Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Evaluating Child Safety Innovations: Have we got the right tools and the right test methodologies?

Suzanne Tylko, Transport Canada,
Alain Bussières, Amanda Starr, PMG Technologies

Objectives

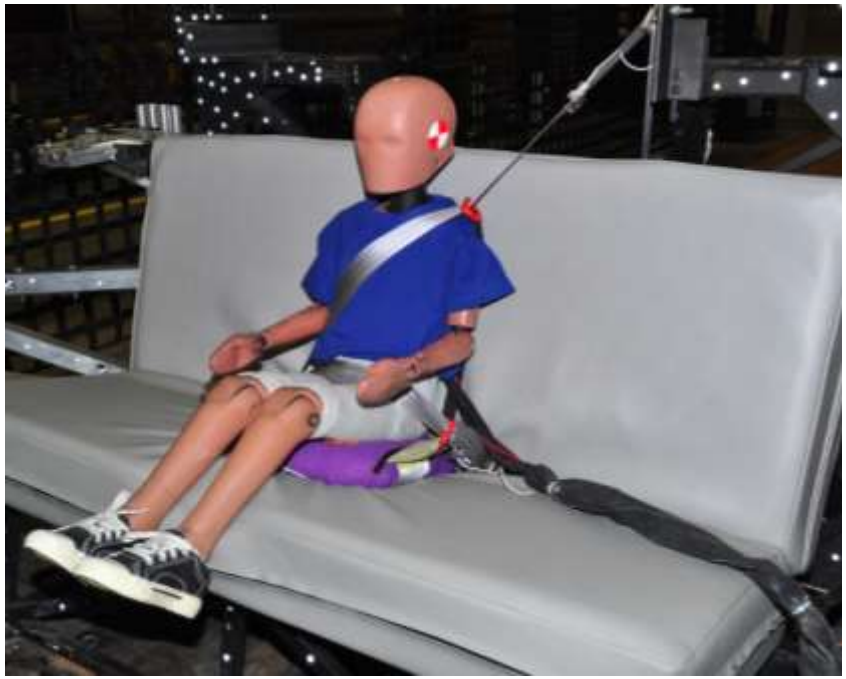
Program

1. Monitor existing regulations and provide the necessary scientific evidence for the development of new or amended regulations;
2. Provide scientific evidence to advance crash test dummy technology.

Objectives of the Study

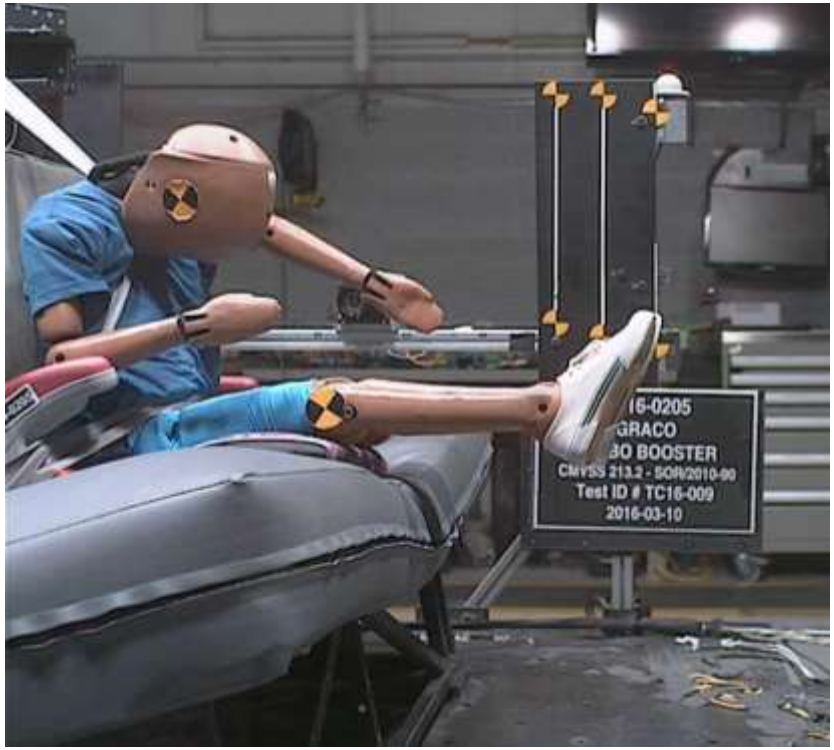
Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

To evaluate whether the capabilities of current child crash test dummy instrumentation and the associated metrics are adequate for the evaluation of booster seat performance.



