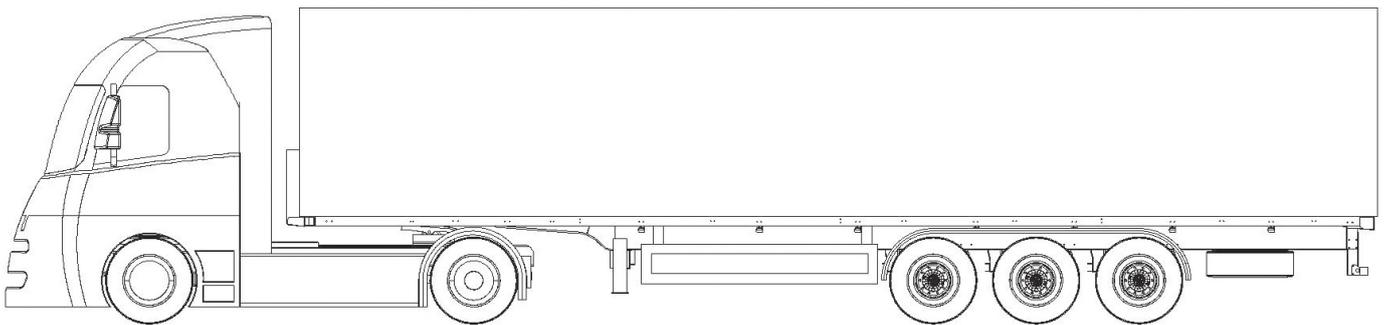


# SMARTER SAFER CLEANER

How small changes to lorry design can make a big difference



Summary of research carried out for T&E by FKA Automotive Research,  
'Design of a tractor for optimised safety and fuel consumption'

**Smarter, safer, cleaner:  
How small changes to lorry design can make a big difference**

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## Context

### **The environmental and safety impacts of lorries are serious and growing**

Freight transport poses a major challenge in terms of both environmental impacts and road safety. Around three-quarters of freight in Europe is delivered by lorry, and road freight transport is one of the sub-sectors of the transport industry with the fastest growing CO<sub>2</sub> emissions. While cars are getting progressively cleaner and more fuel-efficient thanks largely to EU law, and also safer thanks to regulation and consumer initiatives like EURO-NCAP, the same progress has not been made by lorries. As a result, the share of lorries for carbon dioxide (CO<sub>2</sub>) emissions and road accidents is expected to continue growing, unless new and stringent measures are taken.

Today Heavy Goods Vehicles (HGV) over 3.5 tonnes account for almost a quarter of road transport CO<sub>2</sub> emissions, or some 6% of total EU greenhouse gas emissions. This is expected to rise to 8% by 2020. The annual fuel bill for the European lorry fleet exceeds €60 billion, spent largely on imported diesel<sup>1</sup>.

Although lorries only make up 3% of the European vehicle fleet and 7% of driven kilometres, they are involved in 18% of fatal accidents, costing over 7000 lives across the EU in 2008<sup>2</sup>. Per kilometre driven, they are involved in twice as many fatal accidents as cars.

### **Review of rules for lorry sizes – threat but also opportunity**

Europe is set to review directive 96/53 governing the weights and sizes of lorries; the European Commission recently opened a consultation on the subject.<sup>3</sup>

The most contentious issue associated with the review is whether or not to allow for cross-border traffic of so-called 'megatrucks'; road trains with a length of 25.25m instead of the current 16.5 or 18.75 m. The Commission has declared it does not seek a general allowance for such vehicles combinations. For good reasons. Megatrucks will make road traffic less safe and will not reduce its environmental impact. The fact that they make road transport typically 20% cheaper means they will generate, through the rebound effect, a lot of new road transport, and weaken the competitive position of other modes such as rail and inland shipping.<sup>4</sup>

But the review also offers an opportunity to make 'smart' changes to lorry sizes, i.e. to move to a 'smarter' (greener and safer) design of the lorry's cabin. The current rules leave only 2.35m for the cabin. This is why the typical European lorry has a 'cab-over-engine' design, and why even within vehicles from different brands and of different sizes there is very little variation in the frontal shape of the cab.

This blunt (brick-like) shape of the cab unit has numerous disadvantages. It limits the scope to improve aerodynamic performance, which result in high fuel consumption and, as a consequence, in high emissions of greenhouse gases and air pollutants from lorries. It also limits the driver's field of direct vision, thus increasing the likelihood of accidents (so-called 'active safety' problem). In addition, the engine is directly behind the front bumper, without any crumple zone or crash box to absorb collision impacts and to diminish damage to the driver if an accident occurs (the so-called 'passive safety' problem).

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1 CE (2009) Are trucks taking their toll? The safety, environmental and congestion impact of trucks in the EU, Delft, 2009.

2 TRL (2010) for EC DG Enterprise and Industry, from CARE database and national statistics.

3 [http://ec.europa.eu/transport/road/consultations/2012-02-27-weights-and-dimensions\\_en.htm](http://ec.europa.eu/transport/road/consultations/2012-02-27-weights-and-dimensions_en.htm)

4 CE Delft & Significance, *Price sensitivity of European road freight transport – towards a better understanding of existing results*, 2010;

Fraunhofer, *Long-Term Climate Impacts of the Introduction of Mega-Trucks*, 2008; European Transport Safety Council, *Position on Longer and Heavier Goods Vehicles on the roads of the European Union*, 2011.

Allowing for longer cabins would enable lorrymakers to make cabins much safer, more aerodynamic and hence more environmentally friendly.

