



Evaluation of the side impact test procedure proposed by IHRA/SIWG

SP1: Car Accidents

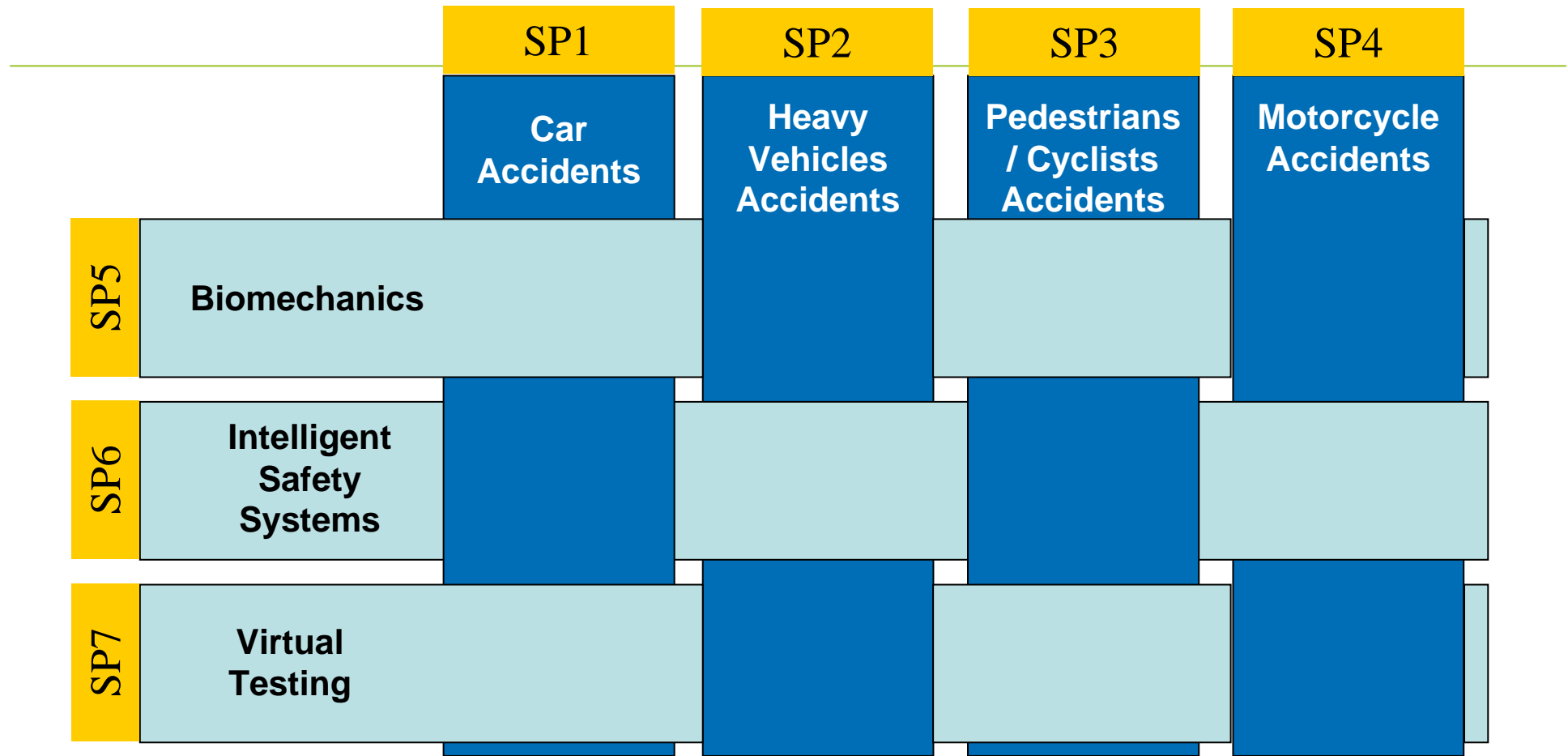
WP1.1: Advanced side impact and compatibility

