

A review of accidents and injuries to road transport drivers

Authors

European Agency for Safety and Health at Work (EU-OSHA)

Sarah Copsey (project manager)

Members of EU-OSHA Topic Centre – Working Environment

Nicola Christie, RCPH, UK

Linda Drupsteen, TNO, The Netherlands

Jakko van Kampen, TNO, The Netherlands

Lottie Kuijt-Evers, TNO, The Netherlands

Ellen Schmitz-Felten, KOOP, Germany

Marthe Verjans, Prevent, Belgium

**Europe Direct is a service to help you find answers
to your questions about the European Union**

**Freephone number (*):
00 800 6 7 8 9 10 11**

(*) Certain mobile telephone operators do not allow access to 00 800 numbers, or these calls may be billed.

More information on the European Union is available on the Internet (<http://europa.eu>).

Cataloguing data can be found on the cover of this publication.

Luxembourg: Publications Office of the European Union, 2010

ISBN -13: 978-92-9191-355-8

doi:10.2802/39714

© European Agency for Safety and Health at Work, 2010

Reproduction is authorised provided the source is acknowledged.

**A REVIEW OF ACCIDENTS AND INJURIES TO ROAD
TRANSPORT DRIVERS**

Table of contents

1.	Introduction.....	3
1.1.	Objective of this report.....	3
1.2.	Methodology	3
1.3	Methodological problems encountered.....	3
2.	Introduction to the overall topic	5
3.	Occupational transport accidents on the road.....	7
3.1.	Unsafe driving	8
3.2	Overload and other cargo problems	9
3.3	Road conditions/ weather conditions.....	12
3.4	Vehicle condition.....	14
3.5	Loss of control.....	16
4.	Accidents in cargo and vehicle handling (Occupational transport accidents on site)	19
4.1.	Coupling and uncoupling, unsafe parking	19
4.2	Loading and unloading	22
4.3	Vehicle maintenance.....	30
5.	Occupational transport accidents and psychological factors	33
5.1	Stress and workload	33
5.2	Fatigue	35
5.3	Alcohol and drug abuse	37
5.4	Illness.....	38
5.5	Violence	38
6.	Managing health and safety and promoting a safety culture	41
7.	Conclusions	48
8.	Table giving overview of accident reports	49
9.	References and bibliography.....	54

1. Introduction



TNO Netherlands

1.1. Objective of this report

The aim of this review is to present reports of work-related transport accidents, near misses, and other effects relating to ill health, published in a range of media that give details identifying the causes and effects of accidents. The main focus of the report is on road transport activities that take place on the public highway; however light deliveries are included, as well as buses and taxis. The report does not include transport activities that take place off public highways on areas such as construction sites, farms, warehouses (forklift trucks) or airports, but accidents caused by uncoupling and coupling as well as loading and unloading are included in the report.

The overall aim is to present 'lessons' suitable for the non-OSH expert. It is not intended to present detailed, technical accident analyses, although the original source may have done so. The emphasis is on accident and injury resulting from occupational risks in the transport sector that should have been prevented or controlled, not road accidents of a general nature.

The report is broken down into three parts:

- Occupational transport accidents on the road
- Accidents in cargo and vehicle handling (Occupational transport accidents on site)
- Occupational transport accidents and psychological factors

1.2. Methodology

The identification and retrieval of relevant accident reports covered: Germany and Austria, the Netherlands, Belgium and Luxembourg and the UK in the member states as well as Canada and Australia.

As causes of accidents and near misses in the road transport sector are very similar in all EU Member States the priority of this report was not to collect reports from all EU Member States, but to try to cover the causes and circumstances of accidents in the transport sector.

Sources used include journals, newspaper reports, good practice web pages, and information from workers' compensation bodies and statutory accident insurance organisations. In some Member States (e.g. Germany, Belgium) collecting accident reports turned out to be difficult because of privacy protection.

1.3 Methodological problems encountered

The accident reports presented in this overview were gathered from newspapers or online news sources, accident insurance institutions and published reports about road traffic accidents.

A review of accidents and injuries to road transport drivers

The information gained from news sources was not very detailed and seldom focused on occupational health and safety. Typically, accident reports in the news media concern spectacular accidents such as overturned tankers or fatal rear-end collisions involving heavy goods vehicles. Nevertheless, accidents involving heavy goods vehicles are often more serious, because the size and weight of trucks means that collisions result in more serious personal injury than similar collisions with passenger cars.

The accident reports regarding violence were all taken from news reports.

It was more difficult to get accident reports from accident insurance institutions. Personal data relating occupational accidents are protected by law. Most of the transport accident reports that were provided by accident insurances deal with driver activities on site such as loading/unloading, coupling/uncoupling or maintenance.

Reports and analyses of transport accidents exist mostly for heavy good vehicles.

Accidents involving light lorries are not reported so often, but in the past few years they have become more and more relevant. Various leaflets have been developed to inform drivers and other relevant parties about accident prevention in light lorries (e.g. Comité de pilotage national pour la prévention du risque routier, 2007; BGF 2004a, 2004b; BG Druck und Papier, 2001).

Accidents involving light lorries have been analysed over a period of years, for example by DEKRA (Berg et al., 2004) and by the Federal Highway Research Institute in Germany (Schmid 2006 and 2008).

Occupational accidents involving motorcycle and bike courier drivers are seldom mentioned in the research.

2. Introduction to the overall topic

The land transport sector encompasses the commercial use of many different vehicles including lorries, light vans, taxis, buses, private cars being driven for work purposes, company cars, construction and agricultural machinery, emergency service vehicles, motorcycles, mopeds and bicycles. The sector is dominated by small companies and male workers, although female employment is increasing, especially in certain areas such as bus drivers.

Some general features of the freight road transport sector in the European Union:

- The sector is characterised by a large number of small companies, predominantly with fewer than 10 drivers, and individual self-employed drivers, although there are marked differences between the different countries.
- There is an outsourcing trend for transport and logistics activities, especially in large enterprises.
- Most of the drivers work full time and a high percentage of them do not have standard and regular working hours, work nights and weekends.
- Training needs to be adapted to the rapidly changing working conditions and there is an urgent need for continuous training.
- The workforce is ageing at a faster pace than in other sectors, and it is difficult to attract younger workers to the sector.
- Conditions are not adapted to a slowly increasing female workforce, which takes place especially in short-distance transport activities, such as school transport.

(European Agency for Safety and Health at Work (EU-OSHA), 2010).

The road transport sector is a highly competitive one. In order to maintain their market share, companies have to work more efficiently, provide higher quality services, and offer additional services than their rivals (European Foundation for the Improvement of Living and Working Conditions, 2004). Work pressure in the transport sector is often a result of 'just-in-time' management: goods have to be delivered at the point in the production process when the customer needs them (European Agency for Safety and Health at Work (EU-OSHA), 2010).

Road transport safety is an important issue in the land transport sector. In the United States, Australia, and for EU countries in general, work-related motor vehicle crashes are estimated to cause between one-quarter to over one-third of all work-related deaths (ERSO, 2007).

According to a Danish analysis of road traffic accidents (Carstensen et al., 2001), the following features of heavy good vehicles increased the accident risk of trucks in comparison with passenger cars:

- the construction/dimensions etc. of trucks can contribute to situations arising that can develop into accidents – situations that would not arise with passenger cars;
- the reduced braking and evasive abilities of trucks can contribute to situations more often developing into collisions, and the collisions occur at higher speed;
- the size and weight of trucks may mean that collisions result in more serious personal injuries than similar collisions involving passenger cars.

Driving mistakes made by heavy goods vehicle drivers may be more serious because of the weight, size, shape, manoeuvring abilities, braking abilities, etc., of the vehicle.

Transport drivers are not only at risk from road accidents. The wider range of occupational safety and health issues that may affect transport drivers include:

- Accidents and injuries related to loading, unloading vehicles
- Falls climbing in and out of cabs
- Rest and toilet facilities

A review of accidents and injuries to road transport drivers

- Vehicle design and maintenance
- Musculoskeletal and vibration related disorders
- Exposure to dangerous substances
- Hot and cold cabs
- Stress
- Violence from members of the public

Some of these areas also feature in the examples given in this review.

Around a third of the deaths of people in workplace accidents in the EU are related to transport. These accidents usually involve people: being struck or run over by moving vehicles (e.g. during reversing); falling from vehicles; being struck by objects falling from vehicles; or vehicles overturning (European Agency for Safety and Health at Work (EU-OSHA), 2001a).

The main types of transport accidents are:

- Vehicle crashes
- People being struck or run over by moving vehicles (e.g. during reversing or coupling)
- People falling from vehicles
- People struck by objects falling from vehicles, or vehicles overturning (European Agency for Safety and Health at Work (EU-OSHA), 2007)

3. Occupational transport accidents on the road



Michał Krakowiak. Courtesy of the Occupational Safety Poster Competition organised by the Central Institute for Labour Protection – National Research Institute, Poland.

'Employees who drive more than 25,000 miles a year have at least a one in 8,000 chance of dying behind the wheel of their company vehicle' (RoSPA, taken from UK Transport Research Laboratory 2008)

Up to a third of all road traffic accidents are thought to be work-related (e.g. UK: 30% of road fatalities are work-related; HSE, 2003a). UK figures exclude commuting accidents. If both crashes while driving for work and commuting crashes are considered, it is estimated that in Europe six out of ten work accidents resulting in death are road crashes (Eurogip).

Over 800 heavy goods vehicle drivers are killed each year in road traffic accidents. This figure increases substantially if the deaths of drivers of vehicles under 3.5 tonnes are included (European Agency for Safety and Health at Work (EU-OSHA), 2001b; European Commission, 2009b; CARE database).

In the US, workers employed in the transport, communications and public utilities sectors were at the highest risk of fatality, especially those in transportation and material moving occupations and truck drivers. The transport, storage communications and public utilities sector accounted for one-third to one-fifth of all work-related motor vehicle deaths. Truck occupants account for 58% of fatalities in the US. Nearly half of these were in semi-trucks (also known as semi-trailers or articulated lorries).

Light transport vehicles are twice as likely as passenger vehicles to present an accident risk to other road users per kilometre, and heavy goods vehicles represent a 7.5 times higher risk (SWOV, 2008). Put simply, the size and weight of heavy good vehicles seems to result in a high fatality risk for the other party upon a collision.

Different explanations are found in the literature for the high numbers of accidents involving commercial road transport. In general, professional drivers have a higher risk of being involved in a traffic accident because most of their working time is spent on the road. They undertake more long journeys, and often drive during the evening when fatigue and drowsiness is more likely to occur. They drive more often under time pressure and are more likely to carry out distracting tasks while driving, such as making phone calls, eating and drinking (Broughton et al., 2003). Driving at night, under bad weather conditions or in heavy traffic increases the risk (European Foundation for the Improvement of Living and Working Conditions, 2007).

According to the scientific study into European Truck Accident Causation (ETAC) (IRU, 2007), the main cause of accidents on the road is linked to human error (85.2%). Other factors such as weather, infrastructure conditions or technical failures of vehicles played a minor role. 25% of the accidents were caused by trucks. 624 accidents were analysed. The main causes for accidents between a truck and other road users are:

- non-adapted speed

- failure to observe intersection rules
- improper manoeuvre when changing lanes.

The study showed that truck drivers suffer more minor injuries than other road users, while other drivers suffer more serious or fatal injuries (IRU, 2007).

Although road traffic accidents still accounted for more than 39% of fatal accidents in 2005, this was slightly less than in 1995.

The analysis of European Statistics on Accidents at Work (ESAW) data reveals that 29% of fatal accidents at work are due to loss of control of means of transport or handling equipment (against 4% for non-fatal accidents). This type of deviation is therefore the first cause of fatal accidents at work. The main types of vehicles involved include light vehicles in 42% of cases, heavy goods vehicles (lorries, buses, coaches) in 28% of cases and two or three-wheeled vehicles in 6% of cases.

Young workers are particularly affected by fatal accidents involving loss of control of two or three-wheeled vehicles, as 13% of workers who died as a result of this type of accident were under 25 years old (for comparison, in 2005 workers aged 18-24 accounted for only 8% of all fatal accidents at work).

Based on data in *Causes and circumstances of accidents at work*, European Commission, 2009

3.1. Unsafe driving

In the UK surveys among company car drivers showed that they were more likely than non-company car drivers to drive

- under time pressure
- whilst tired
- whilst undertaking distracting or demanding tasks

They are **less** likely to consider themselves to be responsible and safe drivers and more likely to report performing dangerous violations and be more hostile to traffic laws.

In the UK an in-depth analysis of work-related road casualties showed that drivers of company cars, vans /pickups and lorries (LGVs) had a high blameworthiness ratio. Company car drivers showed speeding as causal factors, van drivers showed observational failures and LGV crashes were more related to fatigue and vehicle defects.

Case 1 'High speed in spite of bad weather'

Who: Driver of a heavy load vehicle.

Job: Long-distance delivery on highway.

Injury: The driver was fatally injured. The vehicle was completely burned out.

How: The driver drove his truck at high speed through an area of roadworks, although there had been a heavy snow flurry and the road was extremely slippery. A witness reported that the driver overtook him at a speed that was absolutely not appropriate to the weather and street condition. In a work zone (permanent construction at roadside) on the highway the driver lost control and skidded off the road. He hit the concrete crash barrier head on. The truck caught fire and completely burnt out.

Reason: Unsafe driving, speed not adapted to weather condition, possibility of time pressure.

Preventive measures:

Preventive measures that were requested by the accident insurance: the company has to train and to instruct their drivers about traffic regulations and about the risks of driving at high speed.

Other preventive measures that would be advisable to prevent similar accidents:

- planning trips according to weather and road conditions
- avoiding tight schedules for drivers
- planning enough rest periods for drivers.

Source: Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector

3.2 Overload and other cargo problems

3.2.1 Overloaded, unbalanced load and inadequate cargo securing

It has been estimated that up to 25% of accidents involving trucks are caused by inadequate cargo securing. In Germany about 2,300 accidents to heavy goods vehicles per year are the result of improper or insufficient cargo securing (Deutscher Verkehrssicherheitsrat (German road safety council) 2008a). The Kuratorium für Verkehrssicherheit (KVR, 2005) in Austria found out that light lorries in particular are involved in accidents due to improper cargo securing. According to an analysis by KVR 40% of all heavy goods vehicles had insufficient, improper or no cargo securing. And about 70% of the professional drivers had never been trained in cargo safety (KVR, 2008).

Rules on cargo securing exist in several Member States, but they often differ in content and scope. If a cargo is not adequately secured, it can be a danger to the driver and to others: the cargo can fall off the vehicle and form an obstacle that in turn may hurt or kill the driver or other road users. The cargo may even fall directly onto another vehicle. During strong braking or a crash the risk of cargo falling off the vehicle is increased. In addition the steering of a vehicle can be affected by how the cargo is balanced and/or secured, and this can lead to difficulties in controlling the vehicle (European Commission, 2006).

Overloaded cargo, or cargo that is not loaded properly, can cause serious traffic accidents. The balance point (centre of gravity) of overloaded vehicles moves to a bad position: too much weight can cause top-heaviness that may cause the vehicle to overturn when negotiating curves in the road.

Case 2: ‘Driver fatally crushed by cargo’

Who: Driver.

Job: Transport of square timber.

Injury: Fatal injuries, struck by square timber that flew through the vehicle.

How: The driver was carrying square timber in his light lorry when he lost control because of high speed. His vehicle skidded off the road and crashed against a wall. The square timber flew like a rocket through the vehicle and crushed the driver. Proper cargo securing could have prevented fatal injuries.

Reason: No cargo securing, high speed.

Advisable preventive measures:

- Training and instruction for drivers about safe loading of cargo.
- Sensitising drivers of light lorries or small vans to load risks and hazards.

The German technical inspection Centre (DEKRA) and German accident insurance for vehicles (BGF) will develop special guidelines for loading light lorries and small vans.

Source: SWR, 2005, Transporter: zu schwer, zu voll, zu schnell,
<http://www.swr.de/rasthaus/sicherheit/-/id=2896598/nid=2896598/did=3523404/1x2agxu/index.html>

Case 3: 'Unbalanced load'

Who: Driver.