CMVSS 213.2 Compliance

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)



DIFFERENCES

- No retractor
- Anchor at the rear
- Belt is **locked and pre-loaded**
- Cushion is soft & sticky
- Seat back is unyielding

CRITERIA

- Excursion
- Chest acceleration
- Head acceleration (inertial only)

Conventional Booster Seats

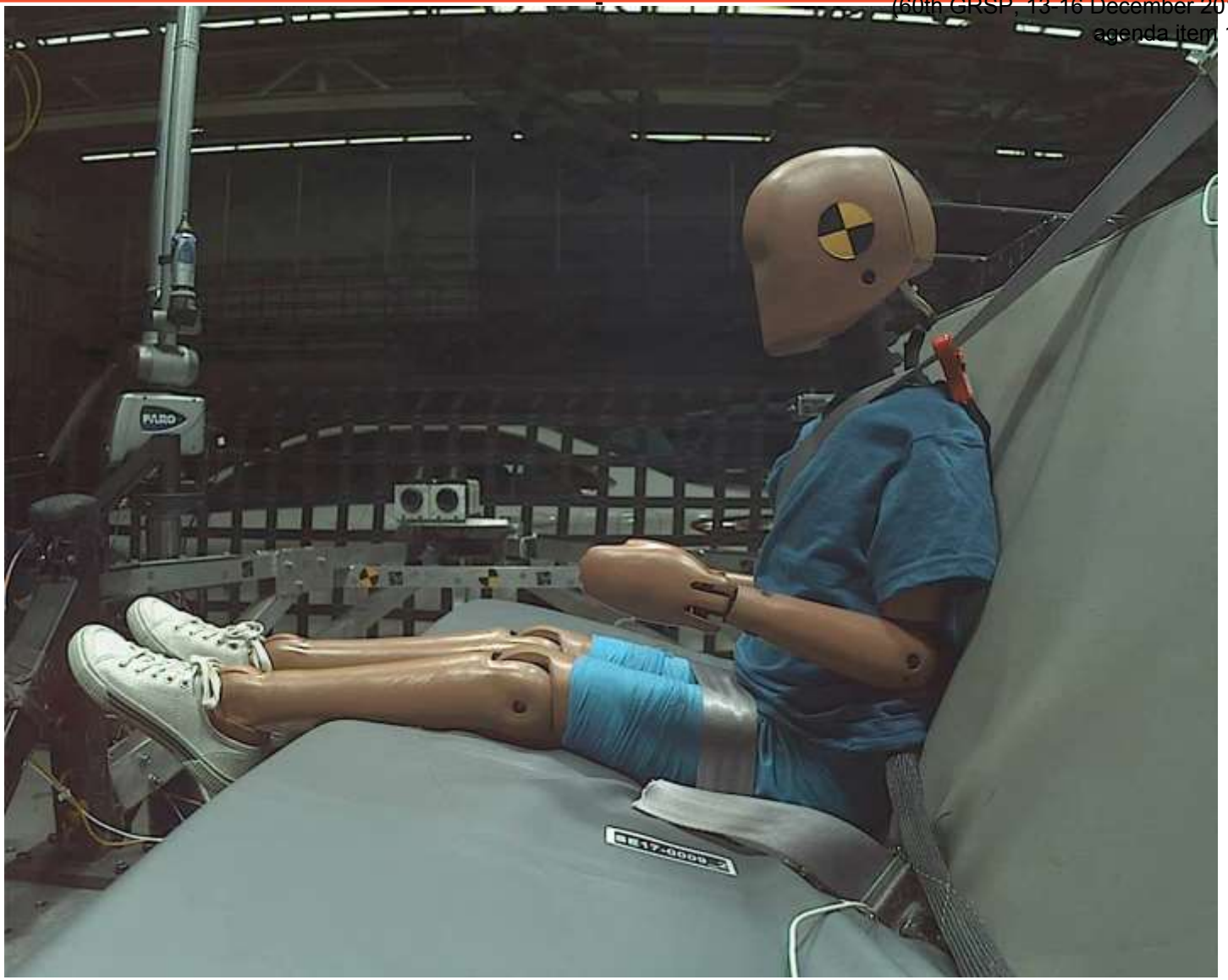
- Moulded elevated base
- Arm rests serve as belt guides
- Move with the occupant