Task 1.1.4: Side Out of Position

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APROSYS Structure



SP1 Car accidents. 1.1 Lateral impacts IHRA/SIWG proposed test suite



Side impact tests

- All WP1.1 partners:
- BAST
- CRF
- IDIADA
- Takata-Petri
- Toyota
- TUG
- Cellbond
- FIAT
- INSIA UPM
- TNO
- TRL
- VW

Advanced protection in multi-vehicle lateral crashes

Protection in single crashes involving narrow objects

Improved head protection in lateral impacts

Evaluating risk from deploying side airbags

Side Out of Position. Objectives

- Review appropriateness of and evaluate the IHRA / TWG proposal for Europe.



Side Out of Position Documentation of reference

TWG Report

Recommended Procedures For
Evaluating Occupant Injury Risk
From Deploying Side Airbags

ISO TR 14933





















Road vehicles — Test procedures for
Evaluating occupant interactions with
Deploying side impact airbags



Side Out of Position Target positions.TWG (ISO 14933).

▲ Maybe critical => investigate

● Not Critical => skip

	Seat-mounted	Door-mounted	Roof-rail-mounted
3- year-child 	 ▲  ▲  ●  ●	 ▲  ●  ●  ▲	 ●
6- year-child 	 ▲		 ●
5%- female 	 ●  ●	 ▲  ●	 ▲  ●

Side Out of Position Approach

- Limited evaluation of IHRA protocol:
 - Focus on EU situation.
 - Forward facing: Hybrid-III 3yo, 6yo, SID-IIs.
 - Rearward facing: Hybrid-III 3yo.
 - Only curtain and seat mounted side airbags.
 - Including repeatability & reproducibility.
- Effects of CRS:
 - Fair and good group II&III seats.
 - Seat mounted side airbags and head thorax bags.
 - Forward facing: Hybrid-III 3yo, 6yo.

Side Out of Position Effect of the CRS

- Test laboratories:
 - IDIADA Hybrid III 3y dummy.
 - TNO Hybrid III 6y dummy.
- Test vehicle / airbag:
 - Toyota Corolla / seat mounted airbags.
- Test period:
 - May – July 2005.

Test program

IDIADA

D-1	3yr old	3.3.3.1	Forward facing		no	Hybrid III 3yr	1			Toyota 2	2		
D-2	3yr old	3.3.3.1	Forward facing	Simple (IWH Vario-Kid)	CRS 1	Hybrid III 3yr	1			Toyota 2	2		
D-3	3yr old	3.3.3.1	Forward facing	Contoured (Romer Kid with backrest)	CRS 2	Hybrid III 3yr	1			Toyota 2	2		
E-1	6yr old	3.3.3.5	Forward facing		no	Hybrid III 6yr	1			Toyota 3	3		2
E-2	6yr old	3.3.3.5	Forward facing	Simple booster cushion (Sunny)	CRS 3	Hybrid III 6yr	1			Toyota 3	3		2
E-3	6yr old	3.3.3.5	Forward facing	Simple (IWH Vario-Kid)	CRS 1	Hybrid III 6yr	1			Toyota 3	3		2
E-4	6yr old	3.3.3.5	Forward facing	Contoured (Romer Kid with backrest)	CRS 2	Hybrid III 6yr	1			Toyota 3	3		2
E-5	6yr old	3.3.3.5	Forward facing	Contoured (Romer Kid without backrest)	CRS 4	Hybrid III 6yr	1			Toyota 3	3		2
Total											6	7	10

TNO

Side Out of Position Test specifications

- IHRA SIWG protocol / 3yo/6yo Forward facing.
- CRS installation according to manual.
- CRS OOP positions according “APROSYS workshop”
- Dummy instrumentation:
 - Focussed on draft injury criteria.
 - Head acceleration.
 - Upper/lower neck forces and moments.
 - Chest acceleration.
 - Sternum deflection.

