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Road Safety

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## **Danish Proposal for Extended Front on Heavy Goods Vehicles by amending directive for weights and dimensions**

Trucks of today are designed to carry a maximum volume of goods within the legally permitted maximum dimensions. Current regulations in the EU mean that the maximum weights and dimensions of trucks clearly are hindering the flexibility needed to improve both safety and aerodynamic problems on Heavy Goods Vehicles (HGV). To accompany the rules the front end of the truck consists of a flat vertical surface where the cabin is positioned above the engine. This design has a number of disadvantages:

- There is little space available between the driver and the front of the vehicle with which to provide room for an energy absorbing front zone to protect the driver or other road users in the event of a collision.
- The relative high position of the driver's eyes and the lower edge of the windscreen leaves a significant blind spot in front and on the side of the vehicle, which is a contributing factor in fatal collisions with pedestrians and bicyclists.
- The tall, flat, vertical structure has an inherently high drag co-efficient.

### **Background**

In 2003 the Scania Group presented a concept truck with a 600mm extended front end build to absorb energy in a frontal collision with other vehicles. The truck also has a low cabin that makes pedestrians and bicyclists more visible to the truck driver and therefore reducing the risk of an accident between turning trucks and cyclist.



Scania Crash Zone Concept Truck.



The 600mm extended front end.

According to Scania the survival collision closing speed of a frontal collision between a truck and a passenger car is expected to rise from 56 km/h for a normal truck to 90 km/h for a truck with a frontal collision zone.

In 2006 The Danish Road Traffic Accident Investigation Board (HUV) published a report showing that by lowering of the windows on trucks it is possible to avoid most of the accidents between turning trucks and bicycles. A way to obtain this is by building trucks with a low cabin.

In 2009 Denmark suggested a change of the rules by demanding both improved direct vision and energy absorbing front zones on HGV N2/N3 and at the time allowing for a 500mm extended front. The proposal was met with interest by the EU Commission ([link to proposal](#)). Mercedes Benz demonstrated that by extending the truck by 500mm it is possible to build trucks with low cabins – thus improving traffic safety.



Mercedes Benz Econic with forward low cabin.

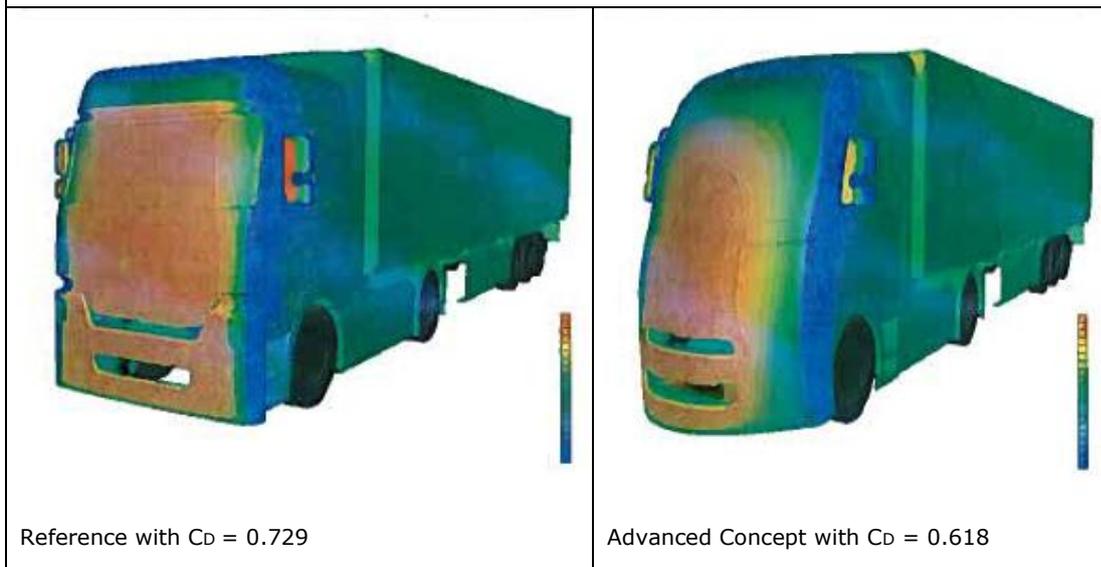


Tractor-Trailer version with forward low cabin.