New products

- Foldable
- Inflatable
- Latch-able

CMVSS 213.2 Compliance - Foldable

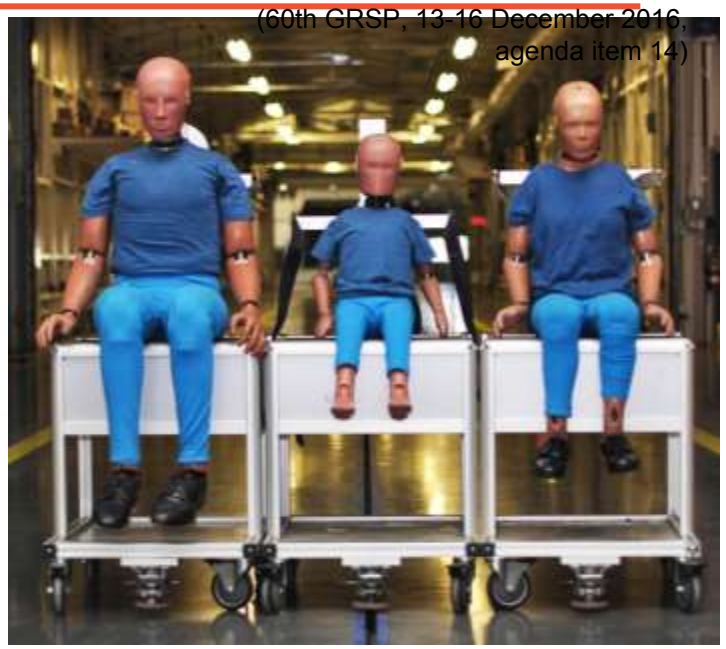
Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

