

Update on Tech neutrality project

Loughborough University Design School (LDS): Design Ergonomics Research Group
[Research funded by The Road Safety Trust](#)

Dr. Steve Summerskill – Senior Lecturer in Industrial design and ergonomics

Dr. Russell Marshall, Dr Abby Paterson, Antony Eland

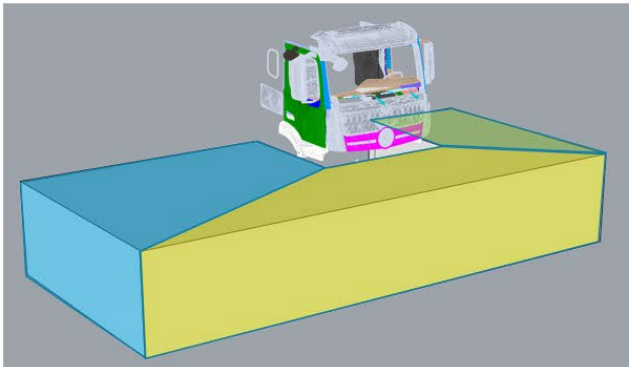
Aims

- To identify a method of **measuring volume to the front and sides of the cab** which is not dependant upon design features of the cab such as inter-a-pillar distance
- To test 3 methods of **subdividing the assessment volume** with a sample of 15 vehicles to determine which method has the correlation between volume score and VRU distance of no less than values used in the previous version (correlation coefficient of ≥ 0.97)

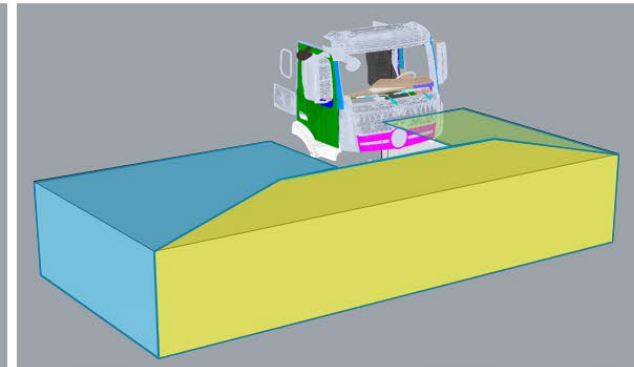
Options currently being analysed using the vehicle sample

Subdivision of the assessment volume to represent areas that should be visible to the front and sides of the cab

