New measures to reduce the number of cycling accidents occurring in collisions with trucks

A. Research conducted by Loughborough Design School (LDS)

A research conducted by Loughborough Design School (LDS) revealed that a great difference exists between the various types and brands of trucks regarding the size of the blind spots. This study can be found at [https://www.transportenvironment.org/sites/te/files/2016_07_Study_Understanding_direct_indirect_driver_vision_HGVs.pdf](https://www.transportenvironment.org/sites/te/files/2016_07_Study_Understanding_direct_indirect_driver_vision_HGVs.pdf) (Dr Steve Summerskill, Dr Russell Marshall, *Understanding direct and indirect driver vision from Heavy Goods Vehicles. Summary Report* prepared on behalf of Transport for London.)


Below texts and illustrations are taken from this report.

1. **Introduction: the truck safety problem**

Every year 4,000 Europeans die in truck crashes leaving many more seriously injured. Because of their weight, size and their poor (brick shaped) design trucks’ safety impact is disproportionate: with just 3% of vehicles, trucks are involved in 15% of road deaths. A quarter of truck fatalities are vulnerable road users. In 2013, 978 cyclists and pedestrians (vulnerable road users) died in an accident involving a truck. Overall the number of vulnerable road user fatalities in the EU is decreasing much slower than the total fatality decrease.

Vulnerable road users (VRUs) including pedestrians, cyclists and motorcyclists account for almost half of the road victims, and their proportion is even higher in urban areas. Twenty eight percent (28%) of fatal truck crashes occur in urban environments and more than half of truck crashes involving cyclists and pedestrians in urban areas, occur at relatively low speeds.

The truck blind spot problem is widespread and well-attested:
In Belgium, 43% of cycling fatalities involve trucks, in Holland 38% and in the UK 33%. In some cities, like London, trucks cause more than 50% of cyclist deaths. (...) [http://archive.etsc.eu/documents/BIKE_PAL_Safety_Ranking.pdf, Pedalling towards Safety, ETSC, 28 August 2012]

Analysis of UK statistics suggest the 3 main danger zones around the truck cab are:

- the front of the lorry (when the lorry pulls away),
- the left (rest of the EU right)
- and the right (rest of the EU left) crashes for turning accidents.

The issue of trucks and VRUs [vulnerable road users] is not going to go away. Indeed, a combination of urbanisation, policies to promote cycling and walking, the rise of e-commerce and continued construction and development in and around cities means that this will become a bigger problem.

2. A once-in-a-decade opportunity: Europe’s new vehicle safety standards

The European Commission is currently reviewing the EU vehicle safety regulations (General Safety Regulation/GSR and Pedestrian Safety Regulation). A communication on the Commission’s assessment is scheduled after the summer of 2016 and a formal proposal is expected to come out in 2017. New vehicle safety rules would be compulsory for all newly produced vehicles in the EU. The Commission is currently assessing how it can improve truck direct vision.

The Commission’s work on the vehicle safety regulations follows a recent agreement to relax the rules that regulate truck design. Historically the EU has limited the overall length of truck combinations (truck + trailer/body). This has led to the typical EU cab-over-engine designs which minimise space of the tractor and driver and maximise cargo space. This high position - the driver sits on top of the engine block - makes much of what happens around the cab invisible to the driver and explains why “blind spots are a major factor in many accidents involving trucks”. But the recently adopted Directive 2015/719 will allow extra length (around 900mm, or 30% extra) to enable new designs. Depending on the speed of implementation new designs would be enabled – but not mandated - from around 2022.

The extra design space creates multiple opportunities for improvement, one of which is direct vision. A 2014 briefing by Transport & Environment, based on research by the Loughborough Design School suggested that by redesigning big tractor cabs you could improve their direct vision performance by 50% - see figure 2.

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2 The height of the driver position above the ground, which is a result of EC regulation 96/53/EC that limits the overall length of a tractor and trailer combination to 16.5m. This has led to a vehicle design process where the driver cab is placed above the engine bay to allow the length constraints to be met, with flat fronted vehicles. (Presentation Steve Summerskill, Modelling HGV blind spots, Brussels, 12 October 2016)
A preparatory report by the Transport Research Laboratory (TRL) identified truck frontal design as one of the major areas where safety could be improved. TRL estimates safer frontal design (better vision plus better crash performance) could save up to 900 lives annually.

