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Direct Vision Standards

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EVERY JOURNEY MATTERS



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Developing a Direct Vision Standard

DVS in London – the HGV Safety Standard Permit Scheme

Defining a ‘Safe System’ – debate and workshop

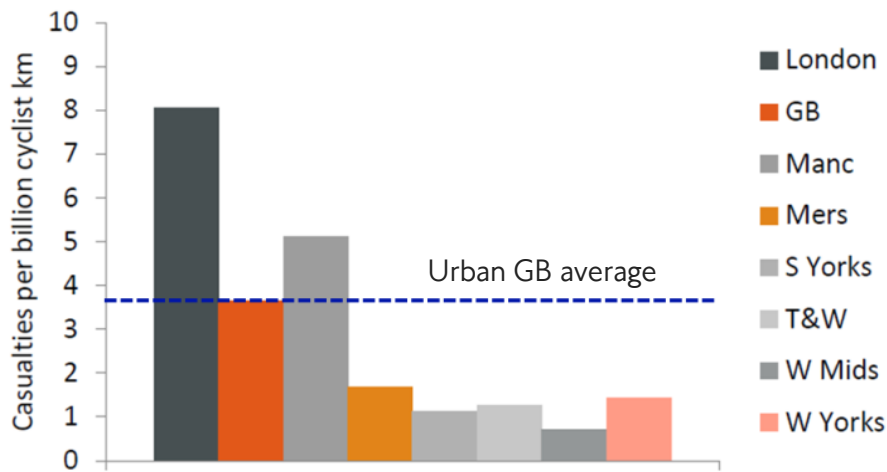
Beyond London – replicating DVS in other cities – debate and workshop

Summary and close



London has a particular problem with HGVs and VRUs

- In London, HGVs were involved in 136 fatalities between 2010-2016
 - Most (107) were with larger HGVs
- HGVs are disproportionately involved in fatalities with pedestrians and cyclist in London
 - HGVs make up 4% of road kms
 - But over 70% of cyclist and 20% of pedestrian fatalities over the past three years
 - London much worse than rest of UK urban areas
- Analysis of UK accident database (STATS 19) shows that poor vision is a commonly cited cause of HGV incidents