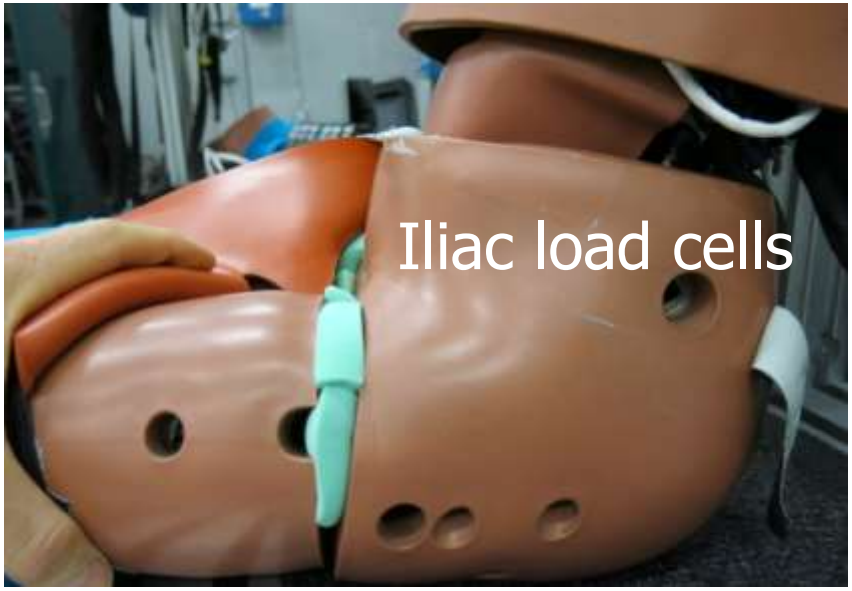


CMVSS 213.2 Compliance - Inflatable

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Dummy Preparation HIII

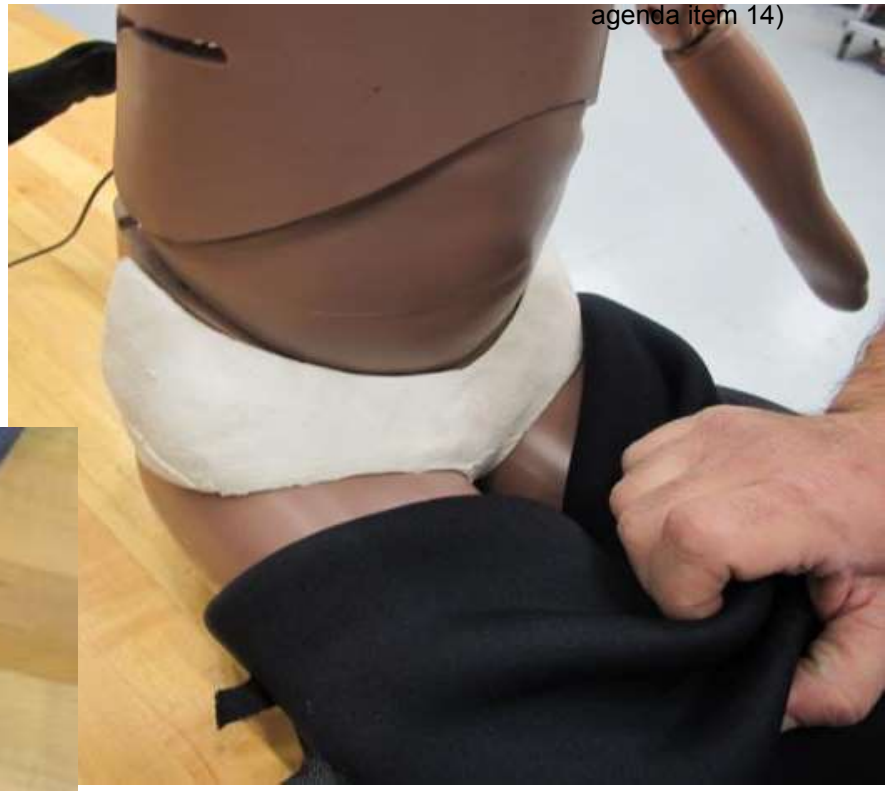




Dummy Preparation Q6

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

APTS



Test Matrix

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

	HIII 6	Q6
FRONTAL BARRIER COMPARISONS		
Foldable	X	X
Inflatable	X	X
Standard/ conventional	X	X
ISOFIX	X	X
No booster vs foldable	X	
FRONTAL OFFSET CAR-to-CAR OBSERVATIONS		
Foldable	X	X
Inflatable	X	X

Q6 vs HIII Foldable

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Frontal Rigid Barrier 48 km/h

HIII standard & Q6 on Foldable

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Q6 Standard & H3 Foldable

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Q6 vs. HIII Standard

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Frontal Rigid Barrier 55 km/h

Q6 vs. HIII Inflatable

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Frontal Rigid Barrier 55 km/h

H3 & Q6 Inflatable

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Q6 vs. HIII Isofix

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Frontal Rigid Barrier 55 km/h

Frontal Rigid Barrier 56 km/h

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Frontal Rigid Barrier Compliance 56 km/h

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Upper pelvis excursion 305 mm