With both these safety and environmental opportunities in mind, T&E commissioned an independent study from the automotive research institute FKA<sup>5</sup> aimed at identifying the optimal shape and dimensions of a lorry cabin (the part of the lorry that pulls the trailer), integrating new aerodynamic solutions and improving both active and passive safety.

It is important to note, that just simply allowing for longer cabins will not, by itself, lead to the benefits identified in the FKA study. Additional design and safety rules would be needed to exploit the full potential of longer cabins. However, changing the allowable cabin size is a necessary prerequisite; without it these benefits are unattainable.

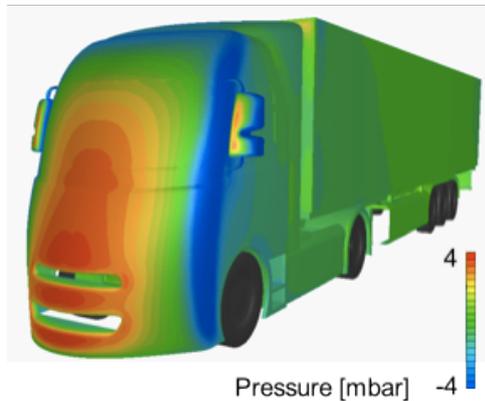
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<sup>5</sup> [www.fka.de](http://www.fka.de). The full study can be downloaded from the T&E website here:  
[www.transportenvironment.org/publications/design-lorry-tractor-optimised-safety-and-fuel-consumption](http://www.transportenvironment.org/publications/design-lorry-tractor-optimised-safety-and-fuel-consumption)

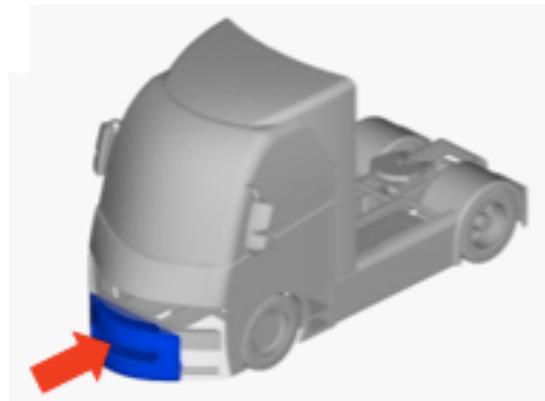
## Summary

The study found that allowing for longer cabins would enable the design of much safer and more aerodynamic lorry tractors compared to today's standard European lorries.

It illustrates how such improvements could be made. As shown in **Figures 1 and 2**, the improvements would essentially be achieved by adding a rounded nose to the lorry cab.



**Figure 1:** Reduced aerodynamic drag



**Figure 2:** Additional crash management system + deflecting shape

FKA studied various changes in cabin length (40-120cm), and concluded that the best solution for future regulation would be to allow an overall length increase of 80cm. Such an increase in length should be allowed exclusively for the cab, while leaving trailer (i.e. load) dimensions and overall vehicle weight limits unchanged, in order to ensure that both safety and environmental improvements are achieved.

The study quantified the benefits of such a design change:

### Safety

- An 80cm longer, and more smartly designed, cab could have positive effects for around 50% of the fatal accidents involving HGVs, thus having an potentially impacting or saving 3200 to 3800 fatal accidents, taking as baseline the 7070 fatalities (EU27, 2008);
- Of this total, the life-saving potential for so-called vulnerable road users (cyclists and pedestrians) is estimated at around 300 lives saved per year. Reduced blindspots and the deflective shape result in a dramatically lower risk of pedestrians and cyclists being run over, compared to a 70% risk with current frontal design.<sup>6</sup> Overruns were entirely avoided in the crash simulations carried out in the study
- The rounded shape incorporates a crash management system (often known as a 'crumple zone') to absorb crash energy, to improve direct vision, to avoid overruns of pedestrians and cyclists and to reduce the impact on other vehicles. This substantially reduces intrusion in case of frontal collisions between HGVs and cars.
- The proposed design fully complies with all other EU and UN-ECE safety regulations.

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<sup>6</sup> APROSYS, 2008.

## Environment

- The new cabin reduces aerodynamic drag by 12%, leading to fuel savings and CO<sub>2</sub> emission reduction of 3.2%-5.3% for a 40t long haul lorry.<sup>7</sup>
- This implies an overall annual emissions reduction of 3-5 Megatonnes CO<sub>2</sub> by 2020
- The increased design space makes it easier to fit exhaust after treatment and noise insulation systems required to meet other environmental regulations.
- The weight increase (13.39kg) is extremely limited

## Economy

- Improved fuel economy would bring about savings of €1500 per lorry per year on average.<sup>8</sup>
- The proposed changes would necessitate limited additional production costs (estimated at €400).
- Overall fuel consumption reduction by 1.1bn-1.8bn litres per year by 2020.

## Policy recommendations

The key recommendation of the study is that allowing for an 80cm extra cabin length through changes in Directive 96/53 on lorry weights and dimensions would yield optimal benefits in terms of environment and safety.

In parallel to this change, EU legislation should introduce requirements for aerodynamic frontal geometry, energy absorption performance criteria (requiring a crash management system / crumple zone) and strict requirements for direct and indirect vision in order to minimise blind spots.

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<sup>7</sup> Three quarters of lorry trips are associated with > 150km trips (AEA 2011, 48). Fuel savings in the FKA study are calculated on the basis of a +- 150km trip (Aachen-Köln-Aachen)  
<sup>8</sup> 40t longhaul truck, 125,000km/yr at diesel price €1.25/l excl. tax.

## European policy context

There are currently no EU policies aimed at reducing tailpipe greenhouse gas emissions from HGVs. The share of lorries in total EU CO<sub>2</sub> emissions is due to rise from 6 to 8% by 2020, if left unaddressed.

