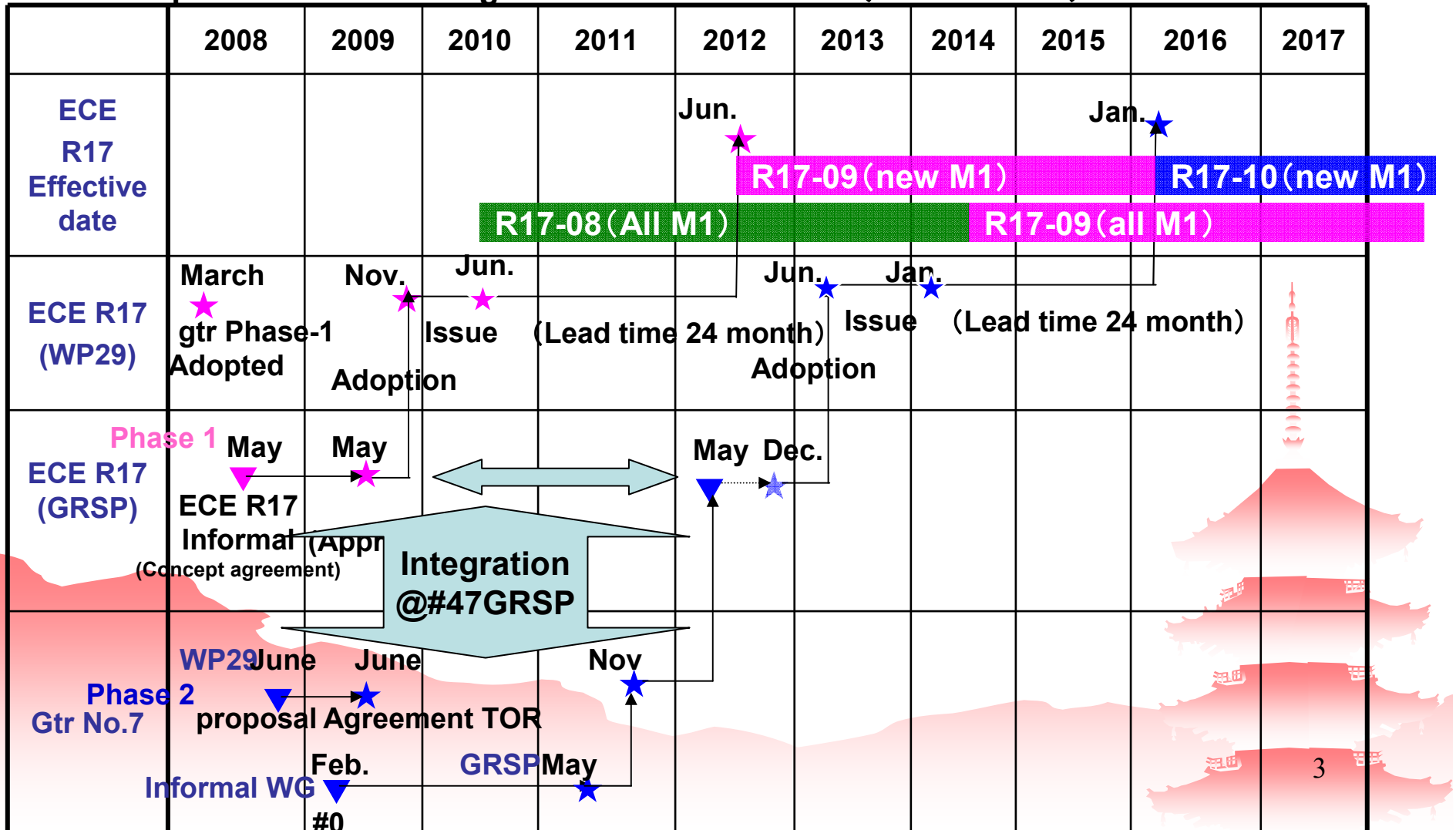
- Positioning of proposals
- Dynamic evaluation methods
- Evaluation indicators
- Proposal for evaluation standards
- Proposal for future activities



Background

In GRSP-45-24, Japan proposed the relation between gtr and ECE R17 as shown in the following chart. At #47 GRSP, it was agreed that gtr Phase 1 (incorporation into ECE R17) and gtr Phase 2 (Step 1) would be integrated.

Schedule plan Head restraint gtr Phase 1 & Phase2 (GRSP-45-24)



Proposal to revise the positioning of gtr Phase 2 (Step 1)

Based on the agreement at #47 GRSP, we propose that gtr Phase 2 (Step 1) and the ECE R17-09 proposal be integrated and that their positioning be revised.

GRSP-45-24 ↓ New proposal	gtr Phase 1	ECE R17-09 ↓ gtr Phase 2 (Step 1) & ECE R17-09	gtr Phase 2 ↓ gtr Phase2 (Step 2)	Reasons for revision
Requirement	Static backset or Hybrid III dynamic evaluation to be selected by manufacturers	Static backset or Bio RID II dynamic evaluation to be selected by manufacturers	Uniform requirement: Bio RID II dynamic evaluation	* Dummy reproducibility and repeatability at $\Delta V=20$ km/h cannot be evaluated. * Development of the Bio RID II dummy for low torso angle seats was moved to Step 2.
Injury level covered	All neck injuries (occurrence rate 7.3% or below)	Equivalent to Phase 1	Reduction of long-term injuries (permanent injuries)	
Dynamic test speed	$\Delta V=17.3$ km/h Sine wave	$\Delta V=16$ km/h Euro NCAP Mid wave	Around $\Delta V=20$ km/h	(Triangular wave, which better represents actual crash waveform than sine wave, should be used.)
Evaluation indicator threshold	Rearward inclination angle $\leq 12^\circ$ (behavior evaluation) HIC ≤ 500 (EA characteristic evaluation)	Dynamic backset $\leq [52]$ ↓ NIC ≤ 22 (evaluated up to HRC) Fx, Fz, My (Neck force evaluation)	Threshold values set with an aim to reduce long-term injuries	Changed from dynamic backset to the indicator that is more based on the occupant injury mechanism, but with the same injury severity.

