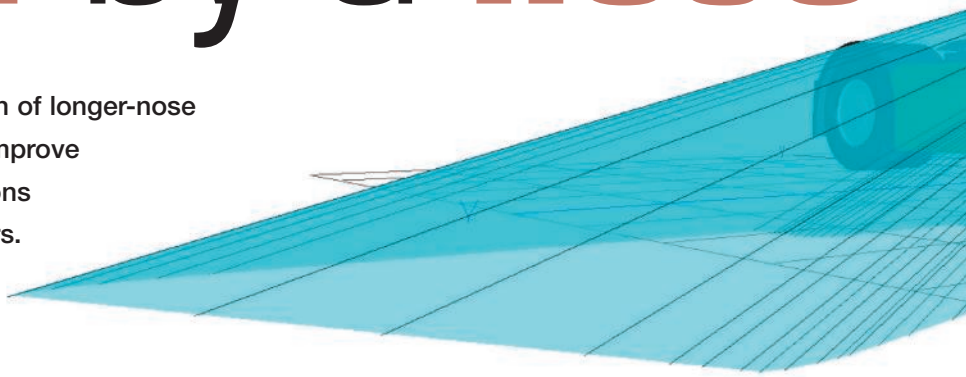
Ahead by a nose

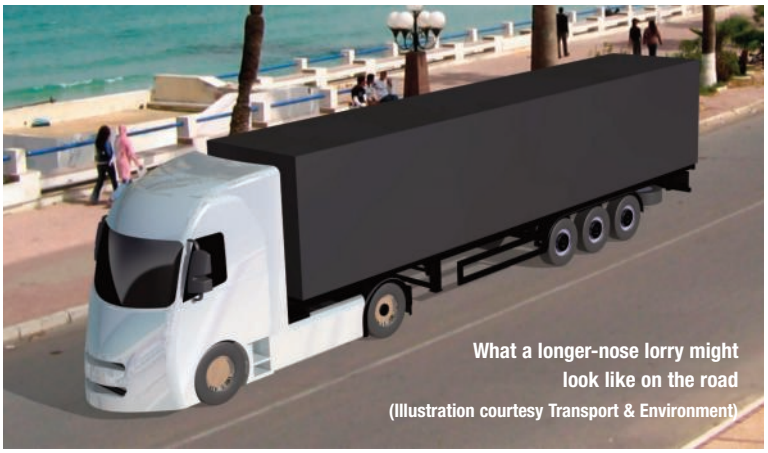
Brussels is keen to see a new generation of longer-nose trucks on Europe's roads – not only to improve aerodynamics but also to reduce collisions between HGVs and vulnerable road users. Brian Weatherley investigates



It's not every day that Brussels talks about changing heavy truck dimensions. When the EC (European Commission) sets maximum vehicle lengths they're set in stone for decades. True, there's the occasional fine tuning, as in 1988 when the width limit of refrigerated vehicles increased to 2.6m. But the last major revision to UK artic and drawbar lengths – to 16.5m and 18.75m respectively, as per 96/53/EC – happened in 1990 and 1998.

So last April's overwhelming vote by the European Parliament in support of the EC's proposal to amend 96/53/EC, allowing longer truck cabs, is of more than passing interest. A new generation of long-nose cabs might provide several benefits, not least that truck makers could build aerodynamic profiles that allow trucks to slice through the air more cleanly, so reducing fuel consumption and CO_2 emissions.

However, by allowing longer cabs, the EC also wants to reduce blind spots under the front windscreen and around the cab, to help cut the number of collisions between HGVs and vulnerable road users, such as pedestrians and cyclists. A longer nose could also incorporate a more 'impact friendly', energy-absorbing structure. The European Parliament specifically wants pedestrian protection to be improved "by adjusting the frontal design to minimise the risk of overruns in case of collisions with vulnerable road users by encouraging the sideways diversion of vulnerable users".



What a longer-nose lorry might look like on the road
(Illustration courtesy Transport & Environment)