The 2011 Transport White Paper<sup>9</sup> sets a 60% greenhouse gas emissions reduction target for the transport sector, compared to 1990, to be met by 2050. This is a 70% reduction compared with today's levels. The White Paper also reiterates a commitment to 'Vision Zero', meaning that more measures should be taken to minimise road accident deaths and injuries.

But with both the climate and the safety objectives, the White Paper fails to specify which measures will contribute to meeting these goals.

Focusing on lorries in particular, being the sub-sector of land transport with the fastest growing emissions, a suite of measures would be urgently needed. Many such measures would bring about both safety and environmental benefits, including harmonising the limited speed for lorries to 80kmh across Europe, fitting lorries with mandatory tyre-pressure monitoring systems, and expanding road charging schemes to take accident and pollution costs into proper account.

As lorries have not become substantially more fuel efficient over the last 10-15 years, progress must be accelerated by introducing fuel economy labeling to drive the market as well as considering binding fuel economy standards, such as those already in place for cars and vans.

The rest of this report looks at the contribution to environment and safety considerations a smarter cab design could make.

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<sup>9</sup> [http://ec.europa.eu/transport/strategies/2011\\_white\\_paper\\_en.htm](http://ec.europa.eu/transport/strategies/2011_white_paper_en.htm)

# The brick: lorry design in Europe today

## 1. Explaining current cab design

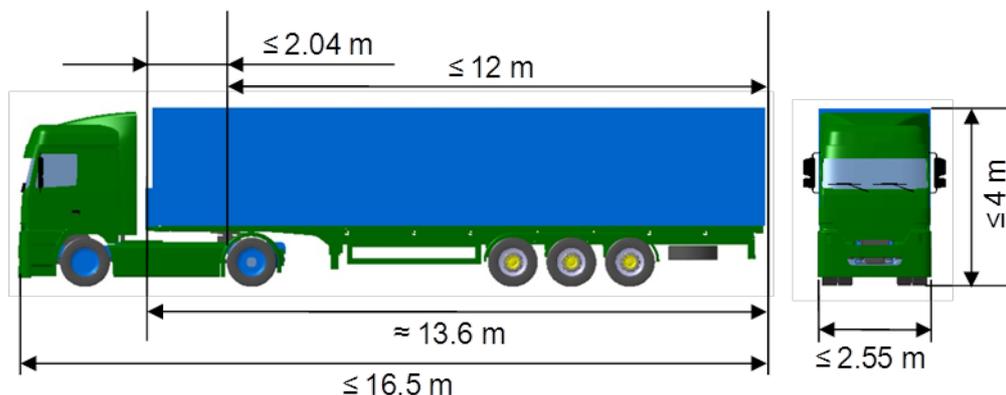
The typical European cab-over-engine design leads to a number of problems. Lorry manufacturers are, in principle, free to design tractors (the part of the lorry that pulls the trailer) and cabs (where the driver sits) as they wish, under the condition that they meet product harmonisation regulations, mostly related to safety standards. Current laws on the weights and dimensions of lorries limit the maximum vehicle height and width, which also directly apply to the cab. But as regards cab length, there is no *maximum* limitation. As a matter of fact, the current laws limit the overall length of the total vehicle combination (tractor + trailer), as well as the maximum trailer dimensions, in such a way that it ensures the *minimum* length of the cab.<sup>10</sup>

So, today's lorry cabs could already be designed to be safer or to save fuel via a more streamlined shape, yet the blunt-fronted cab-over-engine design (that resembles a house brick) has remained dominant. As a result, fuel efficiency and safety are compromised.

Because road freight customers demand maximum cargo space and thus maximise trailer length within the overall limited vehicle dimensions, this has led to demand for cabs that are squeezed as much as possible. The difference, for example, compared to tractor units in the USA is striking (see image, right), and can be explained by the fact that the USA regulates the length of the trailer but not the whole vehicle.<sup>11</sup>



An earlier review of the law recognised the trend towards shrinking cabs, and therefore set maximum dimensions of the trailer and loading space in relation to the overall vehicle length, as illustrated in **Figure 3**. This was deemed necessary to protect cab space for the driver's benefit. As a result, virtually all cabs on the European market today are around 2.35m long.<sup>12</sup>



**Figure 3:** Regulated dimensions of EU HGV tractor and trailer

This means that any regulatory change aimed at granting more cab space for safety and/or aerodynamic purposes would have to be strictly defined by law. This would be necessary to

<sup>10</sup> Directive 96/53/EC, annex 1.1

<sup>11</sup> <http://ops.fhwa.dot.gov/freight/sw/overview/index.htm>

<sup>12</sup> FKA, Design of a Tractor for Optimised Safety and Fuel Consumption, 2012

[www.transportenvironment.org/publications/design-lorry-tractor-optimised-safety-and-fuel-consumption](http://www.transportenvironment.org/publications/design-lorry-tractor-optimised-safety-and-fuel-consumption), 25

prevent that the additional length were devoted to extra cargo space and to ensure that aerodynamic and safety benefits are fully achieved.

## 2. Safety performance of current cabs

The flat frontal shape of cab-over-engine design imposes limitations for both passive (impact reduction) and active (crash avoidance) safety performance.