Head restraint gtr phase2 (step1) Proposal

Phase2 : for common single dynamic option

gtr Phase1

Static

H-point with Backset $\leq 55\text{mm}$

R-point with Backset $\leq 45\text{mm}$

OR*

Dynamic Option

HY-III Head rotation $\leq 12\text{ deg}$

BioRID II: determined by
national regulation



gtr Phase2 (step1)

Static

H-point with Backset $\leq 55\text{mm}$

R-point with Backset $\leq 45\text{mm}$

OR*

Dynamic test requirement

BioRID II injury evaluation
parameters.



*: Manufacture's choice

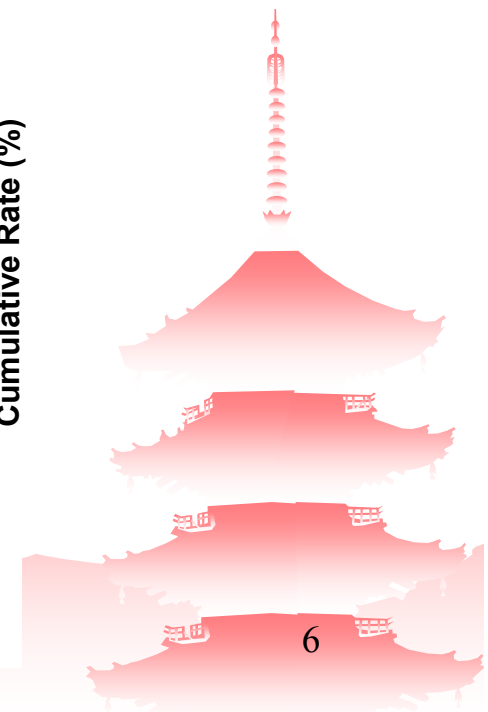
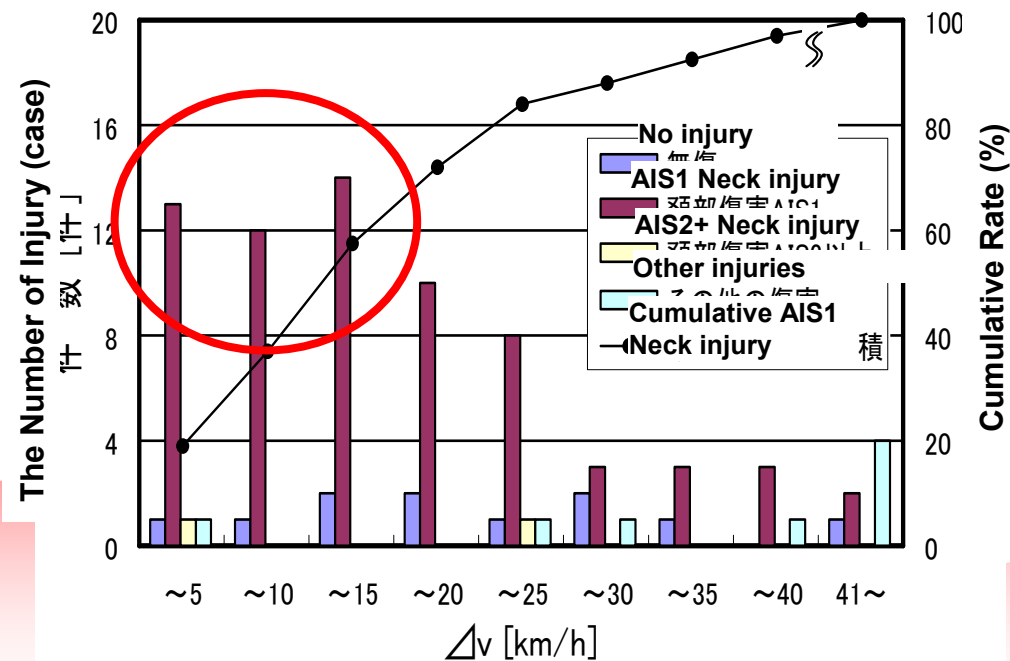
Target accident for gtr phase 1 & phase2 (step1)

- Head restraint GTR Phase 1 & Phase2 (step1) : Reduce all minor neck injury

gtr Phase1

gtr Phase2 (step1)

All rear Impact injuries by delta velocity in Japan
(calculated: 89 cases)