Job: Transport of wooden pallets.

Injury: No injuries, material damage.

How: The driver started his journey by loading some wooden pallets. As he didn't know what else he had to pick up on his trip, he asked the forklift driver to place the pallets at the front wall of the truck. The rest of the vehicle was empty. The plates were secured and he began his journey. He drove on the highway without problems, but as he turned off to the highway his trailer started to skid and suddenly turned over.

Reason: The load was secured but not balanced. The unbalanced loading caused the trailer to skid and the lorry to overturn.

Advisable preventive measures:

- Training and instruction of drivers and workers who load vehicles.
- Checking of cargo by specially trained workers before starting the tour.
- Follow load distribution plan and safe tie-down of cargo.
- Provide load distribution plans for vehicles.

Source: Lampen, A., 2003, *Ladungssicherung: Falsche Lastverteilung*, Berufskraftfahrer-Zeitung, 07-08/2003, p. 18-19 Ladungssicherung.de

http://www.ladungssicherung.de/content/download/BKF0708_03/BKF0708_03s1819.ps.pdf

Case 4: 'Light lorry driver struck by load'

Who: Light lorry driver.

Job: Transport of parcels.

Injury: Severe head injuries

How: The driver was transporting parcels along the highway in his light lorry. He drove very fast and provoked a rear-end collision with the vehicle in front of him. While crashing into the other vehicle his load was thrown forward. The parcels penetrated through the partition wall and struck the driver hard on the head.

Reason: The load was not sufficiently secured. The parcels were able to fly through the vehicle and act as rockets.

Advisable preventive measures:

- Training and instruction of drivers and workers who load vehicles.
- Check of cargo by specially trained workers before starting the tour.
- Follow load distribution plan and safe tie-down of cargo.
- Provide load distribution plans for vehicles.

Source: Karla, W., 2008, *Unfall auf der A 45: Transporter-Fahrer von Paketen beinahe erschlagen*, Ruhr Nachrichten <http://www.ruhrnachrichten.de/lokales/shlo/Schwerte;art937,412383>

3.2.2 Dangerous substances

Truck drivers may be required to carry goods which themselves pose an additional hazard to the driver. Dangerous substances carried in tanker lorries pose various different risks. On one hand these risks may arise from handling the substance (e.g. health effects, or explosions); in addition substances carried may exacerbate the effects of a 'normal' vehicle crash (De Onderzoeksraad Voor Veiligheid, 2006).

The Dutch accident research board (De Onderzoeksraad Voor Veiligheid, OVV) notes that collisions and fires involving trucks carrying dangerous substances occur fairly regularly, although other research shows that tankers carrying flammable goods have a 70-80% lower risk of crashes than heavy goods vehicles in general. Factors may include more stringent training of drivers of tankers carrying flammable goods, stricter standards for vehicles, and differences in the road and traffic environment in which tankers carrying flammable goods and other heavy goods vehicles travel (ERSO, 2006). Nevertheless the effects of this type of collision can be very dramatic and for that reason the board advises relevant Dutch ministries on appropriate policy action (De Onderzoeksraad Voor Veiligheid, 2006).

Case 5 'Driving a tanker lorry carrying hazardous substances'

Who: Lorry driver.

Job: Driving a tanker filled with dangerous substances.

Injury: The driver suffered fatal injuries. Other people involved were also injured.

How: A tanker lorry filled with explosive and flammable LPG (liquefied petroleum gas) struck a roadside barrier near temporary road works. The lorry was turned on its side and caught fire, posing a major public safety hazard. The trailer posed a major fire and explosion hazard, because of the LPG content. Swift fire department response managed to cool and secure the LPG tank and emergency services secured the area around the tanker.

Reasons: Loss of control of vehicle, overturning

Preventive measures:

- Heat-resistant lining.
- Implementation of time frames during which dangerous substances can be transported.
- Better protection of the tank by use of different material or different location on the lorry.
- Selection of appropriate route.
- In addition issues may include:
 - Measures to promote safer driving, especially concerning road works
 - Checking the signing and traffic management near road works

Source: De Onderzoeksraad Voor Veiligheid, 2006.

Case 6 'Truck filled with ethylacetate'

Who: Drivers of two colliding trucks.

Job: Transport of goods. One truck was filled with ethylacetate.

Injury: Fortunately nobody was injured.

How: Two trucks braked sharply to avoid hitting traffic that had slowed down due to congestion on the highway. These trucks were carrying relatively light loads and thus managed to slow down quickly. A third truck followed closely, carrying a large quantity of ethylacetate. This truck carried too much weight and had too little clearance to brake in time, but did try an (unsuccessful) evasive manoeuvre. The three trucks ended up in a head-to-tail collision that resulted in a large fire. The three truck drivers managed to escape the scene and fled several hundred metres for fear of explosion.

Reasons: Driver maintained insufficient clearance to forerunner, especially considering the heavy loading.

Advisory preventive measures:

- Adaptive cruise control.
- Limiting the weight of the load.
- Better protection of the tank by different material or different location on the truck.

Source: De Onderzoeksraad Voor Veiligheid, 2006.

3.3 Road conditions/ weather conditions

3.3.1 Road conditions

In many countries mountainous terrain poses an additional challenge for professional drivers, particularly on the downhill when trucks and lorries gain momentum and may be difficult to control. A major concern here is overheating the brakes through continual use. Preventing this situation requires drivers and companies to plan routes wisely (e.g. using lighter vehicles when appropriate) and drivers to use appropriate techniques (e.g. engine braking and low maximum speed) (Office of Transport Safety Investigations (OTSI), 2006). The potential consequences of hilly terrain for safety are illustrated in the accident example included below.

According to the IRU study (2007) 5% of accidents are related to road conditions, but the road type has also an influence. Heavy goods vehicle drivers are more likely to be involved in accidents on highways than other drivers (bast, 2004).

Different research shows that there is a connection between traffic volumes and accident occurrence: the increase of traffic on the road increases the likelihood of road accidents (Pöppel-Decker et al., 2003; Pfundt, 2001). More traffic leads to more congestion and hence the number of accidents is far higher (Blankennagel, 2006). Accidents involving heavy load vehicles due to congestion accounted for 20% of the total; rear-end collisions are predominant (bast, 2005). Roadworks on major highways were identified as accident hazards for heavy load vehicles (bast, 2005).

Case 7 ‘Driving a minibus on a mountain road’

Who: Bus driver and passengers.

Job: Driving a minibus on a mountain road.

Injury: 3 fatalities, 14 injuries

How: The driver of a minibus lost control of the vehicle as he approached a sharp right-hand bend. He couldn't slow his bus down, because his brakes had overheated while descending a steep and winding section of road. The driver used an inappropriate technique, relying on brake use rather than gear changes. To make matters worse the bus was being driven with a defective air brake pressure alarm system.

In addition, it was found that the road he was driving on was actually signposted as being unsuitable for buses but the tour operator insisted that the driver take that route.

Reasons: The driver used an inappropriate gear/braking technique for the road condition. He had little experience of driving in Australia, and was unknnot familiar with this route. He was required by his company to take a road that was not suitable for caravans, buses and heavy load vehicles.

Advisable preventive measures:

- Management of safety risk (route selection and route and vehicle familiarisation for drivers).
- Driver training for professional drivers.
- Selection of appropriate routes and roads.
- Regular vehicle inspections and maintenance of vehicles.

Source: Office of Transport Safety Investigations OTSI, 2006, *Bus Safety Investigation Report – Bus safety investigation – Jumbo travel – Jamberoo Mountain Road*, Sydney.

<http://www.otsi.nsw.gov.au/bus/IR-Jamberoo-final.pdf>

3.3.2 Weather conditions

The risk of accidents increases when trucks travel under hazardous conditions (European Foundation for the Improvement of Living and Working Conditions, 2004). Rain, sleet and snow can cause

slippery roads. Heavy rain or snow as well as heavy fog can limit visibility for the drivers. A number of factors are known to affect visibility for drivers: especially fog intensity, but also droplet size, blowing snow, wiper speed, ambient light and splash and spray from other vehicles.

According to a Canadian survey weather conditions have an influence in the following areas (taken from Andrey et al., 2001):

- Collision risk usually increases from 50 to 100% during precipitation.
- Snowfall has a greater effect than rainfall on collision occurrence, but snowfall-related accidents tend to be less serious than others.
- Risk varies according to both the type and intensity of precipitation. Risk appears to be greatest for freezing rain and the first snowfalls of the season, and lowest for light drizzle or snow flurries.
- Elevated risk during rainfall appears to be related to visibility, since collision rates quickly return to near-normal after the rain has stopped, even if roads continue to be wet. Snowfall-related risk often remains elevated for an extended period, suggesting that frictional effects dominate.
- High winds and fog are associated with a small proportion of crashes but generally increase the risk of a traffic collision, whether acting alone or in combination with precipitation.
- Few studies have considered the effects of sunlight glare, heat stress and barometric pressure on collision risk, and the evidence is too sparse to draw any definitive conclusions. Few studies consider the interaction between inclement weather and other risk factors, but there is some evidence that weather effects are particularly acute at night and on roadways with a gradient and/or curve.

Driving in bad weather conditions requires careful attention and the vehicles have to be properly equipped to drive in those conditions. Special training and instruction of drivers is also crucial.

Work pressure due to 'just-in-time' management increases the risk of dangerous manoeuvres in spite of bad conditions, and thus increases the risk of accidents.

Case 8: 'Driving a tractor truck on a wet road'

Who: Tractor truck driver.

Job: Driving a tractor truck.

Injury: Driver not injured, material damage.

How: About 100 metres past the bypass outside 'X', the rear of the tractor truck slipped on the wet road, resulting in the driver losing control of the entire vehicle.

Reasons: Wet road.

Advisable preventive measures:

- Regular vehicle inspections and maintenance of vehicles.
- Planning journeys adapted to weather and road conditions.
- Special training and instruction for drivers.

Source: Occupational Accident Insurance – Luxembourg.

Case 9: 'Driving a truck in a storm'

Who: Truck driver.

Job: Driving a truck.

Injury: Driver not injured, material damage.

How: Due to a storm, there was a lot of water on the road. In the bend of junction 'X', the truck formed a 90-degree angle, skidded and came to a halt against an embankment.

Reasons: Wet road due to a storm

Advisable preventive measures:

- Regular vehicle inspections and maintenance of vehicles.
- Planning journeys adapted to weather and road conditions.
- Special training and instruction for drivers.

Source: Occupational Accident Insurance – Luxembourg

Case 10: 'Rain shower catches truck driver unawares'

Who: Truck driver.

Job: Driving a truck.

Injury: Serious (non-fatal) internal injuries.

How: The truck driver was driving on the motorway when he was surprised by a heavy rain shower. He turned the wheel sharply and the trailer slipped and dragged the entire vehicle off the motorway. Both the truck and the trailer toppled over the roadside and consequently the driver was trapped in the truck cabin.

Reasons: A heavy rain shower

Advisable preventive measures:

- Regular vehicle inspections and maintenance of vehicles.
- Planning journeys according to likely weather and road conditions.
- Special training and instruction for drivers.

Source: Occupational Accident Insurance – Luxembourg.

3.4 Vehicle condition

Defective vehicle parts such as tyres, brakes and lights can lead to tragic accidents by affecting the driver's ability to maintain control of his vehicle. Safety products designed for vehicles, such as warning lights, that don't work properly, may also cause serious accidents. Inspection and maintenance of tyres, lights and braking systems is crucial to ensure the safety of drivers and other road users. According to a study by the Department for Transport in the UK (2005) accidents resulting from vehicle defects accounted for only 1.5% of total accidents. The most common defect was found with braking systems. The German Institute for accident research (Institut für Unfallanalysen) identified failure in the braking system as most common technical defect in heavy goods vehicles. This is often due to insufficient maintenance (Institut für Unfallanalysen, 2008). Brake failure can lead to very severe accidents.

Defective tyres can also lead to driver loss of control and severe accidents. Reasons for defective tyres may be insufficient tyre pressure (lack of maintenance), load weights exceeding the tyre specifications, bad installation or bad fabrication of tyres (Institut für Unfallanalysen, 2008).

Case 11: 'Brake failure of a scheduled passenger bus'

Who: Bus driver.

Job: Driving scheduled bus on city route.

Injury: Driver not injured, material damage

How: The driver was driving the route 5 bus behind the number 2 bus, which braked to allow a walker to cross on the pedestrian crossing. The driver then noticed, when braking, that his own brakes weren't working.

Reasons: Brake failure

Advisable preventive measures:

- Regular vehicle inspections and maintenance of vehicles.
- Special training and instruction for drivers.

Source: Occupational Accident Insurance – Luxembourg.

Case 12: 'Brake failure'

Who: The driver of the heavy load vehicle and two passengers suffered from fatal injuries.

Job: Transport of steel plates

Injury: The driver and two people who were shopping in the supermarket died from their injuries.

How: A heavy truck crashed into a supermarket. The driver was unable to stop because the brakes failed. He first tried to drive his truck into a park, but as there were children he swerved and crashed into the supermarket. The truck as well as the supermarket caught fire. The accident was analysed and it turned out that the brakes were in an extremely poor condition. The workshop manager reported that he had noticed the failure some weeks before the accident and informed the company manager about the problem. But nobody reacted and repaired the brakes.

Reasons: Brake failure, poor maintenance.

Advisable preventive measures:

- Regular inspections of vehicles.
- Maintenance of vehicles.
- Selecting appropriate routes.

Source: Panorama, 2007, *Kerkrade: Bewährungsstrafen verhängt*, WDR

http://www.wdr.de/themen/panorama/unfall02/kerkrade_lkw/070621.jhtml?rubrikenstyle%3Dpanorama&rubrikenstyle=panorama

Panorama, 2008, *Neuer Prozess zu Unfall in Kerkrade* WDR

http://www.wdr.de/themen/panorama/unfall02/kerkrade_lkw/080418.jhtml,
http://www.wdr.de/themen/panorama/unfall02/kerkrade_lkw/080418.jhtml

Case 13: 'Serious road tanker accidents caused by defective brakes'

Who: Driver and people near the accident.

Job: Transport of 28,000 l of petrol and 6,000 l diesel fuel.

Injury: 38 injured and 6 killed. The driver was slightly injured.

How: The driver was transporting fuel when he detected that the brake system of his truck didn't work. He was a very skilled driver and knew his route well. He tried to slow down, but due to the brake failure he couldn't. As he was driving downhill his vehicle even gained speed. All attempts to stop the vehicle failed. A newly installed electronic power shift obstructed the use of his engine brake. He lost control on a bend and crashed into an ice cream parlour. The tanker caught fire and exploded. Several houses were destroyed, six people were killed and dozens injured.

Reason: Brake failure, poor maintenance of the braking system.

Advisable preventive measures: The employer knew about the damaged braking system, so he should not have allowed the vehicle on the road. Vehicles with damaged braking systems or other serious problems are not permitted by law to be driven. He was found to be guilty of causing this accident.

The driver was also found to be culpable because he knew about the problems in advance and should not have got behind the wheel of the defective tanker.

Employers need a system both to keep vehicles well maintained and to prevent them being driven if problems are found.

Source: Anonymous, 1987; Wikipedia, 2008; Posluschni & Göbel, 2007; Anonymous, 2007; VMBG, 2003

3.5 Loss of control

Research carried out in Sweden (Kharazzi & Thomsen, 2008) identified three critical manoeuvres that led to loss of control of heavy trucks and subsequent accidents. One of the main causes of loss of control is driving round a bend, followed by avoidance manoeuvres, and manoeuvres where drivers try to regain get back on the road after sliding off onto the verge.

According to Kharazzi and Thomsen loss of control was associated with almost a fifth of trucks involved in accidents. Most accidents caused by a loss of control (84%) involved only a single vehicle.

Case 14: 'Driver loses control of the vehicle because of a coughing and sneezing fit'

Who: Driver returning from delivery.

Job: Transport of fresh vegetables.

Injury: The driver sustained various fractures and bruises. He was unable to work for three months. Partial permanent incapacity for work was not excluded.

