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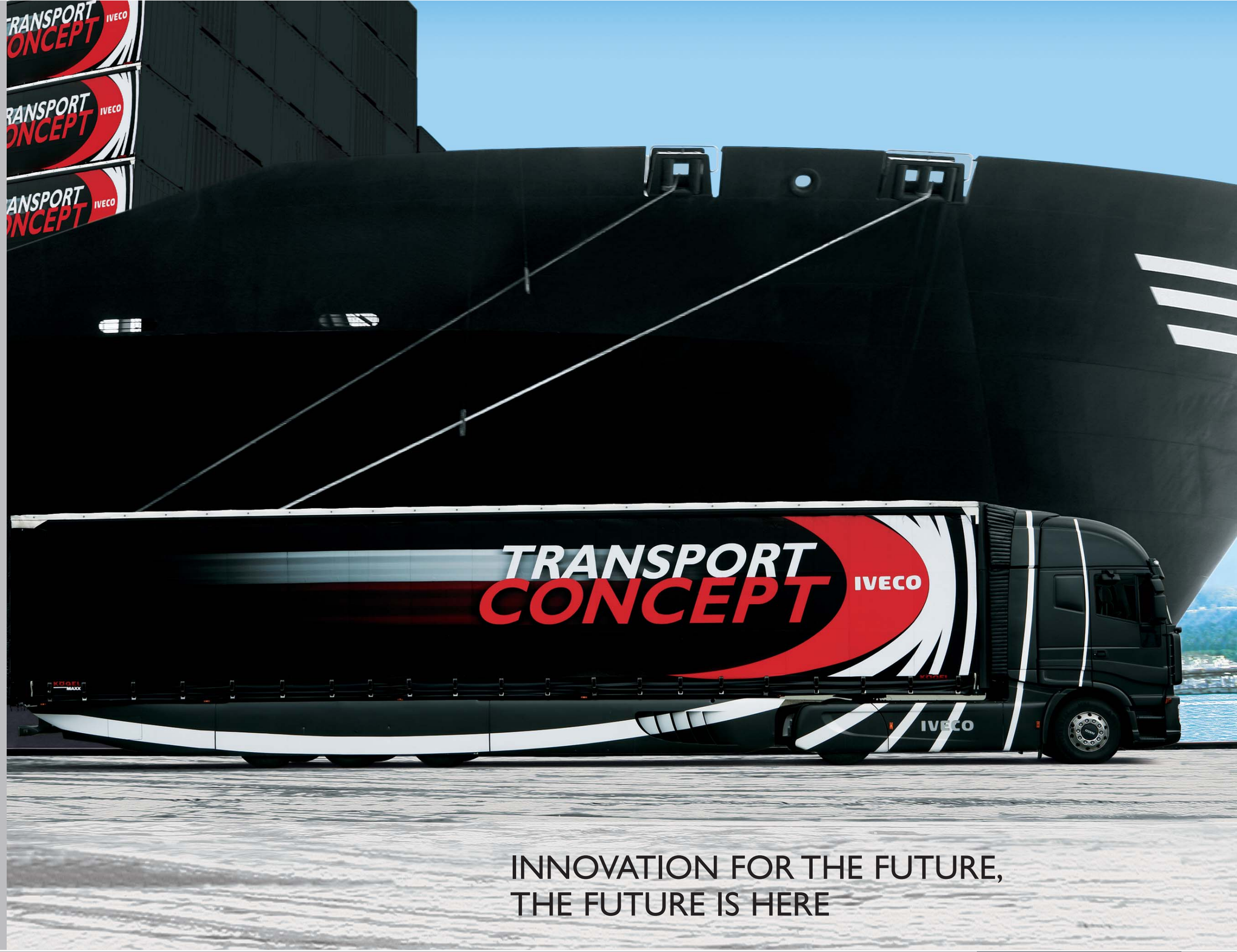

INNOVATION FOR THE FUTURE, THE FUTURE IS HERE

TRANSPORT CONCEPT

IVECO

The idea of vehicle manufacturers building concept vehicles is not new; often these serve to illustrate to the public future trends in vehicle design or applicable technologies.