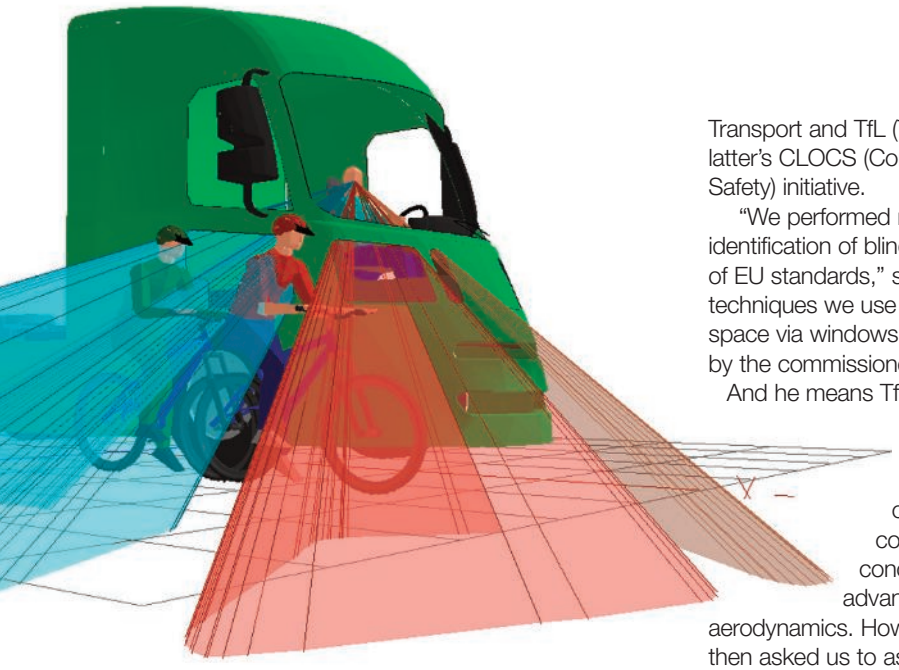
Speculation as to when such long-nose lorries might appear on Europe's roads is premature. There's still a long way to go before a definitive EU directive, amending Directive 96/53/EC, is issued with a clear date for adoption. For now, the EC says it wants to "grant derogations from the maximum dimensions ... for the addition of aerodynamic devices to the rear of vehicles or to redefine the geometry of cabs for tractors, improving drivers' field of vision, and improving safety and comfort".

Seven years to go

The EC says it will specify requirements later. As for when, the official view is: "Within seven years of the entry into force of the directive, new N2 and N3 vehicles and combinations of vehicles shall use cabs that comply with the safety requirements referred to in the directive." In other words, long-nose lorries could start to appear from 2022.

How much longer is a longer nose? According to the EC, "if all conditions are met, cabs could be extended to up to 80cm". That's quite a lot to play with. One condition would be the ability for a longer-truck to still meet existing turning circle requirements. This, it says, is mandatory for all vehicles and hence the calculation of an 80cm limit, with the turning circle criterion ensuring that vehicles comply with existing infrastructure constraints.

That said, while cabs may become longer, current load lengths will remain the same. However, significantly, the EC states that cab extensions are optional. "It is entirely up to manufacturers to decide whether and how to take advantage of such longer cabs," declares the EC. And it adds: "Negotiations are ongoing in view of reaching a final agreement."



Left: Enhanced visibility projections, showing extent of driver's vision

Improving driver vision from a longer-nose truck might, on the face of it, seem somewhat contradictory. However, the Design Ergonomic Group (DEG) at Loughborough Design School (part of Loughborough University) has already created concept designs that go a long way to meeting the Commission's goal – extending earlier project work.

"We have used digital human modelling in the assessment and design of vehicles in many projects, and have software that allows the analysis of direct and indirect vision [for HGVs]," explains Dr Steve Summerskill, senior lecturer in product and industrial design in the DEG. Indeed, he and his colleagues have been involved in several HGV driver vision projects – for example with DfT (Department for Transport and TfL (Transport for London) on the latter's CLOCS (Construction Logistics and Cycle Safety) initiative.

"We performed research with the DfT on the identification of blind spots, which led to the revision of EU standards," states Summerskill. "The techniques we use [including the projection of visible space via windows and mirrors] were seen as useful by the commissioners of the Direct Vision concept."

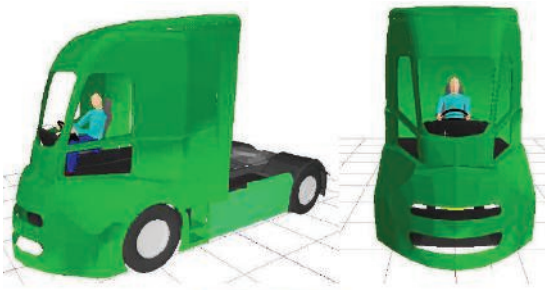
And he means TfL and Transport and Environment – the influential Brussels-based sustainable transport think tank.

This latter organisation initially commissioned German automotive consultancy FKA to create a concept cab that could take advantage of a longer nose for aerodynamics. However, it didn't stop there. "They then asked us to assess this concept for direct vision, and to modify the concept to improve it further," says Summerskill. So working with FKA's computer-generated long-nose design, Summerskill's team has since created three separate design iterations, comparing improvements in direct driver vision to those on a baseline cab over engine – in this case, a DAF XF105, seen as representative of current high-roof, high-datum, top-weight sleeper cabs.