How: The employee involved (51 years old) has worked as a driver for over 30 years and is not known to be accident-prone. On the day of the accident, he picked up fresh vegetables from an external supplier and delivered them to a customer.

The driver then brought his lorry back to his company for his next assignment. A few kilometres from the depot he suddenly veered off the road, through some bushes and small trees, hit a gas box and came to a halt in a ditch.

The police and the public prosecutor arrived on site and a report was drawn up. The officials started an investigation, but couldn't find a cause for the accident. No skid marks were found. Moreover, the marks in the grass did not indicate that the driver had fallen asleep. In fact, he had left his delivery address just a few minutes earlier. The truck was also examined, but no signs of technical failure were discovered. It was a new truck that had only been in use for a few weeks. The driver's licence was also in order. The black box and the tachograph driver card were seized by the public prosecutor for examination and were later found to be in order as well.

Reasons: The driver couldn't remember how he ended up veering off the road and turning into the ditch across the verge. He remembered a coughing and sneezing fit. Possibly this was what caused him to close his eyes temporarily and consequently drive off the road.

Preventive measures:

The investigation report was posted on the noticeboard to inform the other employees. No other preventive measures had been taken to avoid similar accidents.

Source: Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium.

Case 15: 'Loss of control while turning'

Who: Truck driver.

Job: Driving a truck.

Injury: Driver uninjured, material damage.

How: The driver was carrying out a manoeuvre on the road when the truck lost its balance and ended up in the ditch on the side of the road. The driver was then thrown against the passenger seat.

Reasons: Truck lost balance while driver carried out a turn.

Advisable preventive measures:

- Regular vehicle inspections and maintenance of vehicles.
- Special training and instruction for drivers.

Source: Occupational Accident Insurance – Luxembourg

Case 16 'Loss of control while avoiding another truck'

Who: Truck driver.

Job: Driving a truck.

Injury: Serious (non-fatal) injuries, material damage.

How: One kilometre from the exit, a trailer truck overtook another truck. The trailer truck drove too fast along the right lane and failed to leave enough space between his vehicle and the others, who tried to avoid him with a sharp turn of the wheel. However, this manoeuvre caused the driver to lose control of his truck and crash into the safety rail. Subsequently, the driver was transported to hospital by ambulance.

Reasons: While avoiding a trailer truck, the driver lost control of the truck.

Advisable preventive measures:

- Regular vehicle inspections and maintenance of vehicles.
- Special training and instruction for drivers.

Source: Occupational Accident Insurance – Luxembourg.

4. Accidents in cargo and vehicle handling (Occupational transport accidents on site)



© David Tijerio Osorio

Occupational risks may also arise in the transport sector before driving begins or after driving is over. Drivers have a lot of additional tasks to perform such as loading and unloading of vehicles, coupling and uncoupling trailers, checking and making sure that cargo is appropriately secured, checking and maintaining their vehicles before starting their next journey. All these operations (activities) can pose risks to drivers. The following table shows the rate of reported occupational accidents in the road haulage sector in Germany 2005.

Table 1: Rate of reported work-related accidents by working area in the haulage sector in Germany, 2005 (BGF, 2007)

	%
Driver's cab	3.5
Garage	4.1
Loading platform, freight hold	9.5
Loading area	35.6
Warehouse	2.9
Street, highway	11.9
Depot	20.4
Others	12.1

4.1. Coupling and uncoupling, unsafe parking

Incorrect coupling and uncoupling of trailers and unsafe parking can be very dangerous to the driver and to others. Accidents and dangerous situations can happen because drivers of heavy goods vehicles fail to follow safe coupling and parking procedures. (HSE, 2008a; Berufsgenossenschaft für Fahrzeughaltungen (BGF), 2003).

This can cause fatal or serious injuries: drivers can become crushed between the vehicle and the trailer or struck by the vehicle itself. Fatal incidents to heavy goods vehicle drivers due to coupling and uncoupling rank second behind fatalities caused by road accidents (BGF, 2003).

Common unsafe practices are: leaving the vehicle without stopping the engine and applying the parking brakes and disconnecting the trailer airlines while being parked on emergency brakes (HSE, 2002).

Some drivers use slopes to couple trailers to the vehicles, allowing the trailer to move against the hitch. This is a very dangerous procedure, because it is not possible to control the movement of the trailer or to stop it. The risk of being crushed between vehicle and trailer is very high and in the majority of cases fatal. Most of the accident examples presented below deal with this unsafe procedure.

Case 17: 'Temporary worker crushed by trailer during coupling'

Who: Temporary worker.

Job: Coupling a trailer.

Injury: Severe crushing of body and lung.

How: A young temporary worker P who came to his workplace in his free time with his friend S to borrow a car, was asked by his boss to help couple a trailer. He and his friend had no experience in coupling trailers and directing trucks into position. They were not given any instruction by the employer. S stood beside the driver and tried to guide him. The young worker P stood on the co-driver side. Because the drawbar didn't fit exactly to the coupling jaw he went behind the vehicle and stepped on the drawbar to support the coupling procedure with his weight. The driver drove his vehicle back, and because he overshot P was crushed between trailer and truck. The driver and the employer were held responsible for the accident.

Advisable preventive measures:

- Workers must be instructed and trained before working.
- Workers must follow the correct coupling procedure.
- The driver must check the situation before reversing.

Source: BGHW, 2004, *LKW-Fahrer übersieht Aushilfskraft*, Unfall-Stop Heft 5/2004, p.4 http://www.bghw.de/medienangebot/sparte-grosshandel-und-lagerei/archiv_unfallstop/archiv/jahrgang-2004/unfall-stop-heft-5-september-2004/seite4f.pdf/view

Case 18: 'Coupling of trailer'

Who: Driver.

Job: Coupling a trailer.

Injury: Fatal.

How: The driver set his trailer in motion for coupling. He wanted to couple his trailer on his own using a gradient to assist him. But he couldn't handle the moving trailer and was crushed between truck and trailer. He died from internal injuries.

Reason: Unsafe practice for coupling trailers. The driver never had a chance against the moving trailer.

Preventive measures:

- Transport companies were instructed to train and inform their drivers about the safety instructions and safe working procedures of the company.
- Driver working without co-drivers must get help from a skilled worker. It should not be permitted for coupling of trailers to be done by one person.
- Controls in transport companies were intensified.

Source: Holz BG <http://www.holz-bg.de/cgi-bin/holzinfo?state=5&id=111> or <http://www.holz-bg.de/pages/praevention/AUL/sonstiges.htm>

a very similar accident happened in Slovenia; source: http://www.henkel.com/cps/rde/xchg/SID-0AC8330A-C23A3F0D/henkel_de/hs.xsl/10253_DED_HTML.htm

Case 19: 'Driver crushed between trailer and vehicle'

Who: Driver.

Job: Coupling a trailer.

Injury: Fatal, driver died from internal injuries.

How: The driver moved his vehicle backwards towards the trailer. He got out of his vehicle and tried to couple the trailer on his own. As his vehicle was parked on a slight gradient it started to move and struck the driver. He was crushed between truck and trailer and died from internal injuries.

Reason: Unsafe practice of coupling the trailer. He forgot to apply the parking brakes.

Advisable preventive measures:

- Workers must be instructed and trained before working.
- Workers must follow the correct coupling procedure.
- Workers should never be alone while coupling or uncoupling trailers. There has to be at least one additional competent worker.

Source: http://www.presseportal.de/polizeipresse/pm/7304/245431/polizei_bonn?pre=1

Case 20: 'Young worker died because of unsafe coupling practice'

Who: Young driver (20 years).

Job: Coupling a trailer to a vehicle.

Injury: Fatal head injuries.

How: The young driver was working alone. He was in his second year of training and had been trained regarding safe coupling and uncoupling procedures. Nevertheless he tried to couple the trailer with help of a slight slope (2%) and hold the drawbar in his hands. He probably lost control and activated the rear wheel brake at the last moment. The vehicle stopped abruptly, the drawbar bounced up and struck his head hard. He died from blood loss.

Reason: Unsafe coupling practice, difficult to reach the brake application valve in case of emergency.

Preventive measures:

- The brake application valve was transferred to a place where the worker can handle it more easily.
- Regular training of workers about safe working procedures.
- Intensive training for young workers concerning dangerous working procedures.
- Supervision of new and young workers.
- Workers should never be alone while coupling or uncoupling trailers. There has to be at least one additional competent worker.

Source: Berufsgenossenschaft für Fahrzeughaltungen (German statutory accident insurance body for transport sector).

Case 21: 'Coupling without parking mechanically'

Who: Driver.

Job: Preparing his vehicle and trailer to load goods.

Injury: Several fractures of the pelvic and lumbar vertebrae.

How: The driver uncoupled the trailer and drove his vehicle to the loading ramp. He loaded the vehicle, returned to the trailer and reversed to couple the trailer to his vehicle. After he had coupled the drawbar to the coupling jaw he left the cab to connect the lines. Suddenly the trailer started to move backwards and the drawbar bounced aside and crushed the driver between drawbar and vehicle. He suffered from several fractures of his pelvic and lumbar vertebrae.

Reason: The driver didn't apply the mechanical brake of the vehicle of the trailer. This is unsafe coupling practice. The driver was not sufficiently informed about the functionality of the pneumatic spring-operated brake. It was the first time he had driven a vehicle with this type of brake system.

Preventive measures:

- Regular training of workers about safe working procedures, especially coupling and uncoupling procedures.
- Workers should never be alone while coupling or uncoupling trailers. There has to be at least one additional competent worker.

Source: Berufsgenossenschaft für Fahrzeughaltungen (German statutory accident insurance body for transport sector).

4.2 Loading and unloading

One of the most hazardous activities for the drivers apart from driving itself is loading and unloading of goods. The goods are often delivered at the last minute and have to be unloaded very quickly. The drivers have to get used to different situations very quickly. Changing working conditions, time pressure and fatigue after driving long distances increase the risk of accidents. According to the German statutory accident insurance for the transport sector (BGF, 2007) more than one-third of all accidents in the transport sector occur during loading and unloading.

The three main causes of accidents while loading and unloading are:

- Falls from vehicle, platforms and while loading.
- Being struck or run over by moving vehicles.
- Being struck by falling objects or loads (Reinhardt & Kirchner, 1996; Becker, 2006; HSE, 2003b).

Typical risks and hazards that may contribute to accidents while loading and unloading are (Reinhardt & Kirchner, 1996, 1998):

- Overturning of vehicles
- Abrupt rolling of vehicles
- Abrupt starting of vehicles
- Falling, turning over or slipping of load
- Unsafe steps and ladders
- Confined space
- Unsafe or inadequate lighting
- Pressure to meet deadlines

4.2.1 Falls from vehicles, platforms or while loading (Slips, trips and falls)

Falling from a vehicle is one of the most common types of workplace transport accidents that cause major injuries (e.g. broken bones) to workers (HSE, 2003b). A review of accident data has shown that falls from vehicles represent around one-third of workplace transport accidents. Research shows that

in recent years the number of people falling from a vehicle and sustaining a major injury has increased (Scott et al., 2006).

Drivers climb in and out of their cabs hundreds of times a week and routinely access the rear of their vehicles (trailers, flatbeds, tail lifts) to perform loading and unloading activities (HSE, 2003b). Various contaminants are present in the haulage industry that can lead to slippery surfaces. Oil, grease and diesel spills, water from rain, snow and ice can make the work of drivers more hazardous. Wind can also pose problems: moving curtains on large goods vehicles can drag the driver from the platform.

Inadequate lighting also plays a role, because drivers often start to load their vehicles very early in the morning.

Unsuitable footwear, missing guardrails and unsafe steps are also likely to cause slips, trips and falls.

According to an analysis from HSE (2007) the parts of vehicles from which falls most commonly occurred were: trailer (39% of accidents), flatbed (21% of accidents), tail lift/rear (7.5% of accidents) and roof etc. (7.5% of accidents). The three most common activities identified by the authors were: loading and unloading a vehicle (49% of accidents), sheeting, securing or adjusting the load (21% of accidents) and cleaning or maintenance tasks (15% of accidents). Jones and Switzer-McIntyre (2003) found that fall accidents occur mainly from the back of trucks and trailers.

Case 22: ‘Driver falls off trailer’s canvas platform while loading truck’

Who: Company driver.

Job: Loading and transportation of construction waste.

Injury: Broken wrist.

How: The worker involved (24 years old) has been working with the company for about a year, but had only served truck driver for 20 days. On the day of the accident, the driver loaded the truck with construction waste, weighed it and drove it to the car park in order to cover the cargo with a canvas.

In order to reach the canvas, the driver used the fixed trailer ladder to get up onto the platform. Once on the platform, he used the canvas handle to unfold the canvas and cover the cargo. The construction waste appeared to have been loaded somewhat above the upper edge of the trailer, causing the canvas to get stuck. Consequently, the driver put more pressure on the canvas handle. This caused him to lose his balance and fall. In a reflex action he put out his left hand to stop his fall, breaking his left wrist. He was unable to work for a fortnight.

The primary cause of this accident was the lack of railing on the platform at ladder height. Moreover, the construction waste was loaded a little above the upper edge of the trailer, which caused the canvas to get stuck. As a result, the driver needed to put more pressure on the canvas, causing him to lose his balance.

Preventive measure:

Various preventive measures will be introduced to prevent similar accidents:

- line managers will send all drivers a personal message through their onboard computer telling them to always (un)fold the canvas with great care;
- in the scheduled driver’s course, in cooperation with the external service for prevention and protection at work, this item will be discussed at length;
- additional sheathing at ladder height will be considered. However, this additional protection must not pose any additional stumbling risks (at the time of the accident, the platform was almost entirely surrounded by a crash guard. Only at trailer ladder height was there an opening allowing easy access to the platform.

Source: Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium.

Case 23: ‘Driver falls off tailboard while handling 900 kg pallet truck’

Who: Driver for a courier company.

Job: Delivering heavy cargo to a customer.

Injury: Fracture of the left forearm; wrist, back and knee were also injured.

How: The worker involved (30 years old) had been working for the courier company as a driver for about seven years. On the day of the accident, he needed to deliver a heavy cargo of boxes to a customer.

In order to handle the heavy pallet, which weighs about 900 kg, the driver pulled it onto the tailboard with a pallet truck. However, he misjudged the weight of the cargo and was therefore unable to stop the pallet on time. Consequently, the driver fell off the tailboard, while the pallet remained on top. The driver injured his arm, wrist and back in the fall. He also scraped his left knee. He managed to drive back to the company on his own, where a colleague administered first aid. Then he was transferred to hospital, where it transpired that he had fractured his left forearm. He was unable to work for a month.

Reason: This accident was the result of the driver misjudging the weight of the pallet. The instructions for delivery via the tailboard thus proved to be insufficient.

Preventive measure:

For deliveries via the tailboard, the employees of the courier company will be encouraged to – where possible – push the pallet truck to the outside, instead of pulling it onto the tailboard.

Source: Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium.

Case 24: ‘Driver sustains head injury while opening a container’

Who: Container company worker.

Job: Cargo unloading.

Injury: The worker fractured his skull and was unable to work for more than three months.

How: The worker involved (25 years old) had been working for the company, which transports containers, for a year. On the day of the accident, the driver needed to unload a container filled with more than eight tons of chipboard. Each container is closed with a handle and a pin. The handle is more or less at eye level.

To open the container, the driver pushed the handle towards the door with his hand. Then he extracted the pin with the other hand. In doing so, the driver exerted counter-pressure on the handle. The enormous pressure exerted by the chipboard on the doors, and consequently on the handle, caused the latter to hit the driver’s head with great force.

Reason: At the time of the accident, the driver was not wearing any protective headgear (a helmet), as this was not obligatory for this operation. He was insufficiently aware of the danger. Moreover, the company did not have any instructions concerning the opening of container doors.

Preventive measure:

Various preventive measures will be introduced to prevent similar accidents:

- the drivers will be given instructions on how to open container doors;
- wearing a safety helmet will become compulsory, even for other operations near the containers.

Source: Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium.

