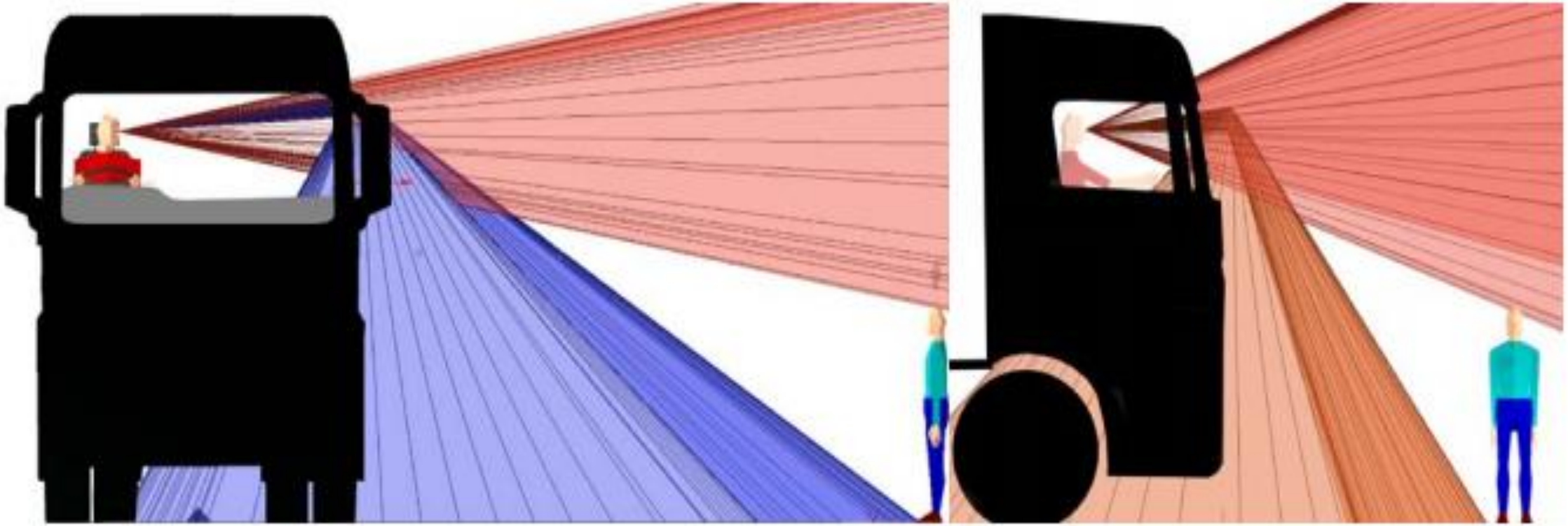


Limit Values: Understanding different positions, exploring common ground & identifying options

Introduction

- Motivation:
  - Many views exist, often seen as conflicting
  - Progress has been contentious and slow
  - Differences are not 'right' or 'wrong' but valid perspectives in a multi-disciplinary problem.
- Aim:
  - Work with Industry and safety stakeholders to understand the differences
  - Identify key technical principles affecting choice of limit value, agree simple, evidenced positions
  - Identify principle-based options, pros and cons with supporting evidence for a well informed choice
  - Focus negotiation of exact limit values on benefit/cost trade-off within an agreed framework
- Status: Work has commenced and aim is to present full agreements, options and supporting evidence at the next VRU-Proxi