### 3. EU policy to date: mirrors, mirrors and... more mirrors

In the last decades, policy makers have mainly focused on improving the indirect vision of trucks – the area around the truck that is visible through mirrors. This has led to six mirrors now being standard for new trucks. In theory these mirrors should eliminate a large part of the blind spot around the truck cab. However, mirrors provide a distorted image: often only (a small) part of the cyclist or pedestrian is clearly visible. Drivers also need to check several mirrors which often are not correctly adjusted. This may help explain why the fitting of extra mirrors has not produced the safety improvements that were initially expected. In addition, research by the Loughborough Design School (LDS) shows that despite the multiple mirrors there remain blind spots where the driver is unable to see pedestrians or cyclists.

[More about this subject can be found in](https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/8873), COOK, S., SUMMERSKILL, S., MARSHALL, R., ... et al., 2011. *The development of improvements to drivers' direct and indirect vision from vehicles - phase 2*. Report for Department for Transport DfT TTS Project Ref: S0906 / V8. Loughborough: Loughborough University, p. 32-133

The six mirrors are:

- Main exterior rear-view mirrors, one on each side of the cabine (Class II)
- Wide-angle exterior mirrors, one on each side of the cabine (Class IV)
- Close-proximity exterior mirror (Class V)
- Front mirror (Class VI)]

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3 FKA : Forschungsgesellschaft Kraftfahrwesen mbH Aachen
4. **Solving the truck blind spot problem: direct vision**

Direct vision, i.e. seeing something with your own eyes, has a number of advantages over indirect vision.

1. First of all, with direct vision you don’t have problems of distorted images or poorly adjusted mirrors.
2. Secondly, seeing something directly also reduces the time needed to “scan” a traffic situation.
3. Thirdly, it is likely that direct vision also has a number of ‘cognitive’ benefits over indirect vision. That means that people react differently to something they see directly. In fact, one of the key principles of traffic safety is that you should **stop, look and wave** and make contact with other traffic participants.

For trucks, better direct vision usually means lowering the position of the driver. This doesn’t only increase what he can see, it also puts truck drivers closer to the level of other participants in (urban) traffic. The University of Leeds is currently investigating possible benefits of eye contact and direct vision as opposed to indirect vision. But even today, there is broad agreement among experts that improved direct vision would be highly effective in preventing casualties. TRL 2015 estimated the lifesaving potential of better direct vision to be up to 553 lives saved per year in the EU.

5. **Direct vision: great potential for improvements**

There is significant potential to improve truck direct vision. Low entry cab vehicles such as the Mercedes Econic eliminate most of the typical blind spots around cab-over-engine trucks and are ideally suited for delivery vehicles. But there is a lot of potential for big trucks too. A 2014 study by Loughborough Design School found that big tractor cabs could have 50% better direct vision. There are also a number of other concept vehicles that could drastically improve direct vision.

But even without moving to new designs or low entry vehicles there is significant room for improvement. A new study commissioned by Transport for London and carried out by Loughborough Design School compares the direct vision performance of top selling vehicles in the UK and finds that the direct vision performance of trucks can be improved significantly with conventional, off-the-shelf designs and configurations whilst low entry cabs offer even more radical improvements.

5.1. **Methodology of the study**

LDS used a virtual modelling technique to model and simulate the different accident scenarios for a selected number of vehicles. In total 19 vehicle models have been created by digitally scanning real world vehicles. The vehicles that have been modelled are divided into four categories:

- large distribution (highway) vehicles,
- urban distribution vehicles,
- construction vehicles
- and high vision low entry cabs.

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4 During the October 12, 2016 Truck Safety Conference in Brussels, prof. Richard Wilkie presented the following preliminary conclusions. In comparison with direct vision, the indirect vision (via mirrors as opposed to windows) led to a 0.7 seconds slower reaction time. At a speed of 5 miles per hour, this means an increased distance of 1.5 m prior to braking. This means that the potential of an increased likelihood of collision amounts to 23%! Of course, the likelihood of an accident increases even more if the attention of the driver in the meantime has been derived (‘cognitive load’).
The brands of the different models are DAF, MAN, VOLVO, Mercedes, Scania and Dennis Eagle and the vehicles are the top selling vehicles (cabs + cab configuration) in their respective category in the UK haulage market. Although this is a UK study, the results are relevant for the rest of the EU too. The one major difference is that on the continent the position of the driver is different.