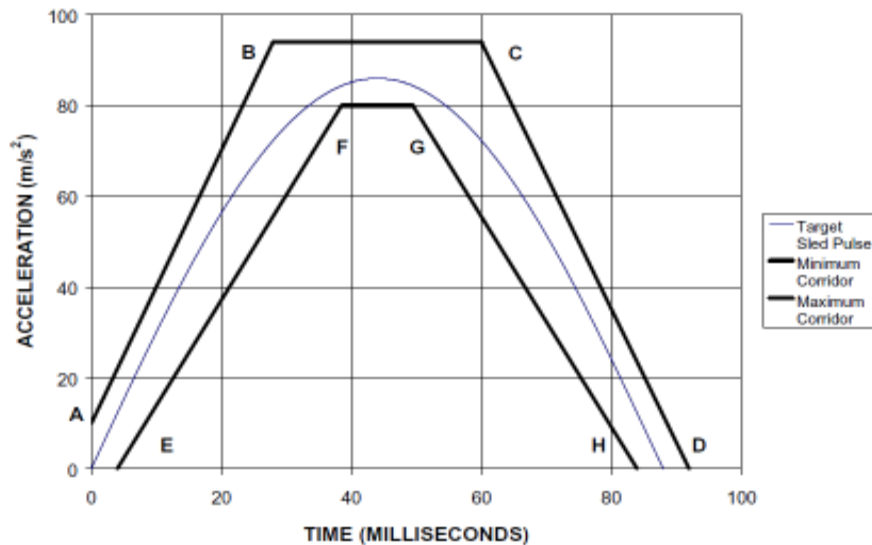


Target crash pulse for gtr phase 1 & phase2 (step1)

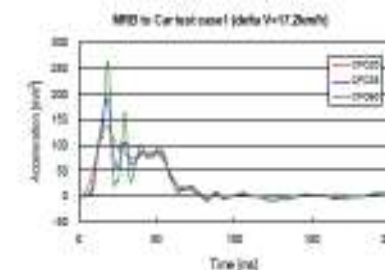
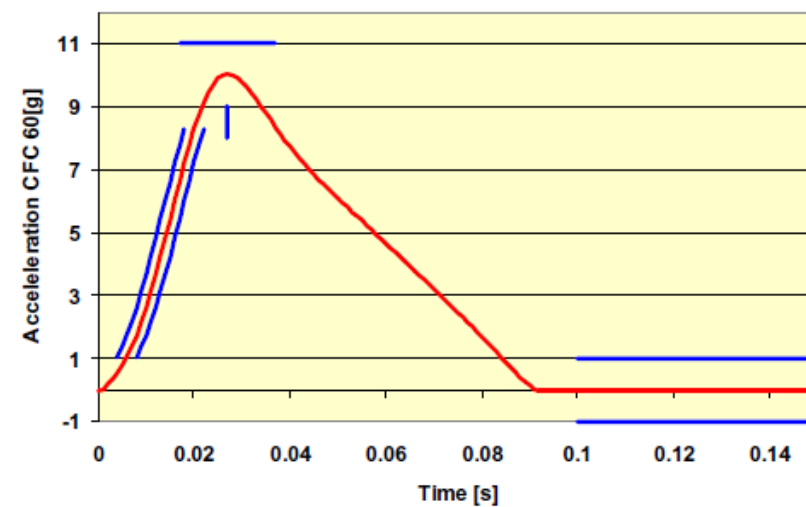
In Phase 2 (Step 1), triangular pulse, which better represents actual crash pulse, is used uniformly.

- Head restraint GTR Phase 1 : 17.3 ± 0.6 km/h delta V, max. peak acc. 10g
- Head restraint GTR Phase 2 : 16 km/hr delta V, max. peak acc. 11g

gtr Phase1



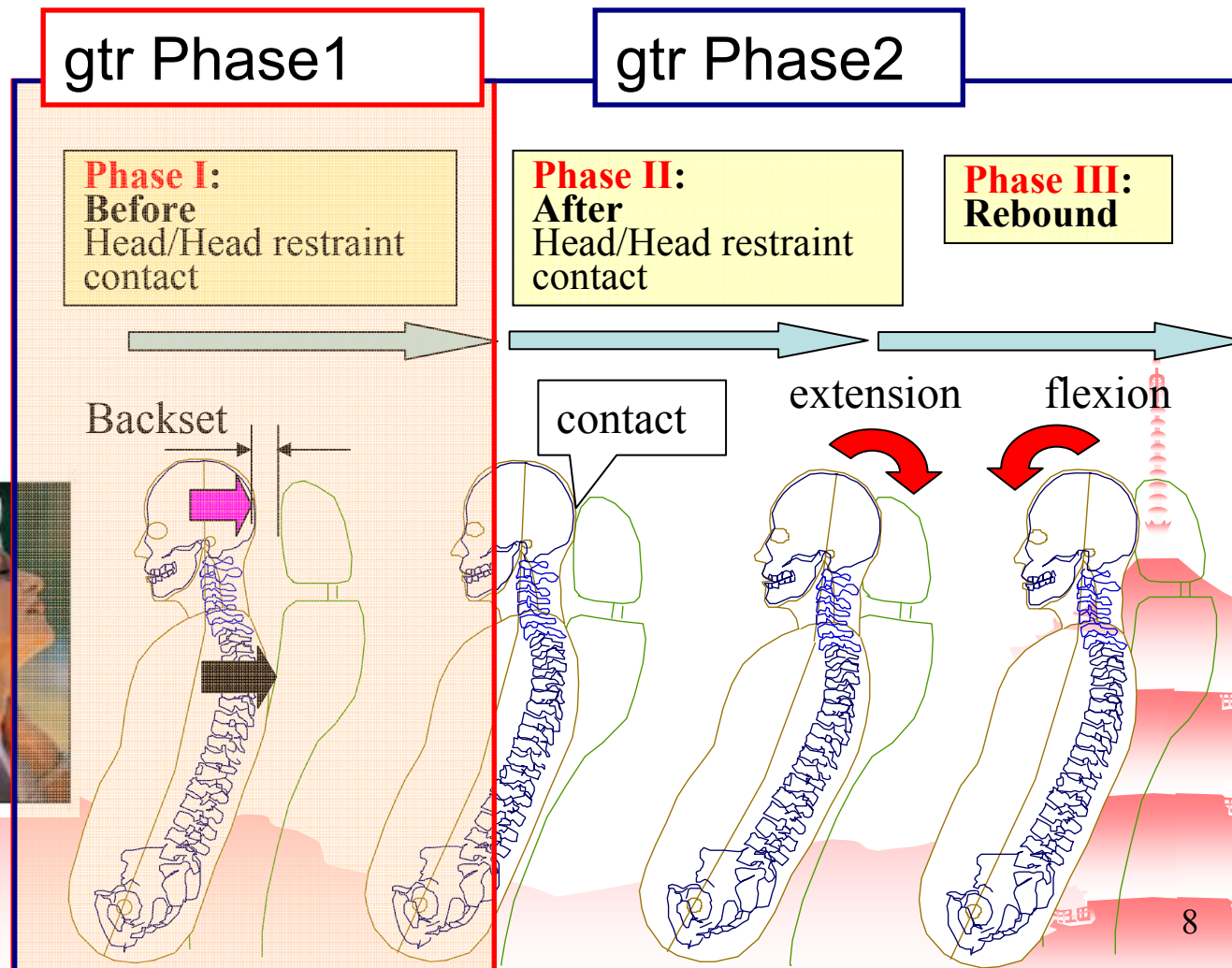
gtr Phase2 (step1)