Side Out of Position CRS selection

- All CRS ECR R44 approved.
- Selection based on ADAC results.
- “Good” seat:
 - Römer KID / with & without back rest.
- “Poor” seats:
 - Simple booster (“supermarket”).
 - IWH variokid.

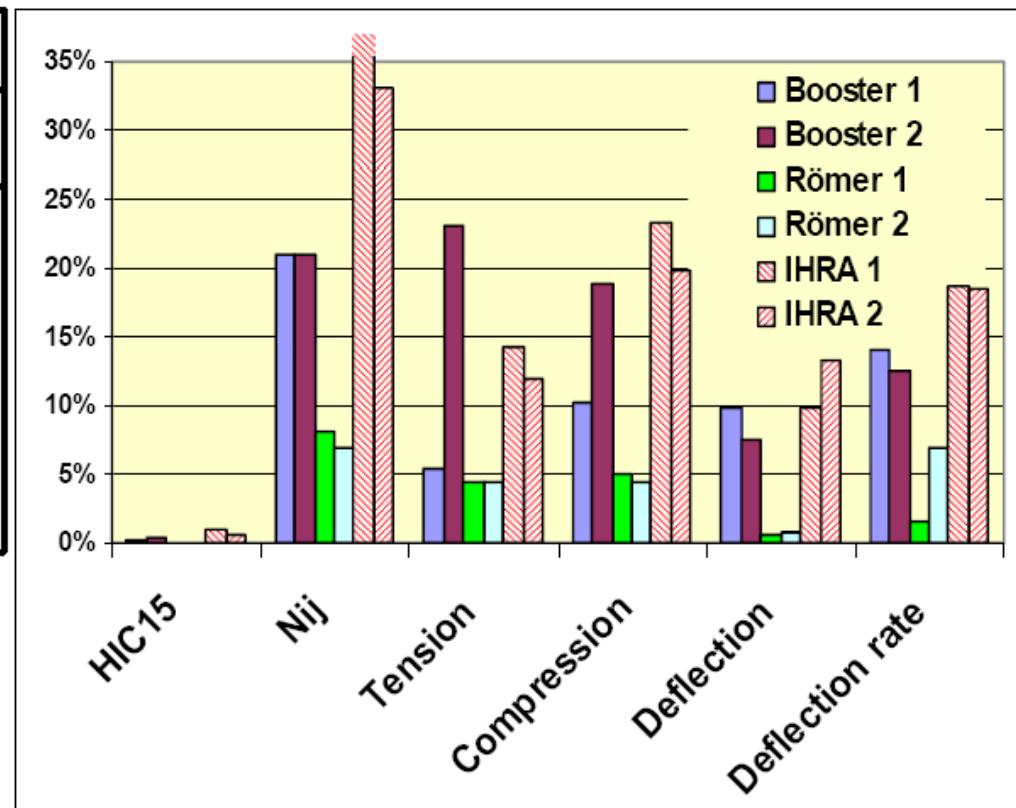


Side Out of Position Test results / Injury criteria limits

Criterion	Unit	HIII 3yo	HIII 6yo
<i>Head</i>			
•HIC 15		570	723
<i>Upper neck</i>			
•Nij		1	1
•Tension force (+Fz)	kN	1.13	1.49
•Compression force (-Fz)	kN	1.38	1.82
<i>Thorax</i>			
•Sternum deflection	mm	36	40
•Deflection rate	m/s	8	8.5

Side Out of Position Test results / Hybrid III 3yo

		052808GI	052809GI	052810GI	052902GI
		Booster 1	Booster 2	Römer 1	Römer 2
HIC15	570	1.46	2.24	0.18	0.17
Nij	1	0.21	0.21	0.08	0.07
Tension	1.13	0.06	0.26	0.05	0.05
Compression	1.38	0.14	0.26	0.07	0.06
Deflection	36	3.5	2.7	0.22	0.25
Deflection rate	8	1.12	1	0.13	0.56