5.2. Best vs Worst in Class

Below we describe the situation for the three main categories:
- large distribution vehicles,
- urban distribution vehicles
- construction vehicles.

We use the LDS results but have combined the vulnerable road user obscuration – i.e. how far does a VRU need be removed from the cab to become visible (...) – of three positions:
- passenger side rear cyclist,
- the central pedestrian,
- and the driver side rear cyclist (see figure 7)
which account for most of the blind spot fatalities involving a HGV in the UK in one year.

![Fig. 7.](image)

5.2.1. Large distribution trucks (long haul)

Large distribution vehicles are the kind of tractor-trailer cabs that you typically find on highways. These vehicles are usually pulling a trailer and are designed for regional or long haul operations. However, they are also regularly used in (sub-)urban operations, e.g. when going to and from warehouses or supermarkets.

Typical long haul tractor cabs

![Scania R](image)  ![Volvo FH](image)  ![MAN TGX](image)  ![DAF XF](image)  ![Mercedes Actros](image)

A comparison between the different vehicles show that there is a considerable gap between the performance of the MAN TGX and the Volvo FH N3. Overall VRUs can be nearly twice as far away from the cab and still be hidden to the MAN TGX when compared to the Volvo FH. In that sense the
Volvo FH performs 47% better than the MAN. But even the difference between the Scania and the Volvo is significant (23%). The comparison of the different tractor cabs demonstrates that there would be considerable benefit in moving towards the best in class direct vision performance (in this case the Volvo FH) of the market. But a direct vision standard could likely go beyond best in class, especially when you take into account the new design possibilities that arise from the review of the truck dimensions legislation. For example, the extra design space would enable a lower driver position.

5.2.2. Urban distribution trucks

Urban distribution vehicles are typically used to deliver goods to shops and restaurants in and around cities. Contrary to the big trucks they are usually not pulling a trailer but instead have a fixed ‘body’. These ‘rigid’ vehicles are smaller, more manoeuvrable, lighter and have smaller engines. This should make it comparatively easier for small rigid trucks to have good direct vision.
The comparison of the vehicles assessed by LDS shows that the direct vision of the urban distribution vehicles varies even more than that of large distribution vehicles. The difference in direct vision between the best (Scania P N3) and worst (MAN TGS N3) is very high since you can go from 2724mm of total obscuration to no obscuration at all. The Scania P has many of the characteristics of a low entry cab and therefore scores very well. But even the difference between the MAN and the Volvo cab (configuration) is very big. Again, setting a direct vision standard that mandates at least best in class performance would enable major safety advances. However, the potential for urban distribution vehicles is even greater. As shown in section 5.2.4 low entry cabs could simply eliminate many of the most deadly blind spots for urban trucks.
5.2.3. Construction trucks

Construction vehicles are used to transport construction material (e.g. tippers carrying sand or concrete mixers). Construction vehicles are designed and configured for off-road conditions – i.e. they have very high ground clearance – but very often operate in urban areas since this is where a lot of construction happens. It is debatable whether such high ground clearance is really required for the majority of construction vehicles. (…)

The LDS study shows that construction vehicles typically have larger direct vision blind spots than large or small distribution vehicles, especially due to the higher position of the driver. On average N3G (i.e. construction) cabs are 32 percent higher than normal distribution cabs (see figure 14). This can be related to the cab itself but also to how the cab was configured. For a construction cab the obscuration distance for pedestrians is on average nearly three times bigger than the N3 cabs. With regards to cyclists to the passenger side, the obscuration distance is on average more than two times greater.
However, there is also a big difference between construction trucks. A comparison of different construction variants shows VRUs can be more than twice as far away from the cab and still be hidden in MAN TGS when compared to the Volvo FMX. In that sense you could argue an 82% improvement in direct vision could be achieved by shifting to the best in class design (and configuration) on the market. It would probably be possible to do even better than. Indeed, Mercedes and Denis Eagle have recently presented ‘low entry’ tipper vehicles.

**Construction Trucks**

The worst construction trucks have 3 blind spots totalling 3.2 metres

- **Hors catégorie: low entry cabs**
  Low entry cabs are trucks where the driver doesn’t sit on top of the engine. Instead, the engine is moved a bit to the back and the driver’s position is lowered almost to the level of other traffic participants. If you combine this with a good positioning of the driver in the cab (not too much to the front) and smart design of the windows and the windscreen, a driver sitting inside a low entry cab
can see – with his own eyes – almost anyone walking, driving or cycling around him. In the Loughborough report all the low entry cabs are assessed as having the same excellent high direct vision performance – so ranking them makes no sense. Low entry cabs are typically used for urban delivery vehicles and are currently not available for long distance traffic (limited engine size) but Mercedes and Denis Eagle have recently presented ‘low entry’ construction vehicles.