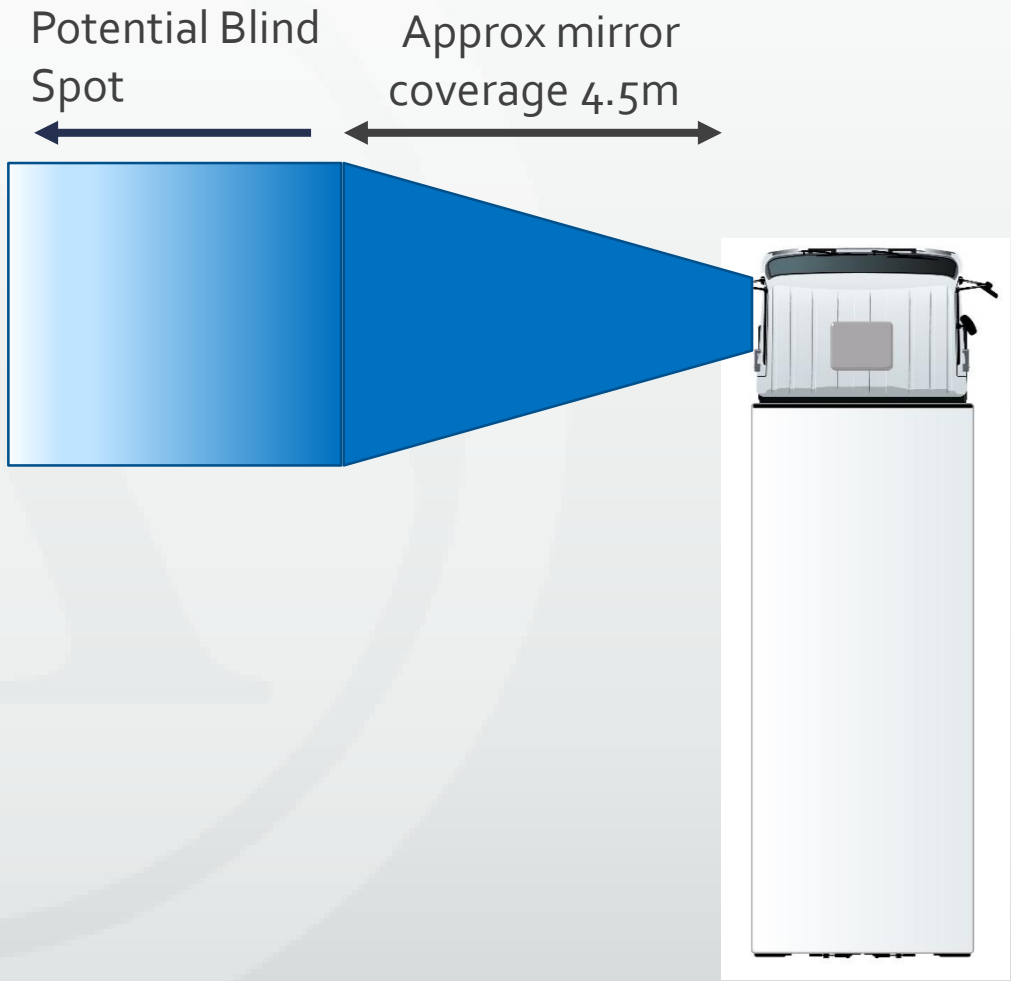
Perspectives of different disciplines

Ergonomics	Collision Investigation & Safety Engineering	Vehicle manufacture
Objective: Design products with characteristics that match performance & limits of human operator. Driving a truck requires hazard identification all around the vehicle. Complete blind spots are a major product failure. Elimination a high priority. Indirect vision is not well matched to human eyesight, object detection & cognitive judgement. 2nd priority is improving areas currently only visible in indirect vision	Objective: Understand how collisions occur and re-engineer vehicles or environments to prevent them. Recognises collisions have multi-factor causes with multiple possible solutions. Removing just one cause can be enough so various single 'solutions' will often help but eliminating the problem usually needs multiple 'solutions' (no 'silver bullets'). Usually pragmatic & 'solution agnostic' – whatever works	Objective: Produce productive, safe, efficient and desirable vehicles as a sustainable business. Will employ ergonomists & collision investigators & safety engineers for a mix of views. Also have to balance with other societal goals in relation to freight economics (productivity), manufacturing economics (profit), environmental impact, other objective safety priorities, perceived safety priorities and comfort of driver (desirable)