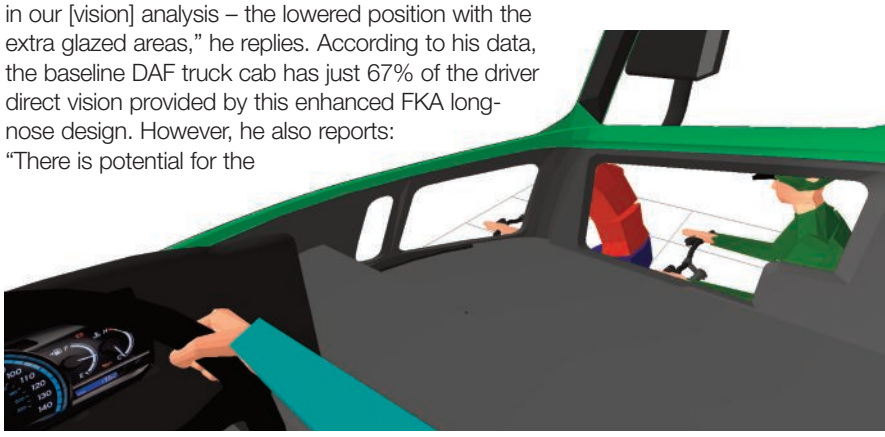
Sightline advantages

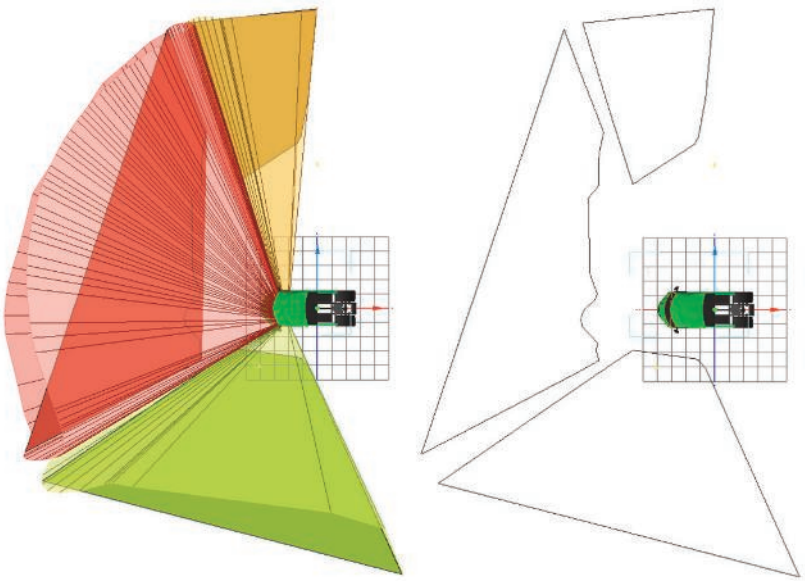
Into FKA's prototype concept, the Loughborough team first placed the driver and conventional XF dashboard to replicate current sightline issues. They then developed and enhanced the FKA design, creating a revised dash layout to overcome issues around dashboard obscuration. The second step was to examine the potential for improving the FKA concept cab's sightlines – initially by lowering the driver's seat position but retaining the conventional location, and then by placing the driver in a central driving position, with the addition of extra glazing for the latter two concepts.

Which of the three versions offers the best solution, or the best compromise, in Summerskill's opinion? "Concept iteration 2 showed the best results in our [vision] analysis – the lowered position with the extra glazed areas," he replies. According to his data, the baseline DAF truck cab has just 67% of the driver direct vision provided by this enhanced FKA long-nose design. However, he also reports: "There is potential for the



Left: Loughborough's third FKA evolution, with central driving position and the cab tapered above the crash structure line
Below: Driver's view of targets adjacent to the vehicle





Sightline projections for the DAF XF cab: the image on the right shows the areas that intersect with the ground

central driving position, too, but this needs further work to stop the dash from obscuring too much of the vision in front of the driver."

Anyone looking at the futuristic designs might be forgiven for wondering whether the deep dashboards (which house a variety of equipment, including heating and ventilation systems) of today's heavy trucks could be repackaged to fit in a cab like the FKA long-nose concept. However, Summerskill is unequivocal. "The section of the dash in front of the driver that goes into the extended nose still provides opportunities for the location of electrical and other services," he insists.

Okay, but while it's not hard to imagine an FKA cab on future long-haul tractors spending much of their time on motorways, just how transferrable would it be to urban delivery trucks? And what about construction vehicles, currently at the heart of TfL's debate on HGV safety around cyclists – and in terms of approach angles and manoeuvrability?

"The design has potential issues in terms of turning cycles in urban environments," concedes Summerskill, pointing to the fact that the steer axle is moved rearwards. "But I would expect vehicles involved in distribution and construction to be developed along the lines of low-entry cabs." And he observes that artics are also found in city centres.

The report from the DEG team, 'The design of category N3 vehicles for improved driver direct vision', has already created interest and Summerskill confirms that he has been in discussion with some OEMs. As yet, there are no plans to create a scale model or prototype. However, there's no doubting the Commission's desire to see longer-nose trucks on our streets, and the Loughborough study provides valuable insights.

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