Mercedes Econic (own photograph)  
Volvo FE (own photograph)  
Denis Eagle low (photograph LDS_publication 2016)

6. How to regulate truck direct vision
Transport for London (TfL) has commissioned Transport Research Laboratory (TRL) to develop a method that allows measuring the HGV direct vision. (...) The final TRL report will be available shortly.

7. Policy recommendations
Trucks pose a disproportionate risk to vulnerable road users, especially in urban areas. This is a problem that will grow in importance, unless additional action is taken. The Commission’s review of the vehicle safety regulations provides a unique opportunity to address the problem and set direct vision standards for new trucks. (...) Setting a direct vision standard that would force at least best in class performance would already produce significant benefits but there is potential to go beyond that. Indeed, low entry cabs outperform the current best in class performers and the new design rules could enable further improvements.

Recommendations to the European Commission
1. Introduce direct vision standards for trucks. Contrary to passenger cars, there are currently no direct vision requirements for trucks. Direct vision – what you can see with your own eyes – has a number of benefits compared to indirect vision (mirrors and camera’s). To measure direct vision the Commission should use a standardised methodology.
2. Introduce differentiated direct vision standards for different truck categories. Construction vehicles, long haul and urban vehicles have different characteristics and potentials for improvement. Urban trucks clearly have the biggest potential whereas construction vehicles with off-road capability are more challenging. The exact classification needs to be further researched but it is clear that one-size-fits-all approach would deliver suboptimal results. Setting a one-size-fits-all direct vision standard would end up having little impact as it would likely be tailored to the lowest common denominator.
3. Introduce a direct vision standard that effectively mandates direct vision equivalent to low entry cab designs for urban distribution vehicles. The Commission should also apply this standard to light commercial vehicles (vans) since these vehicles often compete with urban trucks and the direct vision standard should not lead to an additional shift from N2 to N1 vehicles.
4. Mandate at least best in class direct vision for large distribution trucks (tractor-trailer/long haul) and investigate the potential to go beyond best in class in light of the new design opportunities unlocked by the new weights and dimensions directive. The LDS/FKA concepts has shown that significant further improvements are possible.

5. Mandate at least best in class direct vision for construction trucks and investigate the potential to go beyond best in class. New vehicle safety standards should be designed to discourage high ground clearance. (…)

When should direct vision standards become compulsory?
In March 2016 the Commission has indicated in the Motor Vehicle Working Group it thinks of 2028 as a starting date for its new direct vision rules. On reason why the Commission seeks a long transition period is that by 2028 the rules would be applicable to all newly produced vehicles (first new models, then all vehicles after 2028) and the truck manufacturing industry wants time to continue selling its current products. However, given that better vision cabs are already available on the market and in all market segments (best in class, smarter configurations, low entry vehicles) a 2028 deadline is not justifiable. To provide additional flexibility to manufacturers the Commission could consider two alternative approaches:

1. **To mandate the safety requirement for all cabs benefiting from the additional design space granted by Directive 2015/719.** This would not be mandatory – manufacturers are not obliged to use the extra design space – but in practice it makes it likely that a number of new vehicle models would already comply with the new safety rules in 2022. One question mark is to what extent this would affect urban or construction vehicles since space constraints mostly affect large distribution/long haul trucks.

2. **To gradually phase in the requirements.** Instead of applying the new standard to all vehicles all at once the Commission could propose to only apply the standard to a certain percentage of vehicles (e.g. 20% in 2022). This could then be increased annually to 100% in e.g. 2028. This approach would also require a monitoring and reporting mechanism as well as corrective action for manufactures that do not comply. Alternatively the vision standard could be tightened over time (e.g. mandate small improvements first, move to best in class second and require design changes last). This is somewhat similar to the US model year approach.

**Further information**

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**N.B.:**
- As an illustration of this, all of the cyclists shown in the next figure are not visible to the driver through the windows (direct vision), with the eye point being determined by a standard sitting position (i.e. without leaning to improve the field of view)
The following image shows the driver’s view through the windows.


