

Context

Three quarters of goods in the EU are carried by road. Whilst only 3 percent of vehicles, lorries account for 25 percent of road transport CO₂ emissions in Europe. Over the past 20 years the fuel efficiency of lorries has hardly improved¹ and lorries are also involved in a disproportionate number (15%) of fatal accidents.

One reason for this poor track record is the very blunt, hence unsafe and unstreamlined, front end of Europe's lorries. This situation is caused by EU law, Directive 96/53, which constrains the maximum length of cabins.

The European Commission has proposed to change this law to allow slightly longer lorry cabs, so their safety and aerodynamic performance can be improved. T&E supports this move but wants it complemented by mandating the safety improvements for all lorries. This briefing illustrates the urgent need for smarter design and the benefits of such a change.

Potential benefits of 80cm longer lorry cabins

In 2011 T&E published a study² on the potential gains from longer lorry cabins. It concluded that 80cm longer cabins could yield:

- **Better aerodynamics** which will reduce fuel consumption and emissions by 3-5% in long-haul trucking.
- **Fuel savings** of ca. €1,500 per year per lorry.
- Hundreds of **lives of cyclists and pedestrians saved** through better visibility and deflective shape.
- Bigger windscreens which **reduce blind spots** around the cab.
- **Space for a crash box** to reduce crash impacts on other vehicles.



Problems with current brick-shaped cabs

Virtually all European lorry cabs have the same 'brick-like' shape. The so-called 'cab-over-engine design' minimises the space needed for the cab but reduces the aerodynamic performance which leads to higher fuel consumption and CO₂ emissions.

Current design also affects the safety performance of European lorries. There is no room for crash boxes or crumple zones on cab fronts. The blunt front also leads to a high risk of pedestrians and cyclists being knocked under the wheels and run over in case of collisions. The current design also limits the driver's field of direct vision; this creates deadly blind spots around the cab.

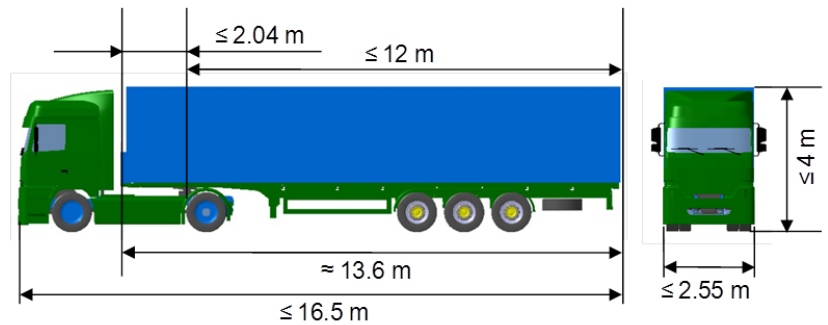
¹ http://www.acea.be/images/uploads/files/20101013_Commercial_Vehicles_CO2.pdf

² FKA, Design of a tractor for optimised safety and fuel consumption, 2012: <http://www.transportenvironment.org/node/2865>

A frontal crash with a lorry is like hitting a brick wall; even collisions at very low speed usually cause pedestrians to end up under the wheels

Explaining current design

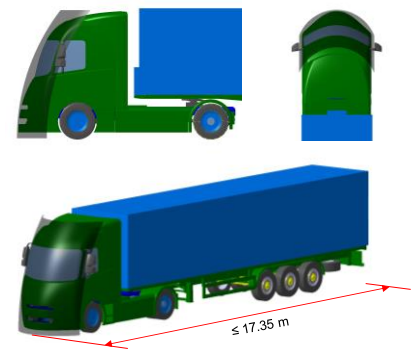
The EU regulates the dimensions of lorries. Directive 96/53/EC limits the overall length of the vehicle (16.5m) and the trailer (13.6m). That leaves approx. 2.3m for the cab. Because market forces drive the maximisation of cargo space, almost all lorry cabs sold in the EU are squeezed 'cab-over-engine' designs.



Improving current design

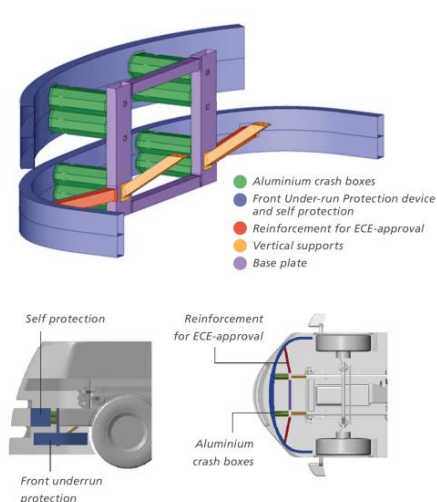
T&E commissioned engineering institute FKA to investigate how smarter lorry design could improve environmental and safety performance.

The study by FKA illustrates how current design limits the potential for improvements and shows how better cab design would be possible if cabs were allowed to be slightly longer so that lorry cabs could be given a rounded, aerodynamic front. An 80cm extension maximises benefits and is compatible with current turning circles and infrastructure.