Phase 2 covers all injuries. Step 1 addresses this in advance.

- Phase 1: Represent mainly initial Head/Neck/Torso's motion
- Phase 2: Represent all minor neck injury phenomenon

Minor neck injury phenomenon



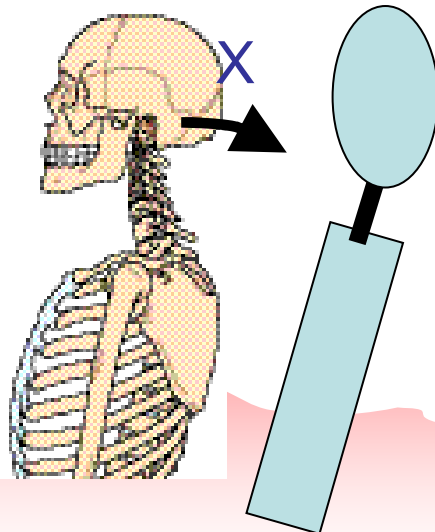
Condition of Dynamic Test for gtr phase 1 & phase 2

Phase 2 uses injury indicators for evaluation. Step 1 addresses this in advance.

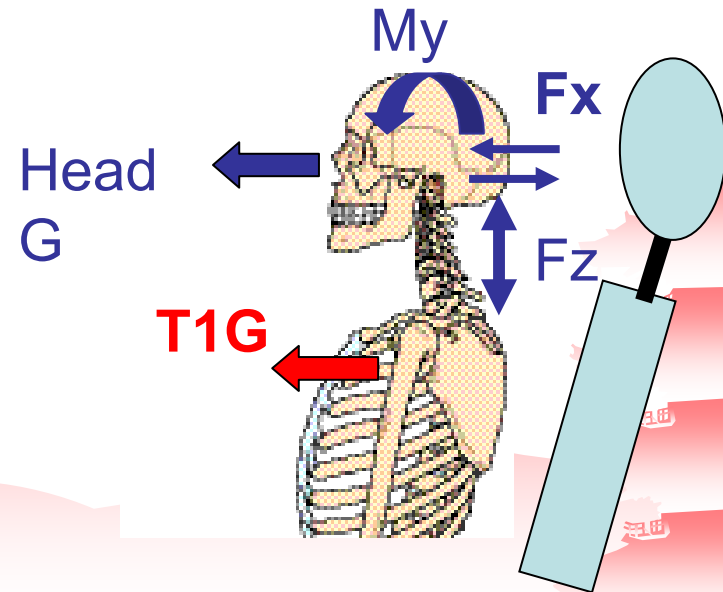
Phase 1: Hybrid III max. rearward displacement angle: $\leq 12^\circ$, HIC15 ≤ 500

