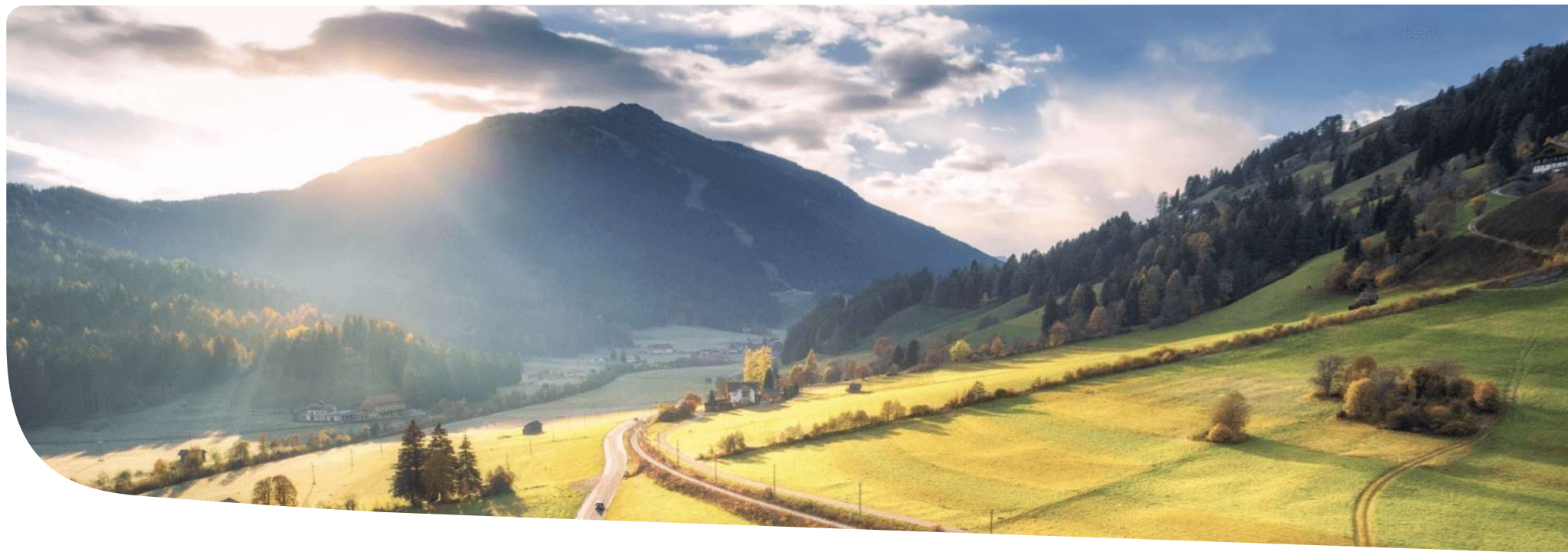


DEOP – Whiplash for females

INES LEVALLOIS – R&D SAFETY & REGULATIONS

September 22nd, 2022

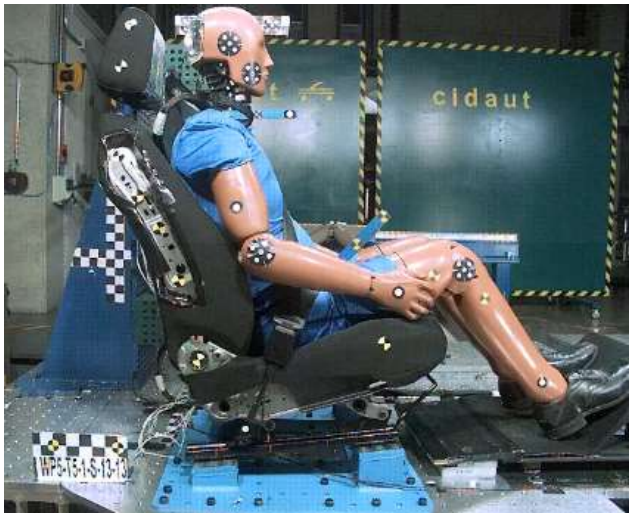


DEOP - WHIPLASH improvements

Effect of whiplash improvements for 50th male and 50th female (ADSEAT project)

Scope of this presentation :

Compare results of dynamic whiplash tests of ADSEAT project realized with a base seat and an improved seat for Biorid 50th male and for an experimental Biorid 50th female (Biorid 50F)



DEOP - WHIPLASH improvements

Effect of whiplash improvements for 50th male and 50th female (ADSEAT project)