Case 25: ‘Driver falls through semi-trailer’s wooden floor’

Who: Semi-trailer driver.

Job: Unloading girders.

Injury: Fracture of the left leg.

How: Two drivers, who had been working for the company for a few years, were working together unloading girders from a semi-trailer.

One of the drivers operated the roller bridge from the ground, whilst the other walked along the side of the semi-trailer to couple the cargo onto the bridge. The semi-trailer’s floor consists of boards. One of the boards on the edge of the semi-trailer was weathered and rotten and unable to bear any weight. However, the two drivers were unaware of the danger. One of them walked across the damaged board, causing it to collapse under his weight and fall to pieces. The driver fell through the gap, with his left leg first. He broke his right leg, which was still on the semi-trailer. The victim fell on the semi-trailer and remained there until the emergency services arrived. He was unable to work for over two months.

Reason: The company employed a staff member who is responsible for the maintenance and repair of the semi-trailers. Replacing damaged boards is one of his tasks. Usually this happens after the drivers report faults or damage. There is no planned preventive maintenance. The boards’ strength is not tested. However, visual assessments are not always sufficient. Weathered boards, such as the one which caused the accident, are not always considered risky and thus in need of replacement.

Preventive measure:

Various preventive measures will be introduced to prevent similar accidents:

- all boards of all semi-trailers will immediately be checked and all the questionable ones will be replaced;
- the staff member responsible for the maintenance and repair of the semi-trailers will be taught the importance of a quality board floor with good bearing power, as well as his role in achieving this;
- during maintenance, the boards will not only be visually checked, but their strength will also be physically tested;
- based on a set of instructions, the drivers will be encouraged to check for damage to the semi-trailer after each use (heavy loads);
- a maintenance procedure will be established detailing the frequency with which the semi-trailers need to be checked;
- when the company purchases new boards, the supplier will be asked to treat them for wood rot.

Source: Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium.

Case 26: ‘Driver falls off semi-trailer while checking his cargo’

Who: Driver.

Job: Animal transport.

Injury: Fracture of the heel bone.

How: The driver involved (23 years old) had been working for an animal transport company for seven years. On the day of the accident, the driver had to transport calves to a customer. The driver loaded the calves onto the truck's semi-trailer. In order to check whether everything was fine in the front part of the truck, he climbed up on the side of the semi-trailer. Subsequently, he jumped down backwards off the trailer. In doing so, he broke his heel bone. He was unable to work for over two months.

Reason: The primary cause of this accident was the lack of a fixed ladder on the front, side or back of the semi-trailer. Due to this lack of facilities, the driver had to climb up via the semi-trailer. Moreover, he was not wearing any safety shoes, despite them being provided by the employer.

Preventive measure:

Various preventive measures will be introduced to prevent similar accidents:

- a fixed ladder will be attached on the inside of the truck to allow the drivers to check the cargo safely from higher up; the driver can then get in and out via the interior of the semi-trailer;
- a manually operated mirror (on a stick) or fixed mirror will be installed inside the semi-trailer and will reflect what is going on in the front part of the semi-trailer;
- wearing safety shoes will become compulsory; line managers will supervise this measure.

Source: Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium.

4.2.2. Being struck by falling objects or loads

While unloading or loading vehicles the drivers are at risk of being struck by falling objects. Loads may fall off the vehicle because they are not secured properly or because the load shifted during transport. The driver can be hit by goods falling from the vehicle while opening the loading ramp or removing the canvas.

Loads that are too heavy or cumbersome can topple and hit the workers, if appropriate handling equipment is not used. Lifting loads that are not well secured or are unstable poses a risk to the driver and to other workers. This also applies to forklift trucks that are overloaded or not used properly. Drivers who have not been properly trained to unload their freight are especially at risk.

Case 27: 'Truck driver killed by laminated veneer beams falling from a forklift'

Who: Truck driver.

Job: Unloading laminated veneer beams.

Injury: Fatal head injury.

How: A 34-year-old male truck driver (the victim), who was employed by a wood product manufacturer, was struck by a load of laminated veneer beams which fell from a forklift. The trailer that was to be driven by the victim had been loaded the previous day. An additional order of support beams had arrived late and, therefore, had not been processed the day before the incident. The order included four laminated veneer beams that were banded into one unit on the morning of the accident. The driver was supposed to assist the load onto the trailer and then to transport and deliver the veneer beams. The forklift operator picked up the beams to place them on top of the loaded trailer. The load had to be placed in the middle of the trailer, but there were no spacers for the forklift to set the forks in, so that the forklift operator had to tip the forks to slide the beams into position. While the beams were being lifted and tipped, the end that was closest to the rear of the trailer started to slide off the forks first. The victim tried to get away from the sliding beams by running towards the front end of the trailer, but the beams slid off the forks and struck the driver. He fell off the trailer, and his head was crushed by the load.

Reason: The driver as well as the forklift operator were trained regularly to carry out their work. Nevertheless this accident was caused by an unsafe loading procedure. The accident was caused by

instable load due to the lack of spacers. In addition the driver didn't wear a helmet to protect his head while loading; this could have protected him from suffering fatal injuries.

Advisable preventive measures:

- Developing and implementing standard safe loading procedures and ensuring that all workers follow the procedures.
- Providing additional refresher training for all forklift operators in the event of an accident, or near-miss incident in the workplace.
- Wearing head protection (hard hat) when assisting forklift loading or performing any tasks with a potential for head injury.

Source: Fatality Assessment and Control Evaluation (FACE)

<http://www.health.state.ny.us/environmental/investigations/face/02ny027.htm>

Case 28: 'Driver turned over with his truck while unloading waste paper'

Who: Company driver.

Job: Transport of waste paper to recycling company.

Injury: No information.

How: The driver drove a heavy goods vehicle loaded with waste paper. He had to transport the waste paper to a recycling company. When he arrived there he started to tip his load. Suddenly the vehicle started to turn over. Fortunately the driver was able to get out of his cab, but he was injured and had to be taken to the hospital.

Reason: The driver forgot to move out the support legs. The vehicle lost its balance and turned over.

Preventive measures:

- Supervising load and upload activities by an additional skilled person.
- Training and informing drivers about safe procedures for loading and uploading.
- Using support legs on hard ground.

Source: <http://vorarlberg.orf.at/stories/152621/>

Case 29: 'Driver trapped between pallet truck and cargo hold'

Who: Delivery driver.

Job: Cargo loading.

Injury: Fractured ribs.

How: The 50-year-old driver had been working for a company that produces sterilised dairy products for 30 years. On the day of the accident he needed to deliver a pallet of plastic bottles to a customer.

To unload the pallet, which weighed about 850 kg, the driver used a manual pallet truck. As the truck was parked on a slight slope, the cargo was also tilted in the truck. The vehicle's platform was wet because of rain. To simplify the unloading process and to adjust the cargo's angle, the driver tried to move the cargo in the vehicle's cargo hold. During this operation, he lost control of the pallet truck and got stuck between the pallet truck's drawbar and the side of the cargo hold. On account of his injuries he was unable to work for two months.

Reason: The company did not have any instructions on the loading and unloading process, and handling of the material in question. The customer had not carried out a risk analysis of the unloading bay.

Preventive measure:

Various preventive measures will be introduced to prevent similar accidents:

- instructions on loading and unloading, and handling of the material will be drawn up and distributed among the company's drivers;
- the customer will be approached to improve the unloading conditions through a risk analysis.

Source: Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium.

Case 30: 'Insufficient knowledge of loading technique'

Who: Driver.

Job: Loading and transport of chipboard.

Injury: Fatal injuries caused by falling chipboard.

How: The vehicle was loaded with units of chipboard. They were placed side by side lengthwise in the driving direction. One space near the driver's cab remained. To use full loading capacity the forklift driver placed one chipboard unit edgewise on the vehicle. While the driver was lashing the unit the forklift driver pressed against the chipboard to prevent it tipping. The driver transported the load to the client and started to unload the chipboard. He untied the unit and suddenly the chipboard fell down and crushed him to death.

Reasons: The edgewise loading of the chipboard unit was unsafe practice. The forklift should never have been used to hold the chipboard: the driver had no chance of preventing the chipboard units falling down while unloading. Inappropriate straps were used to secure the load and the unloading wasn't supervised.

Preventive measures:

- Assessing the risk of the loading and unloading activities.
- Ensuring that the loading procedure is supervised by a skilled employee.
- Informing and training workers about safe loading procedures.
- Preventing and forbidding the use of forklifts for other purposes than intended.
- Using appropriate cargo straps.

Source: BGF, Gesund und Sicher, 2007, Gefährliche Nebensache, http://www.bgf.de/sites/3/sipa/02_2007/sipa02_2007_12u13.pdf

4.2.3. Handling dangerous substances

Drivers of dangerous substances may face a variety of risks due to chemical exposure. During loading and unloading drivers may be exposed to irritating chemicals. For example, drivers of petrol tankers often suffer from headache, dizziness or nausea when exposed to vapours while loading and unloading petrol (NIOSH, 2007). Drivers of cement mixer trucks may be at risk of allergic reactions or chemical burns, and drivers who transport hot bitumen may be at risk of allergic reactions and/or burns.

Drivers transporting shipping containers with chemicals are also at risk. Containers are transported throughout the world in enormous quantities on ships and by road. Cargo handling personnel have to open the containers and use or redistribute the contents. Insecticides are regularly added to these shipping containers in the country of origin. They are intended to protect the cargo from pests and to make sure that no unwanted species are imported. This frequently results in containers with substances at levels which can be dangerous for humans when they open them. These substances are typically gaseous and inhaled when exposure occurs, but exposure may also occur through contact with condensed droplets (Information supplied by TNO, The Netherlands).

Case 31: 'Unloading contaminated containers'

Who: Two workmen.

Job: Unloading containers

Injury: Unconsciousness, permanent brain damage.

How: Whilst a container filled with Chinese glass products was being opened a dangerous substance escaped and the two workers became unconscious. They sustained permanent brain damage. The substance was most likely introduced in order to kill insects (fumigation). The two workmen were taken to a nearby hospital to recover.

Reasons: Shipping containers may contain dangerous concentrations of hazardous substances. Screening and measurement protocols may help prevent exposure. Labelling also an issue.

Source: Miscellaneous news sources and internal interviews. E.g. Logistiek.nl. 4-12-2007. Mensen onwel door container uit China http://www.logistiek.nl/nieuws/id5771-Mensen_onwel_door_container_uit_China.html

Case 32: 'Workers suffer carbon monoxide poisoning during straining assignment using forklift trucks'

Who: Workers who unload the vehicle.

Job: Unloading a vehicle using a forklift truck.

Injury: Workers sustained carbon monoxide poisoning.

How: A customer commissioned a contaminant to be strained from a product. The product was stocked in large one-ton bags. The customer wanted the straining assignment to be carried out in a confined space (with closed doors), because the product was to be used in the food industry. Three LPG forklift trucks were used for the assignment: two to position the big bags and one to supply and transport the product. The product was sieved while being poured from one big bag to another.

The works started on Monday in two different shifts. Because of the speed with which the product was poured from one big bag to another, the forklift trucks' combustion engines were kept running. Moreover, there was no air circulation in the room. On Friday, one of the workers concerned felt unwell and went home. Later, his family doctor referred him to hospital. There, he was diagnosed with CO poisoning. His co-operators were informed by the person in charge at the company and they were also admitted to hospital for treatment.

Reason: The primary cause of this accident was the lack of air circulation combined with the forklift trucks' combustion engines permanently running.

Preventive measures: Various preventive measures will be introduced to prevent similar accidents:

- the gas-fuelled forklift trucks will be replaced with electric forklift trucks;
- CO detectors will be ordered to constantly measure CO concentrations in the cells during the operations;
- a list will be drawn up with telephone numbers of the workers' family members to be contacted in case of emergency. New employees or temporary workers should write down their emergency number on the last page of the induction brochure;
- forklifts in the cells will be replaced by a lifting system.

Source: Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium

Case 33: 'Burns caused by hot bitumen'

Who: Driver of a road tanker.

Job: Delivery of bitumen.

Injury: Second degree burns on the head and the shoulders.

How: The driver delivered bitumen to a company. The bitumen was pumped down to tanks with a height of 10 m. A tube was installed between the tanker and the tank for this purpose. The pressure to pump the bitumen was produced by the exhaust gases of the road tanker. A spillway was installed to prevent bitumen spilling out. After the fill level had been reached the driver decided to stop and clean the tube. He climbed under the vehicle to do so, but as he was doing this his safety helmet fell off. Just as he was putting his helmet back on hot bitumen spilled over the tank and burned him on his head and shoulder.

Reason: The installations were not in a good condition, the spillway was dirty and blocked. The top cover of the tank should have been tightened, but it had only been placed loosely on the tank. The installations were not maintained and the driver was not trained, and no risk assessment was prepared.

Preventive measures:

- Assessing the risk of loading and unloading bitumen.
- Developing and implementing standard safety procedures for loading and unloading dangerous substances.
- Training and information for workers.

Source: Berufsgenossenschaft der Fahrzeughaltungen (German statutory accident insurance body for transport).

4.3 Vehicle maintenance

Employers should ensure that vehicles are well maintained and should have procedures and the means in place to ensure this. Checking vehicles before driving them, as well as maintaining vehicles in a safe condition, may be the task of drivers or inspection personnel in the transport sector. As well as the risks of accidents while driving because of poorly maintained vehicles, drivers may be injured while carrying out repairs to the vehicle. Severe accidents may occur if the workshop is not appropriately equipped to carry out checks and repairs. According to a survey (HSL, 2007) 15% of falls in the transport sector happened during cleaning and maintenance activities.

Lifting vehicles without paying attention to safety measures can lead to severe or fatal accidents. Using improvised or inadequate jacks can cause crush injuries (Millies, 1998). Accidents may also happen when machines are accidentally started during maintenance and repair work (TRIA project, 2007). Tyres can explode and fatally injure workers, dangerous substances such as brake cleaning fluids may also explode, and compressed air equipment can also pose a danger.

Drivers may be also struck by another vehicle while checking the load or working on a truck or bus (changing tyres or other activities) beside the road.

Case 34: 'Tyre explodes during check'

The employee involved (44 years old) had been working for the transport company for four years. On the day of the accident, he needed to pick up a 15-ton load of carpet rolls and deliver them to a customer.

After picking up the cargo, the driver sensed immediately that his semi-trailer was veering slightly off its path. This happened while he was driving on a secondary road. Once on a larger road, he was able to drive a bit faster. Once again, he noticed that the semi-trailer was deviating off its path, and this time worse than before. The driver decided to park the truck and the semi-trailer on the side of the road to investigate the cause of the problem.

He got out of the vehicle and moved from the front of the truck to the right side of the semi-trailer. The driver strongly suspected that one of the wheels was loose. He put on his safety gloves and felt the first wheel, then the second one. While he was inspecting and holding this second wheel, the tyre exploded. It proved to be faulty and the tyre pressure was at 8 bar. The driver sustained several fractures in both hands. He was unable to work for six months.

The company has a procedure to check the tyre profile depth in-house. In case of a tyre depth of less than 3 mm, the tyres are replaced by an external company. The tyre that exploded had a profile depth of 6 mm. The driver misjudged the danger, the tyre was faulty and its pressure stood at 8 bar. No safety instructions for checking the tyres were available in the company.

Preventive measures: Various preventive measures will be introduced to prevent similar accidents. A set of safety instructions for checking the tyres will be developed; these instructions will be used to explain the importance of tyre safety to all relevant staff; a purchasing procedure will be developed and applied for checking and/or purchasing tyres at the suppliers; the tyres of the remaining identical semi-trailers (about 14) will be checked for quality before use. Prior to carrying out this task, the tyre supplier must be informed about the findings of this investigation's report.

Source: Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium.

Case 35: 'Explosion while jump-starting a bus'

Who: Bus driver.

Job: Jump-starting a bus.

Injury: Lacerations on the forehead, hand fracture, perforated eardrum.