Example of the effect on priorities

Ergonomics

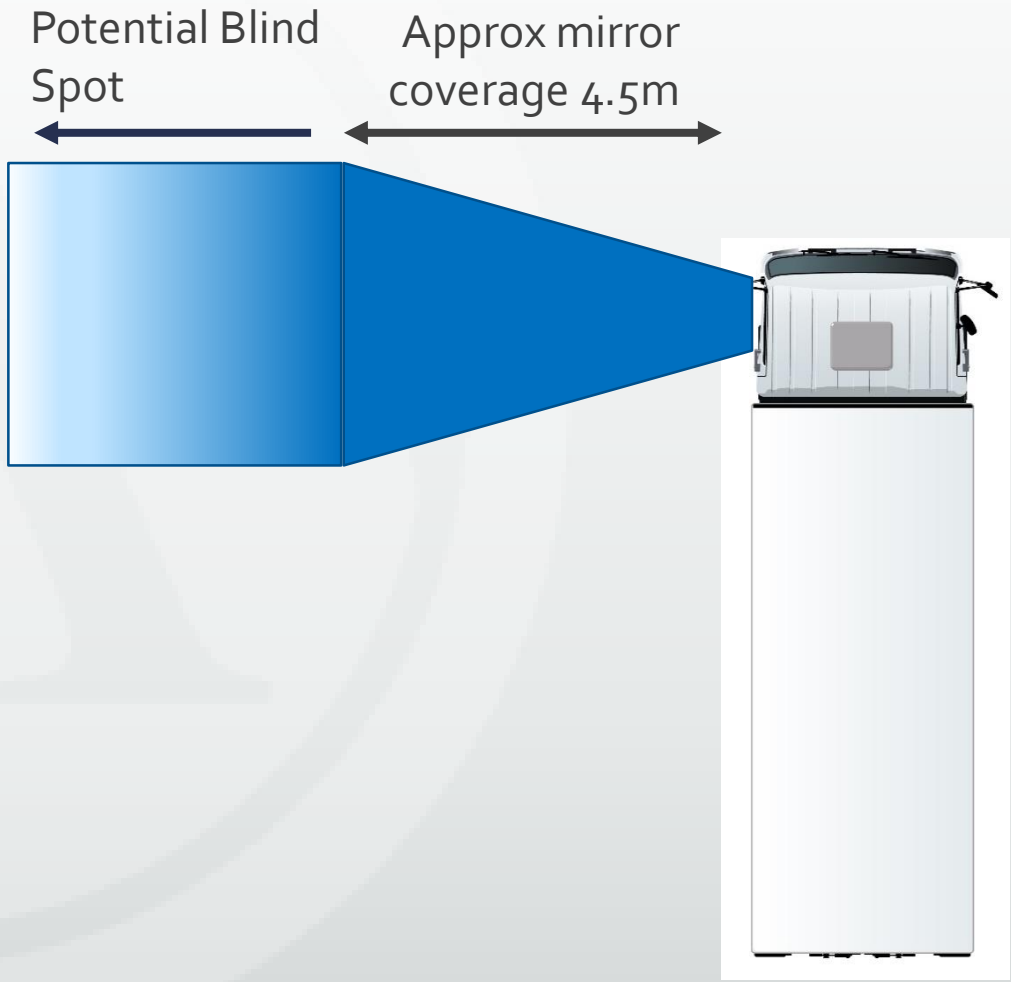
- Blind spot elimination 1st priority
- Improving vision in mirror zone 2nd priority
- Direct vision in area beyond 4.5m is more important than area within 4.5m
- Warnings have potential benefits but also substantial risks unless well matched to human perception. Done badly, they can take attention away from the vision zones