Method :

A base seat and an improved seat were both tested in dynamic whiplash test with Biorid (50th male) and experimental Biorid 50F (50th female)

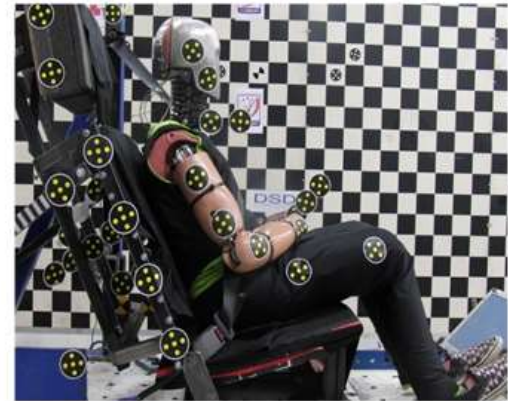
Pulse : 16 km/h IIWPG

Biorid 50F

Experimental BioRid
To represent 50th female

62 kg, adapted from BioRid.
Less vertebrae to represent
50th female height.

This experimental version
Has not yet the mass
distribution of a
50th female as
recommended for
Evarid.

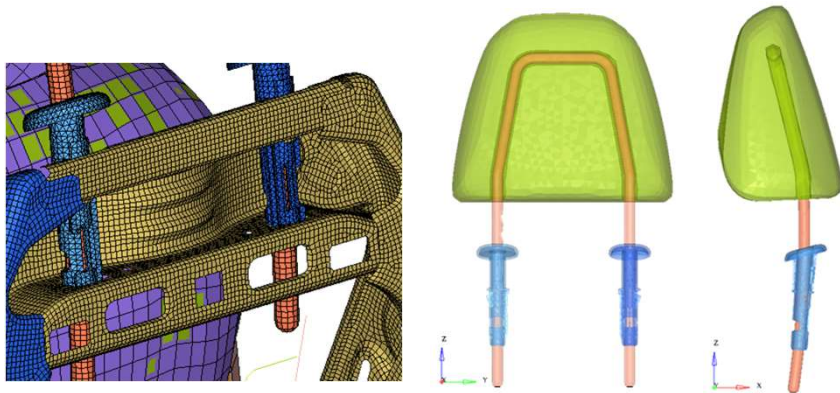


DEOP - WHIPLASH improvements

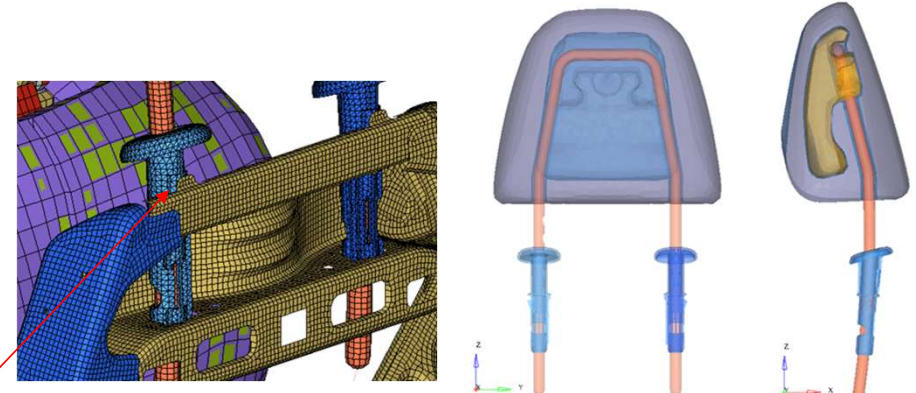
Effect of whiplash improvements for 50th male and 50th female (ADSEAT project)

Description of base seat and improved seat

Seat 1 : Base seat



Seat 2 : Improved seat



Improved seat = Base seat + additional insert in head restraint for 50th male and 50th female + improvement of head restraint fixation (freeplay removed)