In 2011 Transport & Environment presented a very detailed report regarding optimizing safety and fuel consumption on HGV. The report supports the idea of making HGV longer thus improving safety of the driver and other road users. Furthermore the report by Transport & Environment contributes with a third objective for extending the length of HGV: less fuel consumption and CO<sub>2</sub> emission.

An 800mm increased cabin length will improve both safety and environmental performance, achieved by a rounded frontal shape and inclusion of a crash management system. Reducing wind drag by up to 15 % ( $C_D = 0.729$  reduced to  $C_D = 0.618$ ) will lead to a 5 % reduction in fuel consumption, a lower CO<sub>2</sub> emissions and better safety for driver and other road users (The report is attached to the email).

Analysis of model in wind tunnel from the Transport & Environment report



Conclusions of the Transport & Environment report:

**Safety benefits:**

- The rounded shape incorporating a front collision zone system improves direct vision, absorbs collision energy, eliminates overruns of vulnerable road users and offsets the impact on other vehicles.
- Of the 7070 lives lost in accidents involving HGV (EU, 2008), 50% could have been avoided or injuries could have been reduced.
- Particularly important is the dramatically decreased risk of run-over for pedestrians and cyclists, where the risk is currently 70%. Overruns were entirely avoided in the test runs carried out in this study as the front end pushes people away from the truck rather than running them over.
- The life-saving potential for vulnerable road users is over 50% of the ca. 500 fatalities per year.

**Fuel savings & environmental benefits:**

- Fuel savings achieved via improved aerodynamic cabin shape: 3.2% - 5.3% (40t HGV).
- Total CO<sub>2</sub> reduction: 2.3-3.8Mt.
- Increased design space on the cabin should also make it easier to comply with EURO standards.

**Economic benefits:**

- 40t HGV fuel savings: €1500/year (125,000km/year at diesel price €1.25); €6000 fuel savings for first owner.
- Additional production cost (materials): €400 and low amount of additional weight: 13.4 kg easily saved with simple light weight measures elsewhere in the cabin.

## **Analysis**

The above mentioned reports all show that it is possible to re-design the frontal shape of trucks in a way that many of the disadvantages of today's HGV could be reduced or eliminated leading to a better safety on the road - reducing the casualties among pedestrian, bicyclist, truck drivers, car drivers. Furthermore an extension of the front end means that the truck can be shaped with better aerodynamic features leading to a better fuel economy - which is good for the environment and the economy as a whole.

As a 5 % reduction in fuel consumption is very good incentive for the transport operators and therefore it is not necessary to make requirements in the EU-legislation but merely enough to make it possibility in the EU-legislation for these new dimensions of HGV - thus making it worthwhile for the HGV producers to build HGV with these improvements.

It is not necessary to make for CO<sub>2</sub> reduction mandatory as the market forces effectively will solve that.

The Danish Transport Authority sees the following proposal not only as a win, win situation - but as a triple win situation:

## **Proposal**

In Council Directive 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorized dimensions in national and international traffic and the maximum authorized weights in international traffic, in ANNEX 1 inset new 1.1.1:

### *1.1.1 Maximum length with extended front:*

However for motor vehicles in the categories N2 and N3 with extended front which

- includes an energy absorbing collision zone and
- has a low front window and side windows, making it possible to directly see an object placed 1.5 m above ground level, at a distance more than 0.5 m from the side or front of the vehicles cabin. Exemptions apply for areas around pillars, door-frames and mandatory mirrors.

The following shall apply:

- motor vehicle            12.80 m
- articulated vehicle    17.30 m
- road train                19.55 m