Example of the effect on priorities

Collision Investigator & Safety Engineer

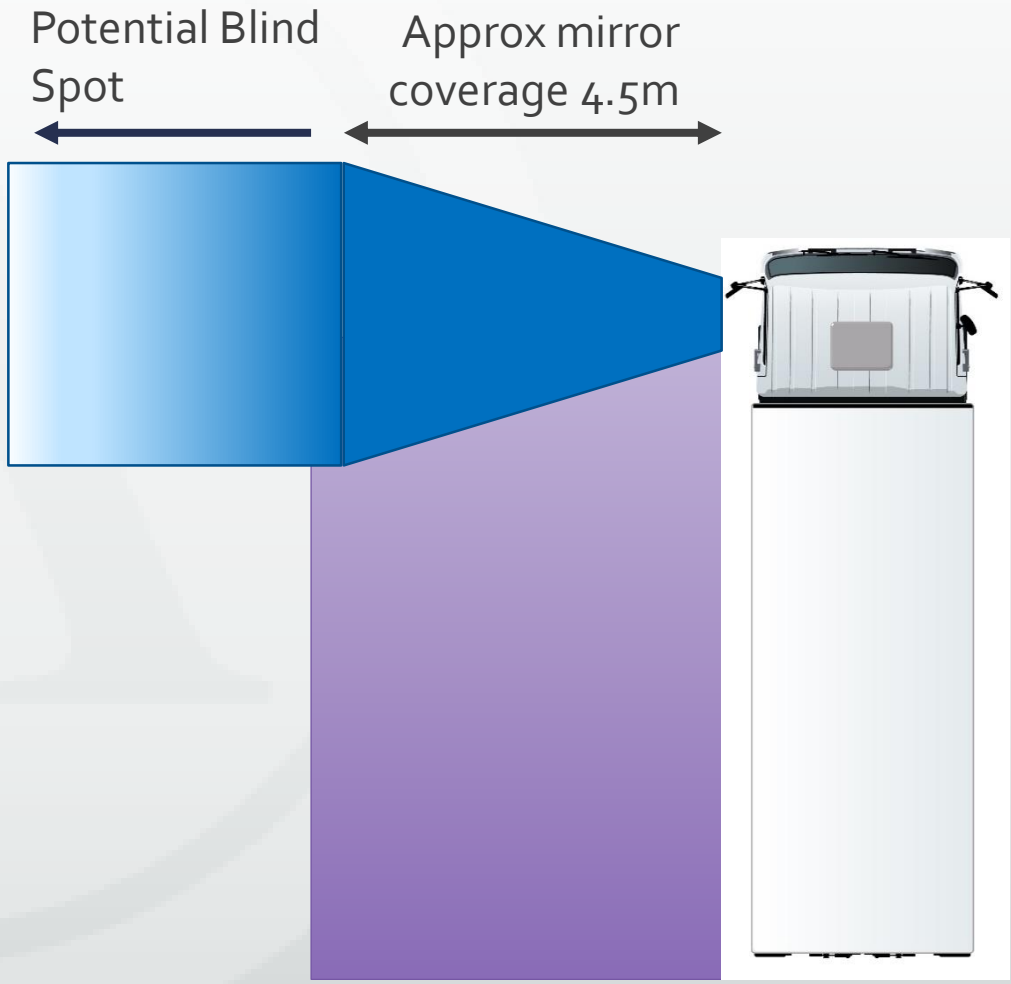
- Improving vision in mirror zone 1st priority – more collisions occur at lateral separation <4.5 – VRU can be seen in mirrors (possibly distorted)
- Blind spot elimination 2nd priority
- Different to Ergonomist view
- Strong effect 'looked but failed to see' causes
- Some effect on 'did not look' causes – relative motion triggers peripheral vision (@ late stage of turn collisions)
- Well designed warnings strong effect on 'did not look' causes and some for 'looked but failed so see' causes. Complements direct vision