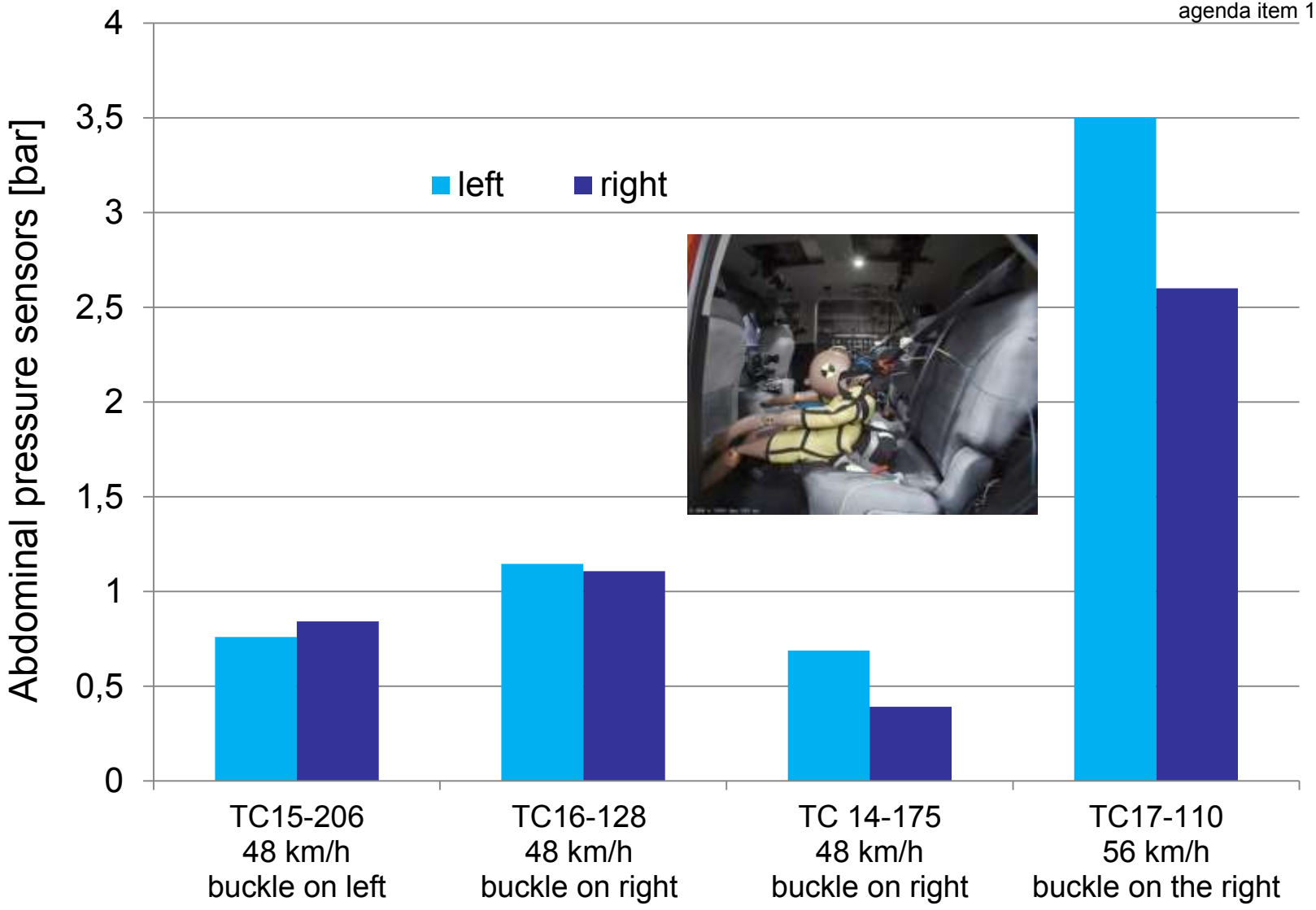
Upper pelvis excursion 138 mm

Injury Metrics

- No single instrumentation based metric that appears helpful in discriminating between good and poor retention;
- Chest deflection misleading;
    - Lowest deflection associated with slippage into the neck or under the belt

Frontal Rigid Barrier Compliance 56 km/h

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)