**Figure 4:** crash simulation: lorry speed 21km/h; car speed 42km/h

As illustrated in **Figure 4**, which shows the damage following a crash test simulating a head-on collision, the lorry front is relatively unscathed, whilst the other vehicle is severely damaged. The limited space available and flat shape of the cab, with the engine under the driver's position, directly behind the bumper and grille, means that crash management systems (crumple zones) are not included in today's lorries. Cars, on the other hand, currently include crumple zones as standard, to absorb kinetic energy in the event of a crash. As the picture makes it clear, most of the kinetic energy is absorbed by the smaller vehicle, and very little of it by the cab.<sup>13</sup>

The flat front also poses a particular risk to pedestrians and cyclists. Even in a low speed collision, there is a 70% risk for pedestrians or cyclists to be knocked or dragged under the vehicle and run over by the wheels, with likely fatal consequences.<sup>14</sup>

With regard to active safety, it is remarkable that there are no current direct vision requirements for HGVs, despite serious blind spot issues around the front and sides of the tractor. (There are indirect vision requirements, mandating a certain field of vision via the mirrors. There are also direct vision standards for smaller vehicles) Due to the flat shape and current structure of the cab, the lorry's windscreen is small and cannot easily be enlarged. In addition, the high position of the driver above the engine, means that other vehicles and road users are significantly below the driver's eyeline or may be obscured in frontal or lateral blind spots.<sup>15</sup>

## 3. Aerodynamic performance of current cabs

Aerodynamic drag is responsible for 35-40% of a 40t lorry's fuel consumption.<sup>16</sup> Reducing aerodynamic drag therefore offers a very promising way to reduce fuel consumption and GHG emissions from HGVs.

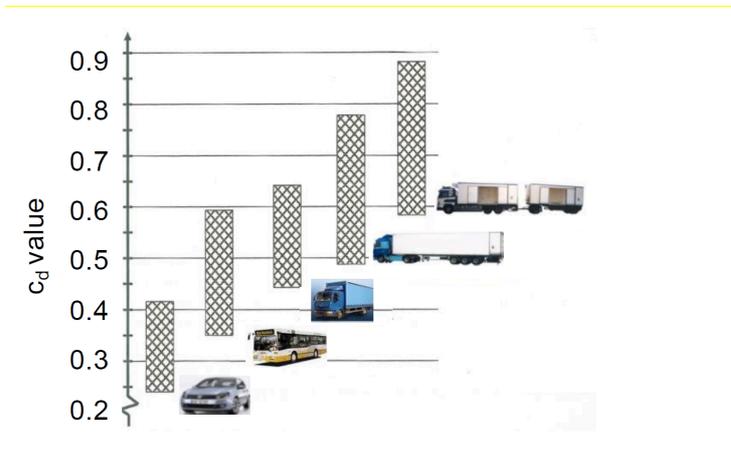
<sup>13</sup> FKA, 73-74

<sup>14</sup> Ibidem, 84-85, from APROSYS, EU-funded research project, 2008.

<sup>15</sup> Ibidem, 91-92.

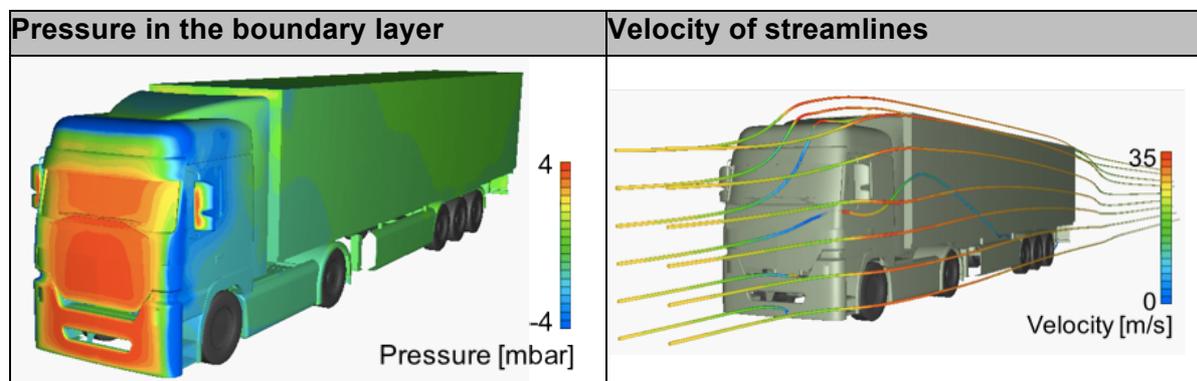
<sup>16</sup> <http://www.part20.eu/en/background/fuel-consumption/>

HGVs generally perform disappointingly from an aerodynamic point of view. Passenger cars, for instance, have much lower aerodynamic drag coefficient ( $C_D$ ), between 0.25 and 0.42 (see **Figure 5**). For an average lorry tractor,  $C_D$  is around 0.6.<sup>17</sup> Aerodynamic drag has the biggest impact on fuel economy at high speeds. Over 70km/h, aerodynamic drag becomes the dominant factor (rather than rolling resistance as far as fuel burning is concerned).<sup>18</sup> Hence there is a direct correlation between aerodynamic drag reductions, fuel economy and emissions reduction.<sup>19</sup>



**Figure 5:**  $C_D$  value of different vehicle types

As shown in **Figure 6**, there is a very large area of high pressure air resistance on the frontal plane of a tractor at highway speeds. The aerodynamic performance of today's cabs could be dramatically improved if the shape were redesigned to be more streamlined.<sup>20</sup>



**Figure 6:** Aerodynamic performance of an average European 40tonne lorry

<sup>17</sup> FKA, 43-49

<sup>18</sup> JRC (2009), Longer and Heavier Vehicles, an overview of technical aspects, 2009, 11-12.

<sup>19</sup> In JRC (2009) it is estimated that a 2% drag reduction results in a 1% fuel economy improvement. The FKA study uses more conservative estimates (12% drag reduction results in 3.2-5.3% fuel economy improvement).