Example of the effect on priorities

Collision Investigator & Safety Engineer

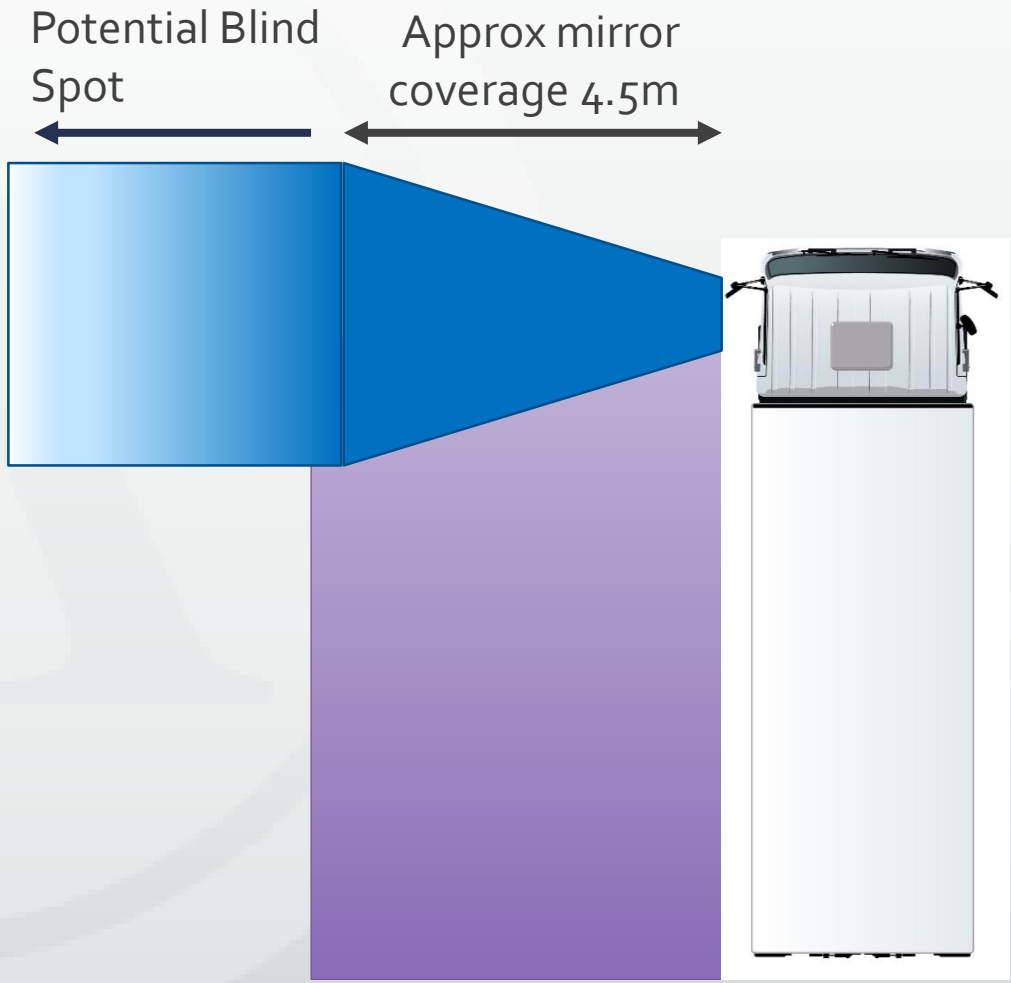
- **A substantial proportion of collisions occur with VRU coming from behind a stationary HGV, positioned in purple zone at the time the driver needs to see them to avoid collision**
- **Already available to be seen in mirrors (possibly distorted)**
- **Direct vision cannot help**
- **Warnings are the main solution for both 'looked but failed to see' and 'failed to look'**
- **All solutions are necessary for 'vision zero'**
- **Recognise the Ergonomics is critical to effectiveness of warnings**