- William Todts, director at Transport & Environment, said: “It’s shocking that there are such large differences between perfectly similar trucks. It shows that some truck makers aren’t factoring in cyclist or pedestrian safety when designing new vehicles. The solution is obvious: we need direct vision standards for trucks. With so many people dying, we can’t afford to wait until 2028. This needs to happen much quicker.”

- Improved direct vision for trucks
  Various solutions exist to improve truck vision (mirrors, cameras) but the most effective is to improve direct vision, i.e. what you can see with your own eyes. TRL 2015 estimates up to 550 blind spot deaths could be avoided through better direct vision. Given the high costs per fatality and the big potential of direct vision to reduce truck fatalities, requiring better direct vision is likely to be very cost-beneficial.

  Low entry, high vision cabs have superior direct vision and are commercially available today. They are ideally suited for urban distribution traffic and have little or no operational
limitations. High vision trucks are more expensive but this is likely related to low sales volumes, not production costs.

Large distribution and construction vehicles generally have poorer direct vision than small trucks. However, there are big differences between comparable truck types and the new truck dimension rules enable further improvements. Setting a direct vision standard that requires at least best-in-class performance for larger trucks would therefore produce significant benefits at limited cost. In combination with cyclist and pedestrian detection systems improved direct vision could radically improve VRU safety. We therefore recommend:

1. That a direct vision standard should be adopted for urban distribution trucks that effectively mandates high vision, low entry cabs.
2. That at least best-in-class direct vision performance should become mandatory for large distribution vehicles and construction trucks.

(Source: Transport & Environment, Road safety - time for Europe to shift gears)

**Does Direct Vision (windows) enhance road safety compared to Indirect Vision (mirrors)?**

Mirrors provide useful visual information not directly visible to drivers. However, there are potential safety issues:

- Mirrors can distort reflected objects.
- Reflected objects may be overlooked compared to direct objects.
- Recognition rates compromised near mirror edges
- Mirrors may be set up incorrectly, impairing coverage.
- View can be influenced by elements such as rain and dust.

Source: (Dr Richard Wilkie, dr Callum Mole, *The Benefits of Direct Vision*, University of Leeds, Arup and Transport for London, presentation 12 October 2016)

**Our eyes are excellent in detecting movements.** The total field of view (the area in which we can see movement) of the human eye is 160 degrees, but outside of the cone of visual attention we can’t really recognize detail, only broad shapes and movement. ([http://petapixel.com/2012/11/17/the-camera-versus-the-human-eye/](http://petapixel.com/2012/11/17/the-camera-versus-the-human-eye/))

**B. The use of cameras in trucks**

1. **360 degree cameras**

A 360 ° camera can provide assistance to the extent it will be able to give a nice picture of the total space around the truck. Here the images of four cameras, mounted on the front, on the rear and on both sides, are brought together on one screen. Of course, the driver has to move during the maneuver sufficiently slow (up to 5 km/h?), depending on the size of the area shown on the screen. The driver must be able to stop whenever a cyclist suddenly comes into the picture.

Currently certain brands are working on a technology with sensors and radar. This makes it possible that brakes and steering are automatically activated if the driver does not taking into account the suggestion of the system to stop for a cyclist or pedestrian.

There are many interesting examples of these cameras, as listed below.
- **18 March 2013**: Since 2013, some types of Nissan have an *Around View Monitor*. The images are shown together on the screen offering an overhead perspective of the vehicle surroundings. ([https://www.youtube.com/watch?v=lvM9BJWUIL8](https://www.youtube.com/watch?v=lvM9BJWUIL8))

- **June 2013**: Brigade Electronics has launched its *Smarteye 360 degree camera system* to the North American commercial truck market. Smarteye is a camera system that eradicates blind spots and greatly reduces collisions because of a bird's eye view of the entire vehicle and its immediate surroundings. ([http://www.utilityproducts.com/articles/2013/06/truck-blind-spots-eliminated-with-360-degree-camera0.html](http://www.utilityproducts.com/articles/2013/06/truck-blind-spots-eliminated-with-360-degree-camera0.html))

- **January 2014**: *Backeye® 360* is an intelligent camera monitor system designed to assist low-speed maneuverability by providing the driver with a real-time complete surround view of the vehicle in a single image. ([http://brigade-electronics.com/uploads/footer_assets/UKCatalogue.pdf](http://brigade-electronics.com/uploads/footer_assets/UKCatalogue.pdf))