The Iveco Transport Concept is the vehicle with which Iveco realises its view of the future of road transport in the near to medium term.

There are three key areas in which this future is portrayed by Transport Concept;

- The integration of road transport with other modes,
- The efficiency of road transport in terms of goods moved as a function of fuel used,
- Accident avoidance by means of Advanced Driver Assistance Systems (ADAS).

Because Transport Concept addresses the near to medium term future rather than a 'blue sky' scenario, the systems and concepts portrayed are exceedingly relevant to road transport issues currently experienced today.

The future starts here

FUTURE

INTEGRATION

Integrated transport guaranteed

Freight transport results from economic activity. Society must resolve the difficulties standing in the way of multi modal transport solutions.

FREIGHT TRANSPORT - DEMAND LED

Europe's roads are becoming ever more congested. Road transport shares road space with other road users and the costs to industry of road congestion are very high. Transport of goods is a necessary part of business and societal activity and as all countries strive for economic growth then the need to transport goods increases.
The resolution to this seemingly insolvable problem is complex and involves political and societal considerations.
What is certain is that Governments must do more to improve the road infrastructure but this alone will not address the road congestion problem, taking into account projected future freight movements.

Compared to other modes of goods transport, rail freight and inland waterway or coastal shipping, for example, road transport is able to boast incredible flexibility, not being subject to a rigid time table, for example, even if it is not always the most energy efficient in terms of goods moved as a function of energy consumed under certain transport missions.

In order to improves the effectiveness of moving Europe's goods by road, it will be necessary to address some development of the maximum permitted mass and dimensions of road vehicles laid down in EU Directive 96/53/EC.

On the one hand, wide scale application of the European Modular System (EMS) favoured in Scandinavian countries could be promoted for international application throughout Europe. Such an approach, allowing road vehicles to operate up to 25.25m in length and up to a total mass of 60t, would pose some difficulties due to the lack of an appropriate road and freight interchange infrastructure.
An alternative strategy, focusing on a modest increase in the maximum permitted length of articulated vehicle combinations to permit an increased integration of road transport vehicles with other transport modes.
It is important to recognise that road transport is not in competition with other transport modes, rather it should play its part in contributing to a multi-modal transport system.

It is well understood that the energy cost to move goods by road in terms of energy consumed per tonne.kilometre reduces as the vehicle mass increases because the payload transported increases as a fraction of the total vehicle mass, an aspect exploited by transport by rail and some increase in total vehicle mass is probably inevitable.

ISO CONTAINERS: THE KEY TO INTERMODALITY

ISO Container transport is a classic example of inter-modal transport existing between continents and often involving all of the above transport modes. However, current European regulations relating to the maximum dimensions of international road transport operation permit only the transport by road of 20' (6.058 m) and 40' (12.192 m) containers. Other containers of 45' (13.716 m) and 48' (14.630 m) are only transportable by water and rail transport. Given that container transport costs often relate to the container as a unit rather than its size, there is a desire to shift to the larger containers.

For short transport distances, the use of Euro-pallets is quite popular. Euro-pallets have a plan area of 800 x 1200 mm and, of the available transport configurations, i.e. truck-trailers and articulated combinations, the current European regulations relating to national and international road transport operation favour road trains in terms of volumetric capacity yet the articulated combination represents the configuration more compatible with other road users, especially for those transport operations involving retail distribution, supermarket deliveries, for example.

Transport Concept proposes a modest revision to the European regulations applicable to national and international road transport operations. An increase in the length of the semi-trailer of only 1.5m would allow the transport of ISO containers up to 48' and would increase the number of Euro-pallets transportable by an articulated combination virtually to that of a truck-trailer.

In parallel, an increase in the maximum operating mass of articulated combinations from 40t on five axles today to 44t and 48t on six axles. These changes would be undetectable by other road users and the resultant vehicles would not see a deterioration in manoeuvrability or on-road stability.

Modest revisions to the European Directive on Masses and Dimensions would dramatically improve intermodality of freight transport.