<sup>20</sup> FKA, 42

## The smarter cab concept

### 1. A smarter cab concept: design development and benefits

The study by FKA investigates how the design of tractor units could be optimised. For this purpose, it builds on the findings of several EU-funded research projects, most notably the APROSYS Work Package on safer frontal design of HGVs.<sup>21</sup> Similarly, the study has been inspired by various concept cabs presented by the major lorry manufacturers in Europe.<sup>22</sup>

Working on the basis of the 'soft nose' cab design from the APROSYS project, the concept was scaled up to a 40t lorry and underwent further aerodynamic optimisation. The most promising variants were tested in safety simulations to assess active (crash avoidance) and passive (impact reduction) safety performance. Both self-protection and partner protection were included in the technical assessment. The aerodynamic performance for several variants was assessed in Computational Fluid Dynamics (CFD) simulations using computer modelling.

The results of the different design concepts were also compared to a reference lorry, based on today's typical designs. The aerodynamic performance was further tested in a wind tunnel tests on a 1:10 scale model of the best performing variant from the simulations.

The results of the crash test simulations were assessed in light of accident causation and impact research. In particular, the study analysed the effects of adding a crumple zone / crash management system (CMS) in the event of a car-to-lorry collision, or a lorry-to-lorry collision, in terms of energy absorption and reduction of intrusion into the driver and passenger compartment. Different variants of CMS were analysed which could be fitted into the additional rounded frontal space. The study also analysed statistics of collisions between lorries and vulnerable road users, to quantify the benefits of the rounded frontal shape and improved direct vision.

Environmental and economic impacts, including fuel savings, utility and total costs of ownership were also assessed. The concept respects all relevant EU and UNECE legislation with regard to type-approval, active and passive safety and environment.

Further aerodynamic improvements are possible, notably on the trailer. For example aerodynamic add-ons, such as tails and side wings, could help deliver even higher significant fuel savings. Their potential is explored in another T&E briefing.<sup>23</sup>

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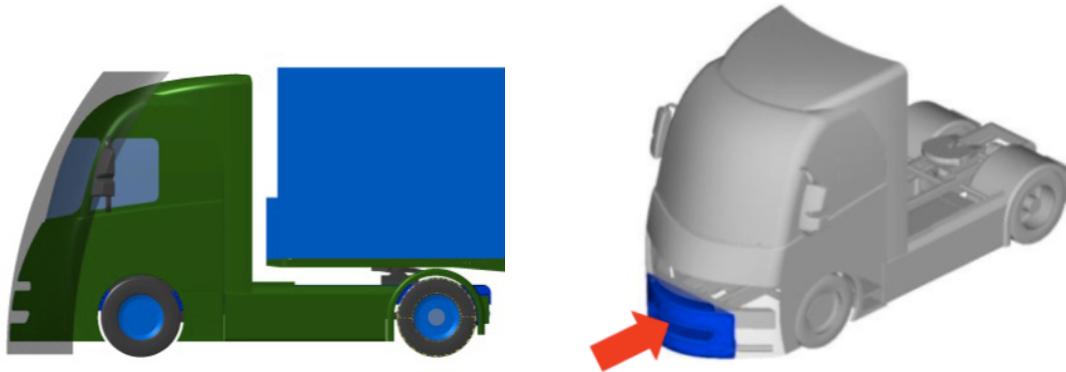
<sup>21</sup> TNO, APROSYS Advanced Protection Systems. Final report, 2009, 15.

<sup>22</sup> FKA, 16-20.

<sup>23</sup> See also: T&E, The case for the exemption of aerodynamic devices in future type-approval legislation for heavy goods vehicles, 2010. [www.transportenvironment.org/publications/exempting-aerodynamic-devices-future-hgv-type-approval-legislation](http://www.transportenvironment.org/publications/exempting-aerodynamic-devices-future-hgv-type-approval-legislation)

## 2. Design recommendations

Following the detailed assessment of different design concepts, the study concludes that the optimal solution would be an 80cm increased cab length in order to improve both safety and environmental performance. This could be achieved by a rounded frontal shape and inclusion of a crash management system as presented in **Figure 7**.



**Figure 7:** round nose cab with crash management system (crumple zone)

It was found that an 80cm length increase would yield better results compared to a 40cm or a 120cm increase. Moreover, an 80cm increase would achieve both aerodynamic and safety improvements while ensuring full compliance with existing EU safety regulations, without requiring a redesign of the basic structure (wheelbase). Other variants were considered, but found to be less promising on at least one of the above-mentioned criteria.<sup>24</sup>

## 3. Safety benefits

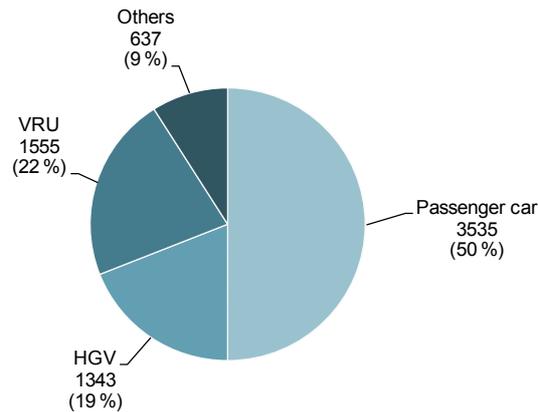
A smarter cab design would essentially have an impact on accidents that involve the lorry tractor. It was therefore investigated what proportion of accidents involving HGVs falls into this category.

In 2008, statistics said that lorries were involved in 7070 fatal accidents in EU27.