How: The driver was due to drive a school bus, but the bus wouldn't start. He thought that the battery was flat and obtained a transportable jump-starter. He connected the lines correctly to the different terminals of the battery, started the jump-starter and tried to start his engine. But nothing happened. He went to the power-starter and checked all connections. Then he started the jump-starter again. Suddenly one of the accumulators in the jump-starter exploded. The driver was hit by flying objects.

Reason: The bus driver assumed that the battery of the bus was flat without checking, but the battery was charged – the failure was in the electric system of the bus starter. The driver was also not trained to use the jump-starter and didn't know how to use it correctly or to check it. Unfortunately the jump-starter was deep-charged. The connection of the charged bus battery to the deep-charged jump-starter led to the explosion.

Preventive measures:

- Developing and implementing standard safety procedures to maintain the electrical system of buses.
- Training and information for workers concerning use of jump-starters.
- Assessing the risk of maintaining vehicles (jump-start).

Source: Berufsgenossenschaft für Fahrzeughaltungen (German statutory accident insurance body for transport).

Case 36: 'Truck slipped from the lifting jack'

Who: Motor mechanic.

Job: Repair and maintenance work.

Injury: Fracture of the ribs, bruises to the shoulder.

How: The mechanic's task was to repair a truck. He lifted the truck with the help of a lifting jack. He didn't use the vehicle-specific lifting jack, but one with more lifting capacity. He secured the rear wheel with a wheel chock. Then he started working under the vehicle. Suddenly the vehicle slipped from the lifting jack and trapped the worker under the front axle.

Reason: The worker didn't use the vehicle-specific lifting jack and didn't place the jack in the correct position. Unsafe procedure for lifting trucks.

Preventive measures:

- Assessing the risk of maintaining vehicles and using lifting jacks.
- Developing and implementing standard safety procedures to maintain the trucks.
- Training and information for workers concerning the safe use of lifting jack.

Source: Berufsgenossenschaft für Fahrzeughaltungen (German statutory accident insurance body for transport).

5. Occupational transport accidents and psychological factors



Max Skorwider, Courtesy of the Occupational Safety Poster Competition organised by the Central Institute for Labour Protection – National Research Institute, Poland.

5.1 Stress and workload

According to the ESWC 2005 (European Survey on Working Conditions, 2005), workers in the transport sector have more stress than the average working population. Within the EU-27, about 22% of the workers report that work affects their health in terms of stress. This percentage is much higher in the land transport sector where about 32% of the workers report stress.

Table 2: Percentage of workers reporting stress, EU-27, European Survey on Working Conditions (ESWC) 2005

	%
Land transport; transport via pipelines	32.2
Water transport	30.6
Air transport	38.2
Total EU-27	22.3

Drivers experience stress for various reasons, such as long working hours, irregular shifts, often having to drive to new places, and spending long periods away from home. Sometimes drivers have very long waits before they can load or unload their vehicles and are treated disrespectfully by shipping and receiving personnel (NIOSH, 2007). Other factors that can cause stress are high traffic volumes, poor roads and bad weather conditions, fear of robbery and assaults (Millies, 1998) and conflicts with passengers. Time pressures when driving will also be stressful, such as meeting tight delivery times or keeping buses on time in heavy traffic.

The Belgian Transport Workers Union (ABVV- BTB) investigated the causes of stress in the transport sector pertaining to work organisation, human resources, support, social aspects, 'on the road' (only for drivers), and personal factors.

The following items were considered the most stressful for sector freight transport by road (ABVV-BTB, 2002):

- responsibility for material;
- lack of involvement in decision making;
- traffic legislation;
- other traffic drivers and aggression;
- quality requirements; and
- unsafe working conditions.

For other scheduled passenger land transport:

- responsibility for material;
- lack of involvement in decision making;
- not enough personnel;
- traffic legislation;
- other drivers, aggression and responsibility; and
- no promotion possibilities.

Stress can lead to an increased accident risk and probably influenced most of the accidents described in this report.

Case 37: 'Confusing the reverse with the forward gear'

Who: Driver.

Job: Loading a light lorry.

Injury: Bruised ribs.

How: The driver wanted to load her light lorry with the help of a powered lift truck. As she was under extreme time pressure she confused the reverse with the forward gear. As a result she was struck by the lift truck.

Reason: Stress because of time pressure

Advisable preventive measures:

- Developing and implementing standard safety procedures for loading and unloading procedures.
- Training workers on safe loading and unloading procedures.
- Providing and planning enough time to carry out the work safely.
- Preventing time pressure.

Source: Berufsgenossenschaft für Fahrzeughaltungen (German statutory accident insurance body for transport).

5.2 Fatigue

A large number of research studies have discussed the effects of fatigue on driver behaviour and accident risk, and it has become evident that fatigue is an important issue in road safety (e.g. Horne & Reyner, 1995; ETSC, 2001; Van Schagen, 2003). Attempts to estimate the extent of the issue are complex and therefore highly dependent on the chosen method (Van Schagen 2003; Jettinghof et al., 2003). It is often difficult to ascertain whether an accident was fatigue-related because consequences are often severe and the accident tends to remove symptoms of fatigue. Nonetheless the issue is considered very relevant; the European Transport Safety Council (ETSC) for instance estimates that fatigue is a factor in approximately 20% of commercial road transport crashes. Jettinghof et al. (2003) estimate that fatigue amongst truck drivers in the Netherlands is related to between 18 and 44 traffic deaths each year. According to some authors fatigue may be a relatively bigger safety issue amongst truck drivers than amongst the drivers of passenger vehicles (ETSC, 2001).

A four-year research project by the Katholieke Hogeschool Kempen on sleep disorders in truck drivers in Belgium (Wuyts, 2007) found that an important cause of fatigue in truckers was related to OSAS (obstructive sleep-apnoea syndrome). This research also underlined that tiredness among drivers is an important cause of traffic accidents (contributing to almost 20% of accidents). Time of day (especially night driving), duration of wakefulness, inadequate sleep, sleep disorders, and prolonged work hours (including time spent performing non-driving tasks) have all been identified as contributing to the risk of fatigue-related crashes. Time pressures, the limited number of parking spaces for large trucks in rest areas, and the common industry practice of paying drivers by the mile can also contribute to drivers' exceeding allowable hours of driving or continuing to drive while fatigued. But according to this survey one of the most important causes is OSAS.

In OSAS the throat closes up during sleep, which causes breathing to stop for at least ten seconds and results in a lack of oxygen. The patient wakes up, falls asleep again and the respiration stops again. This process can repeat itself hundreds of times a night. This decreases the quality of sleep drastically and leads to increased fatigue during the day. Research has found that there is a significant correlation between the average body mass index (BMI) and the prevalence of OSAS, snoring and hypertension. A large majority of the OSAS cases was found in truckers with BMI of 30 or more and/or a belly width of 94 cm and more in the age category 45 to 54 (Wuyts, 2007). According to this research truckers have a high prevalence of obesity, which is probably due to the occupational context (little physical activity during the day and bad eating habits). The average body mass index (BMI) of 28.2 for this occupational group is higher than in the rest of the male population (25.4 according to the 2001 National Health Survey [Nationale gezondheidsenquête]). There is also a high incidence of OSAS in the group studied, with 13% suffering from serious OSAS. The syndrome is combined with a higher risk of traffic accidents and a higher mortality risk. Research has found that there is a significant correlation between BMI and the appearance of OSAS, snoring and hypertension. A large majority of the OSAS cases were found in truckers with a BMI of 30 or more and/or a belly width of 94 cm or more in the age category 45-54 (Wuyts, 2007).

Typical fatigue-related crashes often involve only one vehicle, which may have run off the road, tend to occur at night (when natural alertness is low) and typically happen on monotonous roads (unstimulating driving task). Long work hours cut into time available for sleep, and work-related stress makes it hard for drivers to sleep when the time is available. Shiftwork and irregular schedules lead drivers to go against their body clock by sleeping in the day and being awake when they should be asleep.

Drivers who have completed a long shift or journey in the day or in the days before may also increase the risk of fatigue-related crashes. When fatigue-related accidents occur speeds tend to be higher than average and the consequences are more severe because braking is absent or late.

In the US 25% of long-distance truck drivers reported falling asleep at the wheel in the previous year; 47% reported falling asleep at some time in their career. Truck drivers were more likely to report falling asleep at the wheel if they split their off-duty periods or if they worked a demanding schedule, e.g. 10 or more hours of consecutive driving or less than 8 hours per day off duty. Australian truck drivers who reported 6 hours sleep or less prior to a trip were significantly more likely to report a hazardous event related to fatigue, such as nodding off (Saltzman and Belzer, 2007).

Case 38: 'Sleep apnoea'

Who: Driver and a young woman in the car with which he collided.

Job: Transport, driving on a highway.

Injury: The driver suffered from shock, the young woman died from her injuries.

How: The driver had already caused an accident in 2005. He reported suffering a blackout while driving. His employer arranged medical checkups for the driver because he had noticed that he was often forgetful, nervous and clumsy. The checks identified sleep apnoea syndrome, but he was still allowed to work as a driver with the aid of special equipment. So the driver resumed his work. The day the accident happened he was driving on the highway. The weather was good, visibility good and the road clear. Without cause he drove his vehicle directly into the one in front. The car in front was squashed between two heavy good vehicles and the young female driver died from her injuries. The driver suffered from shock and is still undergoing psychological treatment.

Reasons: The driver suffers from sleep apnoea. He has been through several medical checkups but he was still allowed to drive his vehicle with help of a special instrument. This was probably an incorrect decision.

Preventive measures:

- Check the driver's fitness and physical ability to drive.
- If special measures are taken, monitor to check that they are effective.
- Plan enough time for drivers to have a rest and to relax between journeys (tour orders); drivers must be fully rested before working.
- Prevent time pressure.
- Avoid driving at night.

Source: Berufsgenossenschaft für Fahrzeughaltungen (German statutory accident insurance body for transport).

Case 39: 'Fatigue caused road accident'

Who: Driver of a motor coach and four of the passengers.

Job: Driving on a highway, passenger transport.

Injury: Fatal injuries.

How: The driver of a semi-trailer truck fell asleep while driving on the highway. His vehicle left the right-hand lane then overturned, blocking the highway. One minute later a coach came along the highway. The driver was not able to see the truck blocking the highway and crashed into it. The driver and four passengers died from fatal injuries.

Reasons: The driver of the semi-trailer failed to use his off-duty time to get enough sleep before driving the vehicle.

Advisable preventive measures:

- Assessing the risk of passenger transport.
- Planning enough time for the drivers to have a rest and to relax between jobs; drivers must be fully rested before starting work.
- Preventing time pressure.
- Avoiding night-time journeys.
- Planning two drivers, so they can take turns to drive on long journeys.

Source: Safety Service Company, 2008, *Fatigue cause more and more Transportation Accidents*, safety blog:

<http://www.safetyservicescompany.com/blog/fatigue-cause-of-more-and-more-transportation-accidents>)

Case 40: 'School bus accident caused by distraction'

Who: 21 children and the bus driver.

Job: School bus, transport of children.

Injury: Unknown.

How: The bus driver lost control while taking a left curve on the road. The bus went off the road and fell into a ditch 2 m deep. It is not clear how the accident happened, but the police assumed that the driver was distracted for a short time. An alcohol test was negative.

Reason: Probably distraction.

Advisable preventive measures:

- Assessing the risk of driving school buses.
- Implementing standard safety rules for driving school buses.
- Training for bus drivers on how to avoid distraction in school buses.
- Planning enough time for the drivers to have a rest and to relax between jobs; drivers must be fully rested before starting work.
- Preventing time pressure .

Source: Passauer Neue Presse PNP, 6.12.2008, <http://www.pnp.de/nachrichten/artikel.php?cid=29-22462322&Ressort=bay&BNR=0>

5.3 Alcohol and drug abuse

Long hours cause psychological stress and may lead the driver to use stimulating drugs which are potentially addictive. Even though European legislation regulates the driving time in the road transport sector (Regulation No. 561/2006 EC) drivers are still on the road for long periods, sometimes even more than 40 hours. In order to cope with this workload, drivers may take stimulants (ORF, 2006). Time pressure, stress and peer pressure may lead to drug and alcohol use (Millies, 1998).

The fact that drivers don't have the opportunity to consult a doctor while driving may cause drivers to take over-the-counter medicines that may influence their driving activity. Many common medicines influence driving capacity by lowering concentration, alertness and reaction rate and can even be the cause of accidents (Deutscher Verkehrssicherheitsrat DVR, 2008b).

Case 41: 'Rear end accident caused by fatigue and drug abuse'

Who: Driver of a heavy load vehicle (HLV).

Job: Freight transport on the highway.

Injury: Fatal injuries.

How: The driver of the HLV drove without reducing his speed into a line of cars on the motorway. The car in front of him saw the HLV driving at full speed and tried to take evasive action. The HLV struck the car and pushed it to the other side of the road. Then it crashed against the rear end without braking. The HLV driver died in his cab. In the cab the police found various medicines for treating an infection and stress, as well as a letter indicating that the driver suffered from sleep apnoea. A blood test showed that he had also drunk alcohol.

Reason: The driver suffered from sleep apnoea and consumed alcohol and medicines. This led to a complete loss of control.

Preventive measures:

- Regularly checking the driver's fitness and physical ability to drive.
- Informing drivers about the effect that drugs and alcohol have on their driving ability.
- Planning enough time for the drivers to have a rest while on the road, and to relax between assignments.
- Preventing time pressure.
- Avoiding night driving.
- Planning two drivers to take turns.

Source: Berufsgenossenschaft für Fahrzeughaltungen (German statutory accident insurance body for transport).

5.4 Illness

Normally people can visit a physician whenever they want if they have health problems. Long-distance drivers are not in a position to do so, however, because they are often on the road for long periods and cannot take time off to see a doctor because it would interfere with their delivery schedules. Hence drivers often ignore their health problems and carry on driving with headaches and other health impairments, or take over-the-counter medicines to relieve pain (DocStop, 2008). But this can be very dangerous for the drivers and other road users. For example, case 41 above in the section on alcohol drug abuse appears to include an element of self-medication for an illness among the contributing factors.

5.5 Violence

Violence is a source of occupational risk in the transport sector. According to the ESWC 2005, workers in the transport sector, except for those in the water transport sector, seem to be more vulnerable to physical violence from other people than the average working population. About 11.0% of land transport workers say they are subject to physical violence from other people as compared to 4.3% in the working population as a whole.

Table 3: Have you personally been subjected at work to physical violence from other people? EU-27, European Survey on Working Conditions, ESWC 2005

	%
Land transport; transport via pipelines	11.0
Water transport	2
Air transport	10.8
Total EU-27	4.3

The transport sector is affected by different aspects of violence. Public transport workers are often victims of attacks by drunken, drugged or angry passengers, as well as criminals. They are more at risk than other working people because they often work alone (taxi driver, bus driver), carry cash in their vehicles which may attract theft and robbery, and they have direct contact with clients (HSE, 2008b).

The risk of being attacked by angry passengers is higher in the afternoon or early evening, when passengers are returning from work, particularly if they have had a long wait for a bus. In the evening and at night it is more likely that drivers will be attacked by drunken and drugged clients.

The Belgian Transport Workers Union (ABVV- BTB) launched an awareness campaign against aggression, because workers in public transport were being attacked regularly by customers.

Although in 2006 only one case of aggression was registered, road transport union OGBL-ACAL said that the situation in the private sector was much more serious than the statistics indicated. Taxi drivers and bus drivers were asked to fill in a questionnaire. Six different topics were investigated: work organisation, human resources, support, social aspects, 'on the road', and personal aspects.

About 71% of the truck drivers considered aggression of other drivers or passengers as an extra burden for their job and 69% were annoyed by the behaviour of other drivers. Another important issue was the discrepancy in instructions received from the clients compared with their own company's instructions.

A specific issue relating to violence is the increasing number of truck thefts. Research revealed that in 80% of all truck thefts, it was the freight that the thieves were interested in (Vorst, 1999). Several prevention strategies are necessary to overcome this increasing problem, e.g.:

- a manual for drivers that mentions what to do to prevent thefts and how to react in case of thefts;
- clear instructions on how to handle the load, how to use safety systems, where to park trucks, etc.