Addressing the problem

Safer operations

- Encouraging, supporting and recognising safe and compliant fleets

Safer people

- Improving driver and manager knowledge, skills and performance

Safer vehicles

- Stimulating innovative HGV design and providing evidence for change

Safer supply chains

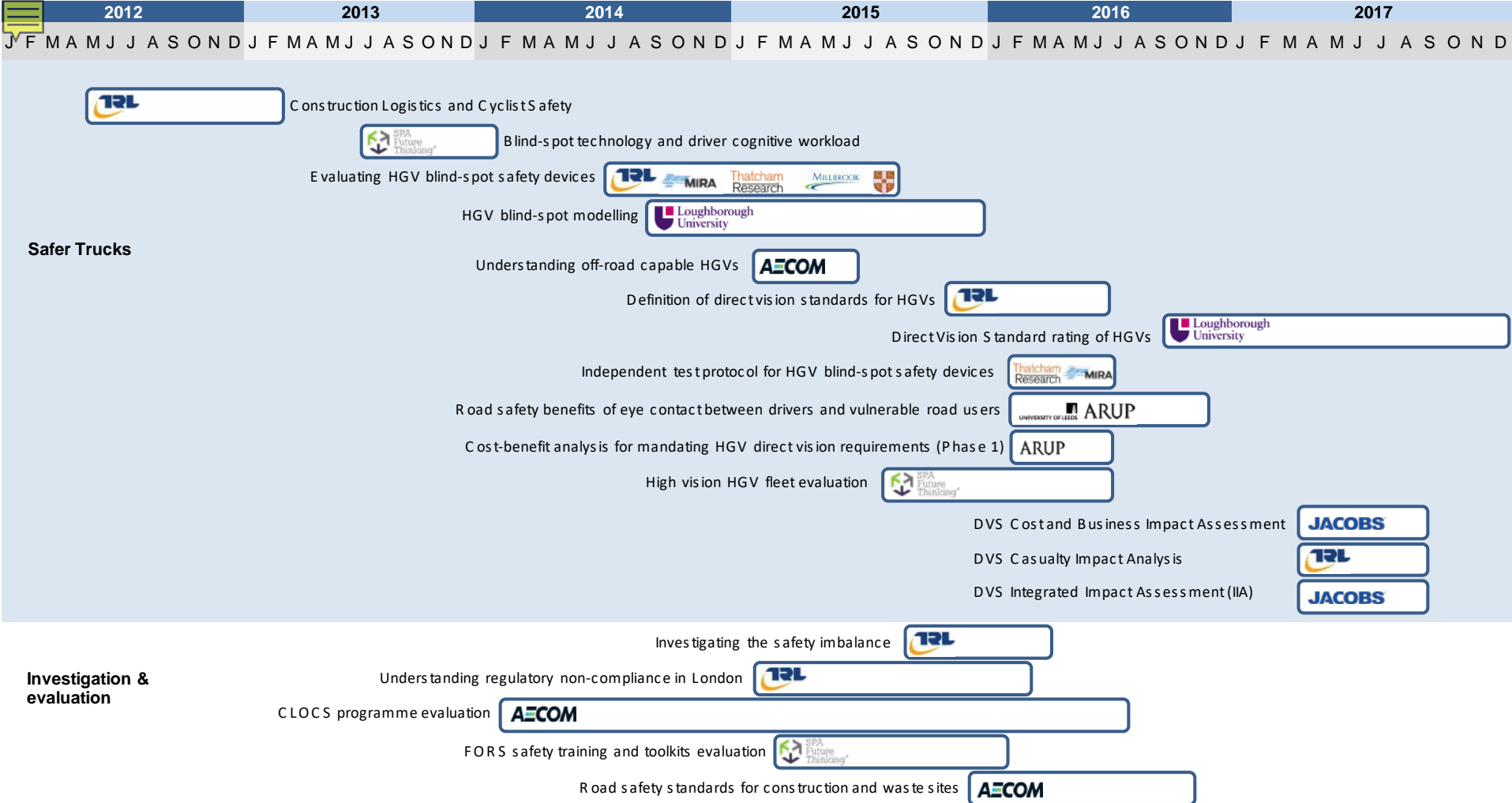
- Using buying power and planning to manage road risk in supply chains



Momentum through CLOCS

- Original CLOCS research report, published in 2013 highlighted the issue of vehicle blind-spots, particularly for construction type vehicles
- Stimulated engagement with vehicle manufacturers
- 'Operator delegation' established and trials of concept vehicles started
- Prompted further research and a dedicated 'safer trucks' programme

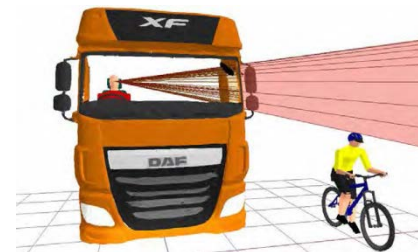




Developing a Direct Vision Standard (DVS) for HGVs

A definition

- **Direct Vision** - what a driver can see through the windows rather than using mirrors or cameras
- **Indirect Vision** - what the driver can see through mirrors or cameras



A measure

- We have developed the world's first and only HGV Direct Vision Standard
- It's an **objective measurement** of the 'volume of space' that a driver can see **directly** through windows of the cab weighted by risk to other road users

A rating

- This measurement is converted to a "star rating" from zero (worst) to five (best)
- Loughborough University have worked with the principle manufacturers to do this

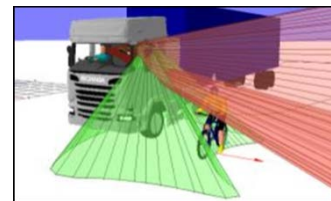
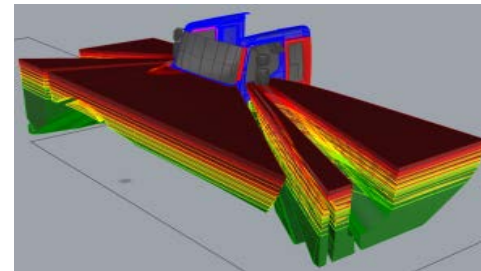
0	☆ ☆ ☆ ☆ ☆	Low
1	★ ☆ ☆ ☆ ☆	
2	★ ★ ☆ ☆ ☆	
3	★ ★ ★ ☆ ☆	Good
4	★ ★ ★ ★ ☆	
5	★ ★ ★ ★ ★	High