Phase 2 : Bio RID II dummy NIC, Upper & Lower Fx, Fz, My

Phase 1
Rearward inclination
angle, HIC

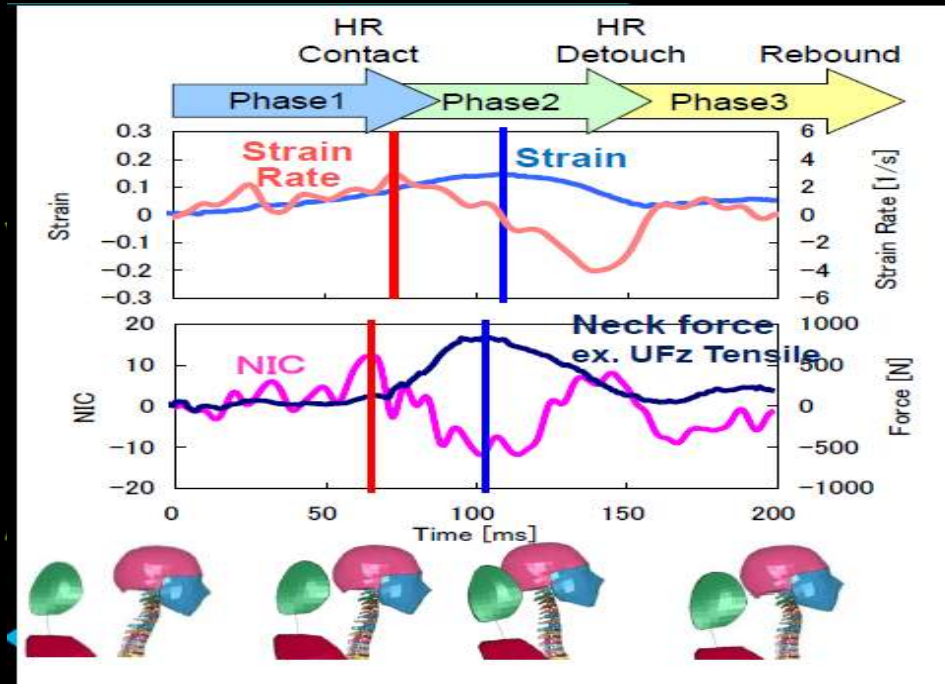


Phase 2
NIC, Upper & Lower Fx, Fz, My



Selection of Neck Injury Evaluation Parameters

Neck Force	Upper	Fx	Forward
			Backward
		Fz	Tensile
		Compression	
		My	Extension
			Flexion
Lower	Fx	Forward	
		Backward	
	Fz	Tensile	
		Compression	
	My	Extension	
		Flexion	
NIC			
T1G			
Nkm			
LNL			
Rebound V			
OC-T1 disp			
Head-Chest rot. ang.			



- ← T1 G is involved in NIC

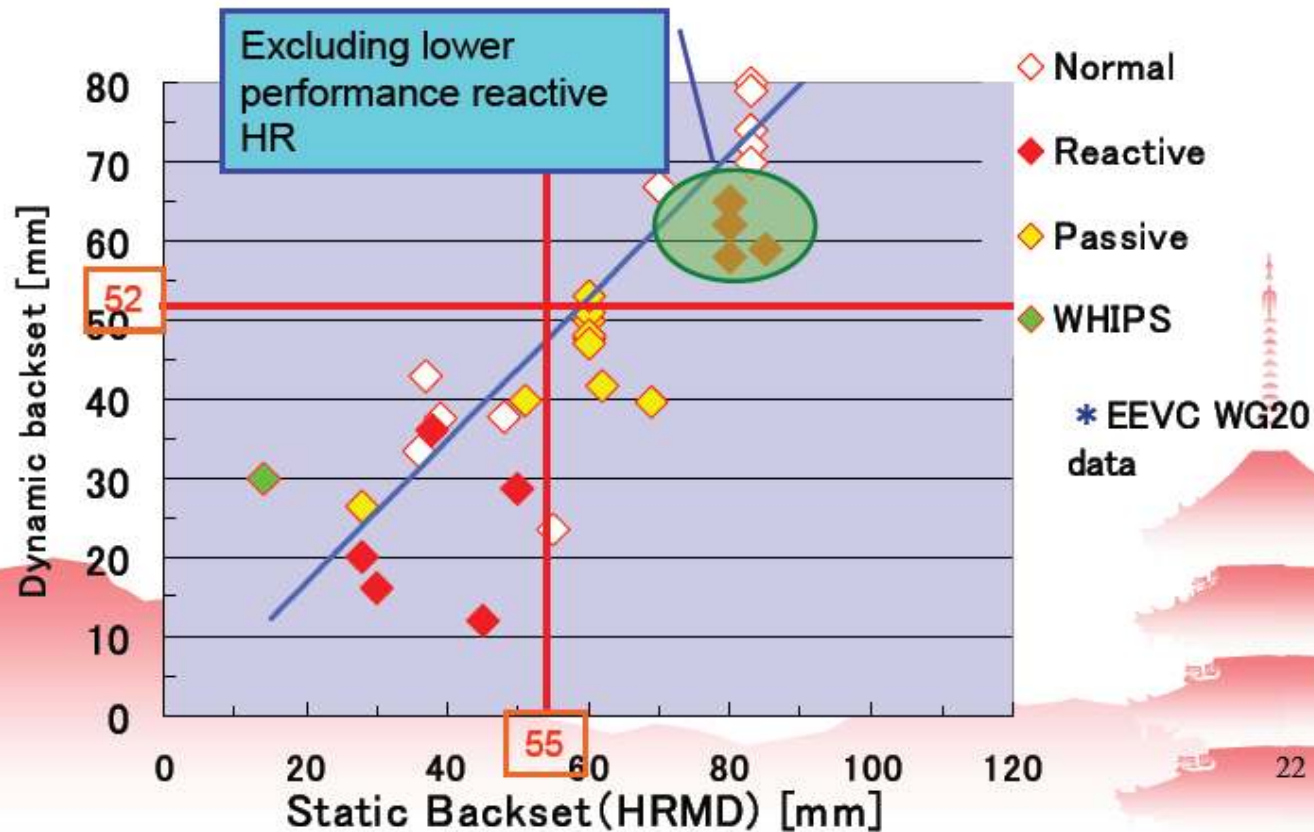
$$NIC = 0.2 a_{rel} + v_{rel}^2$$
 - ← Relative Acc. (Head, T1)
 - ← Relative Vel. (Head, T1)
- ← OC-T1 is displacement and substitute for Lower Fz
- ← Head-Chest rot. ang. is angular displacement and substitute for Lower My