Increased fuel economy and lower emissions

Around 40 percent of fuel use of a long haul lorry is burned to overcome aerodynamic drag. A slightly longer, aerodynamically optimised shape would have 12 percent lower drag, leading to fuel savings of 3-5 percent for an average 40t lorry. At current diesel prices, this would save hauliers on average €1500 per lorry, per year. This would add up to future savings of 3-5 megatonnes CO2 emissions per year across the fleet.



Reducing crash impacts

Currently, the engine block sits directly behind the front bumper of a lorry, with severe impacts in crashes as a result. Equipping lorry cabs with a crash box (crumple zone), would allow more of the crash energy to be absorbed by the cab. That would reduce crash impacts and save lives.

Better direct vision: reduction of blind spots

Blind spots are an important cause of fatal accidents (e.g. turning accidents in cities). The current design limits the driver's field of vision. Smarter design allows for bigger windscreens and a better driver position to prevent collisions.

Deflection of pedestrians and cyclists

In case of frontal collisions, the rounded shape would deflect pedestrians and cyclists out of the path of the wheels and prevent them being run over by the lorry. The FKA study included crash simulations with impressive results, showing that the deflective shape prevented overruns in 100% of simulated cases. This will significantly improve the likelihood of survival of low speed collisions.

Are lorry makers ready to build cleaner and safer lorries?

Most of Europe's lorry manufacturers have concept tractors with a slightly longer, streamlined shape, better aerodynamics and better safety. Some have even called for changes to EU law to be able to start building better cabs.³



MAN Concept S



SCANIA Crash Zone Concept



Volvo Vision 2020 concept



Renault Concept CX/03

More design space would have multiple benefits for manufacturers. Apart from being able to offer customers a better product, they would have more space to fit the equipment needed to limit air and noise pollution.

The Commission proposes (see below) that lorry makers will be allowed but not obliged to build smarter lorries; This means that lorry makers can adapt to the changes at their own pace and that lead time to delay the entry into force of the law is not necessary.

Won't cleaner and safer trucks be very expensive and complicated?

The suggested safety and aerodynamic improvements do not require any new technology, only smarter design. Essentially this requires extra materials (steel, glass) and possibly a crash box or crumple zone and of course R&D. According to FKA 2011 the extra material would cost no more than €400. The redesign and R&D cost is more difficult to estimate but could be limited too.

Indeed, lorry makers redesign lorry cabs every time they introduce a new or updated model. The Commission proposal would enable lorry makers to redesign the cabs in a safer and more aerodynamic way and lorry makers are free to go for it. The fuel savings will probably far outweigh the extra purchase costs. Some manufacturers have already made it clear they are interested (see above). Since there is no obligation, there is no need for lead time either.

To complement the EC proposal and maximise the safety benefits, also in urban areas, T&E proposes to mandate the safety improvements for all lorries. For this, lead time is needed. If lead time is sufficient, lorry makers can integrate the mandatory changes into the planned redesign process and the additional costs would remain limited.

It is also sometimes claimed that aerodynamic improvements to lorry cabs will not have a significant impact. Such claims run counter not only to common sense and independent studies but also to what lorry makers have said⁴ and done in the past (e.g. their future concepts above).

³ <http://blog.transport-efficiency.com/en/the-man-concept-s-the-revolution-part-two/>

The European Commission proposal (April 2013)

The Commission proposes to allow lorry makers to include extra design space if they comply with a number of conditions, notably:

- improved aerodynamics
- improved crash performance
- improved direct vision
- improved comfort and safety of the driver

The amount of extra space, as well as the conditions that manufacturers will need to comply with, is supposed to be further specified by an expert committee to be convened by the European Commission.⁵

What needs to happen next?

The Commission proposal is a crucial step towards safer and cleaner lorries. It tackles the key problem, i.e. space constraints, and seeks to improve it to reducing fuel consumption and emissions as well as improving safety, although this seems to be an afterthought rather than a priority.

In addition to the clear direct benefits for safety and emissions, we believe that the extra design space can also spur a virtuous circle of improvements in lorry manufacturing. Extra design space can facilitate cleaner and more efficient engines, making it easier to comply with air pollution requirements, fit noise reducing materials and hybridise engines. These changes would however need to be driven by further regulatory initiatives.

Policy recommendations

The Commission proposal contains many positive elements but needs to be further improved. Parliament and Council notably need to:

- **Clearly define the safety conditions** in the law rather than leaving this to an expert committee and **set a clear deadline** for the expert committee to finish its technical work and the changes to be enacted to avoid unnecessary delays;
- **Require a deflective shape to improve pedestrian protection:** this would save hundreds of lives every year;
- **Mandate safety improvements for all lorries:** smaller lorries (3.5t-12t weight) commonly used in urban areas are less constrained by current length rules and may not need the proposed length increase. The Commission proposal is a good basis but all lorries should comply with stricter safety rules after a transitional period;

Every year of delay will cost hundreds of lives and billions of litres of diesel.

For more information, please contact:

William Todts

william.todts@transportenvironment.org 0032(0)2/851.02.21

⁴ "For several years now, we are trying to convince the European Union to allow us more freedom. If we are allowed to build longer trucks, then we can realise the potential in aerodynamics and safety" Stephan Kopp, senior manager aerodynamics MAN TRUCK & BUS AG.
<http://www.bbc.co.uk/news/business-23152918>

⁵ Through so-called delegated acts, a comitology procedure initiated by the European Commission.