For more details
see separate fact sheet

AERODYNAMICS

Revolution in evolution

Reduces energy consumption and hence transport costs - environmentally and fiscally.

REDUCING ENERGY LOSSES

The use of energy and the consequential emission of CO_2 by road transport is of major concern to us all. Basic laws of thermodynamics limit the efficiency of the Diesel engine and efficiency improvements to current engines for heavy road transport vehicles will be quite small. However, a significant amount of energy is used to overcome various resistances such as those associated with tyre rolling and vehicle aerodynamics.

It is well understood that much can be done to reduce aerodynamic losses for commercial vehicles and today most tractors use an air deflector to improve the integration between the cab and the semitrailer, for example. Aerodynamic losses become very significant at high road speeds and Transport Concept addresses this issue using an inflatable tractor / semitrailer gap filler to eliminate the interrupted air flow and a further application of the inflatable spoiler is used at the rear of the semitrailer to improve the air management and hence drag of the slipstream.

The use of super-wide tyres rather than the more usual twin tyres for the drive axle offers a significant reduction in rolling resistance. This is because the energy dissipated during tyre wall deflection is almost halved – four walls rather than eight, two contact patches rather than four for each axle. The challenge is to find appropriate savings by reducing losses which do not impose restrictions on tractor / semitrailer connectivity. The measures taken for Transport Concept are readily applicable to standard tractors and semitrailers and so meet this requirement.

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For more details
see separate fact sheet

TRANSPORT CONCEPT

ADAS

Advanced Driver Assistance Systems: more control, more safety

ADVANCED DRIVING SKILLS

The number of heavy commercial vehicles in operation within the EU is very low compared to the number of cars and light commercial vehicles in circulation (5.5 million compared to 241 million, ACEA 2005). In the case of a road accident, death or serious injury resulting from a collision involving a heavy commercial vehicle is more likely due to its size and mass compared to other road users' vehicles. Modern road vehicles in themselves are very safe; only vary rarely does an accident occur resulting from a failed mechanical or electrical component.

It is generally agreed that the cause of the majority of road accidents occur due to driver error. Whether this is due to behaviour, competence, tiredness or simple error of judgement is not quantified but this has lead to the creation of Advanced Driver Assistance Systems (ADAS) for accident avoidance.

By now well known systems such as Anti-lock Braking Systems (ABS), where the directional stability of the vehicle is assured under braking, are typical of such ADAS enhancements.

Accidentology data has directed research activity to provide driver assistance in the areas suggested by the above described systems. Under all circumstances the driver remains in control of the vehicle. It is the intention of the ADAS enhancements to alert the driver of impending danger and to allow the driver to take the necessary action.

Providing driver assistance to actively help the driver to avoid road accidents.

SOLUTIONS

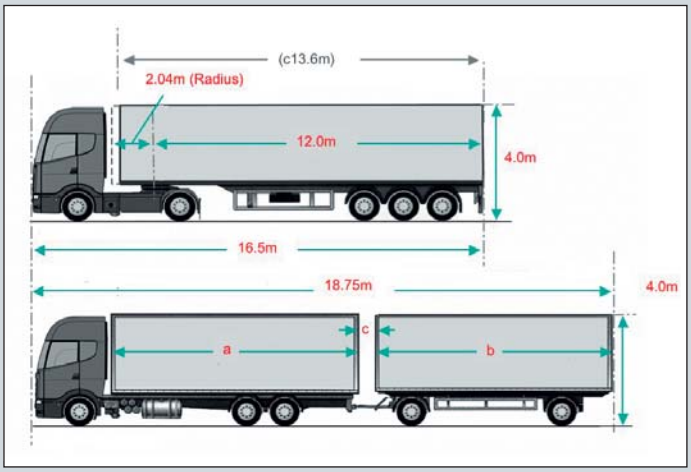
In summary, Transport Concept provides a test bed used to evaluate and finely tune future technologies and to evaluate these, also to demonstrate their function when required to do so. In the field of masses and dimensions, Transport Concept has served to demonstrate the suitability of a modest increase in overall length to dramatically improve the intermodality of goods transport by the on-road component.
All aspects demonstrated by Transport Concept are applicable for implementation in the short to medium future.