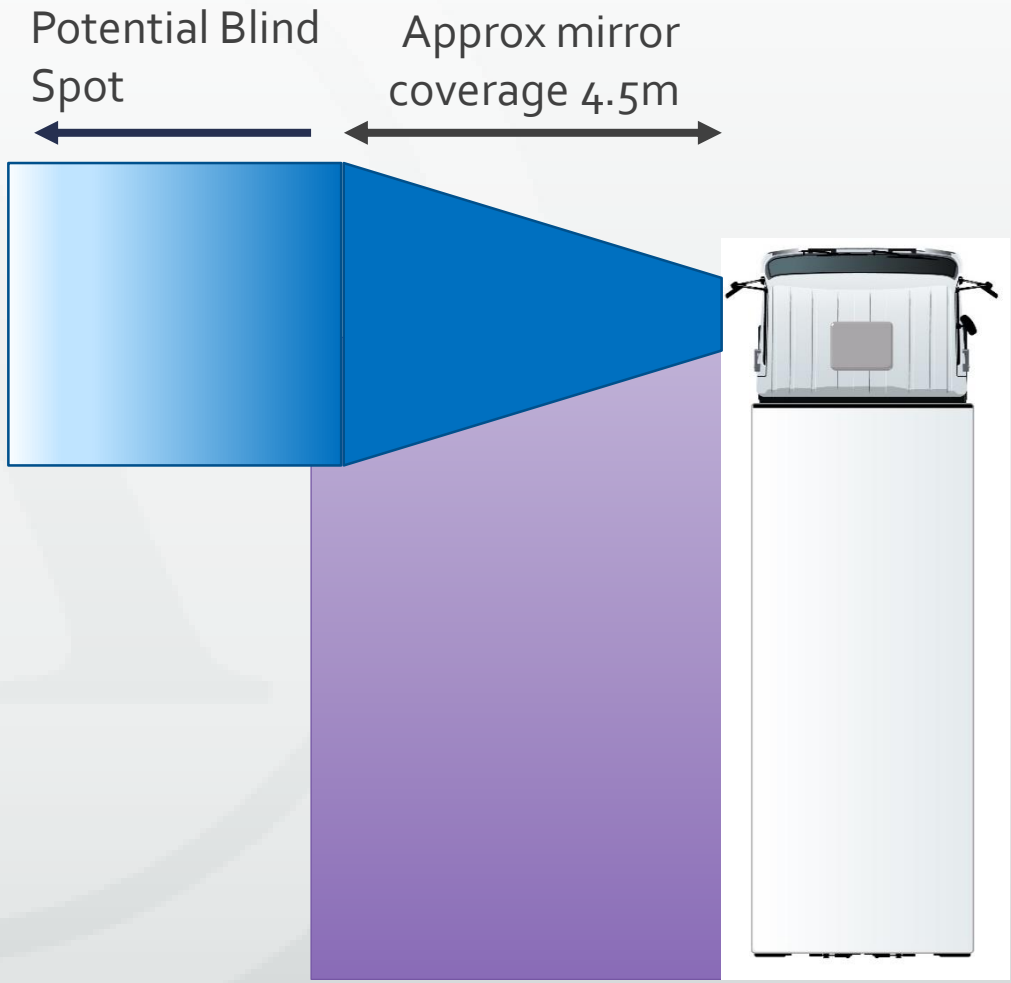
Example of the effect on priorities

Vehicle Manufacturer

- **Recognises the validity of all the previous views but must balance with other objectives**
- **Considers that vision zero standards across all safety & emissions areas cannot be achieved by all manufacturers in all sectors in the time frame – prioritising is needed.**
- **Identifies warnings as less conflicting with other objectives. Many truck makers see these as 1st priority and direct vision as 2nd priority**



Example of the effect on priorities



- None of these statements or perspectives are wrong
- We only need to find the right compromise

Planned analysis of principles

Principle	View Point		
	Ergonomics	Collision	Industry
Close proximity VRU vision vs other vision needs			
How to measure direct vision (volume/other)?			
What do you need to see to detect VRU presence (head/shoulders)?			
How do we decide what volume represents "good" performance (VRU distance, collision weighting etc)?			

Aim: Agreement across all view points wherever possible. Simple transparent choices with agreed pros and cons where not possible

Identification of options

- Each option to be backed with evidence with simple transparent outline of pros & cons (agreed at tech level from each perspective wherever possible)
- Stakeholders will have different preferred options but decision makers will have a clear informed choice
- Propose discussion of absolute limit values within chosen option is last in sequence

Example Options	Mandatory minimum standard		Publication of actual result
	Inter Urban	Urban	
Acceptance of residual blind spots			
Volume consistent with blind spot elimination (flexible)			
Volume consistent with blind spot elimination to each side separately (limited flexibility)			
Guaranteed blind spot elimination			
Volume consistent with quality improvement in mirror zone (flexible)			
Volume consistent with quality improvement in mirror zone to each side separately (limited flexibility)			

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Thank You

Participation & Views Welcome