ECE R17-09 amendment proposal (GRSP-44-12)

Informal document No.GRSP-44-24
(44th GRSP, 10-12 Dec 2008,
agenda item 12b))

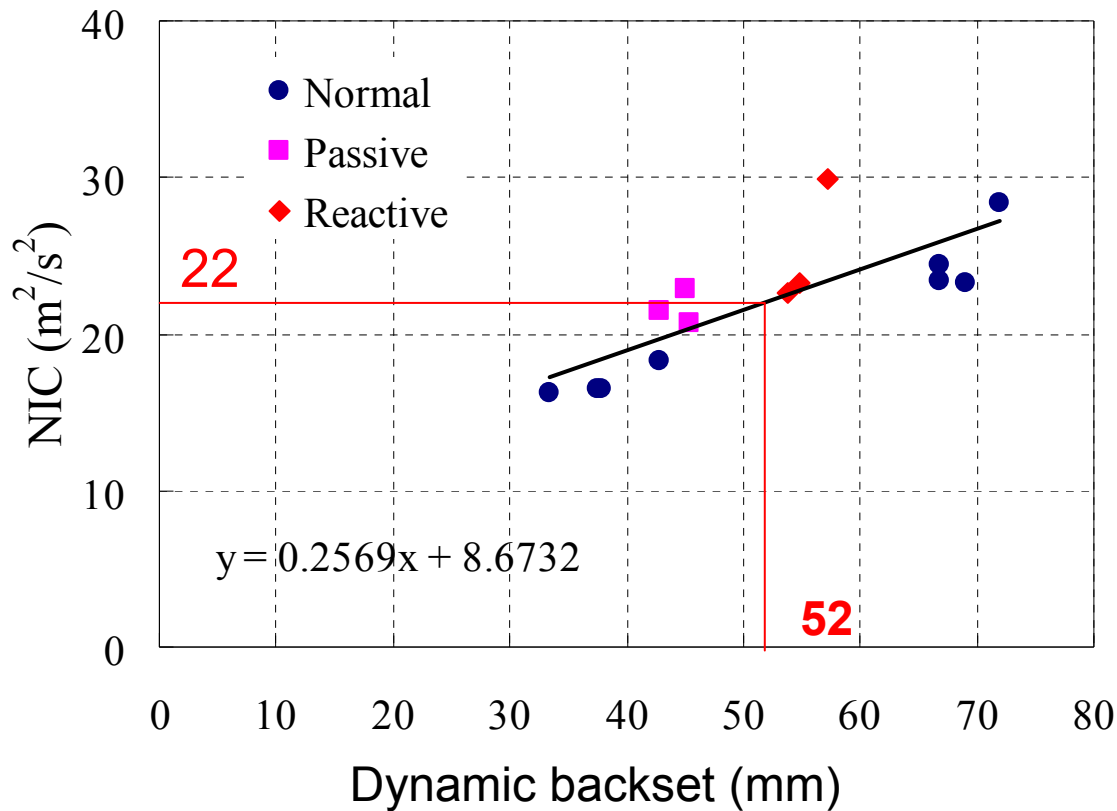
Effect of this proposed Threshold

This proposed threshold could be excluding lower performance reactive type head restraints.



Proposal for evaluation standards for Phase 2 (Step 1)

Dynamic backset in GTR-Phase1 evaluates injuries of whiplash mechanism Phase 1 (up to head contact). The evaluation indicators currently being proposed correspond to NIC. The NIC value that corresponds to the proposed standard (52 mm) of dynamic backset in GRSP-44-24 is 22.

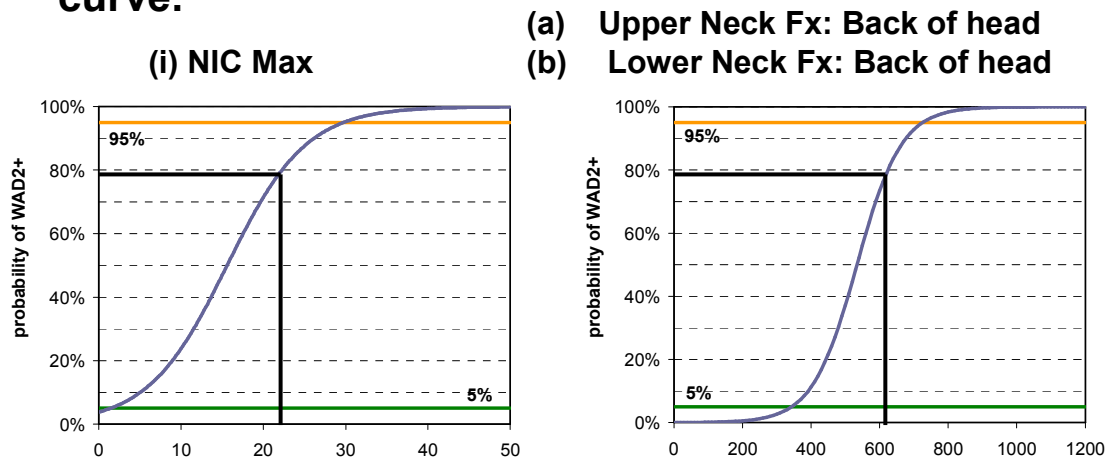


Proposal for evaluation standards for Phase 2 (Step 1)