Transport solutions brought to you by Transport Concept

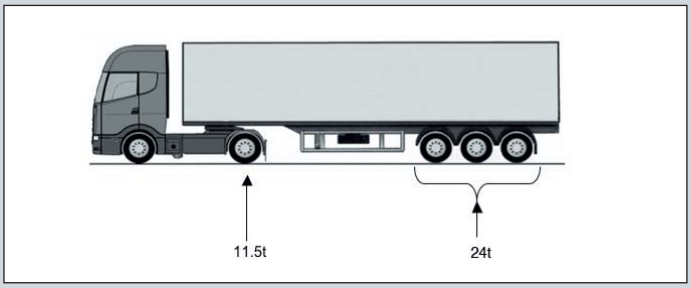
The potential for road transport to integrate better can be achieved by modest changes to maximum permitted vehicle dimensions while equally modest changes to maximum permitted vehicle mass can play an important part in improving energy efficiency and reducing the number of vehicles required to transport Europe's freight.

Vehicle Masses and Dimensions

European Council Directive 96/53/EC lays down maximum dimensions for both national and international transport and maximum mass for international transport within the European Union.
In addition, the Directive lays down manoeuvrability requirements applicable to vehicles and their trailers.
The volumetric capacity of truck / trailer combinations exceeds that of articulated combinations by 11%.



N.B.
- 4,0m overall height is the minimum of the EU Member States permitted heights.
- Drawbar lengths:
  a+b ≤ 15.65m
  a+b+c ≤ 16.40m



Maximum permitted mass = 40t

ISO Container Review

Extensively used for shipping, allowing rapid transit through ports, ISO containers provide an excellent means by which inter-modal freight can be handled without unloading and repacking. Generally, larger containers are preferred by packers because charges tend to be based on a 'per container' basis. The following table shows container application for road vehicles.

ISO Container	Length (m)	Width (m)	Height (m) (Standard)	Height (m) Hi-cube [a]	Gross mass (t)	Suitability Draw-bar Artic	
20 ft	6.10	2.44	2.59	2.89	24.00	1+1 [b]	2 [b]
30 ft	9.10	2.44	2.59	2.89	25.00	-	1
40 ft	12.20	2.44	2.59	2.89	25.00	-	1
45 ft	13.70	2.44	-	2.89	25.00	-	-
48 ft	14.60	2.44 / 2.59	-	2.89	25.00	-	-

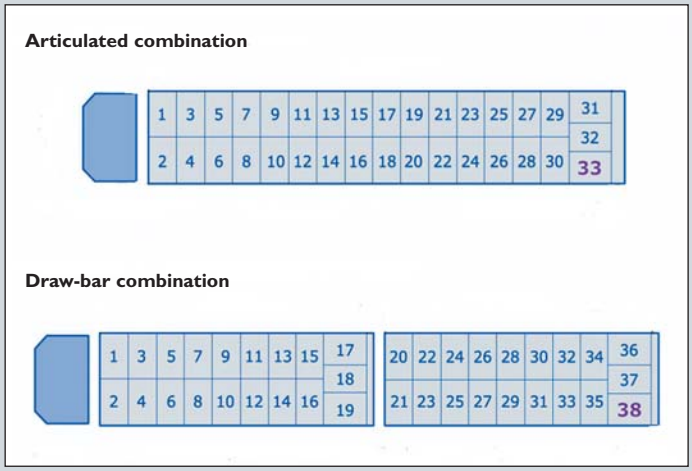
OK
Partially feasible
Not international
Not feasible