**Figure 8** illustrates the danger for partners involved, especially in car-to-lorry collisions and those involving pedestrians and cyclists. The category 'Others' includes mopeds and motorcyclists. Contact with the cab is relevant in around 50% of these accidents, and this percentage could be dramatically reduced by improving the cab design.<sup>25</sup>

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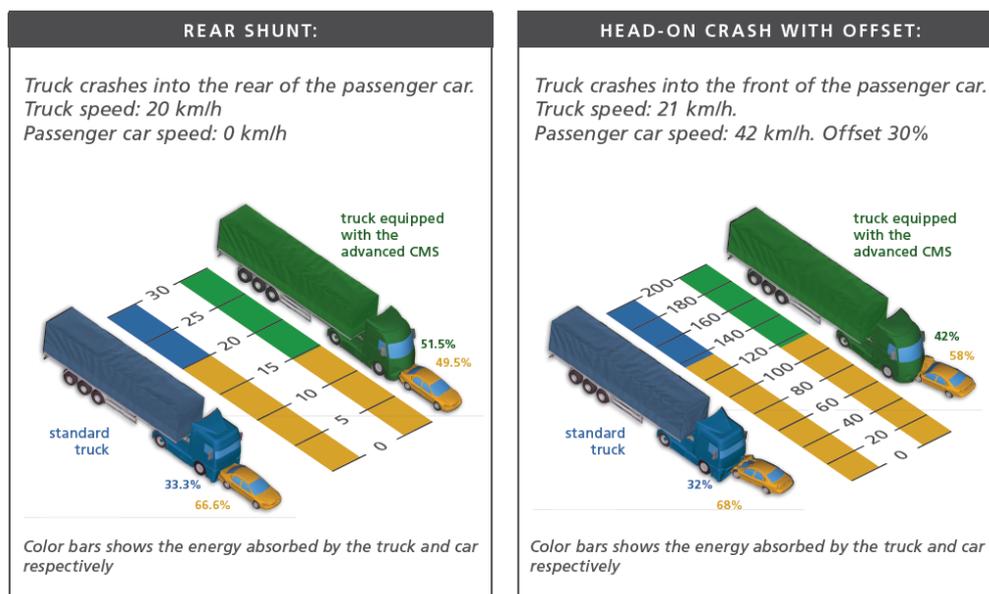
<sup>24</sup> FKA, 51-52  
<sup>25</sup> FKA, 68-72



**Figure 8:** Fatalities in accidents with HGV involvement (EU27, 2008)

An improved cab design improves safety performance in the following ways:

Thanks to extra space in the rounded nose, the cab can now incorporate a crash management system (crumple zone) which would lead to a substantial increase in crash energy absorption by HGVs in case of frontal collisions (see **Figure 9**).<sup>26</sup>



**Figure 9:** Energy absorption performance of cabs with crash management system<sup>27</sup>

**Figure 9** illustrates how rear shunt crash impacts would result in a 65% reduction in car's acceleration levels. For head-on crashes there would be a 17% reduction in such levels. Acceleration levels in cars are correlated to the risk of injury to the motorists.<sup>28</sup>

The crash simulations showed that kinetic impact energy is absorbed by the CMS and intrusions into the car's firewall are significantly reduced. This area is critical, because intrusions can cause contact between the car occupants and parts of the car which increase

26 FKA, 78-84.

27 EAA, Aluminium for safer trucks, 2011, 4.

<http://www.alueurope.eu/wp-content/uploads/2011/10/Aluminium-for-safer-trucks-rev01.pdf>

28 Ibidem, 4.

the risk of severe injuries. Of the 3500 in-car fatalities, around 2200 could be avoided by the addition of CMS.<sup>29</sup>

The different design of the lorry enables improved direct vision. Because of the rounded front, a person directly in front of the cab would be further forward in the driver's field of vision. The changed pillar structure of the cab also enables windscreens to be larger, thereby improving vision and reducing blind spots. It is difficult to quantify life-saving potential, but it can be inferred that a significant number of collisions would be prevented.<sup>30</sup>