DEOP - WHIPLASH improvements

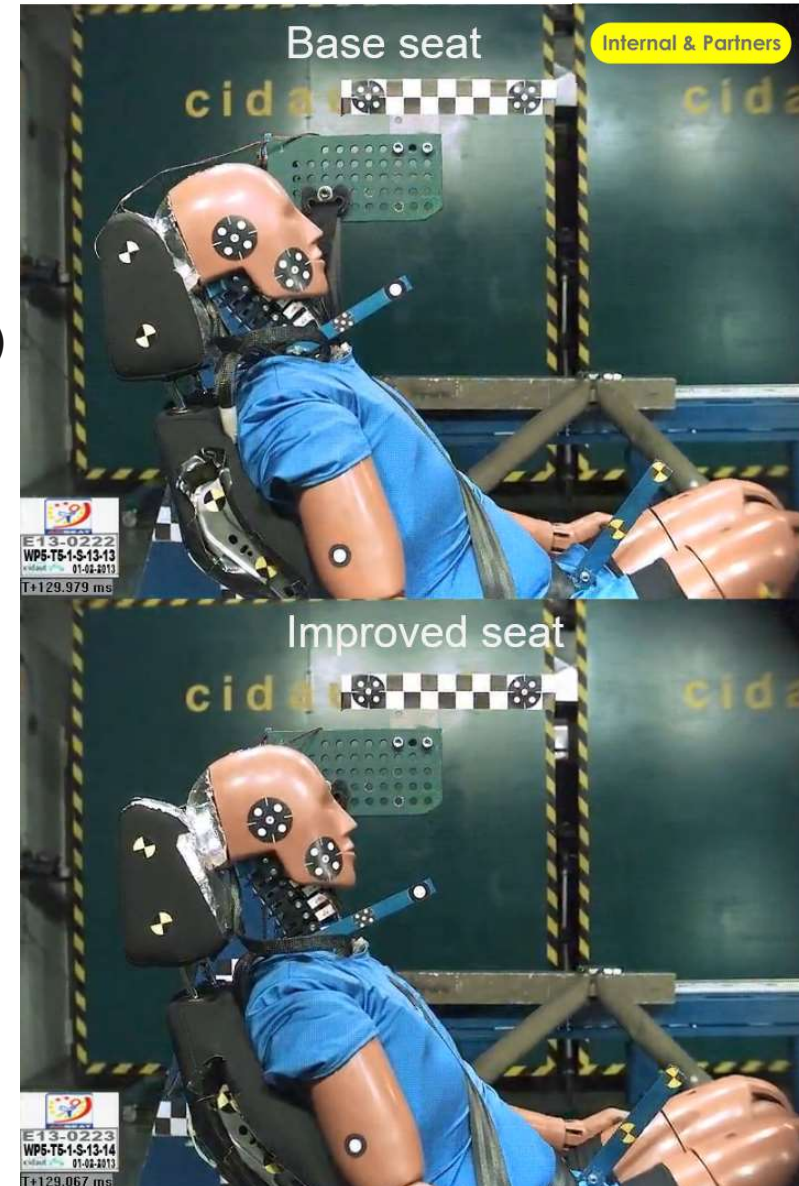
Whiplash for males and females – Extract ADSEAT Project

Results of base and improved seat with Biorid (50th male)

Seat, Head restraint adjustment & Criteria measured following EuroNcap protocol 2012 :

				E13-0222	E13-0223	Test
				Biorid	Biorid	Dummy
				Base	Improved	Seat
IIWPG 16 km/h	lower limit	upper limit	capping	measured result	measured result	Variation in %
NIC (m ² /s ²)	11	24	27	11,7	13,7	17,1%
Nkm	0,15	0,55	0,69	0,85	0,48	-43,5%
Head rebound [m/s]	3,2	4,8	5,2	5,07	4,65	-8,3%
Fx+ upper [F]	30	190	290	289	123	-57,4%
Fz+ upper [F]	360	750	900	617	628	1,8%
THRC [ms]	57	82	92	65	62	-4,6%
T1x[m/s ²]	9,3	13,1	15,6	11,8	12,5	5,9%
EuroNcap score of dynamic test, maxi 3 points				0	1,3	

Significant improvement on shearing force Fx upper + and Nkm (rearward moment My) for Biorid, NIC increased, but values are rather low.