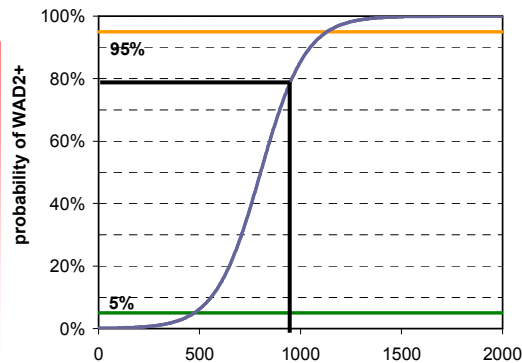
NIC=22 corresponds to 79.2% of WAD2 + injury risk curve.

Other indicators are also calculated to be equivalent to 79.2% of WAD2 + injury risk curve.

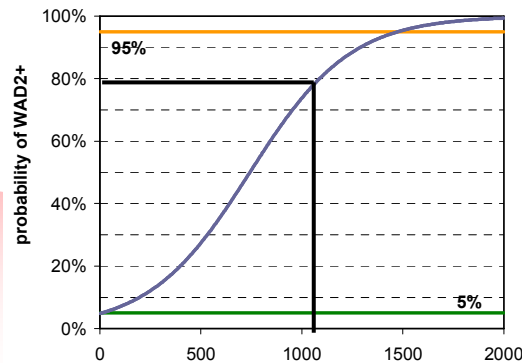
	WAD2 ⁺ =79.2% Value
NIC	22
UpperFx	620
UpperFz	950
UpperMy(Flx.)	32
UpperMy(Ext.)	32
LowerFx	620
LowerFz	1075
LowerMy(Flx.)	32
LowerMy(Ext.)	32



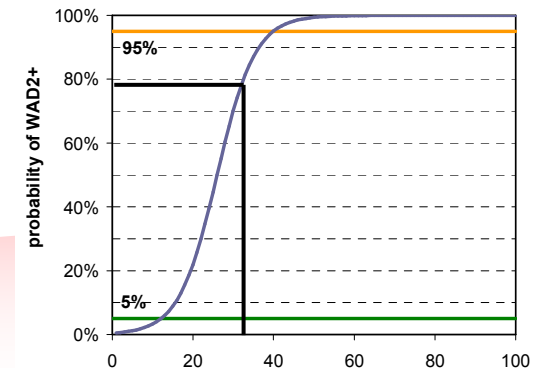
(c) Upper Neck Fz: Tension



(d) Lower Neck Fz: Tension



**(e) Upper Neck My: Bending
(f) Lower Neck My: Bending
(g) Upper Neck My: Extension
(h) Lower Neck My: Extension**



Head restraint gtr phase2 Proposal

Phase3 : for common single dynamic requirement

gtr Phase2(step1)

Static

H-point with Backset $\leq 55\text{mm}$

R-point with Backset $\leq 45\text{mm}$

OR*

Dynamic test requirement

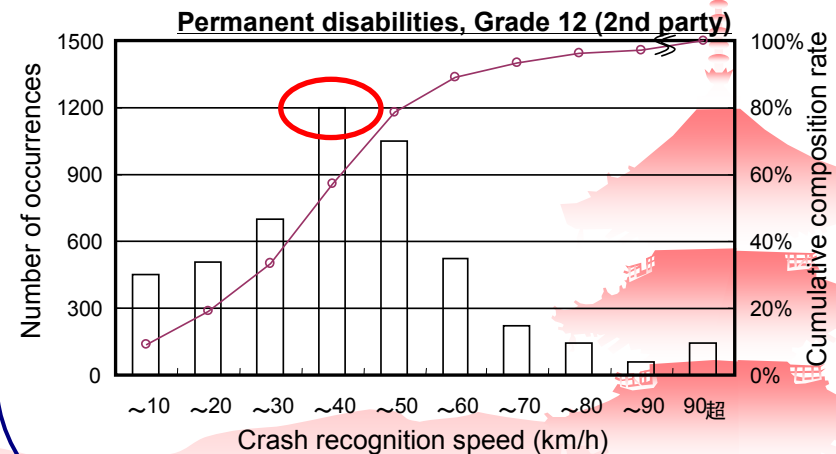
BioRID II injury evaluation parameters.



gtr Phase2(step2)