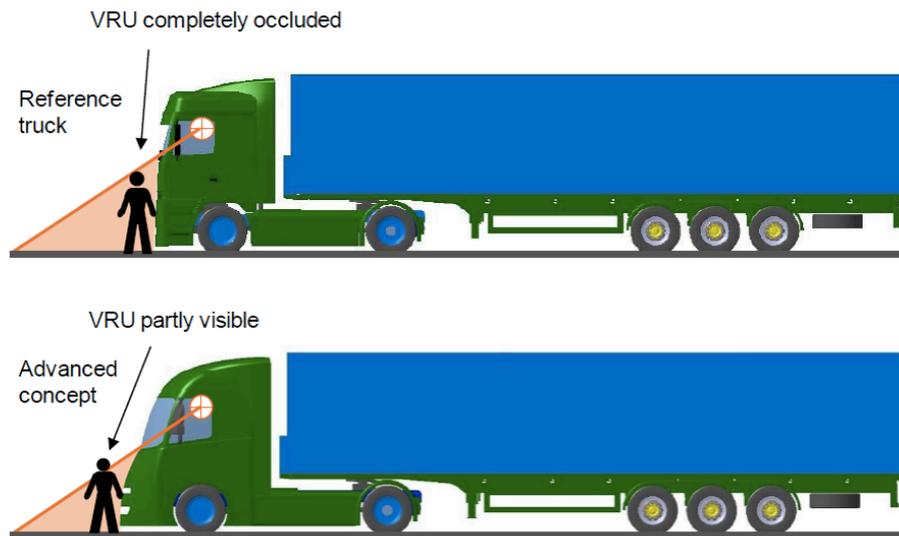


Fig. 7-9: Occultation of VRUs in side view

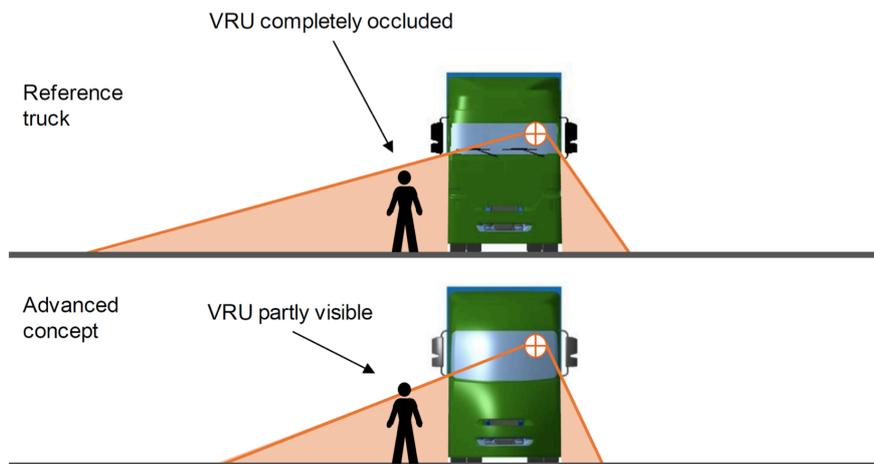


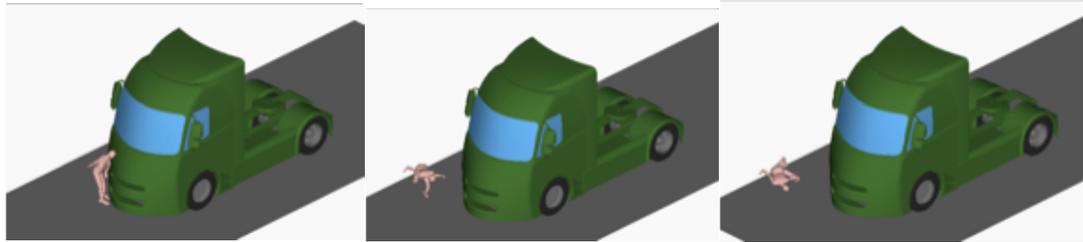
Fig. 7-10: Occultation of VRUs in front view

The rounded nose would allow for deflection in case of collisions, as shown in **Figure 10**. This would mainly benefit pedestrians and cyclists, who currently have a very high chance of ending up under the wheels when hit by a lorry. In crash simulations testing the impact on human models (male, female, child), overrun was avoided in all cases. Deflection would

29 FKA 79  
30 FKA, 91-95

dramatically improve the chance of surviving to such a collision. This is compared to 70% risk of overrun with the reference tractor.

In total, it is estimated that around 300 cyclists' and pedestrians' fatalities (the so-called vulnerable road users) could be avoided through smarter cab design every year.<sup>31</sup>



**Figure 10:** Frontal collision between lorry and pedestrian; 100% overrun avoidance

**Overall, the safer design of lorry cabs would reduce the impacts or entirely avoid collisions in some 50% of cases, with accident reduction potential estimated at up to 3200-3800 lives per year.<sup>32</sup>**

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31 FKA, 85  
32 FKA, 70

## 4. Fuel savings and environmental benefits

The increased cab length is used to add a rounded nose to the cab. Once this new design was optimised and implemented, CFD simulations proved that aerodynamic drag would be reduced by 12% for a 40t lorry.<sup>33</sup>

This means fuel savings of 3.2 to 5.3% depending on load factor. Wind tunnel tests of a 1:10 scale model yielded considerably bigger improvements, with a 31% drag reduction, but neglected the role of the trailer. When this was included in measurements, the above-mentioned 12% drag reduction for the whole vehicle was confirmed.

A fuel saving of around 4% from one single measure is significant, when considering that business-as-usual improvements claimed by lorry makers are foreseen at around 1% per year. Average fuel savings of 4% means a haulier would spend €1500 a year less on diesel, at today's prices. This, in turn, would drive the market for smarter cabs.<sup>34</sup>

If such a length extension were allowed, it could be expected that lorry makers would be able to further streamline such smarter cabs to make even greater fuel savings. In addition, other measures could also be adopted to improve the lorry fuel efficiency, such as reducing the lorry weight, as well as improving the aerodynamics of the trailer and articulation points. In this respect, changes to the EU legislation are much needed, if lorry aerodynamics are to be improved.

It should also be noted that the extra design space provided by the smart truck might well be welcomed by manufacturers for other reasons. It is a common complaint that the technology needed to comply with air pollution (EURO) standards requires much space. Smarter cab design would solve this issue.<sup>35</sup>

To sum up, smarter cab design would reduce annual emissions by 3-5 megatonnes CO<sub>2</sub> by 2020.<sup>36</sup> At the same time it would lead to a reduction of total European fuel consumption by 1.1bn-1.8bn litres of diesel per year.

## 5. Benefits for fleets and drivers

Lorry owners will benefit from smarter design in several ways. First of all, improved fuel efficiency will make them save money. For a 40t long haul lorry there would be an average annual gain of around €1500. Over the typical first owner lifetime (4 years) this would yield around €6000.<sup>37</sup> A short payback period for higher purchase costs is therefore expected.<sup>38</sup>

As the basic structure of the cab remains largely unchanged from today's standard models, retooling costs are not expected to add significantly to production costs.