Frontal Rigid Barrier Compliance 56 km/h

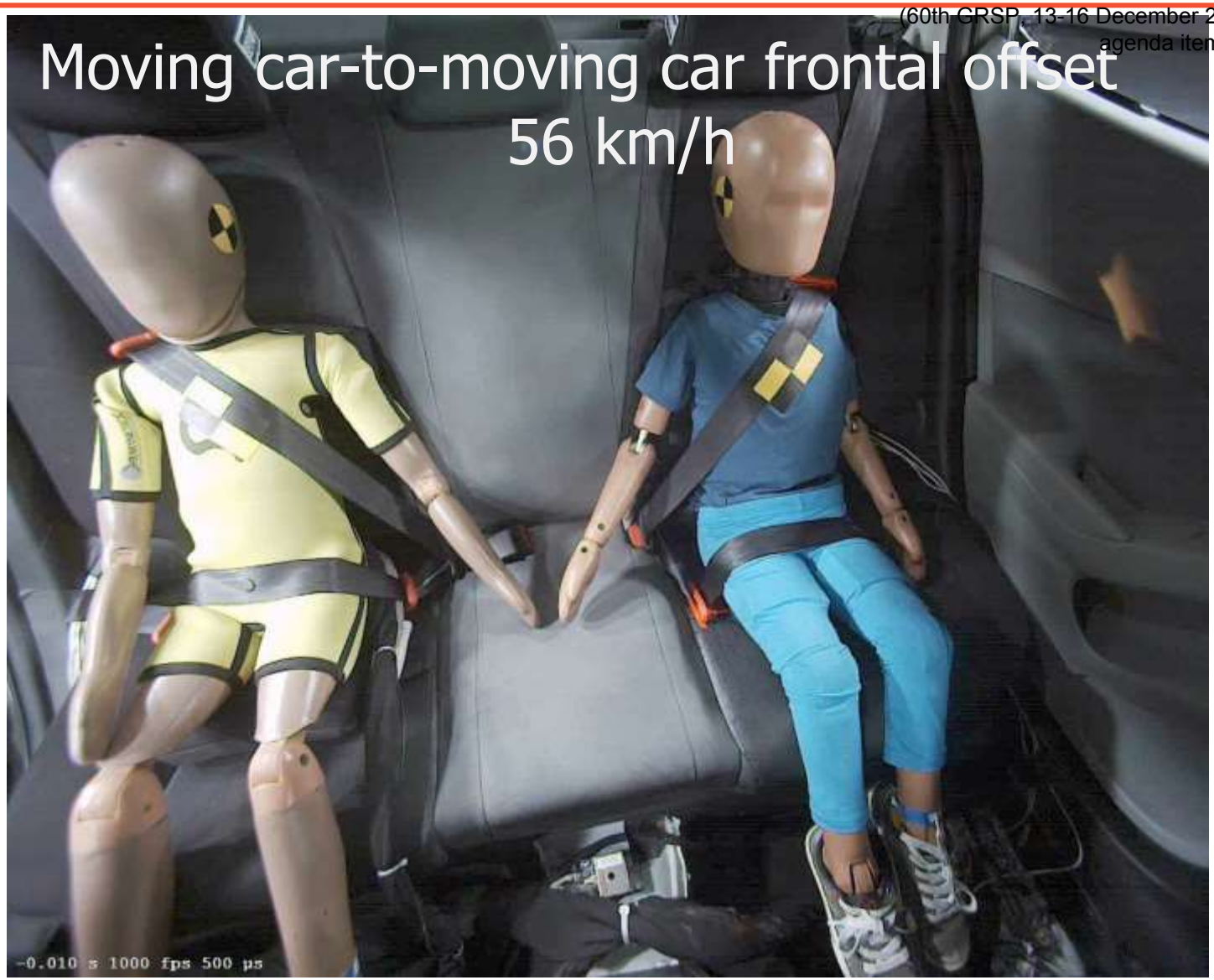
Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

HIII Inflatable

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Q6 on inflatable & H3 Foldable

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)



H3 Foldable

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

H3 Foldable

Informal document GRSP-60-25,
(60th GRSP, 13-16 December 2016,
agenda item 14)

Conclusions

- Movement of the HIII and the Q6 and the interactions with restraints are notably different
- Dummy measures/ traditional injury metrics were not predictive
- Variables worthy of further consideration:
    - frontal excursion
    - Pressure sensors