- **10 October 2014**: Volvo is developing *360-Degree Scanning Tech* for trucks. The technology is in the test phase, but the company said it may become a reality within 10 years [to count from 2014 on]. The system uses sensors, radars and cameras placed around the truck to feed the driver information on how to avoid accidents. The steering and braking system can be automatically activated if the driver does not respond to the truck's suggestions, according to Volvo. A video is shown. ([http://www.ttnews.com/articles/basetemplate.aspx?storyid=36286](http://www.ttnews.com/articles/basetemplate.aspx?storyid=36286))

- **2015**: *360° Omnivue* is a camera system for trucks, buses and other vehicles. The system gives the driver a bird's eye view of the vehicle and of the area on the monitor in the cab. Due to this complete overview there are no longer blind spots around the vehicle. ([http://www.grootjebbink.nl/360-omnivue](http://www.grootjebbink.nl/360-omnivue))


2. **Blind spot cameras**
A PhD student is currently testing a blind-spot camera with image recognition. When a cyclist or a pedestrian appears, an alarm is generated. There are still problems in heavy fog or overexposure from the sun. Therefore additional sensors are tested that are infrared sensitive. (Het Laatste Nieuws (Flemish newspaper), Fleming equips blind spot cameras with image recognition, September 29, 2016)

C. The blind spot problem is experienced in many cities as very urgent. They no longer wait and impose immediate measures.

Some measures taken by cities:

1. London

Lorries face London ban 'to protect cyclists' (30 September 2016:

“Thousands of lorries could be banned from London to make the roads safer for cyclists, under plans proposed by London Mayor Sadiq Khan. He wants a rating system from zero to five stars for heavy goods vehicles based on the driver’s level of vision from the cab. Under the proposals 35,000 zero star-rated HGVs currently operating in London would be banned by 2020. Only those lorries with a rating of at least three stars would be allowed in to the city by 2024.

In the past two years HGVs were involved in 23% of pedestrian fatalities and 58% of cyclist deaths in London, despite accounting for just 4% of the miles driven in the city, the mayor’s office said.

Mr Khan claimed many lorries would be upgraded before the ban comes into place.

Reactions in London

The Road Haulage Association's chief executive Richard Burnett believes the proposal is an "imposition of unnecessary rules on haulage firms". He said: "Demonising lorries is unfair. Lorries, including construction vehicles, play a vital part in the economic life of London. Without them the capital's businesses would grind to a standstill."

The cycling commissioner of former mayor Boris Johnson, Andrew Gilligan, said that idea [all lorries to have a new side window so drivers can better see pedestrians and cyclists] was cheaper and quicker to implement than Mr Khan’s, adding cyclists "will pay the price" of HGV operators not being required to make any improvements for three years.

Reactions in Flanders (Belgium)

Transport and Logistics Flanders has accumulated for more than fifteen years a lot of experience and knowledge about the blind spot problem. It has been organizing awareness campaigns in the Flemish schools under the slogan ‘Safe on the Road’. Flows also asked Secretary-General Lode Verkinderen to give a reaction to the London measures.

"In the Netherlands and Belgium considerable research has been made regarding the causes of such accidents and the way we can anticipate. That research shows that there must be a
A combination of three measures: these are technology – mirrors, cameras, and the like –, (road) infrastructure and education of both the drivers as the cyclists," said Verkinderen. He also has serious doubts about the effectiveness of Khan’s plan because it aims solely on technology.

Other information

From the next financial year, Transport for London (TfL) and the Greater London Authority will not sign any contracts that involve the use of zero-starred trucks. (http://usa.streetsblog.org/2016/10/21/london-is-going-to-ban-the-deadliest-trucks-from-its-streets/) Or in other words:
Beginning next year, the city government will not work with contractors who use “zero-star” vehicles, the Guardian reports. (https://www.theguardian.com/uk-news/2016/sep/30/lorries-face-london-ban-plans-improve-safety-cyclists)

2. Kortrijk (city in West Flanders, Belgium)

In the next two years 80 construction sites are planned in Kortrijk. To meet the safety of school children, on August 30, 2016 a charter has been signed among three partners: the city of Kortrijk, the Construction Union and the Construction Confederation of West Flanders. In this charter is promised to keep voluntarily the construction trucks exceeding five tons out of region of the schools in Kortrijk during opening and closing hours. Also trucks would avoid the major bicycle axles to schools.