In addition, given that long-haul drivers spend on average more than 4 nights per week in the lorry, extra space could also offer new possibilities for better ergonomic design.<sup>39</sup> To date, "*aerodynamic improvements in the European truck business have required a compromise in interior space and driver comfort*".<sup>40</sup> But as noted before, cargo space has always taken precedence over both driver comfort and aerodynamic design.

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33 FKA, 54-59.

34 CE Delft, Are trucks taking their toll? 2009, 17.

35 FKA, 93.

36 FKA, 111.

37 125,000km/year assuming a diesel price of €1.25 (excluding VAT) yields annual savings of +/- €1500.

38 FKA, 109-110.

39 [http://www.volvotrucks.com/dealers-rtc/en-gb/MCTB/newsmedia/Pages/volvo\\_news.aspx?pubid=12077](http://www.volvotrucks.com/dealers-rtc/en-gb/MCTB/newsmedia/Pages/volvo_news.aspx?pubid=12077)

40 AEA, Reduction and testing of GHG emissions from heavy duty vehicles – lot 1 : strategy, 2011, 102.

## Policy recommendations

To achieve both the safety and environmental benefits identified in the FKA study, EU legislation would need to be changed. In light of the results of the study, T&E makes the following recommendations:

### 1. Legislation on Weights and dimensions (Directive 96/53/EC)

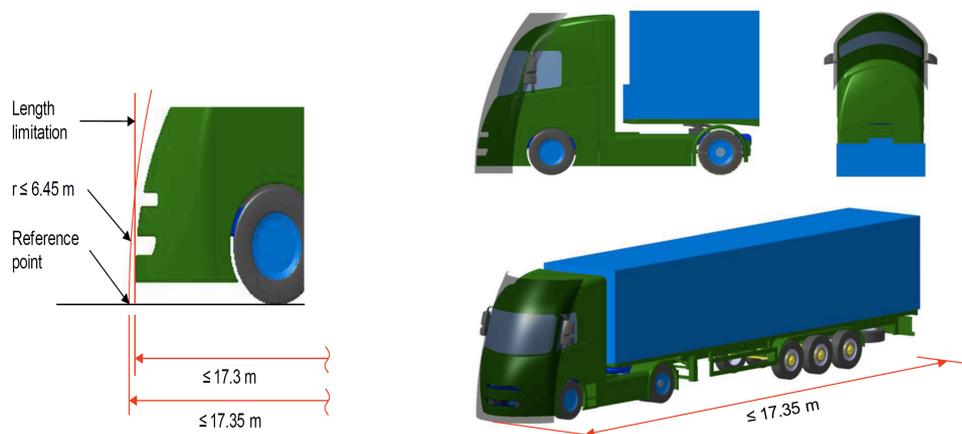
With regard to the legislation dealing with weights and dimensions of HGV in circulation:

**Allow for a length increase of 80cm, exclusively for the cab:** Both the safety and aerodynamic improvements require extra length for the cab. Integrating the optimal extension of 80cm exclusively for the cab, can be achieved by allowing articulated lorries to reach a length of 17.30m and road trains to reach a length of 19.55m, while leaving maximum trailer lengths unchanged at 12m.

### 2. Type-approval legislation

Changes to the law on weights and dimensions must be accompanied by new vehicle standards to ensure that new cab designs fully realise the safety and aerodynamic potential identified. To ensure that the extra space is devoted to safer and cleaner cabs, rather than other purposes, new laws must:

**Mandate a more aerodynamic shape:** Define a frontal geometry requirement to maximise aerodynamic benefits, which could be approached as in **Figure 10**.



**Figure 10:** frontal geometry recommendations

**Mandate a crash management system for lorries:** Equipping lorries with CMS would significantly improve their safety performance. Specific energy absorption criteria for lorries should be set and appropriate test procedures must be developed.

**Direct vision requirements:** There are currently no direct vision requirements for HGVs. New direct vision requirements are needed to minimise frontal and lateral blindspots from

the position of the driver. The Danish transport ministry recently made a proposal to this end.<sup>41</sup>

### 3. Link to vehicle emissions legislation

Passenger cars and light commercial vehicles are subject to CO<sub>2</sub> emissions limits, while HGVs are currently exempt. Given their proportionally high and rapidly increasing share of road transport emissions, further measures will be needed to cut lorry emissions.

**Develop emission standards and labels for HGVs:** Better aerodynamics, for example smarter designed cabs, are part of the package that is needed to reduce lorry emissions.<sup>42</sup> Setting ambitious standards and creating transparency via labelling could create a framework in which such improvements and innovations would be rewarded.

### 4. Non-legislative measures – extend EURO-NCAP testing to HGVs

The system of EURO-NCAP safety ratings for cars has had a very positive impact on road safety. The development of pedestrian protection ratings has become more important over recent years, and would be an essential focus for commercial vehicles. Extending EURO-NCAP ratings to vans and lorries could inspire a similar drive towards improving safety standards in the commercial vehicle sector.

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41 "The driver shall be able to directly see an object placed 1.5 m above ground level, at a distance more than 0.5 from the side or front of the vehicle, and in front of the rear cabin wall. Exceptions shall be allowed for areas around pillars, door-frames, and mandatory mirrors."

[http://circa.europa.eu/Public/irc/enterprise/automotive/library?!=/technical\\_committee/meeting\\_december\\_2009/denmark\\_vision/pdf/\\_EN\\_1.0\\_&a=d](http://circa.europa.eu/Public/irc/enterprise/automotive/library?!=/technical_committee/meeting_december_2009/denmark_vision/pdf/_EN_1.0_&a=d)

42 AEA, Reduction and testing of GHG emissions from heavy duty vehicles – lot 1 : strategy, 2011.