DEOP - WHIPLASH improvements

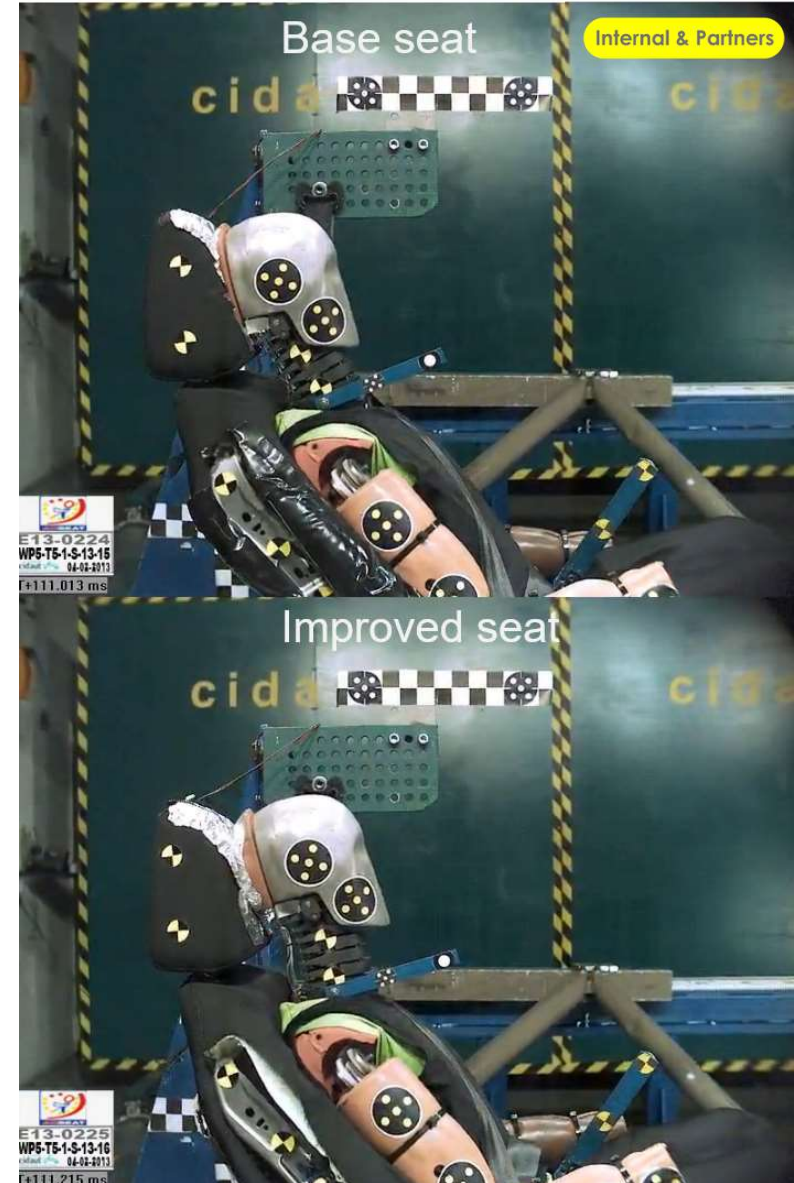
Whiplash for males and females – Extract ADSEAT Project

Results of base and improved seat with Biorid 50F (50th female) : Seat adjustment & Criteria measured following EuroNcap protocol 2012 ,Head restraint adjusted lowest :

Nota : Nkm intercept values used identical to Biorid here.

				E13-0224	E13-0225	Test
				Biorid 50F	Biorid 50F	Dummy
				Base	Improved	Seat
IIWPG 16 km/h	lower limit	upper limit	capping	measured result	measured result	Variation in %
NIC (m ² /s ²)	11	24	27	12,8	14,6	14,1%
Nkm	0,15	0,55	0,69	0,58	0,32	-44,8%
Head rebound [m/s]	3,2	4,8	5,2	5,05	4,13	-18,2%
Fx+ upper [F]	30	190	290	385	264	-31,4%
Fz+ upper [F]	360	750	900	210	232	10,5%
THRC [ms]	57	82	92	65	55	-15,4%
T1x[m/s ²]	9,3	13,1	15,6	9,1	15,5	70,3%
EuroNcap score of dynamic test, maxi 3 points				0	1,85	

Significant improvement on shearing force Fx upper + and Nkm (rearward moment My) for Biorid 50F, too. NIC increased, but values low. Absolute Fx+ upper twice the value of Biorid.



DEOP - WHIPLASH improvements

Effect of whiplash improvements for 50th male and 50th female (ADSEAT project)

Discussion :

Head restraint insert which retains the head in the height of the Biorid and in the height of the Biorid 50F show the same tendency of whiplash improvement for 50th male and 50th female :

Significant decrease of Shearing force : Fx upper+, but absolute shearing force value remains higher for female than for male

The seat back adjustment is identical for Biorid and Biorid 50F in this test. Only the head restraint height is different. But it is expected that females ride with lower seat back angles in the vehicle.

The effect of using lower seat back angles by females has not been assessed and can have further influence to whiplash results for females.