3. Antwerp (Belgium)
Antwerp would not only make arrangements with the sector but wants to keep all trucks from the neighborhoods showing busy traffic to schools. To succeed, new road signs are needed and that may take some time. Meanwhile, agreements with the transport sector could be made. Also Ghent looks forward to the first results of the experiment in Kortrijk. (Het Laatste Nieuws, (Belgian newspaper), “Even Ghent and Antwerp want no trucks in the region of schools”, 3 September 2016)

Summary and recommendations

We can deduce the following facts:
- It is against all human values to allow vehicles on the road in which the driver actually does not know what is happening around the vehicle. That’s asking for trouble!
- To meet the many fatalities among vulnerable road users, due to trucks, a blind spot mirror was made compulsory in the Netherlands, Belgium (2003) and Denmark (2004). It was a measure imposed to reduce the number of blind spot accidents at a time when the European Union still had not developed its own measures, “motivated by the fact that as soon as possible, measures have to be taken to drastically reduce accidents caused by blind spots by trucks. The mandatory installation of blind spot mirrors or cameras on existing trucks is indispensable for that purpose.” (Belgium, December 20, 2002). However, the additional mirror did not reduce drastically blind spot accidents.
- Governments know since a long time that some trucks, with all existing mirrors, still have blind spots. Even nowadays, the truck driver cannot see sufficiently in certain types of trucks, even with the six mirrors. This is totally unacceptable.
- Meanwhile, interesting research was made by the Loughborough Design School (LDS). They made it clear that there are large differences between similar trucks. Also, there is broad agreement among experts that improved direct vision would be highly effective in preventing casualties.
- The benefits of direct vision are obvious.
  - Mirrors can distort reflected objects.
  - Reflected objects may be overlooked compared to direct objects.
  - Recognition rates compromised near mirror edges
  - Mirrors may be set up incorrectly, impairing coverage.
  - View can be influenced by elements such as rain and dust. (Dr Richard Wilkie, dr Callum Mole, The Benefits of Direct Vision, University of Leeds, Arup and Transport for London, presentation 12 October 2016)
  - Seeing something directly also reduces the time needed to “scan” a traffic situation.
  - It is likely that direct vision also has a number of ‘cognitive’ benefits over indirect vision. That means that people react differently to something they see directly. In fact, one of the key principles of traffic safety is that you should stop, look and wave and make contact with other traffic participants. [T&E_publication 2016]
  - Our eyes are excellent in detecting movements, even outside the center of our field of view.

Blind spot accidents must absolutely be avoided. In the short term, not by 2028, this avoidable suffering involving annually hundreds of road users in the EU must come to an end. An
**improvement of direct vision, as is used in the low-entry trucks, is ultimately the only and best solution.**

Considering the heavy toll that blind spot accidents require, we cannot wait until all trucks are constructed according to the new design. We note that some cities have taken **urgent measures** to reduce blind spot accidents. Some measures are indeed immediately performable.

- Without further waiting the decisions of other governments, the Mayor of London, Sadiq Khan, planned a rating system from zero to five stars for heavy goods vehicles based on the driver's level of vision from the cab. One can expect that a lot of lorries will be upgraded before the ban comes into place, i.e. by 2020 for zero star-rated HGVs and by 2024 for lorries having a rating less than three stars.
- Very interesting is that, from 2017 on, the city government of London will not work with contractors who use “zero-star” vehicles.
- Other cities made a deal with construction unions to keep voluntarily the construction trucks out of region of the schools during opening and closing hours.
- Another solution is to provide certain bad rated trucks with a 360° camera. For the driver, it is much simpler to keep an eye on one screen than to follow six or seven mirrors (if a blind spot mirror is added) during certain maneuvers.

**Recommendations:** Cities have the duty to investigate how truck safety is evolving on the market.

- When new trucks are ordered, cities should prefer trucks having low entry direct vision cabs! Such trucks are already available today on the market.
- The truck rating system, now applied in London, could be generalized in other cities.
- Cities could only work with contractors who use high vision vehicles.
- Specific agreements with construction unions and delivery companies could be elaborated in order to avoid major bicycle axles during certain hours.
- Although not all problems are solved, installing 360° cameras or blind spot cameras in trucks could have a positive impact. But direct vision is preferable.

Rik Gheysens, October 30, 2016