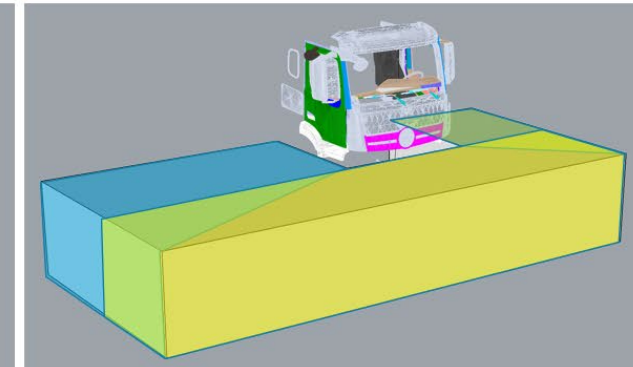
Option 1



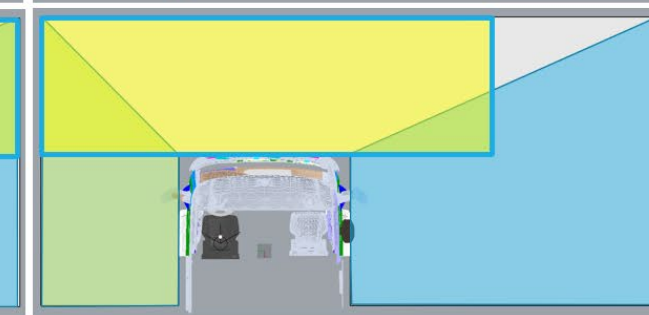
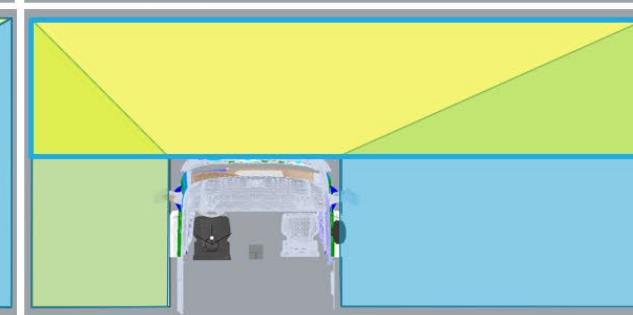
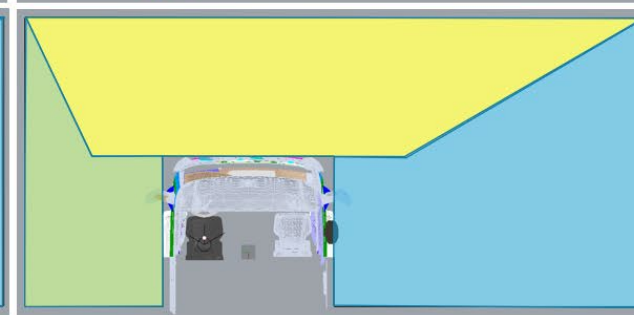
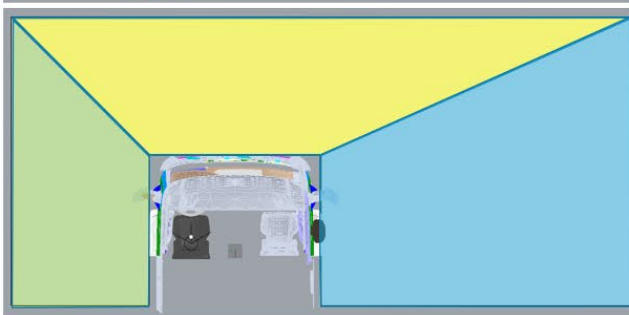
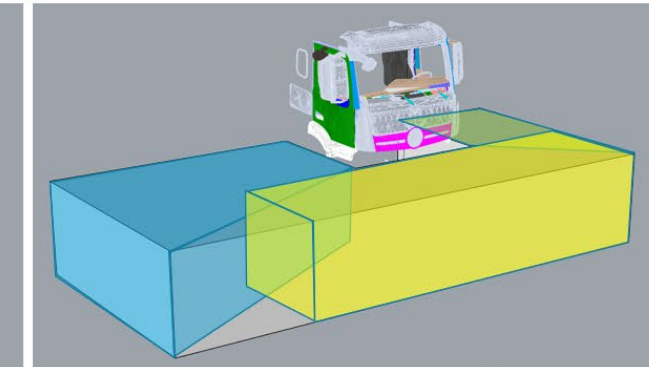
Option 2






Option 3



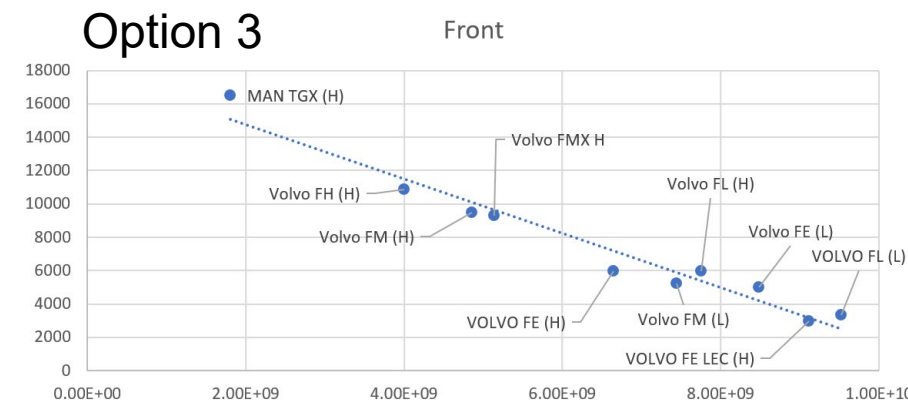
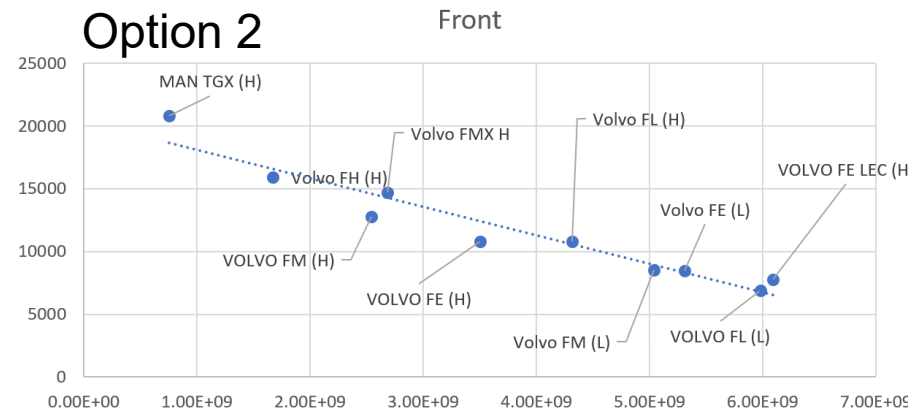
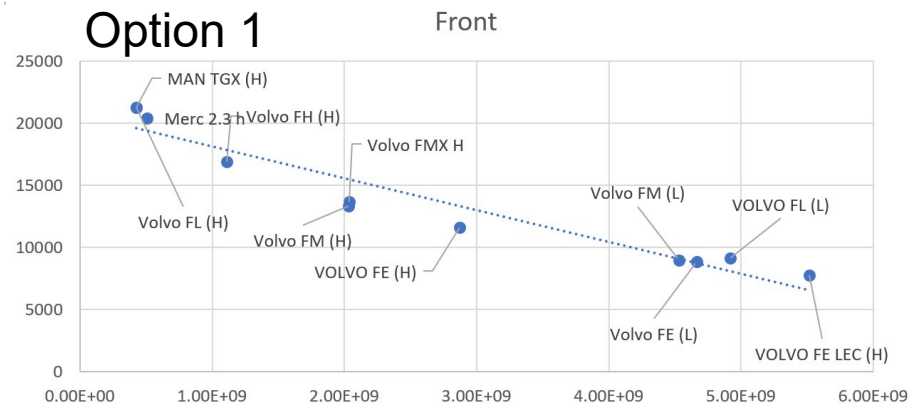
Option 4