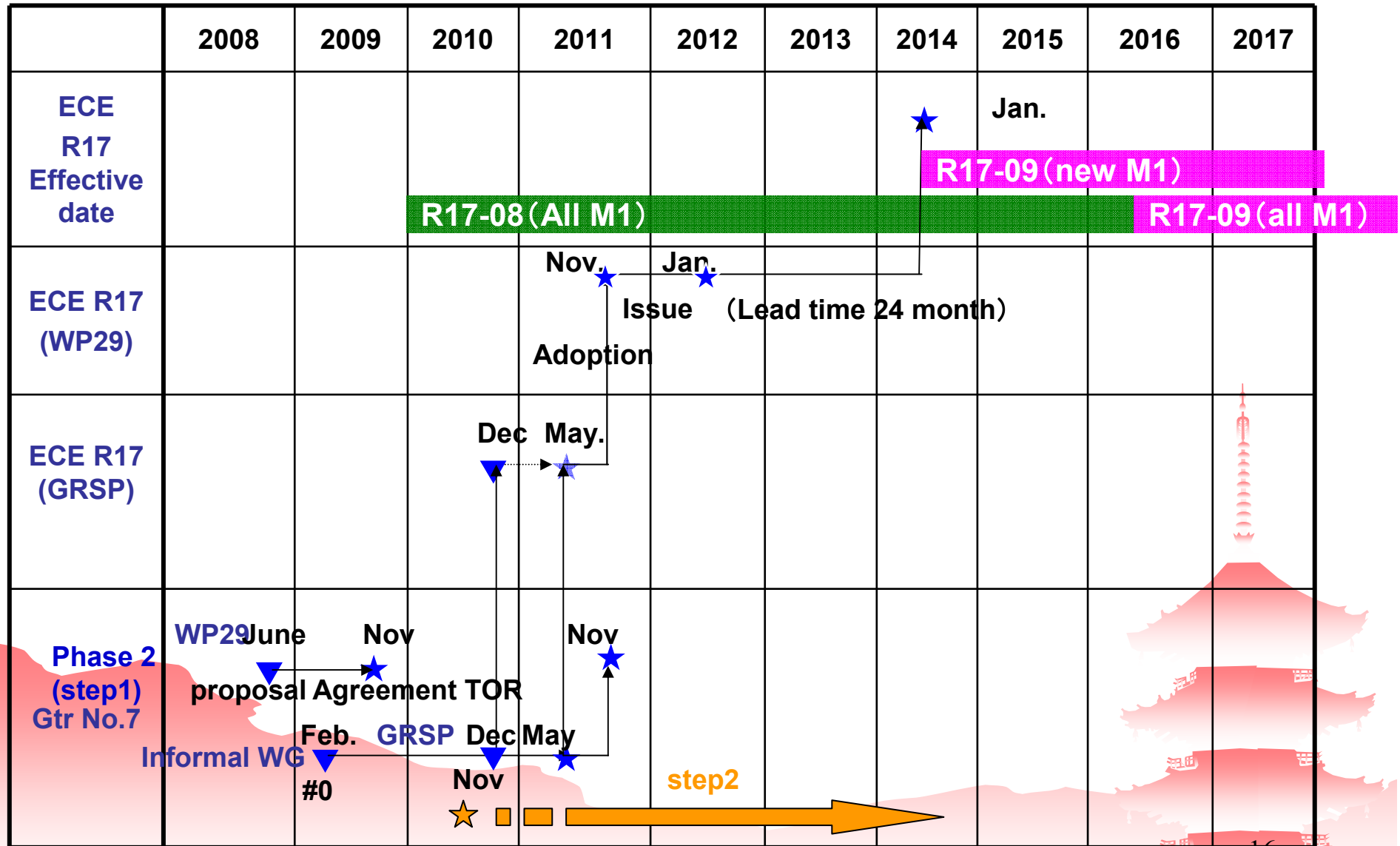
Dynamic test requirement

BioRID II injury evaluation for long term injury.



*: Manufacture's choice

Schedule plan Head restraint gtr Phase2 (step1 & 2)

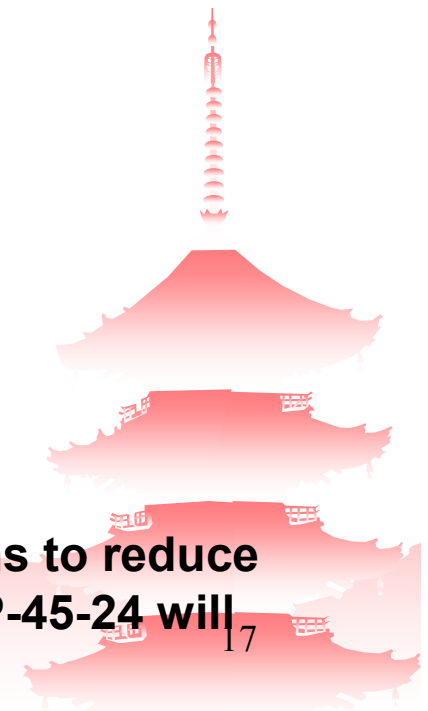


SUMMARY

- ◆ Based on the agreement at #47 GRSP, gtr Phase 2 (Step 1) and ECE R17-09 proposals will be integrated and gtr Phase 2 (Step 1) will have requirements that are equivalent to Phase 1 or below:
 - Static backset evaluation or Bio RID II dynamic evaluation to be selected by manufacturers
 - In dynamic evaluation, triangular pulse at $\Delta V=16$ km/h and the following evaluation indicators and threshold values will be used:

NIC	$\leq [22]$
UpperFx	$\leq [620]$
UpperFz	$\leq [950]$
UpperMy(Flx.)	$\leq [32]$
UpperMy(Ext.)	$\leq [32]$
LowerFx	$\leq [620]$
LowerFz	$\leq [1075]$
LowerMy(Flx.)	$\leq [32]$
LowerMy(Ext.)	$\leq [32]$

- ◆ Establishment of the dynamic evaluation method that aims to reduce long-term injuries (permanent injuries) proposed in GRSP-45-24 will be addressed in gtr Phase 2 (Step 2).



Thank You for your attention