Note:
a – Subject to overall height
b – Containers below rated mass

INTEGRATION

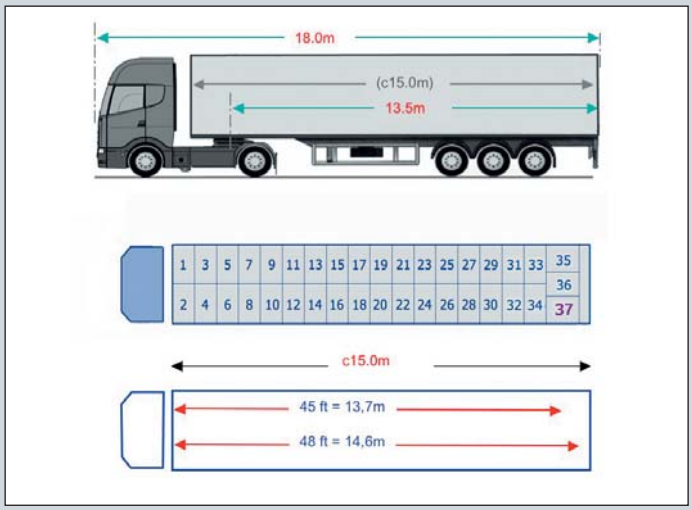
Euro pallet configuration

Euro pallets are the preferred means of goods containment for retail distribution. Pallet plan area is 800 mm x 1200 mm.



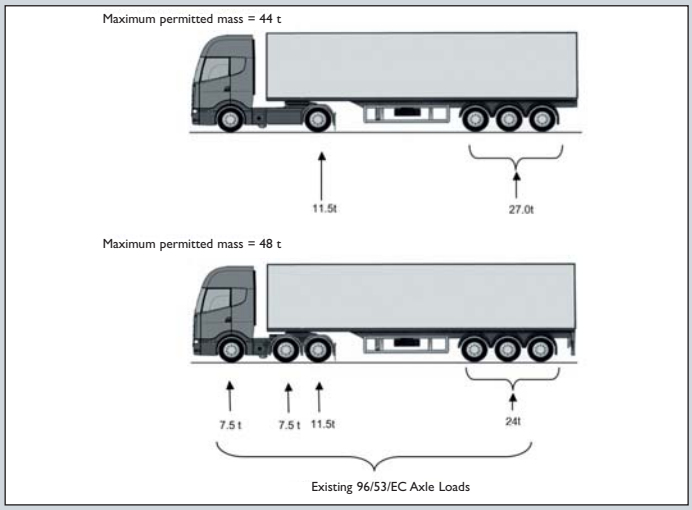
Transport Concept Proposal Dimensions

A modest increase in length of the semi-trailer by 1.5m to provide increased inter-modal use of containers and an improved capacity for euro pallet loading.