-  Vision to the front
-  Vision to the passenger side
-  Vision to the driver's side

Results so far – Front view for Options 1, 2 & 3

- Excellent results for correlation 10 vehicles
- 10 VRU distance values are required and these be completed this week for the sample of 15
- Correlation Coefficients
- Option 1 = -0.947
- Option 2 = -0.961
- Option 3 = -0.978



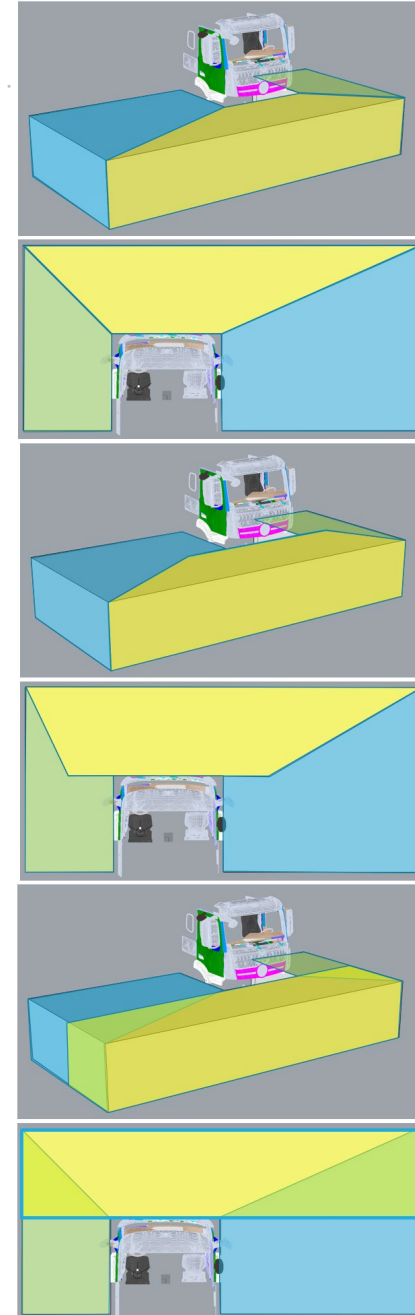
Front		
Merc 2.3 h	5.06E+08	20423.39
VOLVO FE LEC (H)	5.52E+09	7760.61
MAN TGX (H)	4.26E+08	21257.16
Volvo FL (H)	3.32E+09	9551.2
VOLVO FL (L)	4.92E+09	9170
VOLVO FE (H)	2.87E+09	11647.93
Volvo FM (L)	4.53E+09	8995.14
Volvo FMX H	2.04E+09	13663.5
Volvo FM (H)	2.03E+09	13340.35
Volvo FE (L)	4.67E+09	8871.93
Volvo FH (H)	1.11E+09	16895.17
	Correl Pearson	R squared
	-0.947838899	0.898398579