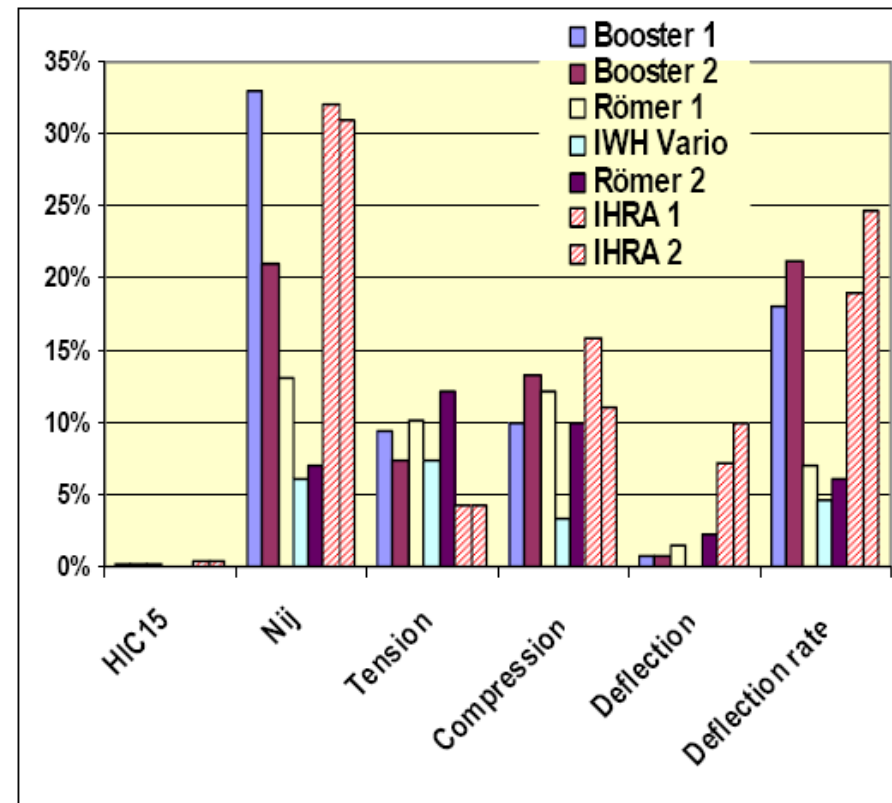


Test results / Hybrid III 6yo

No backrest

with backrest

		CL052601	CL052602	CL052603	CL052604	CL052605
		Booster 1	Booster 2	Römer 1	IWH Vario	Römer 2
HIC15	723	1.6	1.7	0.9	0.3	0.4
Nij	1	0.33	0.21	0.13	0.06	0.07
Tension	1.49	0.14	0.11	0.15	0.11	0.18
Compression	1.82	0.18	0.24	0.22	0.06	0.18
Deflection	40	0.3	0.3	0.6	0	0.9
Deflection rate	8.5	1.54	1.80	0.66	0.39	0.52



Side Out of Position Test results / Hybrid III 3yo



Side Out of Position Test results / Hybrid III 3yo



Side Out of Position Test results / Hybrid III 6yo



Side Out of Position Test CRS conclusions

- No serious airbag interaction (loading < 15%) between airbag and child in CRS.
- Most injury values lower than “standard” IHRA scenarios.
- Neck tension force higher with CRS but still very low <10%.
- OOP in case of use of group I CRS not an issue, results with booster comparable with “standard” IHRA.
- No significant difference between “good” and “poor” CRS.

Side Out of Position Main findings



- IHRA/TWG reproducibility very difficult, repeatability is possible.
- TWG interpretation needs clarification (a.o. seat foremost/rearmost position).
- Tests with CRS show that to cover the EU situation, the TWG proposal covers the worst case situation.
- From accident studies: side OOP is not (yet?) an issue in Europe.
- Any new tendency to (re)introduction of door mounted airbags in Europe should carefully be monitored because of the potential higher injury risk in case of out-of-position.

THANKS FOR YOUR ATTENTION!!!