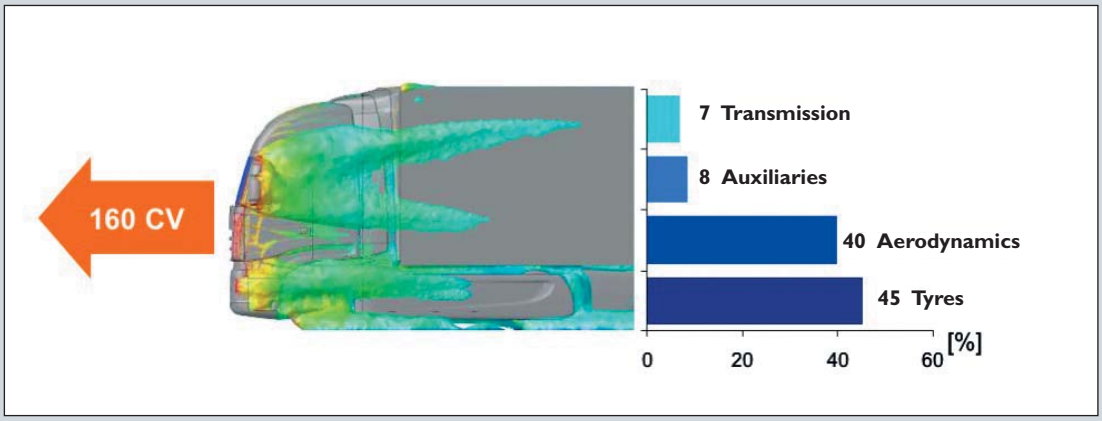


Transport Concept Proposal Operating Mass

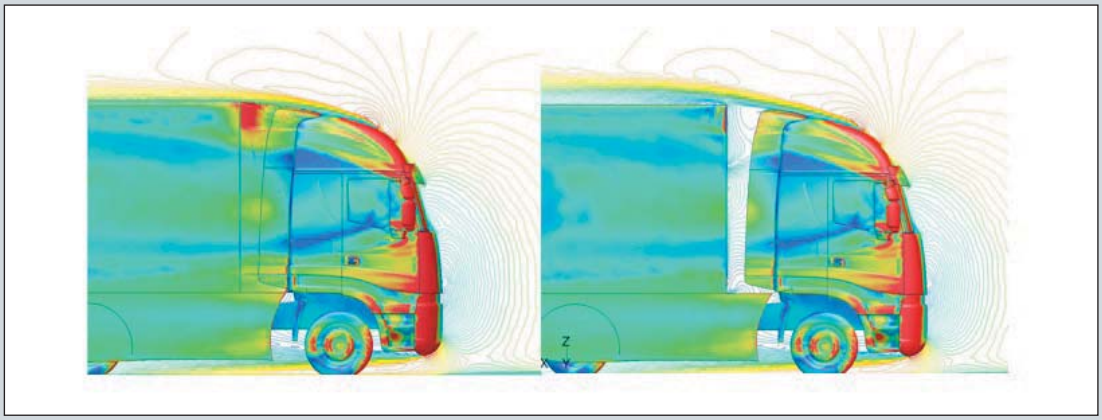
A modest increase in operating mass of both 5 and 6 axle combinations will enable a worthwhile improvement in energy utilisation.



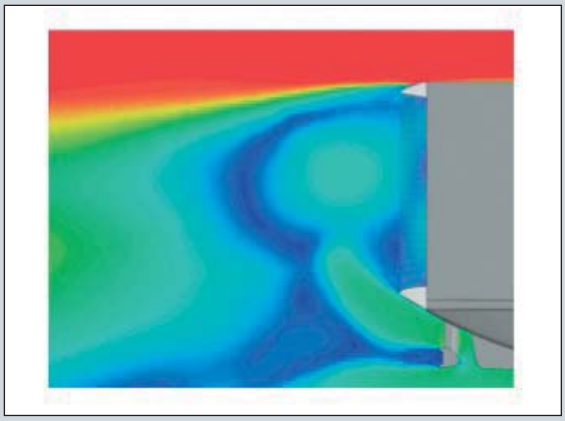
AERODYNAMICS



The power required to move a modern commercial vehicle along the road is quite modest.
Ascending a gradient and acceleration pose greater power demands, however.
In the example shown, an articulated combination of 44t operating mass and driven at a constant speed of 85 km/h gives the power loss attributable to the four key areas. While transmission and auxiliary losses can be addressed, the greatest opportunity clearly lies in the area of vehicle aerodynamics and tyre equipment.

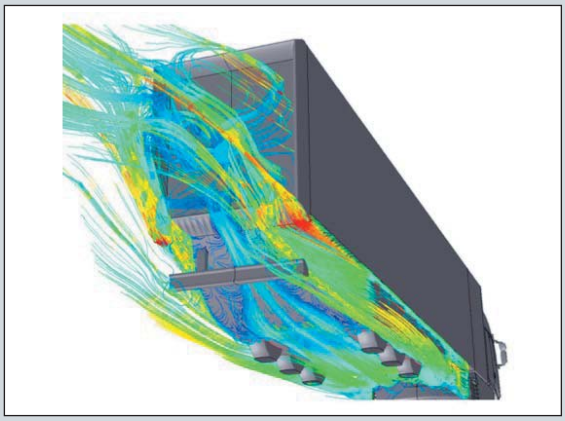


Studying the aerodynamic effects of the gap between the tractor and semitrailer. Transport Concept uses an innovative inflatable filler system to close the gap. Such a system is applicable to many semitrailer types and does not impede coupling and decoupling of the semitrailer.