DVS measurement

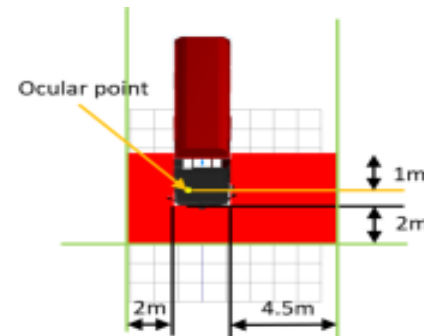
The measure

- The greater the 3D volume of space a driver can see directly from the cab, the closer the person can be seen to the vehicle and the more of them that can be seen
- There assessment volume zone created concentrates on the on the area of greatest risk to vulnerable road user – Class V and VI mirrors, UNECE Reg 46



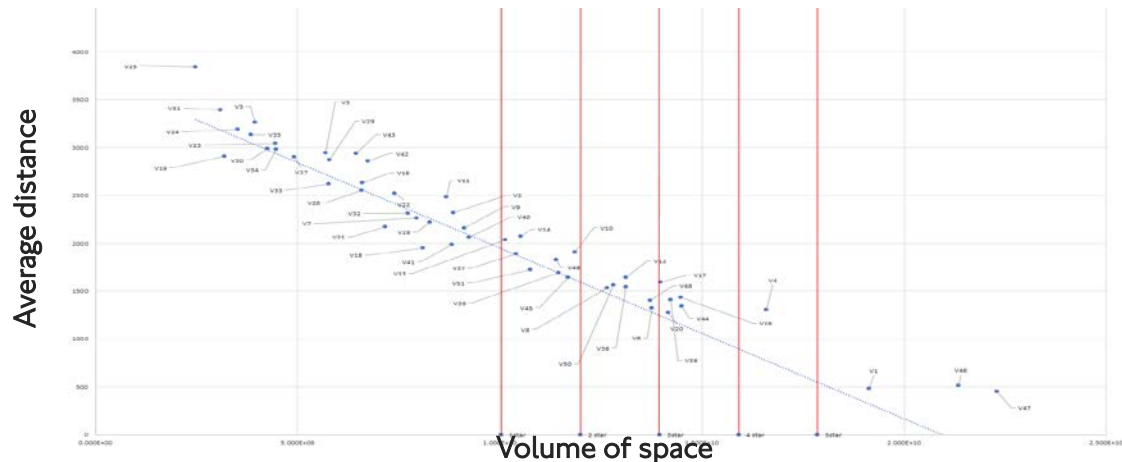
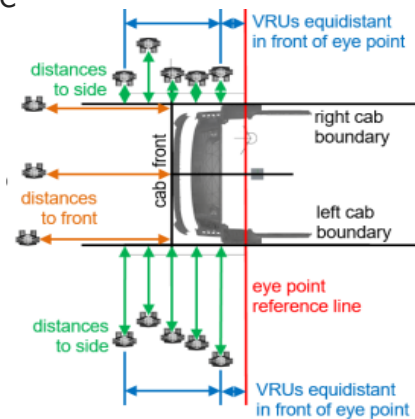
The assessment volume

- A 3D zone is important because it takes into account all of the space in which someone could be seen – from the top of someone's head to the ground plane
- Direct vision needs to cover the area outside of the current mirror coverage but within the mirror zone.
- The more of the assessment zone that can be seen, the higher the volume result.



Linking to the 'real world'