(OGBL-ACAL, 2006).

Case 42: 'Taxi driver attacked'

Who: Taxi driver.

Job: Driving clients.

Injury: Laceration on the forehead.

How: The driver received a call to pick up a client at 4 am. He drove to the address and rang the doorbell. At that moment three men surrounded him and attacked him. One of the men had a gun and threatened the driver. They forced him to hand over his money. As the driver didn't react promptly he was hit over the head with the gun. The criminals took his money and escaped.

Reason: Lone working at night, handling money.

Preventive measures:

- Assessing the risk of driving at night and alone.
- Ensuring regular contact with the driver, keeping in touch with drivers.
- Train the driver on how to handle difficult clients (e.g. aggressive and drunken clients).
- Train the driver on how to react in case of aggression and violence.
- Driver stays in the car and rings the client on arrival.

Source: news in Taxi heute, from 11.04.2007, 'Taxler in München überfallen' www.taxi-heute.de/nachricht/news.php?pos=180&arch=1)

Case 43: 'Truck driver attacked'

Who: Truck driver.

Job: Driving.

Injury: Facial injuries.

How: A truck driver was assaulted after a traffic row escalated. The driver of a small van attempted to pass the victim's truck in a dangerous manner. Subsequently the van braked dangerously in front of the truck, provoking the victim into making an agitated hand gesture. Eventually, both vehicles came to a stop. The van driver proceeded to physically assault the victim, hitting him in the face four times and also assaulting witnesses.

Reasons: Escalating traffic row.

Preventive measures:

- Train the driver on how to react when confronted with aggression and violence.
- Train the driver in defensive driving.

Source: Transport-online.nl, 11-04-2008, 'Vrachtwagenchauffeur mishandelt bij verkeersruzie'
<http://www.transport-online.nl/site/transportnieuws/index.php?news=3850>

Case 44: 'Bus driver hit by drunken passengers'

Who: Female bus driver.

Job: Driving bus.

Injury: Bruises and mental trauma.

How: The bus driver was driving through Berlin, in an area that was not considered risky. Two young women (about 16 years old) got on the bus, both smelling of alcohol. One of them screamed at the bus driver to open the bus door and started to hit her. The bus driver was able to fend off the assailant and closed the bus door. She suffered from bruises and bloody scratches. The next day she wanted to work again, but she wasn't able to because of the traumatic experience. Only after she received psychological support could she resume driving, but she never drove on the route where her attack took place.

Reason: Contact with drunken passengers.

Preventive measures in place: training in how to handle difficult passengers, self-defence courses. The bus driver had taken part in training, but the behaviour of drunk passengers is not predictable.

Preventive measures:

- Ensuring regular contact with the driver, keeping in touch with drivers.
- Train the driver on how to handle difficult clients (e.g. aggressive and drunken clients).
- Train the driver on how to react in case of aggression and violence.
- Physical measures to separate driver and passengers, surveillance measures, emergency contact system, cooperation with the police, well published policy of no tolerance of violence to staff etc.

Source: Katarina Peters, *Man sitzt wie in einem Käfig aus Angst*, Gewalt gegen Busfahrer, spiegel online, 03.11.2008 <http://www.spiegel.de/panorama/justiz/0,1518,592448,00.html>

6. Managing health and safety and promoting a safety culture

6.1. Improving safety management

The way the transport sector operates and conditions of employment in the sector are an important factor influencing occupational road safety. Research suggests that pay and conditions, training, procedures, planning, incident management, feedback and communications are organisational factors associated with occupational road risk (Saltzman & Belzer, 2007). Poor management systems increase driver stress and fatigue, which in turn increases work-related road risk.

Prevention strategies for employers

US national institute NIOSH provide some key areas that employers need to pay attention to in order to manage occupational road safety (NIOSH Publication No. 2004-136). They point out that unlike other workplaces, the roadway is not a closed environment. Preventing work-related roadway crashes requires strategies that combine traffic safety principles and sound safety management practices.



© Wiktor Pawlik

Courtesy of the Occupational Safety Poster Competition organised by the Central Institute for Labour Protection – National Research Institute, Poland

Although employers cannot control roadway conditions, they can define which specific routes are to be used, and promote safe driving behaviour by providing safety information to workers and by setting and enforcing driver safety policies. NIOSH emphasises that crashes are not an unavoidable part of doing business and set out some basic steps that employers can take to protect their employees and their companies:

Policies

- Assign a key member of the management team responsibility and authority to set and enforce comprehensive driver safety policy.
- Enforce mandatory seat belt use.
- Do not require workers to drive irregular hours or far beyond their normal working hours.
- Do not require workers to conduct business on a mobile phone while driving.
- Develop work schedules that allow employees to obey speed limits and to follow applicable hours-of-service regulations.
- Align the policy with road traffic legislation, driving times legislation and highway codes.¹

Vehicle Management

- Adopt a structured vehicle maintenance programme.
- Provide company vehicles that offer the highest possible levels of occupant protection.
- Ensure vehicles are right for the job (task, terrain etc)².

Safety Programmes

¹ N.B. this is an additional item, which is not in the NIOSH list

² N.B. this is an additional item, which is not in the NIOSH list

A review of accidents and injuries to road transport drivers

- Teach workers strategies for recognising and managing driver fatigue and in-vehicle distractions.
- Provide training to workers operating specialised motor vehicles or equipment.
- Emphasise to workers the need to follow safe driving practices on and off the job.

Driver Performance

- Ensure that workers assigned to drive on the job have a valid driver's license and one that is appropriate for the type of vehicle to be driven.
- Check driving records of prospective employees, and perform periodic rechecks after hiring.
- Maintain complete and accurate records of workers' driving performance.

Providing a vehicle in poor condition is tantamount to letting workers operate dangerous machinery (European Commission, 2009a):

Employers should:

- have a structured vehicle maintenance programme;
- identify a responsible person;
- plan for the servicing of vehicles:
 - define servicing requirements;
 - set frequency of controls according to conditions under which vehicles are used;
- monitor the status of vehicles on a daily basis;
- create and maintain a service history for each vehicle;
- require vehicle hire companies, owner-drivers and contractors to have their vehicles properly maintained and serviced regularly.

Regular vehicle inspection and maintenance should pay special attention to:

- brakes;
- steering;
- tyres;
- mirrors and any fittings that allow the driver to see clearly (for example, CCTV cameras);
- windscreen washers and wipers;
- warning devices (for example hooters, reversing alarms or lights);
- ladders, steps, or walkways;
- pipes, pneumatic or hydraulic hoses, rams, outriggers, lifting systems or other moving parts or systems;
- specific safety systems, for example, control interlocks to prevent the vehicle or its equipment from moving unintentionally, racking, securing points for ropes.

Drivers should:

- be requested to report any problems encountered during use – according to established administrative procedures (report form, intervention request form etc.);
- be encouraged to check tyres, lights and indicators at the start of every shift;
- be provided with a list of daily and weekly checks to sign off for their vehicles.

Driver competence, cooperation and involvement

When managing road safety the following are relevant regarding drivers:

- Driver competence, licence to drive the type of vehicle, and attitudes on recruitment.
- Instruction and training regarding driving skills, vehicle manoeuvring and knowledge and familiarisation with the vehicle.
- Instruction and training regarding non-driving risks.
- Knowledge of what to do in an emergency.
- Defining clear procedures and making sure drivers know their responsibilities.
- Fitness to drive.
- Attitude and behaviour.
- Adjustable features of vehicle cabs.
- Involvement in identifying and managing risks, using their knowledge and experience.

Drivers, whether owner-drivers or directly employed, need to cooperate with their employer or contracting organisation, and follow health and safety procedures and road safety regulations and advice. For example, they need to take responsibility for wearing a seatbelt and avoiding distracting tasks such as taking mobile phone calls whilst driving or eating, drinking, or adjusting non-critical vehicle controls. Drivers should also be encouraged to check their vehicles according to instructions provided by the employer. Employers should make sure that drivers are aware of their responsibilities and listen to their' views concerning road safety. Drivers should be informed of and involved in prevention strategies, including planning and implementation. They should report problems or incidents.

If enterprises contract owner-drivers they can still specify standards for vehicle maintenance, safety features, seat belt and mobile phone use, training and experience etc. Driving schedules, routes etc. and safety procedures will often be directly or indirectly under the control of the enterprise. (Factsheet 18,European Agency for Safety and Health at Work (EU-OSHA), 2001b)

Leadership in road safety management - setting the culture and a positive approach

- Ensure that you and your supervisors lead by example. Set a pattern for others to follow by the way you drive yourself.
- Consult staff and listen to their views.
- See that any lessons to be learnt from experience are shared and fed back to promote safer driving.
- Recognise, celebrate and reward safe driving achievements.
- While staff should be required to report all road traffic offences, in the first instance always consider help and support, rather than disciplinary action.
- Keep the topic live by always focusing on road safety in meetings, internal memos, briefings, staff appraisals etc.

(RoSPA, *Managing occupational road risk: advice for SMEs*, UK)

Working hours and time pressures

Human fatigue is now recognised around the world as being the main cause of accidents in the transport industry (Australian House of Representatives Standing Committee on Communications 2000).

Special attention needs to be paid to working hours and time schedules. The road transport sector faces enormous and increasing competitive pressure. The stress of competition for small companies or freelancers influences the working conditions as well as the employment conditions in the transport sector. Drivers face longer journeys with increasing distances between enterprise and clients, increasingly tight delivery schedules that have to fit in with 'just-in-time' operations and more demanding clients. This creates more time pressure for drivers and a constant feeling of being in a hurry. Just-in-time operations are the result of a clear trend towards higher demands from customers for precision, speed and flexibility in the delivery of goods (European Survey on Working Conditions, 2005; European Commission 2009a).

The time pressure resulting from competition is responsible for many of the hazards (accident risks) in the transport sector:

Time pressure			
Working hours (long working hours, evening work, inadequate rest periods)	Training (lack of training)	Maintenance (poor maintenance)	Organisation (Just in time principle)
Fatigue			
Influence on accidents due to			
stress and workload	overload	vehicle condition	stress and workload
coupling/uncoupling	coupling/uncoupling	equipment condition	road condition (planning of routes!)
loading/unloading	loading/unloading	handling dangerous substances	loading/unloading
unsafe driving	unsafe driving		
distraction			

Long working hours, evening work and inadequate rest periods are among the main reasons for fatigue and the resulting loss of alertness, loss of concentration and slower reaction time. Fatigue is a growing health and safety concern for the road transport sector. It is the workplace hazard that is the main cause of thousands of road transport accidents and fatalities each year (ILO, 2005). Although fatigue cannot always be avoided, it can be better managed (Beaulieu, 2005). The working time regulation in the European Union (Regulation (EC) No 561/2006) sets minimal standards for working time, driving and rest periods. But every time the regulations on working hours and tachographs are ignored or circumvented, the lives of drivers, passengers and other road users are put at risk.

Loading and unloading also contributes to fatigue. If possible trained personnel other than drivers should do the loading and unloading. Planning of rest periods should take account of both loading work and driving.

Driving at excessive speed is also often a consequence of the highly competitive nature of the industry, because drivers are often forced to travel faster than the speed limit to maintain their schedules.

The European Commission (2009a) emphasise that the management and planning of journeys (departure times, travel time etc.) is a key element in the reduction of occupational road traffic accidents. Trips should be planned in advance on the premises of the enterprise, not at the last

moment or while on the road. Trip planning prior to departure should cover: appropriate scheduling of appointments; planning of rounds; choice of itineraries; estimation of distance covered; observations of break; times management of emergencies and delays, etc. It is particularly important to pay attention to the management of emergencies and delays when organising driving work.

Employers need to provide realistic time frames for contact with clients and deliveries so that drivers do not work irregular hours or extend their workday far beyond their normal working hours. They must establish timetables that allow drivers to obey speed limits and follow applicable hours-of-service regulations. Therefore employers need to involve contractors, regular clients and/or suppliers in the planning and organisation of driving work. Clients should also be made aware of other road safety measures, such as that drivers will not take mobile phone calls when out on the road. There should be cooperation between parties in the delivery chain to ensure coordination over safety for both pick up and delivery of goods (e.g. manual handling, entry to sites).

The European Commission (2009a) point out that effective cooperation on the prevention of road traffic risks will enable: better organisation of rounds, with emphasis on planning in order to better understand the time constraints specified by the client and organise rounds accordingly; the integration of safety considerations when setting deadlines for delivery and; better coordination of tasks for the receipt or delivery of goods.

Set limits in the daily distances and time spent driving, both during the day and night. Rules and regulations on driving and rest times must be observed (European Commission, 2009a.)

Make it clear that drivers must not speed. Don't set impossible schedules and deadlines. Avoid systems of work (for example, 'just-in-time' delivery, payment by number of calls made, 'job-and-finish', unrealistic guaranteed call-out or delivery times etc.) which may encourage speeding. (RoSPA, *Managing occupational road risk: advice for SMEs*, UK.)

Training, instruction and safety culture

Another big issue for road transport accidents identified in this report is the lack of training and instruction for drivers regarding the multifaceted (different) tasks drivers have to perform. Different transport vehicles, for example heavy goods vehicles, deliver vans and mini buses have very different characteristics and so may require drivers to have specific competences. Technology is advancing and drivers need to be trained regularly to use the new technologies, as well as to handle vehicles equipped with new technologies. Driving many thousands of kilometres per year, perhaps in difficult circumstances (wet roads, icy roads, poor visibility etc.) also requires specific skills.

As drivers are often responsible for loading and unloading their goods as well as securing the loads they have to transport, they need to be trained to perform these tasks safely. For this reason regular training regarding loading and unloading, and safe carriage of goods, should be provided for drivers.

The security of your load, your life and the life of others relies on proper load restraint (National Transport Commission, Australia, 2004).

Drivers of light lorries in particular often receive no training in loading, unloading and the safe carriage of goods (tie-down of goods). They are not generally given special training for road transport in the same way that truck drivers are, although they sometimes carry very heavy, dangerous or fragile goods. Training should cover driving risks, defensive driving techniques and non-driving hazards.

Suitable training for all professional drivers, as part of a broader risk management system, would help in reducing accidents. However there needs to be an effective management of safety culture in order for workers to develop the competencies required to do the job, and develop appropriate attitudes in relation to safety.

- Consider drivers' attitudes and their driving competence on recruitment and as necessary thereafter.
- Assess drivers while driving or by using online tools. Ask them about their crash histories and driving infringements/penalty points.
- Invest in extra driver training, for example, for those particularly exposed to occupational road traffic risks or with greater development needs such as younger workers.
- Draw up a checklist of competences that drivers require.
- Define additional training needs – driving is only useful if it is adapted to the activity carried out: type of vehicle, distance travelled, load-securing techniques and driving with heavy loads, manoeuvring etc.
- Establish a training plan and subsequent monitoring.
- Driver training can be complemented by first aid training to minimise the consequences of accidents.
- Carry out regular monitoring and update of drivers' competences.
- Train older, experienced workers to coach and mentor younger and new workers.
- Training should cover non-driving risks such as manual handling, prevention of falls from cabs etc.

More advice on managing occupational road safety is given in *Factsheet 18: Preventing road accidents involving heavy goods vehicles*, European Agency for Safety and Health at Work (EU-OSHA), 2001b – this factsheet includes advice for drivers as well; *Causes and circumstances of accidents at work in the EU*, European Commission, 2009; *Managing occupational road risk: advice for SMEs*, RoSPA, UK, undated. *Managing risks in road transport*, European Agency for Safety and Health at Work (EU-OSHA), in print, provides good practice case studies.

Strategies to improve safety culture

Research in the UK (Bomel Ltd, 2004) suggests that work-related road safety could be improved by improving the safety culture. The report makes a number of recommendations about how to improve safety culture.

The report suggests that governments, companies and other stakeholders should consider aspects of safety culture when addressing work-related road safety issues, in particular training, procedures, planning, incident management/feedback, management/supervision and safety communications. In particular, they should be encouraged to look at how the various parts of the company culture (e.g. training, procedures, planning, incident management) apply to driving safety and assess their own areas of weakness and strength, as well as considering how to improve the culture. To learn about causal factors in driving incidents workplaces need to improve incident reporting and feedback. Information about risks can be shared to improve the safety of all drivers. SMEs must be persuaded of the importance of taking into account road risk and the benefits of encouraging a safety culture.