Similarly, an inflatable spoiler applied to the top and sides of the semitrailer rear door provides a managed slipstream to reduce aerodynamic drag.

AERODYNAMICS



Application of tractor and semitrailer side skirts and a profiled under floor of the semitrailer contribute to a highly managed airflow beneath and around the vehicle.

The results of the analysis, realised into Transport Concept, show significant improvements to the power loss due to aerodynamic drag, results that manifest themselves into energy and hence fuel consumption savings.

Compared to twin 315/70R22.5 tyres for the drive axle, Transport Concept uses super wide 495/45R22.5 drive axle tyres and reduces the rolling resistance by up to 4%

IVECO

ADAS

Transport Concept is equipped with ADAS enhancements, some of which are now regularly requested by customers of new vehicles. ADAS features included are:

Collision Warning

To develop a Forward Collision Warning system, able to warn the driver when the vehicle is approaching a dangerous obstacle in order to avoid the collision. The scenario in front of the vehicle is detected by means of a sensor-set composed of Long Range Radar and front looking camera. The front scenario is analysed in order to detect obstacles approaching in the vehicle path, thus bearing a collision risk. When an obstacle is detected, the system can provide a Collision Warning, i.e. a visual/acoustic warning and also a haptical warning.

Adaptive Cruise Control with braking activation

Cruise control is used by the driver to maintain a specific road speed without the need to use the accelerator.
The cruise control may be manually cancelled or by emergency measures i.e. by application of the foot brake or clutch pedal if present. However, in the event that the vehicle under cruise control conditions becomes too close to the vehicle directly ahead, forward looking radar devices will cause the vehicle to slow down by modulating the engine power or even by applying the engine brake, retarder (if fitted) and then the foundation brakes in order to maintain the correct distance from the vehicle ahead. In this case, cruise control is not cancelled and the vehicle will accelerate to its target speed when road conditions permit.

ESC (Electronic Stability Control)

Consists of sensors capable of comparing actual vehicle direction with that desired by the driver based on steering wheel input (yaw control) and tendency to overturn (roll control). Control is by selective engine torque modulation and selective wheel brake application in order to correct vehicle instability.

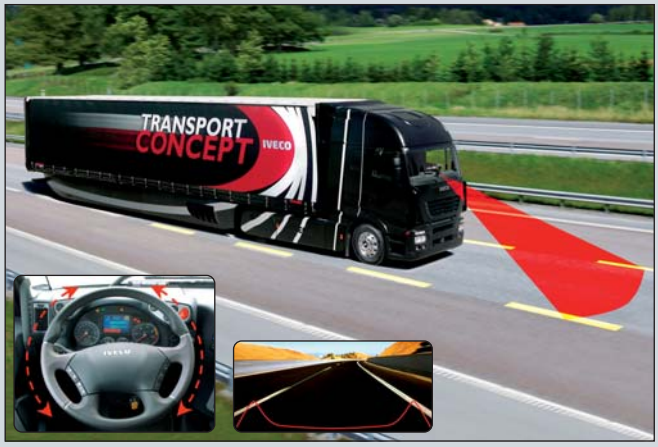
ADAS

Lane Warning (acoustic)

Vehicle based cameras scan the road and provide an acoustic warning to the driver should the vehicle wander across the road lane delimiting markers in the absence of making a direction change indication.

Active Lane Assistant (Haptic feedback)

Starting from Lane Warning contents, the system suggests the corrective action when the vehicle is unintentionally approaching the edge of the lane.
This is done by giving a smooth reaction torque on the steering wheel, in order to drive back the vehicle toward the center of the lane.



Lane Change Assistant

Side facing cameras indicate to the driver by means of an acoustic warning should the driver attempt to change lane in the presence of another road user.

Front Vehicle Monitoring

A vehicle based camera provides the indirect vision requirement of a Class VI mirror and the image is displayed on an in-cab monitor. The image is visible only for road speeds from 0 – 30 km/h.