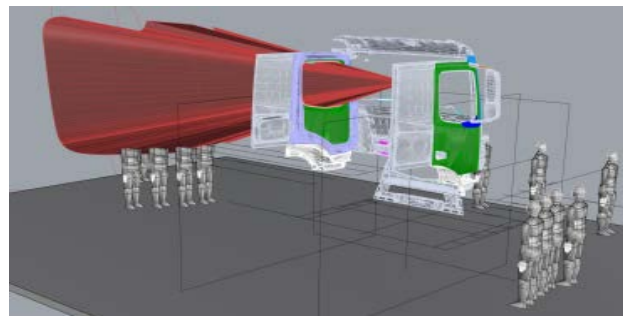
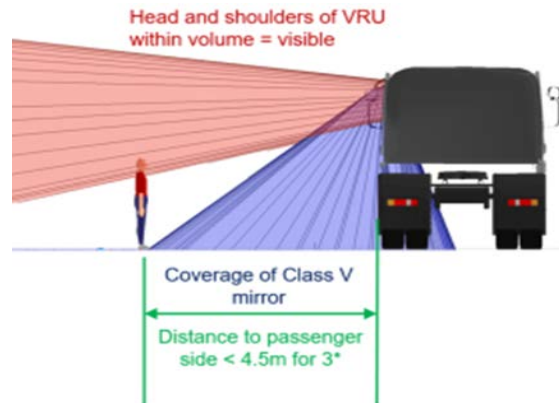
- The volume of space has been linked to 'real world' performance
- Vulnerable road users are placed around the vehicle and the distance that the head and shoulders can be seen is calculated
- The 5th percentile Italian female is the key VRU used - if the head and shoulders of the smallest European females can be seen then in theory the whole adult population of Europe can be seen
- This was correlated with the volume results and shows that the larger the volume the closer VRUs can be seen to the vehicle



11 DVS star rating boundaries

- To meet 'one star', at least the head and shoulders of **99 per cent** of the European adult population must be seen within an 'acceptable' distance at the front and side
- The 'acceptable' distance is set to where people become directly visible within the area covered by mirrors and indirect vision becomes complemented by direct vision – 4.5 m to the near side (Class V mirror) and 2m to the front (Class VI mirror) as per UNECE reg 46 and 0.6m to the offside
- The two, three, four and five star rating boundaries are set by equally dividing the volume of space over and above the one star measurement to show relative direct vision performance.

Star ratings must reflect the need to reduce the risk to VRUs posed by poor direct vision from HGVs. Rating have been set in a suitably ambitious way to: in the short term encourage use of best in class and to influence radical design changes in the future



The case for improving direct vision

TfL commissioned research to exploring the road safety benefits of direct vision

Indirect vision has a 0.7s slower response time

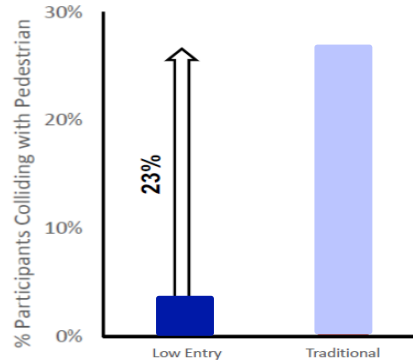
Risk increases with speed as more distance travelled

Extra distance in urban environment especially high risk

Speed	Distance
15 mph	4.7m
10 mph	3.1m
5 mph	1.5m

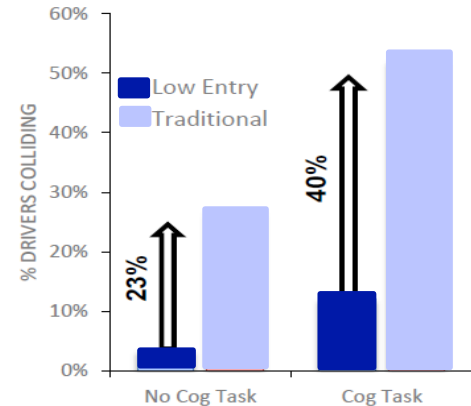
Bigger collision risk

Indirect vision resulted in increased incidence of simulated pedestrian collisions by 23%



Limits to technology benefits

Drivers processing a cognitive task increased simulated collision by 40%





Developing a Direct Vision Standard

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Summary and close



Vision Zero: No loss of life should be considered acceptable or inevitable.

- The Mayor's Transport Strategy commits to a Vision Zero approach to road danger reduction.
- We aim to eradicate all deaths and serious injuries from road collisions in London by 2041.
- A comprehensive road danger reduction programme addressing all sources:
 - road conditions
 - infrastructure design
 - road user behaviour
- Why is it appropriate for our challenges in London?
 - Reducing danger becomes a consideration in everything and for everyone
 - Stretches targets and accountability
 - Improves procedure and process for infrastructure design, vehicle design and behaviours
 - Establishes an environment where risk is diminished



The Safe Systems approach

Four central principles underpin the **Safe Systems** approach:

1. **People make mistakes** – a road environment should be forgiving to human error
2. **There are physical limits to what the human body can tolerate** – impact energy levels should not be sufficient enough to cause fatal or serious injury
3. **Road danger reduction should be a common policy** - all those with a role in designing, building, operating, managing and using the road network have a responsibility to improve safety
4. **All parts of the system must be strengthened in combination to multiply their effects** - road users should still be protected if one part of the system fails



Direct Vision Standard

The DVS scheme development has been shaped by:

1. **Consultation feedback:** vulnerable road user groups, manufacturers, operators and trade associations
2. **Independent impact assessment :** legal, environmental, equalities, health, economic and business factors
3. **DVS performance**

What we've learnt:

- Direct vision from the majority of current HGV designs is extremely poor
- Direct vision can't be used to avoid all collision scenarios
- There is a strong desire to bring **all safety initiatives together**
- Greater safety benefits exist if we set the ambition **wider than DVS alone**
- Following Vision Zero principles we should take a '**safe system**' approach to reduce road danger
- We should continue to lobby for more radical HGV design changes in European regulations

"the benefit of **technology**, such as cameras and sensors, should be recognised "

"the good work of existing schemes such as **CLOCS** must be recognised and built on"



HGV Permit Scheme and Safe System Proposal

HGV Permit scheme

All HGVs over 12 tonnes would require a permit to enter London

- **2020:** all zero star HGVs banned unless they prove a 'safe system'
- **2024:** all zero - two star HGVs banned unless they prove a 'progressive safe system'

What could a HGV safe system look like?

- Build on existing industry-recognised safety standards and what's proven to work best
- Standard evolve over time, taking into account advances in technology.
- A safe system would reduce other areas of risk when direct vision was poor
- A Safe System could include:
 - sensors and other indirect vision devices
 - audible or visual warning around the vehicle
 - physical protection to deflect vulnerable road users
 - driver safety training



Defining specific measures to offset those risk

Area to address	Desired outcome	Example measures
Direct vision	To improve visibility for drivers and reduce the risk of close proximity blind-spot collisions	<ul style="list-style-type: none"> DVS star rating
Indirect vision	To improve visibility for drivers and reduce the risk of close proximity blind-spot collisions	<ul style="list-style-type: none"> Class V and VI mirrors Acceptable approved blind spot camera systems
Warning of intended manoeuvres	To reduce the risk of close proximity collisions by audibly alerting VRUs to vehicle hazards	<ul style="list-style-type: none"> Vehicle manoeuvring warnings such as left-turn audible alarms Sensors that warn drivers of a VRU's presence Non-prescriptive warning signage
Physical impact of a hazard	To minimise the probability and severity of collisions with VRUs	<ul style="list-style-type: none"> Side under-run protection Front under-run protection where ground clearance presents a hazard
Urban driving skills	To ensure all drivers have the knowledge, skills and attitude required to recognise, assess, manage and reduce the risks their vehicle poses to VRUs	<ul style="list-style-type: none"> Theoretical and practical VRU training such as the Safe Urban Driving CPC course Appropriate training in use of VRU equipment and technology



Setting, testing and maintaining the safe system

We have consulted on the design principles that should inform a process for setting and keeping relevant the components of a safe system

- Easily identifiable
- Evidence based
- Consistent with existing good practice scheme
- Retrofit capability
- Market availability
- Proportionate costs
- Fit for purpose
- Progressive & responsive to future technologies

We have set up an multi-stakeholder advisory group that would set and review the components of a safe system





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Discussion – Safe System proposal

Should the safe system be aligned with existing schemes such as CLOCS?
What specific measures should be included?

Are there any other design principles that should be considered?

Should the scheme be focussed on the vehicle only or include driver training?





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Towards consistency – we want an international standard

- In the longer term we are working to ensure a single, common DVS informs vehicle design standard

European interest in DVS



- *17 peer cities have joined us in presenting the case for DVS in General Safety Regulation (GSR) review*
- *MEPs voted for HGV Direct Vision in November 2017*
- *February 2018 - European Commission agreed to include Direct Vision in GSR review*



Global interest in DVS



- *UN's Economic Commission for Europe's vulnerable road user group met in London to discuss our DVS*



Discussion – DVS beyond London

How could DVS be replicated in other urban areas?

What challenges exist?

What benefits could be achieved?





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Thank you

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