Front – Option 2		
VOLVO FE LEC (H)	6.09E+09	7760.61
Volvo FL (H)	4.31E+09	10787.04
MAN TGX (H)	7.55E+08	20823.9
VOLVO FL (L)	5.98E+09	6869
VOLVO FE (H)	3.51E+09	10787.04
Volvo FM (L)	5.04E+09	8528.14
Volvo FMX H	2.68E+09	14724.11
Volvo FE (L)	5.31E+09	8488.87
VOLVO FM (H)	2.54E+09	12775.1
Volvo FH (H)	1.67E+09	15899.74
	Correl Pearson	R squared
	-0.961370933	0.92423407

Front – Option 3		
VOLVO FE LEC (H)	9.12E+09	2957.61
Volvo FL (H)	7.75E+09	5963
MAN TGX (H)	1.80E+09	16497.75
VOLVO FL (L)	9.52E+09	3358
VOLVO FE (H)	6.65E+09	5963
Volvo FE (L)	8.49E+09	4980.83
Volvo FMX H	5.14E+09	9307.48
Volvo FM (L)	7.44E+09	5245.9
Volvo FM (H)	4.86E+09	9459.57
Volvo FH (H)	4.00E+09	10859
	Correl Pearson	R squared
	-0.97832414	0.957118122

Results so far – Front view for Options 1, 2 & 3

- The results are encouraging for all three methods.
- Currently option 3 has the best correlation
- However, we have identified an issue with option 3 in that it allows VRUs to be visible to the front of the vehicle at a distance of 4.5m to the side of the cab.
- The location of these **VRUs strongly skews the result**, reducing the average VRU distance, and yet we question the value of seeing a VRU at a location 4.5m from the side of the cab, in an urban environment.
- This is why we have proposed the fourth option with agreement from ACEA that it is valuable to explore
- We are now adding data for the fourth option and it appears that the volume/VRU distance correlation is further improved based upon the data added.

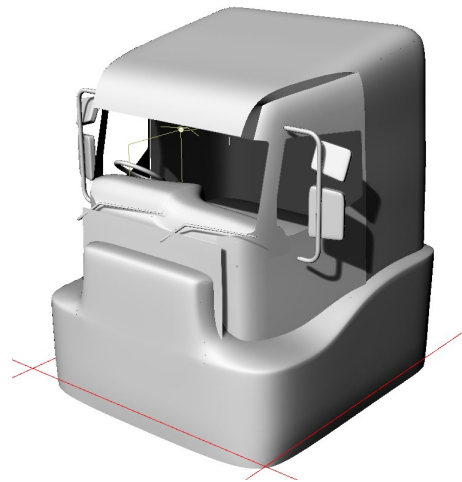


Further tech neutrality exploration

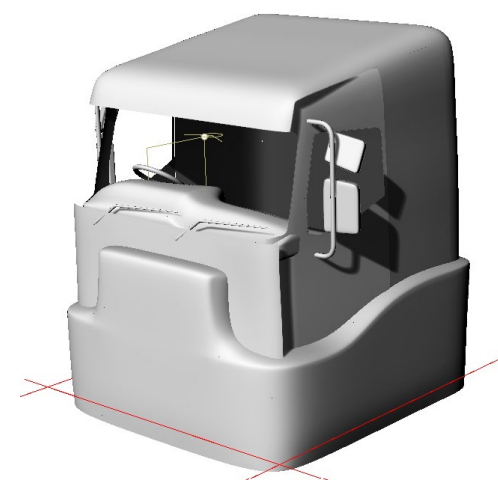
- We have gained further funding from the Road Safety Trust to further explore the design neutrality further at the request of ACEA.
- This involves a sensitivity analysis of the 4 options performed by changing key design variables of the Generic cab design produced by my team
- This will build upon the analysis already performed by ACEA
- As shown by Iain Knight, the ACEA analysis validates the need for the new approach to measuring volume
- The variables to be considered are
 - The location of the A-pillar
 - Change fore aft location of the A-pillar and distance between the A-pillars
 - The level of front end protrusion



Original version



Tapered cab and extended front end



A-pillars forwards/ rearwards

Thanks for your attention

Are there any questions?

Dr Steve Summerskill
s.j.summerskill2@lboro.ac.uk
Loughborough University