The report also recommends the following:

- All stakeholders in the company need to be consulted on problem areas and solutions to ensure that driving risk management is likely to be effective. Employee representative bodies should be used to help influence this process.
- To facilitate the adoption of a safety culture, governments should help identify 'good practice' companies as a platform for raising industry standards in general. This could include initiatives to increase the value of driver professionalism (e.g. accreditation of company driver training and award schemes, raising the public profile of professional drivers (the ETSC PRAISE project is an example of an award scheme)).
- Publicity campaigns are needed to increase public awareness of work-related road risk.

- As a lever to improve safety the financial benefits of managing road risk should be emphasised.
- Governments need to consider legislation that will help reduce injuries

There are many roles that the different stakeholders could play. For example:

Employer associations are in a position promote good practices among their members. The 'responsible care' programme of the European Chemical Transport Association is one such initiative.

Safety organisations and safety professionals can help make the general public aware about sharing the road safely with trucks and other large commercial vehicles. This information could be incorporated into driver education courses, drivers' manuals and workplace driver training programmes. *Insurance organisations* can set requirements, implement incentives for improved performance, produce guidance and promote awareness.

Better safety, lower costs, caring for the environment

- Road sector generates over 93% of EU transport and 20% of EU greenhouse gas emissions, with passenger cars responsible for around 12%.
- Between 1990 and 2004 road emissions have risen by 26%.

Speeding in particular amplifies the environmental impact of road transport. Managing driving speeds is therefore a very effective carbon abatement policy. In the EU speeding also contributes to as much as one third of all road deaths. Reducing speed through the enforcement of speed limits and technologies such as Intelligent Speed Assistance can save lives and mitigate global warming at the same time.

- At any one moment, 50% of drivers exceed legal speed limits (OECD data).
- Driven speeds on motorways in particular are well above the optimum level for fuel efficiency.
- Controlling the speed of heavy vehicles, including vans and light trucks, can also play an important role in cutting CO₂, especially considering the constant increase of freight transport.
- In addition to bringing about great casualty reductions, fitting vehicles with Intelligent Speed Assistance has also been demonstrated to mitigate CO₂ emissions.

Source: ETSC leaflet, http://www.etsc.eu/documents/Leaflet_ETSC.pdf

7. Conclusions



© Sabin-Stelian Todorean, EU-OSHA Photo Competition 2009

Road accidents and other accidents to transport drivers remain high, The examples covered in this report demonstrate the variety of factors involved in causing road accidents involving transport vehicles. In addition they provide an insight into the variety of non-driving accidents to professional drivers and their cause.

The cases provide graphic evidence of both the human consequences and the material costs of the accidents. They also provide insight into the steps that could have been taken to avoid the accidents. Only by attention to improved health and safety management and the promotion of a safety culture throughout the sector will the accident and ill health rate among drivers be reduced. Road risk needs to be integrated into health and safety management and health and safety management needs to be integrated into general management. It is particularly important that all parts of the delivery chain cooperate on safety, and for employers to set standards for their contracted delivery services/ owner-drivers.

When accidents happen, it is important that employers learn as much from them as possible. As part of risk assessment to define a prevention strategy, all occupational road traffic accidents which have occurred in the course of the past years should be analysed. Such an analysis should include looking at material damage, physical injuries, preventive measures implemented and any direct or indirect costs (European Commission 2009a). All work accidents and 'near-misses', including road traffic accidents, should be reported by drivers and investigated and the prevention strategy modified if shown to be necessary.

For the company, activity to improve the safety and health of its drivers is profitable: a reduction in material accidents, expenditure on fuel and wear of vehicles and especially a reduction in accidents to people with serious consequences. The company stands to gain in both productivity and quality. In addition, associated with the saving in fuel and reduction in accidents, improved occupational road safety is related to the concept of sustainable development (Eurogip, 2009).

Accidents involving transport accidents make a significant contribution to the overall numbers of road accidents and the severity of outcome. This underlines the continuing need for the various actors involved in road safety to work together to gain a clear understanding of the issues, set objectives and determine coordinated strategies for action

8. Table giving overview of accident reports

Case	Title	Issue	Injury	Source
1	High speed in spite of bad weather	Unsafe driving	Fatal injuries	Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector
2	Driver fatally crushed by cargo	Overload and other cargo problems	Fatal injuries	News: SWR, 2005, Transporter: zu schwer, zu voll, zu schnell
3	Unbalanced load	Overload and other cargo problems	No injuries, material damages	Lampen, A., 2003, Ladungssicherung: Falsche Lastverteilung, Berufskraftfahrer-Zeitung, 07-08/2003, p. 18-19
4	Light lorry driver struck by load	Overload and other cargo problems	Severe head injuries	News: Karla, W., 2008, Unfall auf der A 45: Transporter-Fahrer von Paketen beinahe erschlagen, Ruhr Nachrichten
5	Driving a truck filled with dangerous substances	Dangerous substances	Fatal injuries	De Onderzoeksraad Voor Veiligheid
6	Truck filled with ethylacetate	Dangerous substances	No injuries	De Onderzoeksraad Voor Veiligheid
7	Driving a minibus on a mountain road	Road condition	Fatal and severe injuries	Office of Transport Safety Investigations OTSI, 2006, Bus Safety Investigation Report – Bus safety investigation – Jumbo travel – Jamberoo Mountain Road,
8	Driving a tractor on a wet road	Weather condition	No injuries; material damage	Occupational Accident Insurance – Luxembourg
9	Driving a truck in a storm	Weather condition	No injuries; material damage	Occupational Accident Insurance – Luxembourg
10	Rain shower surprises truck driver	Weather condition	Severe injuries	Occupational Accident Insurance – Luxembourg

A review of accidents and injuries to road transport drivers

Case	Title	Issue	Injury	Source
11	Brake failure of a scheduled passenger bus	Vehicle condition	No injuries, material damage	Occupational Accident Insurance – Luxembourg
12	Brake failure	Vehicle condition	Fatal injuries	News: Panorama, 2007, Kerkrade: Bewährungsstrafen verhängt, WDR
13	Serious road tanker accidents caused by defective brakes	Vehicle condition	Fatal and serious injuries	News: Anonymus, 1987, Wikipedia, 2008; Posluschni and Göbel, 2007; Anonymus, 2007; VMBG, 2003
14	Driver loses control of the vehicle because of a coughing and sneezing fit	Loss of control	Fractures and bruises	Driver loses control of the vehicle because of a coughing and sneezing fit
15	Loss of control during manoeuvre	Loss of control	No injuries; material damage	Occupational Accident Insurance – Luxembourg
16	Loss of control while avoiding another truck	Loss of control	Serious injuries	Occupational Accident Insurance – Luxembourg
17	Temporary worker crushed by trailer during coupling	Coupling and uncoupling, unsafe parking	Serious injuries of lung and body	BGHW, 2004, LKW-Fahrer übersieht Aushilfskraft, Unfall-Stop Heft 5/2004, p.4
18	Coupling of trailer	Coupling and uncoupling, unsafe parking	Fatal injuries	Holz BG (German accident insurance for the woodworking industry)
19	Driver crushed between trailer and vehicle	Coupling and uncoupling, unsafe parking	Fatal injuries	Police news, Germany: http://www.presseportal.de/polizeipresse/pm/7304/245431/polizei_bonn?pre=1

A review of accidents and injuries to road transport drivers

Case	Title	Issue	Injury	Source
20	Young worker died because of unsafe coupling practice	Coupling and uncoupling, unsafe parking	Fatal injuries	Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector
21	Coupling without parking mechanically	Coupling and uncoupling, unsafe parking	Serious injuries	Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector
22	Driver falls off trailer's canvas platform while loading truck	Falls from vehicles, platforms or while loading	Broken wrist	Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium
23	Driver falls off tailboard while handling 900 kg pallet Truck	Falls from vehicles, platforms or while loading	Fractures	Labour and Social Dialogue – Belgium
24	Driver sustains head injury while opening a container	Falls from vehicles, platforms or while loading	Fracture	Labour and Social Dialogue – Belgium
25	Driver falls through semi-trailer's wooden floor	Falls from vehicles, platforms or while loading	Fracture	Labour and Social Dialogue – Belgium
26	Driver falls off semi-trailer while checking his cargo	Falls from vehicles, platforms or while loading	Fracture	Labour and Social Dialogue – Belgium
27	Truck driver killed when struck by laminated veneer beams falling from a forklift	Being struck by falling objects or loads	Fatal injuries	Fatality Assessment and Control Evaluation (FACE)

A review of accidents and injuries to road transport drivers

Case	Title	Issue	Injury	Source
28	Driver turned over with his truck while unloading waste paper	Being struck by falling objects or loads	No information	News: http://vorarlberg.orf.at/stories/152621
29	Driver trapped between a pallet truck and cargo hold	Being struck by falling objects or loads	Fracture	Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium
30	Insufficient knowledge of loading technique	Being struck by falling objects or loads	Fatal injuries	Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector
31	Unloading contaminated containers	Handling dangerous substances	Serious injuries	Various news sources and internal interviews
32	Workers suffer carbon monoxide poisoning during straining assignment using forklift trucks	Handling dangerous substances	Poisoned by CO	Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium
33	Burns caused by hot bitumen	Handling dangerous substances	Second-degree burns	Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector
34	Confusing the reverse with the forward gear	Car maintenance		Labour Inspection of the Federal Public Service Employment, Labour and Social Dialogue – Belgium
35	Explosion while jump-starting a bus	Car maintenance	Serious injuries	Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector

A review of accidents and injuries to road transport drivers

Case	Title	Issue	Injury	Source
36	Truck slipped from the lifting jack	Car maintenance	Fractures	Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector
37	Confusing the reverse with the forward gear	Time pressure	Bruises	Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector
38	Sleep apnoea	Fatigue, distraction	Fatality; driver went into shock	Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector
39	Fatigue caused road accident	Fatigue, distraction	Fatal	Safety Service Company, 2008, <i>Fatigue causes more and more Transportation Accidents</i>
40	School bus accident caused by distraction	Fatigue, distraction	Unknown	News: Passauer Neue Presse PNP, 6.12.2008
41	Rear-end accident caused by fatigue and drug abuse	Alcohol, drug abuse – self medication	Fatal	Berufsgenossenschaft für Fahrzeughaltungen (BFG): German statutory accident insurance body for transport sector
42	Taxi driver attacked	Violence	Laceration	News: Taxi heute, from 11.04.2007, 'Taxler in München überfallen'.
43	Truck driver attacked	Violence	Facial injuries	Transport-online.nl, 11-04-2008, 'Vrachtwagenchauffeur mishandelt bij verkeersruzie'.
44	Bus driver hit by drunken passengers	Violence	Bruises, psychological trauma	Katarina Peters, <i>Man sitzt wie in einem Käfig aus Angst, Gewalt gegen Busfahrer</i> , spiegel online

9. References and bibliography

ABVV-BTB, Wegwijs april/mei/juni 2002.

Analysegruppen for Vejtrafikuheld AVU, *Lastbiluheld – en dybdeanalyse af 21 uheld*, AVU-rapport nr. 3, 2001.

http://www.trm.dk/graphics/Synkron-Library/DTF/PDF/PDF_Andet/AVUrap0301.pdf

Andrey, J., Mills, B., Vandermolen, J., *Weather Information and Road Safety*, Institute for Catastrophic Loss Reduction, 2001.

<http://www.iclr.org/pdf/Road%20Safety%20-%20Jean%20Andrey.pdf>

Anonymous, *Mörderische Praxis*, Der Spiegel 29/1987, 1987.

<https://wissen.spiegel.de/wissen/dokument/dokument.html?id=13523836&top=SPIEGEL>

Anonymous, *Die Brandkatastrophe von Herborn*, hr online.de, 2007.

http://www.hr-online.de/website/specials/home/index.jsp?rubrik=26238&key=standard_document_31882850

Australian House of Representatives Standing Committee on Communications, *Transport and the Arts: Report: Beyond the Midnight Oil: An inquiry into managing fatigue in transport* (Canberra, 2000).

bast (Bundesanstalt für Straßenwesen), *Unfallgeschehen mit schweren LKW über 12 t*, Berichte der Bundesanstalt für Straßenwesen, Mensch und Sicherheit, Heft M 156, 72 pp., 2004.

bast (Bundesanstalt für Straßenwesen), *Verhaltensbezogene Ursachen schwere LKW-Unfälle*, Berichte der Bundesanstalt für Straßenwesen, Mensch und Sicherheit, Heft M 174, 40 pp., 2005.

Beaulieu, J.K., *The Issue of Fatigue and Working Time in the Road Transport Sector*, ILO, WP 232, 2005,

<http://www.ilo.org/public/english/dialogue/sector/papers/transport/wp232.pdf>

Becker, Miriam, *Be- und Entladen von LKW Gefährliche Nebensache*, Arbeit und Gesundheit online, Oktober 2006.

http://www.arbeit-und-gesundheit.de/webcom/show_article.php/ c-376/ nr-2/ p-1/i.html
(January 2009)

Berg, A., Niewöhner W., Rücker, P., Groer, M., *Sicherheit von Transportern* Aktualisierte Unfallanalysen, Befragungen und Tests, DEKRA, 2004.

http://serv.dekra.bawue.com/dekra_net/develop/content_net/psfile/pdfdown/64/15_Berg_de41da845da3867

Berufsgenossenschaft für Fahrzeughaltungen, BGF, *Sicheres Kuppeln von Fahrzeugen*, BGI 599, 2003.

<http://www.arbeitssicherheit.de/arbeitssicherheit/html/modules/bgi550599/550-599/bgi599.pdf>

BG Druck und Papier, *Kleintransporter – Ladungssicherung ist lebenswichtig*, Tag für Tag, 6, 2001.

<http://www.bgdp.de/pages/service/download/tft/2001/tft-2001-6-S26.pdf> and website,
<http://www.bgdp.de/pages/arbeitsicherheit/grundinfo/verkehrssicherheit/tft-2001-6-S26.htm>

BGF, *Transporter Sicherheit: Der sicherheits-optimierte Kastenwagen*, B051, 2004a.

<http://www.bgf.de/sites/3/11.html>

BGF, *Gesund und sicher – Arbeitsplatz Transporter* B056, Bordbuch, 2004b.