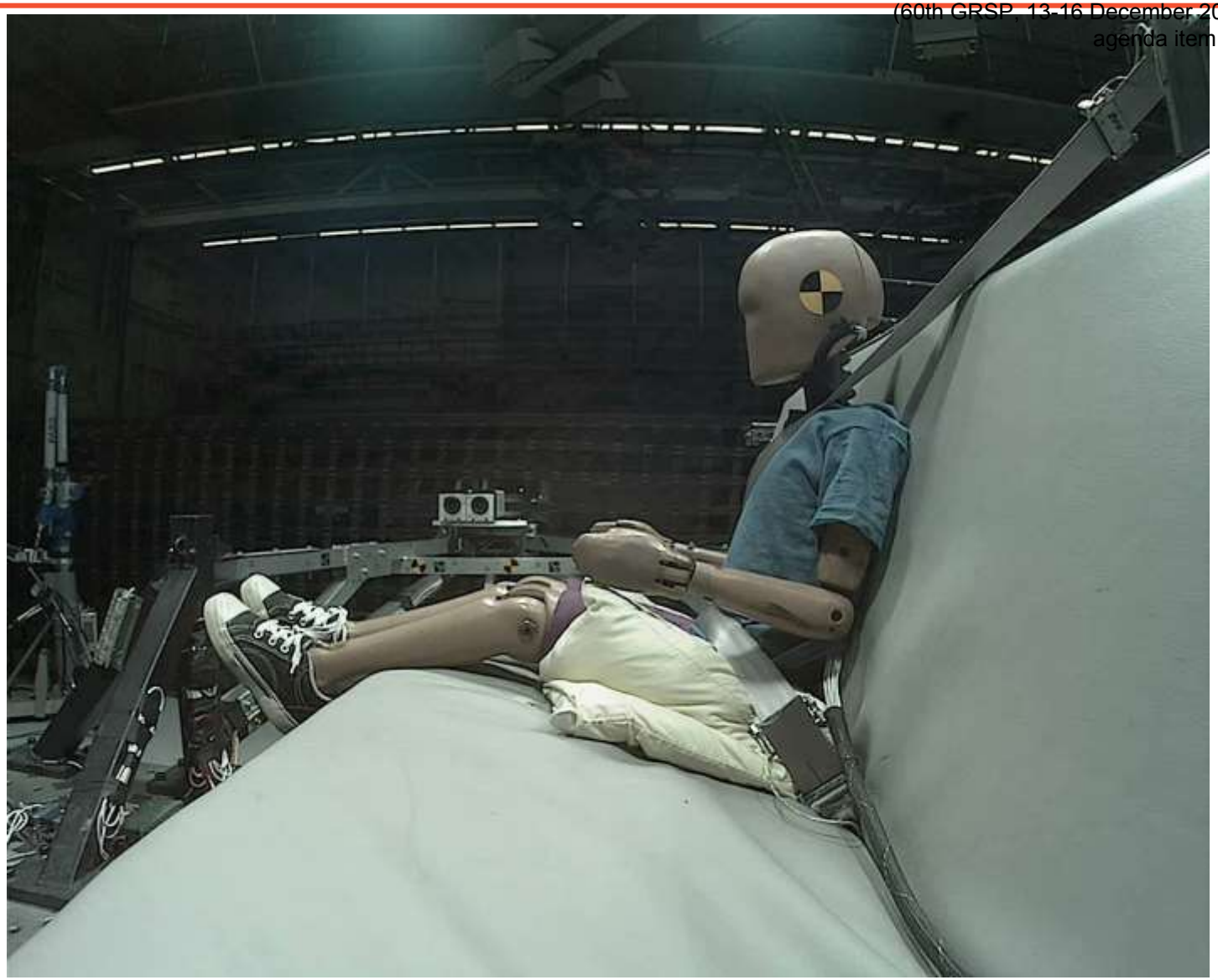
Conclusion

- A harmonized child dummy capable of reproducing human posture and motion in a realistic vehicle environment is needed.
- Test programs should explore alternative test methods
- Reliance on minimum requirements and the associated test methodologies may not be conducive for the development or for the optimization of child safety

Future work

Additional paired comparisons conducted in a vehicle buck at lower impact speeds and regulatory-like tests using the proposed FMVSS 213 sled buck.

Canada Goose- Foldable



ACKNOWLEDGMENTS

The authors would like to thank

Yoann Brunnetière of Dorel (FR) for the loan of the Q6 abdominal shield and

Mark Pitcher of TRL (UK) for the loan of the abdominal pressure sensors.