<http://www.bgf.de/sites/3/11.html>

BGF, *Gefährliche Nebensache*, Sicherheitspartner online 02/2007, 2007.

http://www.bgf.de/sites/3/sipa/02_2007/sipa02_2007_12u13.pdf

- BGHW, *LKW-Fahrer übersieht Aushilfskraft*, Unfall-Stop Heft 5/2004, p.4, 2004
http://www.bghw.de/medienangebot/sparte-grosshandel-und-lagerei/archiv_unfallstop/archiv/jahrgang-2004/unfall-stop-heft-5-september-2004/seite4f.pdf/view
- Blankennagel, *Weniger Unfälle, mehr Opfer*, Berliner Zeitung, 2006.
<http://www.berlinonline.de/berliner-zeitung/archiv/.bin/dump.fcgi/2006/0822/brandenburg/0013/index.html>
- Broughton, J., Baughan, C., Pearce, L., Smith, L., Buckle G., *Work-related road accidents*, Prepared for Road Safety Division, Department for Transport, TRL Report TRL582, 2003.
<http://www.orsa.org.uk/guidance/pdfs/trl582.pdf>
- CARE database (DG Energy and Transport), national sources
http://ec.europa.eu/transport/road_safety/observatory/statistics/reports_graphics_en.htm
- Carstensen, G., Hansen, W., Hollnagel, V., Hojgaard, H., Jebsen, Ib, Knies, P., Klit, L., Kofoed, P., Mikkelsen, B., Petersen, K., *Lastbiluheld – en dybdeanalyse af 21 uheld*, Analysegruppen for Vejtrafikuheld (AVU) rapport nr 3, 2001.
http://www.trm.dk/graphics/Synkron-ibrary/DTF/PDF/PDF_Andet/AVUrap0301.pdf
- Ceunen, A., *Naar een veiliger wegtransport*. In: Promosafe 93/2: 6-9, 19, 1993.
- Comité de pilotage national pour la prévention du risque routier, *Livre blanc*, 12 propositions pour un véhicule utilitaire plus sûr, 2007.
http://www.risquesprofessionnels.ameli.fr/atmp_media/LIVREBLANCVU.pdf
- De Onderzoeksraad Voor Veiligheid (OVV), *Tankautobranden met gevaarlijke stoffen*, 2006.
Retrieved from: http://www.onderzoeksraad.nl/publicaties/ovv/veiligheidsstudie_tankautobranden.pdf
- Department for Transport (UK), *An in-depth Study of Work-related Road Traffic Accidents*, Road Safety Research Report No. 58, 2005.
http://www.orsa.org.uk/guidance/pdfs/indepth_study_work_related_road_accidents.pdf
- Department for Transport (UK), *Company vehicle incident reporting and recording (CoVIR) No. 31*, 2008.
<http://www.dft.gov.uk/pgr/roadsafety/research/rsrr/theme5/companyvehicleincidentreport4781?page=3#a1002>
- Deutscher Verkehrssicherheitsrat, *Gewusst wie. Richtige Ladungssicherung spart Kosten und erhöht die Sicherheit*, website, 2008a.
<http://www.dvr.de/site.aspx?url=html/vtn/lkw/ladungssicherung.htm>
- Deutscher Verkehrssicherheitsrat, *Auch freiverkäufliche Arzneien können die Fahrtüchtigkeit erheblich beeinträchtigen*, Presseinformationen, November 2008.
<http://www.dvr.de/site.aspx?url=html/presse/informationen/903.htm>
- DocStop, 2008, Website: http://www.docstoponline.eu/cms/front_content.php
- ERSO – European Road Safety Observatory, *Work-related road safety*, retrieved 14 September 2007 from www.erso.eu, http://www.erso.eu/knowledge/Fixed/60_work/work_related_road_safety.pdf
- ETSC, ETSC leaflet, European Transport Safety Council (ETSC), undated,
http://www.etsc.eu/documents/Leaflet_ETSC.pdf
- ETSC, *The role of driver fatigue in commercial road transport crashes*, European Transport Safety Council (ETSC), 2001.
- ETSC PRAISE website, accessed 11.08.2010 <http://www.etsc.eu/PRAISE.php>
- Eurogip, *Le risque routier encouru par les salariés en Europe*, 2009
- European Agency for Safety and Health at Work (EU-OSHA), *Preventing Vehicle Transport Accidents at the Workplace*, Factsheet 16, 2001a.
http://old.osha.europa.eu/publications/factsheets/16/?set_language=de

- European Agency for Safety and Health at Work (EU-OSHA), *Preventing Road Accidents involving Heavy Goods Vehicles*, Factsheet 18, 2001b.
<http://osha.europa.eu/en/publications/factsheets/18>
- European Agency for Safety and Health at Work (EU-OSHA), *Preventing vehicle accidents in construction*, e-fact issue 02, 2007.
<http://osha.europa.eu/en/publications/e-facts/efact02>
- European Agency for Safety and Health at Work (EU-OSHA), *OSH in figures – OSH in the transport sector – an overview*, 2010
- European Agency for Safety and Health at Work (EU-OSHA), *Managing risks in road transport*, in print.
- European Chemical Transport Association, webpage of the ETCA 'responsible care' programme, accessed 11.08.2010 <http://www.ecta.be/public/content/joinrc/>
- European Commission, *European Best Practice Guidelines on Cargo Securing for Road Transport*, 2006.
http://ec.europa.eu/transport/roadsafety/vehicles/best_practice_guidelines_en.htm
- European Commission, *Causes and circumstances of accidents at work in the EU*, 2009a pp 219-223
http://epp.eurostat.ec.europa.eu/portal/page/portal/health/documents/phase_3_causes_circumstances.pdf
- European Commission, *EU Energy and Transport in Figures (statistical pocketbook)*, 2009b
- European Foundation for the Improvement of Living and Working Conditions, *EU road freight transport sector: Work and employment conditions*, 2004.
<http://www.eurofound.europa.eu/publications/htmlfiles/ef03102.htm>
- European Foundation for the Improvement of Living and Working Conditions, *European Survey on Working Conditions 2005*, Data extracted by Prevent for OSH Data Collection 2007.
<http://www.eurofound.eu.int/working/surveys/index.htm>
- Eurostat, *People killed in road accidents – Number of killed people*, 2006,
<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdtr420>
- Eurostat, *European Union Labour Force Survey*, 2007, Figures available on:
<http://www.epp.eurostat.ec.europa.eu>
- Essenberg, B., *Violence and stress at work in the transport sector*, ILO working paper, 2003.
<http://www.ilo.org/public/english/dialogue/sector/papers/transport/wp205.pdf>
- Haudum, E., *Gedanken zur Ladungssicherung*, Fachverband der Chemischen Industrie Österreich Konferenz: Chemikalien Sicher Transportieren, Wien 2008.
http://www.fcio.at/uploads/05_CST3_127838_EN.pdf
- Holz BG, *Beim „Blättern“ von senkrecht gelagerten Spanplatten tödlich verletzt*, Aktuelle Holzinfo, 2006/1 No. 122, 2001.
<http://www.holz-bg.de/cgi-bin/holzinfo?state=5&id=111>
- Horne, J.A., Reyner, L.A. 'Sleep-related vehicle accidents', *BMJ*, 310 (6979): 565, 1995.
- HSE, *Reducing at-work road traffic incidents*, The Work-Related Road Safety Task Group, Report to Government and the Health and Safety Commission, 2001.
<http://www.hse.gov.uk/roadsafety/experience/traffic1.pdf>
- HSE, *Parking large goods vehicles safely*, INDG 312, 06/02, C250, 2002,
http://www.equai.eu/materials/EN/couplinguncoupling/Parking_LGV_safely.pdf
- HSE, *Driving at work – Managing work-related road safety*, HSE Books, ISBN 0 7176 2740 3, 2003a.
<http://www.dsa.gov.uk/Documents/WRRS/HSE%20Driving%20at%20Work.pdf>
- HSE, *Health and Safety in Road Haulage*, INDG 379, 2003b.

<https://www.hse.gov.uk/forms/transport/wtchk1.pdf>

HSE, *Workplace transport safety*, INDG 199 rev1, revised in 2005 and reprinted in 2006.

<http://www.hse.gov.uk/pubns/indg199.pdf>

HSE, *Analysis of RIDDOR DATA 2000 to 2005 – Falls from Vehicles*, HSL/2007/39, 2007.

http://www.hse.gov.uk/research/hsl_pdf/2007/hsl0739.pdf

HSE, *Work-related violence case studies*, public transport – bus drivers, website, 2008b.

<http://www.hse.gov.uk/violence/hslcasestudies/first.htm>

HSE, *Coupling and uncoupling, vehicles at work*, website, 2008a.

<http://www.hse.gov.uk/workplacetransport/information/coupling.htm>

ILO, *Dangerous substances: Transport and Storage*, International Occupational Safety and Health Information Centre, 2004.

<http://www.ilo.org/public/english/protection/safework/cis/products/safetytm/transpo.htm>

ILO, *Fatigue and working time in the road transport sector*, Transport – recent development, 2005.

<http://www.ilo.org/public/english/dialogue/sector/papers/transport/wp232.pdf>

Institut für Unfallanalysen Hamburg, *Technische Mängel*, IFU Lexikon, 2008,

<http://www.unfallforensik.de/>

IRU (International Road Transport Union), *A scientific Study 'ETAC' European Truck Accident Causation*, Executive Summary and Recommendations, 2007. http://www.iru.org/index/cms-filesystem-action?file=mix-publications/2007_ETACstudy.pdf

Jettinghof, K., Houtman, I.L.D., Evers, M.S. *Oorzaken van vermoedheid bij vrachtwagenchauffeurs in het beroepsgoederenvervoer*. TNO Arbeid, In opdracht

van VenW (DGG), en de Adviesdienst Verkeer en Vervoer (AVV), 2003.

Jones, D., Switzer-McIntyre, S., 'Falls from trucks: A descriptive study based on a workers compensation database', *Work: A Journal of Prevention, Assessment and Rehabilitation*, Vol. 20, No. 3, pp. 179-184, 2003.

Kharazzi, S., Thomsen, R., 'Study of heavy truck accidents with focus on manoeuvres causing loss of control', *International Journal of vehicle safety*, Vol. 3, No. 1, pp. 32- 44, cited in *Science Daily*, 2008, Heavy Trucks: Safety Research Identifies Factors That Lead To Loss Of Control, Accidents, 2008.

<http://www.sciencedaily.com/releases/2008/09/080901085724.htm>

Kuratorium für Verkehrssicherheit, *Ladung richtig sichern*, Verkehr und Mobilität, website, 2005.

<http://www.kfv.at/kuratorium-fuer-verkehrssicherheit/landesstellen/salzburg/presse/presse-details-salzburg/artikel/603/613/bd7abdd4e3/browse/25/>

Kuratorium für Verkehrssicherheit, *Rollendes Risiko*, Verkehr und Mobilität, Unfallursachen: Mangelnde Ladungssicherheit, 2008.

<http://www.kfv.at/verkehr-mobilitaet/unfallursachen/mangelnde-ladungssicherung>

LFS (Labor Force Survey), 2006

<http://www.census.gov.ph/Bicol/LFS/index.html>

Millies, B.A., 'Truck and Bus Driving', ILO, *Encyclopedia of Occupational Health and Safety*, 4th Edition, Vol. 3, No. XVII, Ch. 102, 1998.

<http://www.worksafesask.ca/files/ilo/tra09ae.html>

Nationale gezondheidsenquête, Belgium, 2001

<http://www.iph.fgov.be/epidemiopnl/crospnl/hisnl/table.htm>

National Transport Commission and Roads and Traffic Authority NSW, *Load restraint guide*, ISBN 0 7313 0134 X, 2004.

<http://www.ntc.gov.au/filemedia/Reports/IntroductionLRGDec2004.pdf>

NIOSH, *Truck Driver Occupational Safety and Health*, 2003 Conference Report and Selective Literature Review, 2007.

<http://www.cdc.gov/niosh/docs/2007-120/pdfs/2007-120.pdf>

NIOSH, *Work-related Roadway Crashes: Prevention Strategies for Employers*, NIOSH Publication No. 2004-136. <http://www.cdc.gov/niosh/docs/2004-136/default.html> accessed 11.08.2010

Office of Transport Safety Investigations OTSI, *Bus Safety Investigation Report – Bus safety investigation – Jumbo travel – Jamberoo Mountain Road*, Sidney, 2006

<http://www.otsi.nsw.gov.au/bus/IR-Jamberoo-final.pdf>

OGBL ACAL, *Agressions transport public – OGBL-ACAL lance aujourd’hui campagne de sensibilisation*, 2006.

<http://www.acal.lu/fra/news/90/>

ORF, *Aufputschmittel-Doping seit Jahren ‘bekannt’*, News from ORF, Austria from 10.08.2006.

<http://oesterreich.orf.at/salzburg/stories/128819>

RoSPA, *Managing occupational road risk: advice for small and medium-sized businesses*, Royal Society for the Prevention of Accidents, UK, undated.

Pfundt, K., *Eindrücke zum Unfallgeschehen von Nutzfahrzeugen auf Autobahnen*, Institut für Landes- und Straßenentwicklungsforschung des Landes Nordrhein-Westfalen: Immer diese Brummis?, No. 176, 2001

Pöppel-Decker, M., Schepers, A., Koßmann, I., *Grundlagen streckenbezogener Unfallanalysen auf Bundesautobahnen*, bast-Bericht M 153, 2003.

Posluschni, C., Göbel, S., *Brand und Explosionskatastrophe 1987*, Feuerwehr Herborn, 2007.

http://www.feuerwehr-herborn.de/index.php?option=com_content&task=view&id=17&Itemid=43

Regulation No (EC) 561/2006 of the European Parliament and of the Council of 15 March 2006 on the harmonisation of certain social legislation relating to road transport and amending Council Regulations (EEC) No 3821/85 and (EC) No 2135/98 and repealing Council Regulation (EEC) No 3820/85 (Text with EEA relevance) – Declaration,

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:102:0001:01:EN:HTML>

Reinhardt, O., Kirchner, J.-H., *Verhütung von Unfällen beim Be- und Entladen von Lastkraftwagen*, Schriftenreihe der Bundesanstalt für Arbeitsschutz, Fb 741, pp. 169, 1996.

Reinhardt, O., Kirchner, J.-H., *Verhütung von Unfällen beim Be- und Entladen*, Forschungsergebnisse für die Praxis, Arbeitswissenschaftliche Erkenntnisse No. 105, 1998.

Saltzman, G.M., Belzer, M.H., *Truck Driver Occupational Safety and Health 2003*, Conference Report and Selective Literature Review. NIOSH, CDC, 2007.

<http://www.cdc.gov/niosh/docs/2007-120/pdfs/2007-120.pdf>

Schmid, M., *Unfallbeteiligung von Kleintransportern – 2004*, bast, 2006.

http://www.bast.de/cln_005/nn_42718/DE/Publikationen/Downloads/downloads/kleintransporter-2004,templateld=raw,property=publicationFile.pdf/kleintransporter-2004.pdf

Schmid, M., *Unfallbeteiligung von Kleintransportern – 2006*, bast, 2008.

http://www.bast.de/cln_007/nn_42718/DE/Publikationen/Downloads/downloads/kleintransporter-2006,templateld=raw,property=publicationFile.pdf/kleintransporter-2006.pdf

Scott, A., Miller, M., Hallas, K., *The underlying causes of falls from vehicles associated with slip and trip hazards on steps and floors*, HSE books, research report 437, 2006.

<http://www.hse.gov.uk/research/rrpdf/rr437.pdf>

SWOV, *SWOV Factsheet Vracht- en bestelauto's*. Stichting Wetenschappelijk Onderzoek Verkeersveiligheid, Leidschendam, Nederland, 2008.

Transport Research Laboratory TRL, *Work-related safety*, website, 2008.

http://www.trl.co.uk/consultancy/managing_risk/safety.htm

TRIA project, *Training material for assessing the risk in car repair workshops*, Module 06, 2007.

http://www.aulbremen.de/triatria/en/en_modules/en_m06/en_module_06-03.html

Van Schagen, I.N.L.G., *Vermoeidheid achter het stuur*. Een inventarisatie van oorzaken, gevolgen en maatregelen. Stichting Wetenschappelijk Onderzoek Verkeersveiligheid (SWOV), 2003.

Verkeerscentrum Nederland, *Quick scan vrachtauto-ongevallen op het hoofdwegennet en de invloed op filevorming*. 2005.

Retrieved from: http://www.verkeerenwaterstaat.nl/Images/1130328315_tcm195-143873.pdf

VMBG, *Verantwortung und Haftung*, Herborn Urteil-LG-Limburg, Vorlesung, 2003.

http://www.fhmuenchen.de/fb03/persona/Vorlesung_Arbeitssicherheit/AAA_Folien%20zu%20Skript%202004ff/Verantwortung_BG/F-008.pdf

Vorst, J.L.H., *Diefstal in het wegvervoer: niet alleen een Nederlands probleem*, Handboek Schadepreventie: C5160-1 – C5160-11, 1999.

Wikipedia, *Großbrand von Herborn*, version from 18.11.2008

http://de.wikipedia.org/wiki/Gro%C3%9Fbrand_von_Herborn

WMB, *Flemish Workability Monitor*, SERV, STV- Innovatie & Arbeid, 2004.

<http://www.serv.be/uitgaven/603.pdf>

Wuyts, B., *Implementatie en effectmeting van een interventie bij truckers met een belangrijk gezondheidsrisico*, Katholieke Hogeschool Kempen, Departement Gezondheidszorg en Chemie, Bachelor, Optie Voedings- en dieetkunde, 2007.